14 Receiver

In this clause on receiver measurements, the procedures to test equipment which is fitted with a permanent antenna connector, and the procedures to test equipment which is designed to only be used with an integral antenna, are in general combined into one single test description.

Tests on Mobile Stations fitted with an integral antenna and having no means of connecting an external antenna are specified in terms of received field strength. In order to perform tests on such Mobile Stations without the need for separated access to a calibrated test site a temporary antenna connector is used as defined in annex 1 subclause 1.1.3 (General Conditions).

In practice the temporary antenna connector may be used for transmitter measurements described in clause 3, but the calibration factors determined in annex 1 will not be directly usable. The detailed calibration, when needed, for transmission tests are described in the relevant subclauses of 3.

Wherever in this subclause, for FACCH tests, the SS is required to send a Layer 3 message not requiring a Layer 3 response from the MS the message can be a TEST INTERFACE message or a STATUS message, possibly with an unknown Protocol Discriminator.

Testing philosophy

Certain assumptions concerning the functional mechanisms of GSM receivers have been made in order to define tests that will verify the receiver performance without excessive redundancy and excessive test times.

The receiver functions can be divided into:

- Analogue RF and IF stages that are affected by input levels, temperature and power supply levels.
- Demodulator that is affected by input levels and interfering signals.
- Decoders that are affected by the different logical channels and input levels.

The tests are designed to stress each of these blocks with a minimum of redundancy.

Statistical testing of receiver BER/FER performance

Error Definition

1) Frame Erasure Ratio (FER)

   A frame is defined as erased if the error detection functions in the receiver, operating in accordance with 3GPP TS 05.03, indicate an error (BFI = 1). For full rate or half rate speech this is the result of the cyclic redundancy check (CRC) as well as other processing functions that cause a Bad Frame Indication (BFI). For signalling channels it is the result of the FIRE code or any other block code used. For data traffic FER is not defined.

2) Residual Bit Error Ratio (RBER).

   The Residual Bit Error Ratio is defined as the Bit Error Ratio (BER) in frames which have not been declared as erased.

3) Bit Error Ratio (BER).

   The Bit Error Ratio is defined as the ratio of the bits wrongly received to all data bits sent.

4) Unreliable Frame Ratio (UFR).

   The Unreliable Frame Ratio is defined as the ratio of frames declared as erased (BFI=1), or unreliable (UFI=1), to the total number of frames transmitted. An unreliable frame is indicated by setting the UFI flag (UFI=1) and an erased frame is indicated by setting the BFI flag (BFI=1) (see 3GPP TS 06.21).

5) Erased SID Frame Ratio (ESIDR).

A SID Frame is erased (SID=0) when the MS does not detect a valid transmitted SID frame as a valid SID frame (SID=2), or an invalid SID frame (SID=1). The Erased SID Frame Ratio is defined as the ratio of erased SID frames (SID=0), to the total number of valid SID frames transmitted (see 3GPP TS 06.41).

6) Erased Valid SID Frame Ratio (EVSIDR).

An Erased Valid SID Frame is declared when the MS does not detect a valid transmitted SID frame as a valid SID frame (SID=2) and (BFI=0 and UFI=0). The Erased Valid SID Frame Ratio is defined as the ratio of erased valid SID frames (SID=0), or (SID=1), or ((BFI or UFI)=1), to the total number of valid SID frames transmitted (see 3GPP TS 06.41).

7) Erased Valid SID_UPDATE frame Rate associated to an adaptive speech traffic channel (EVSIDUR).

This related to the erasure of a SID_UPDATE frame related to an AMR channel (full rate or half rate) due to the failure to detect the SID_UPDATE identifier or to a due to a CRC failure.

8) Erased Valid RATSCCH Frame Rate associated to an adaptive speech traffic channel (EVRFR).

This relates to the erasure of the RATSCCH message due to the failure to detect the RATSCCH identifier or due to a CRC failure.

9) Frame error rate for the In-Band channel (TCH/AFS-INB or TCH/AHS-INB).

This related to the erasure of an AMR speech frame (full rate or half rate) due to the bad decoding of the Mode Indication in-band bits.

Test method

Each test is performed in the following manner:

a) Set up the required test conditions.

b) Perform the test for at least the minimum number of samples (frames, bits or bits from non erased frames) and record the number of offered samples and the number of occurred events (frame, bit or residual bit errors).

c) Terminate the test and determine the test result ("pass" or "fail") by comparing the measured error rate against the test limit error rate.

It is permitted to run the test over more samples than the value stated for minimum number of samples. The effect of increasing the number of samples is always to give a higher probability that a good unit will pass and a lower risk that a bad unit will pass, according to the definitions of good and bad unit in this subclause.

Test criteria

The limits on number of samples and test limit error rate shall be defined in order to comply with different requirements:

1) to keep reasonably low the risk of passing a bad unit for each individual test;

2) to have high probability of passing a good unit for each individual test;

3) to perform measurements with a high degree of statistical significance;

4) to keep the test time as low as possible.

The risk of passing a bad unit (point 1) should be kept lower than 0,2 %. The performance on a full rate channel, or a half rate data channel, is generally considered "bad" if its BER (or FER) performance is 1,5 times worse than that specified in AWGN (Additive White Gaussian Noise) and 1,26 times worse than that specified in multipath environment. These values have been adopted (taking into account the expected shapes of the BER performance) in order not to pass a unit with performance worse than the specifications by more than 1 dB.

The performance on a half rate speech channel, is generally considered "bad" if the BER (or FER, or UFR) is worse than that specified, multiplied by the factors given in table 14-1. These values have been adopted (taking into account the expected shapes of the BER performance) in order not to pass a unit with performance worse than the specifications by more than 1 dB.

Table 14-1: TCH/HS "bad" unit multiplication factors

	GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900				DCS 1 800 and PCS 1 900			
Propagation Conditions	**TUlow (No FH)**	**TUhigh (FH/ No FH)**	**HT (No FH)**	**RA (No FH)**	**TUlow (No FH)**	**TUhigh (FH/ No FH)**	**HT (No FH)**	**RA (No FH)**
Reference sensitivity: TCH/HS FER TCH/HS class Ib (BFI=0) TCH/HS class II (BFI=0) TCH/HS UFR TCH/HS class Ib (BFI=0 and UFI=0)		 1,7 2,2 1,2 2,0 1,8	1,2	1,2		 1,7 2,0 1,2 1,9 1,7	1,2	1,2
Reference interference: TCH/HS FER TCH/HS class Ib (BFI=0) TCH/HS class II (BFI=0) TCH/HS UFR TCH/HS class Ib (BFI or UFI)=0 EVSIDR RBER (SID=2 and (BFI or UFI)=0 ESIDR RBER (SID=1 or SID=2)	 1,2 1,3 1,3 1,3	 1,6 1,8 1,2 1,6 1,4			 1,2 1,3 1,3 1,3	 1,6 1,8 1,2 1,6 1,4		

The probability of passing a good unit operating on the specification limit of performance (point 2) should be at least 99,7 %.

If the error events can be assumed to be random independent variables, outputs of stationary random processes with identical Gaussian distributions, the previous figures suggest a number of events (point 3) not lower than 200 in AWGN channel and not lower than 600 in a multipath environment, and to test a BER (or FER) performance 1,22 times worse than that specified in AWGN and 1,12 times worse than that specified in a multipath environment (this corresponds to testing a performance, at the most, 0,5 dB worse than that specified).

For multipath propagation conditions the hypothesis of stationary random processes does not generally hold. In case of non frequency hopping operation mode, the radio channel may be assumed to change 10 times per wavelength of travelled distance and to be short term stationary in between. So, in this case, the required observation time for having good statistical properties should not be lower (with some rounding) than that reported in table 14-1.

Table 14-2: Minimum test time according to propagation profile

	GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900				DCS 1 800 and PCS 1 900			
Propagation Conditions	**TUlow**	**TUhigh**	**HT**	**RA**	**TUlow**	**TUhigh**	**HT**	**RA**
Min. test time (s)	500	30	15	6	500	15	7,5	6

Tables 14-3 and 14-4 detail, for the different test conditions, the minimum number of samples required in order to meet points 1) to 3): the corresponding test time (point 4) can be consequently computed.

As can be seen in the tables, in some of the cases in which both FER and RBER have to be tested on the same channel, the length of time for the FER measurement has been adopted for the RBER measurement. This is longer than that required for the RBER only according to the discussed criteria, but allows the use of a test limit error rate closer to the specified error rate while maintaining the same statistical significance. When, as is normal, it is desired to perform the FER and RBER tests, the closer test limit error rate for the RBER measurement can be achieved without increasing the total test time. It is always possible to extend the length of any test and further improve the statistical significance of that test.

Co-channel rejection tests with a frequency condition noted as "@ndB" are performed with the interfering frequency transmitted with an additional n dB attenuation, see 3GPP TS 45.005.

Table 14-3: Test conditions for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900

Type of test	Type of channel	Propagation/ frequency conditions	Specified FER/ BER %	Test limit FER/ BER %	Minimum No of samples	Prob that good unit will pass %	Bad unit BER/ FER %	Risk that bad unit will pass
BFI	TCH/FS	Static	0,033	0,041	492000	99,813	0,050	0,140
	TCH/FS	Static / FH	0,033	0,041	492000	99,813	0,050	0,140
	TCH/AFS	Static	0,033	0,041	492000	99,813	0,050	0,140
	TCH/AHS	Static	0,033	0,041	492000	99,813	0,050	0,140
Sensitivity	TCH/FS	Static/FH	0,100*α	0,122*α	164000	99,717	0,150*α	0,140
,,	TCH/FS Class Ib	Static/FH	0,400/α	0,410/α	20000000	100,000	0,600/α	<0,001
,,	TCH/FS Class II	Static/FH	2,000	2,439	8200	99,714	3,000	0,001
,,	TCH/FS	TUhigh/No FH	6,000*α	6,742*α	8900	99,825	7,560*α	0,162
,,	TCH/FS Class Ib	TUhigh/No FH	0,400/α	0,420/α	1000000	99,919	0,504/α	<0,001
,,	TCH/FS Class II	TUhigh/No FH	8,000	8,333	120000	99,999	10,080	<0,001
,,	TCH/FS Class II	HT/No FH	9,000	9,333	60000	99,779	11,340	<0,001
,,	TCH/FS Class II	RA/No FH	7,000	7,500	24000	99,873	8,694	<0,001
,,	TCH/EFS	Static/FH	0,100	0,122	164000	99,758	0,150	0,171
,,	TCH/EFS Class Ib	Static/FH	0,100	0,110	20000000	100	0,150	<0,001
,,	TCH/EFS Class II	Static/FH	2,000	2,439	8200	99,753	3,000	0,168
,,	TCH/EFS	TUhigh/No FH	8,000	8,867	8900	99,808	10,080	0,016
,,	TCH/EFS Class Ib	TUhigh/No FH	0,210	0,224	1000000	99,887	0,265	<0,001
,,	TCH/EFS Class II	TUhigh/No FH	7,000	7,500	120000	99,999	8,820	<0,001
,,	TCH/EFS Class II	HT/No FH	9,000	9,350	60000	99,787	11,340	<0,001
,,	TCH/EFS Class II	RA/No FH	7,000	7,500	24000	99,829	8,820	<0,001
,,	TCH/HS (FER)	TUhigh/No FH	4,100	4,598	13050	99,776	6,970	<0,001
,,	TCH/HS Class Ib (BFI=0)	TUhigh/No FH	0,360	0,404	148500	99,750	0,792	<0,001
,,	TCH/HS Class II (BFI=0)	TUhigh/No FH	6,900	7,725	25500	100,00	8,280	0,061
,,	TCH/HS Class II (BFI=0)	HT/No FH	7,600	8,500	20000	100,00	9,120	0,110
,,	TCH/HS Class II (BFI=0)	RA/No FH	6,800	7,600	20000	100,00	8,160	0,182
,,	TCH/HS (UFR)	TUhigh/No FH	5,600	6,250	9600	99,702	11,200	<0,001
"	TCH/AFS-INB (FER)	TUhigh/No FH	0,034	0.047	150000	99.733	0.068	0.103
"	TCH/AHS-INB (FER)	TUhigh/No FH	0.720	0.806	74000	99.728	0.907	0.191
,,	FACCH/F	TUhigh/No FH	8,000	8,961	6696	99,798	10,080	0,108
,,	FACCH/H	TUhigh/No FH	6,900	7,728	7764	99,785	8,694	0,115
,,	TCH/F9,6and H4,8	HT/No FH	0,700	0,778	180000	99,995	0,882	<0,001
,,	TCH/F4,8	HT/No FH	0,010	0,011	5350000	99,732	0,013	0,197
,,	TCH/F2,4	HT/No FH	0,001	0,001	11900000	99,734	0,002	<0,001
,,	TCH/H2,4	HT/No FH	0,010	0,011	5350000	99,732	0,013	0,197
Input level	TCH/FS Class II	Static<-40dBm	0,010	0,012	1640000	99,716	0,015	0,141
Input level	TCH/FS Class II	Static<-15dBm	0,100	0,122	164000	99,717	0,150	0,140
range	TCH/FS Class II	EQ	3,000	3,250	120000	100,000	3,780	<0,001
Co-channel	TCH/FS	TUlow /No FH	21,000*α	24,000*α	25000	100,000	27,720*α	<0,001
rejection	TCH/FS Class Ib	TUlow /No FH	2,000/α	2,091/α	3300000	100,000	2,520/α	<0,001
,,	TCH/FS Class II	TUlow /No FH	4,000	4,300	2000000	100,000	5,040	<0,001
,,	TCH/FS	TUhigh/FH	3,000*α	3,371*α	17800	99,797	3,780*α	0,194
,,	TCH/FS Class Ib	TUhigh/FH	0,200/α	0,215/α	2000000	100,000	0,252/α	<0,001
,,	TCH/FS Class II	TUhigh/FH	8,000	8,333	1200000	100,000	10,080	<0,001
,,	TCH/EFS	TUlow /No FH	23,000	24,000	25000	99,951	27,720	<0,001
,,	TCH/EFS Class Ib	TUlow /No FH	0,2000	0,209	3300000	99,987	0,252	<0,001
,,	TCH/EFS Class II	TUlow /No FH	3,000	3,039	2000000	99,927	3,780	<0,001
,,	TCH/EFS	TUhigh/FH	3,000	3,357	17800	99,702	3,780	0,185
,,	TCH/EFS Class Ib	TUhigh/FH	0,100	0,115	2000000	100,00	0,126	<0,001
,,	TCH/EFS Class II	TUhigh/FH	8,000	8,333	1200000	99,998	10,08	<0,001
"	TCH/AFS-INB (FER)	TUhigh/FH@-3 dB	0,160	0.189	150000	99.737	0.224	0.197
"	TCH/AHS 7.95 (FER)	TUhigh/NoFH@3dB	6,700	8.44	8960			
"	TCH/AHS-INB (FER)	TUhigh/No FH	0.700	0.784	76000	99.726	0.882	0.193
"	O-TCH/AHS-INB (FER)	TUhigh/No FH	10.500	11.760	5102	99.822	13.230	0.089
,,	FACCH/F	TUlow /No FH	22,000	24,000	25000	100,000	27,720	<0,001
,,	FACCH/H	TUlow /No FH	22,000	24,000	25000	100,000	27,720	<0,001
,,	TCH/F9,6 or H4,8	TUhigh/FH	0,300	0,336	178500	99,716	0,378	0,180
,,	TCH/F4,8	TUhigh/FH	0,010	0,011	5350000	99,732	0,013	0,197
,,	TCH/F2,4	TUhigh/FH	0,001	0,001	11900000	99,734	0,002	<0,001
,,	TCH/H2,4	TUhigh/FH	0,010	0,011	5350000	99,732	0,013	0,197

Type of test	Type of channel	Propagation/ frequency conditions	Specified FER/ BER %	Test limit FER/ BER %	Minimum No of samples	Prob that good unit will pass %	Bad unit BER/ FER %	Risk that bad unit will pass
Adjacent channel 200 kHz	TCH/FS	TUhigh/No FH	6,000*α	6,742*α	8900	99,825	7,560*α	0,162
	TCH/FS Class Ib	TUhigh/No FH	0,400/α	0,420/α	1000000	99,919	0,504/α	<0,001
	TCH/FS Class II	TUhigh/No FH	8,000	8,333	600000	100,000	10,080	<0,001
,,	TCH/HS (FER)	TUhigh/FH	5,000	5,607	10700	99,787	8,000	<0,001
,,	TCH/HS Class Ib (BFI=0)	TUhigh/FH	0,290	0,325	184700	99,711	0,522	<0,001
,,	TCH/HS Class II (BFI=0)	TUhigh/FH	7,100	7,961	25500	100,00	8,520	0,065
,,	TCH/HS (UFR)	TUhigh/FH	6,100	6,834	8780	99,781	9,760	<0,001
,,	TCH/HS Class Ib (BFI or UFI)=0	TUhigh/FH	0,210	0,235	255000	99,715	0,294	<0,001
,,	EVSIDR	TUlow /No FH	21,900	24,000	25000	100,000	26,280	<0,001
,,	SID RBER (SID=2 and (BFI or UFI=0)	TUlow /No FH	0,020	0,022	2678500	99,705	0,026	0,010
,,	ESIDR	TUlow /No FH	17,100	19,152	25000	100,000	22,230	<0,001
,,	SID RBER (SID=1 or SID=2)	TUlow /No FH	0,500	0,560	500000	100,000	0,650	<0,001
,,	FACCH/F	TUhigh/No FH	9,500	10,640	5639	99,812	11,970	0,096
Adjacent channel 400 kHz	TCH/FS	TUhigh/No FH	10,200*α	11,461*α	8900	99,995	12,852*α	0,004
	TCH/FS Class Ib	TUhigh/No FH	0,720/α	0,756/α	1000000	99,999	0,9077/α	<0,001
	TCH/FS Class II	TUhigh/No FH	8,800	9,167	600000	100,000	11,088	<0,001
,,	FACCH/F	TUhigh/No FH	17,100	19,152	3133	99,878	21,546	<0,052
Intermod.	TCH/FS Class II	Static	2,000	2,439	8200	99,741	3,000	0,122
	FACCH/F	TUhigh/No FH	8,000	8,961	6696	99,798	10,080	0,108
Blocking and spurious resp.	TCH/FS Class II	Static	2,000	2,439	8200	99,741	4,000	<0,001
	FACCH/F	TUhigh/No FH	8,000	8,961	6696	99,798	10,080	0,108

Table 14-4: Test conditions for DCS 1 800 DCS 1 800 and PCS 1 900

Type of test	Type of channel	Propagation/ Frequency conditions	Specified	Test limit FER/BER %	Mini-mum No of samples	Prob that good unit will pass %	Bad unit FER/BER %	Risk that bad unit will pass
BFI	TCH/FS	Static	0,033	0,041	492000	99,813	0,050	0,140
	TCH/FS	Static/FH	0,033	0,041	492000	99,813	0,050	0,140
	TCH/AFS	Static/FH	0,033	0,041	492000	99,813	0,050	0,140
	TCH/AHS	Static/FH	0,033	0,041	492000	99,813	0,050	0,140
Sensitivit y	TCH/FS	Static/FH	0,100*α	0,122*α	164000	99,717	0,150*α	0,140
,,	TCH/FS Class Ib	Static/FH	0,400/α	0,410/α	20000000	100,000	0,600/α	<0,001
,,	TCH/FS Class II	Static/FH	2,000	2,439	8200	99,714	3,000	0,001
,,	TCH/FS	Tuhigh/No FH	4,000*α	4,478*α	13400	99,743	5,040*α	0,133
,,	TCH/FS Class Ib	Tuhigh/No FH	0,300/α	0,320/α	1500000	100,000	0,378/α	<0,001
,,	TCH/FS Class II	Tuhigh/No FH	8,000	8,333	60000	99,865	10,080	<0,001
,,	TCH/FS Class II	HT/No FH	9,000	9,333	30000	97,826	11,340	<0,001
,,	TCH/FS Class II	RA/No FH	7,000	7,500	24000	99,873	8,820	<0,001
,,	TCH/EFS	Static/FH	0,100	0,122	164000	99,758	0,150	0,171
,,	TCH/EFS Class Ib	Static/FH	0,100	0,110	20000000	100,00	0,150	<0,001
,,	TCH/EFS Class II	Static/FH	2,000	2,439	8200	99,753	3,000	0,168
,,	TCH/EFS	Tuhigh/No FH	4,000	4,475	13400	99,701	5,040	0,179
,,	TCH/EFS Class Ib	Tuhigh/No FH	0,120	0,130	1500000	99,979	0,151	<0,001
,,	TCH/EFS Class II	Tuhigh/No FH	8,000	8,333	60000	99,804	10,080	<0,001
,,	TCH/EFS Class II	HT/No FH	9,000	9,498	30000	99,798	11,340	<0,001
,,	TCH/EFS Class II	RA/No FH	7,000	7,500	24000	99,829	8,820	<0,001
,,	TCH/HS (FER)	Tuhigh/No FH	4,200	4,706	12750	99,763	7,140	<0,001
,,	TCH/HS Class Ib (BFI=0)	Tuhigh/No FH	0,380	0,426	141000	99,706	0,760	<0,001
,,	TCH/HS Class II (BFI=0)	Tuhigh/No FH	6,900	7,725	25500	100,00	8,280	0,061
,,	TCH/HS Class II (BFI=0)	HT/No FH	7,800	8,735	20000	100,00	9,360	0,114
,,	TCH/HS Class II (BFI=0)	RA/No FH	6,800	7,600	20000	100,00	8,160	0,182
,,	TCH/HS (UFR)	Tuhigh/No FH	5,700	6,383	9400	99,769	10,830	<0,001
,,	TCH/HS Class Ib (BFI or UFI0=0)	Tuhigh/No FH	0,260	0,291	206000	99,712	0,442	<0,001
,,	TCH/AHS-INB (FER)	Tuhigh/No FH	0,640	0.717	83000	99.724	0.806	0.195

Type of test	Type of channel	Propagation/ Frequency conditions	Specified	Test limit FER/BER %	Mini-mum No of samples	Prob that good unit will pass %	Bad unit FER/BER %	Risk that bad unit will pass
,,	FACCH/F	TUhigh/No FH	3,900	4,368	13736	99,752	4,914	0,140
,,	FACCH/H	TUhigh/No FH	7,200	7,752	7440	97,027	9,072	0,002]
,,	TCH/F9,6	HT/No FH	0,700	0,784	76500	99,721	0,882	0,176
,,	TCH/F4,8	HT/No FH	0,010	0,011	5350000	99,732	0,013	0,197
,,	TCH/F2,4	HT/No FH	0,001	0,001	11900000	99,734	0,002	<0,001
Input level range	TCH/FS Class II	Static-23dBm	0,100	0,122	164000	99,717	0,150	0,140
	TCH/FS Class II	Static<-40dBm	0,010	0,012	1640000	99,716	0,015	0,141
	TCH/FS Class II	EQ	3,000	3,250	60000	99,981	3,780	<0,001
Co-channel rejection	TCH/FS	TUlow /No FH	21,00*α	24,00*α	25000	100,000	26,460*α	<0,001
	TCH/FS Class Ib	TUlow /No FH	2,000/α	2,091/α	3300000	100,000	2,520/α	<0,001
,,	TCH/FS Class II	TUlow /No FH	4,000	4,300	2000000	100,000	5,040	<0,001
,,	TCH/FS	TUhigh/FH	3,000*α	3,371*α	17800	99,797	3,780*α	0,194
,,	TCH/FS Class Ib	TUhigh/FH	0,200/α	0,215/α	2000000	100,000	0,252/α	<0,001
,,	TCH/FS Class II	TUhigh/FH	8,000	8,333	1200000	100,000	10,080	<0,001
,,	TCH/EFS	TUlow /No FH	23,000	24,000	25000	99,999	26,680	<0,001
,,	TCH/EFS Class Ib	TUlow /No FH	0,200	0,209	3300000	100,000	0,252	<0,001
,,	TCH/EFS Class II	TUlow /No FH	3,000	3,039	2000000	100,000	3,780	<0,001
,,	TCH/EFS	TUhigh/FH	3,000	3,357	17800	99,815	3,780	0,185
,,	TCH/EFS Class Ib	TUhigh/FH	0,100	0,115	2000000	99,999	0,126	<0,001
,,	TCH/EFS Class II	TUhigh/FH	8,000	8,333	1200000	100,00	10,08	<0,001
,,	TCH/AFS-INB (FER)	TUlow /No FH@-3 dB	3.500	3.920	15000	99.744	4.410	0.173
,,	TCH/AFS-INB (FER)	TUhigh/FH@-3 dB	0.120	0.145	150000	99.759	0.180	0.074
,,	TCH/AHS-INB (FER)	TUhigh/No FH	0.710	0.795	75000	99.727	0.895	0.192
,,	O-TCH/HS-INB (FER)	Tuhigh/No FH	11.000	12.320	4870	99.827	13.860	0.086
,,	FACCH/F	TUlow /No FH	22,000	24,000	25000	100,000	27,720	<0,001
,,	FACCH/H	TUlow /No FH	22,000	24,000	25000	100,000	27,720	<0,001
,,	TCH/F9,6 or H4,8	TUhigh/FH	0,300	0,336	178500	99,716	0,378	0,180
,,	TCH/F4,8	TUhigh/FH	0,010	0,011	5350000	99,732	0,013	0,197
,,	TCH/F2,4	TUhigh/FH	0,001	0,001	11900000	99,734	0,002	<0,001
,,	TCH/H2,4	TUhigh/FH	0,010	0,011	5350000	99,732	0,013	0,197
Adjacent channel 200 kHz	TCH/FS	TUhigh/No FH	3,000*α	3,371*α	17800	99,797	3,780*α	0,194
	TCH/FS Class Ib	TUhigh/No FH	0,250/α	0,270/α	2000000	100,000	0,315/α	<0,001
	TCH/FS Class II	TUhigh/No FH	8,100	8,333	1200000	100,000	10,206	<0,001
,,	TCH/HS (FER)	TUhigh/FH	5,000	5,607	10700	99,787	8,000	<0,001
,,	TCH/HS Class Ib (BFI=0)	TUhigh/FH	0,290	0,325	184700	99,711	0,522	<0,001
,,	TCH/HS Class II (BFI=0)	TUhigh/FH	7,200	8,078	25500	100,00	8,640	0,066
,,	TCH/HS (UFR)	TUhigh/FH	6,100	6,834	8780	99,781	9,760	<0,001
,,	TCH/HS Class Ib ((BFI or UFI)=0)	TUhigh/FH	0,210	0,235	255000	99,715	0,294	<0,001
,,	EVSIDR	TUlow /No FH	21,900	24,000	25000	100,000	26,280	<0,001
,,	SID RBER (SID=2 and (BFI or UFI)=0)	TUlow /No FH	0,020	0,022	2678500	99,705	0,026	0,010
,,	ESIDR	TUlow /No FH	17,100	19,152	25000	100,000	22,230	<0,001
,,	SID RBER (SID=1 or SID=2)	TUlow /No FH	0,500	0,560	500000	100,000	0,650	<0,001
,,	FACCH/F	TUhigh/No FH	3,400	3,808	15756	99,746	4,284	0,145
Adjacent channel 400 kHz	TCH/FS	TUhigh/No FH	5,100*α	5,714*α	10500	99,773	6,426*α	0,134
	TCH/FS Class Ib	TUhigh/No FH	0,450/α	0,483/α	1200000	100,000	0,567/α	<0,001
	TCH/FS Class II	TUhigh/No FH	8,900	9,167	720000	100,000	11,214	<0,001
,,	FACCH/F	TUhigh/No FH	6,100	6,832	8782	99,777	7,686	0,122
Intermod,	TCH/FS Class II	Static	2,000	2,439	8200	99,741	3,000	0,122
	FACCH/F	TUhigh/No FH	3,900	4,368	13736	99,752	4,914	0,140
Blocking and spurious resp.	TCH/FS Class II	Static	2,000	2,439	8200	99,741	4,000	<0,001
	FACCH/F	TUhigh/No FH	3,900	4,368	13736	99,752	4,914	0,140

NOTE 1: α is a parameter which ranges from 1 to 1,6. The value of α for a RBER test on TCH/FS class Ib bits under particular measurement conditions shall be the same as that determined in the FER test on TCH/FS under the same conditions. For example, the value of α may be different for a TUhigh sensitivity test and an RA sensitivity test. The value of α is determined by dividing the measured error rate for the FER test by the value of the test limit error rate listed in the limits section of the test corresponding to α=1; if the result of the division is lower than 1, a value of α=1 shall be used, if the value of α > 1,6 the FER test has failed (the normal treatment of stimulus uncertainties applies). The probabilities that a good unit will pass and the risks that a bad unit will pass, listed in the table are valid for α=1, and would be slightly different for other values of α.

NOTE 2: In order to save time the sensitivity and co-channel rejection tests for the TCH/F2,4 channel does not comply with the above said constraints.

In fact, a bad unit which performs 2 times (instead of 1,26) worse than that specified is accounted for, so reducing the required number of events to 150, instead of 600. On the other hand, the specified RBER is in this case 10E-5 and, on the basis of simulations and hardware validation results, doubling this RBER results in a drop in performance of less than 1 dB.

14.1 Bad frame indication

14.1.1 Bad frame indication - TCH/FS

14.1.1.1 Bad frame indication - TCH/FS - Random RF input

14.1.1.1.1 Definition

The performance of the Bad Frame Indication (BFI) is a measure of the effectiveness of the MS under DTX conditions. It includes the effect of the 3 bit Cyclic Redundancy Check (CRC) and all other processing associated with the DTX function. The BFI is measured on a full rate speech TCH (TCH/FS) by counting the number of undetected bad frames whilst the input signal is a randomly modulated carrier.

14.1.1.1.2 Conformance requirement

On a full rate speech TCH (TCH/FS) with a random RF input, the overall reception performance shall be such that, on average, less than one undetected bad speech frame (false bad frame indication) in 60 s will be measured;
3GPP TS 05.05, subclause 6.4 b

14.1.1.1.3 Test purpose

1. To verify that the BFI performance does not exceed the conformance requirement with an allowance for the statistical significance of the test.

2. To verify that on reception of a SID frame the BFI is not set.

14.1.1.1.4 Method of test

14.1.1.1.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/FS with an ARFCN in the Mid ARFCN range, power control level set to maximum power.

The SS commands the MS to complete the traffic channel loop back and signal the bad frame indication.

NOTE: DTX is used during the test to prevent the MS dropping the call.

14.1.1.1.4.2 Procedure

a) The SS simulates a BSS in DTX mode. During the period when no transmission would occur the SS transmits a GSM carrier modulated with random data at a level 11 dB above reference sensitivity level( ). The SACCH is transmitted normally at a level 20 dB above reference sensitivity( ). The SID frame is transmitted in its correct time interval with valid information at a level 20 dB above reference sensitivity level( ). During transmission of SACCH or SID frames the random data is discontinued.

b) The SS transmits at least the minimum number of samples of frames of TCH/FS information and checks the BFI of the looped back signal from the MS. The SS records the number of frames where the bad frame indication is not set. During transmission by the SS of SID frames the SS checks that the BFI is not set.

NOTE 1: Further explanations on the mechanism of signalling the BFI to the SS will be found in clause 36.

NOTE 2: In some cases the MS decodes half SID frames correctly even if these are not transmitted completely. Therefore, in case that a MS detects a good SID frame, the SS has to consider the received bits in detail.

14.1.1.1.5 Test requirements

The BFI performance is accepted if the measured rate of undetected bad frames does not exceed the test limit error rate:

Test limit error rate: 0,041 %;

Minimum number of samples: 492 000 (excluding SID frames).

During loop back of SID frames no BFI shall be set.

14.1.1.2 Bad frame indication - TCH/FS - Frequency hopping and downlink DTX

14.1.1.2.1 Definition

The performance of the Bad Frame Indication (BFI) is a measure of the effectiveness of the MS under DTX conditions. It includes the effect of the 3 bit Cyclic Redundancy Check (CRC) and all other processing associated with the DTX function. The BFI is measured on a full rate speech TCH (TCH/FS) by counting the number of undetected bad frames whilst the input signal is a randomly modulated carrier.

14.1.1.2.2 Conformance requirement

On a speech TCH (TCH/FS or TCH/HS), when DTX is activated with frequency hopping through C0 where bursts comprising SID frames, SACCH frames and dummy bursts are received at a level 20 dB above the reference sensitivity level and with no transmissions at the other bursts of the TCH, the overall reception performance shall be such that, on average less than one undetected bad speech frame (false bad frame indication BFI) shall be measured in one minute for MS. 3GPP TS 05.05, subclause 6.4c.

14.1.1.2.3 Test purpose

1. To verify that the BFI performance in case of frequency hopping including the C0 radio frequency does not exceed the conformance requirement with an allowance for the statistical significance of the test.

2. To verify that on reception of a SID frame the BFI is not set.

14.1.1.2.4 Method of test

14.1.1.2.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/FS with a transmitted burst 20 dB above reference sensitivity. Random frequency hopping on two channels including the C0 radio frequency with ARFCNs with at least 5 channels separation shall be used, power control level set to maximum power.

The SS commands the MS to complete the traffic channel loop back and signal the bad frame indication.

NOTE: DTX is used during the test to prevent the MS dropping the call.

14.1.1.2.4.2 Procedure

a) The SS sets downlink DTX on.

b) The SS performs the measurement over at least the minimum number of samples of frames of TCH/FS information and checks the BFI of the looped back signal from the MS. The SS only transmits SID frames, SACCH frames and dummy bursts, with no transmission of TCH bursts. The SS records the number of frames where the bad frame indication is not set. During transmission by the SS of SID frames the SS checks that the BFI is not set.

NOTE 1: Further explanations on the mechanism of signalling the BFI to the SS will be found in clause 36.

NOTE 2: In some cases the MS decodes half SID frames correctly even if these are not transmitted completely. Therefore, in case that a MS detects a good SID frame, the SS has to consider the received bits in detail.

14.1.1.2.5 Test requirements

The BFI performance is accepted if the measured rate of undetected bad frames does not exceed the test limit error rate:

Test limit error rate: 0,041 %;

Minimum number of samples: 492 000 (excluding SID frames).

During loop back of SID frames no BFI shall be set.

14.1.2 Bad frame indication - TCH/HS

14.1.2.1 Bad frame indication - TCH/HS - Random RF input

14.1.2.1.1 Definition

The performance of the Bad Frame Indication (BFI) is a measure of the effectiveness of the MS under DTX conditions. It includes the effect of the 3 bit Cyclic Redundancy Check (CRC) and all other processing associated with the DTX function. The BFI is measured on a half rate speech TCH (TCH/HS) by counting the number of undetected bad frames whilst the input signal is a randomly modulated carrier.

14.1.2.1.2 Conformance requirement

On a half rate speech TCH (TCH/HS) with a random RF input, the overall reception performance shall be such that, on average, less than one undetected bad speech frame (false bad frame indication) in 60 seconds will be measured; 3GPP TS 05.05, subclause 6.4b.

14.1.2.1.3 Test purpose

1. To verify that the BFI performance does not exceed the conformance requirement with an allowance for the statistical significance of the test.

2. To verify that on reception of a SID frame the BFI is not set.

14.1.2.1.4 Method of test

14.1.2.1.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/HS with an ARFCN in the Mid ARFCN range, power control level set to maximum power.

The SS commands the MS to complete traffic channel loop back A and signal frames detected with BFI=1 as erased.

NOTE 1: Test loop A is defined in clause 36. Frames detected with BFI=1 are signalled as erased on the uplink.

NOTE 2: DTX is used during the test to prevent the MS dropping the call.

14.1.2.1.4.2 Procedure

a) The SS simulates a BSS in DTX mode. During the periods when no transmission would occur, the SS transmits a GSM carrier modulated with random data, at a level 11 dB above reference sensitivity level( ). The SACCH is transmitted normally, at a level 20 dB above reference sensitivity( ). The SID frame is transmitted in its correct time interval, with valid information, at a level 20 dB above reference sensitivity level( ). During transmission of SACCH or SID frames, the random data is discontinued.

b) The SS transmits at least the minimum number of samples of frames of TCH/HS information and checks the BFI of the looped back signal from the MS. The SS records the number of frames where the bad frame indication is not set. During transmission by the SS of SID frames the SS checks that the BFI is not set.

14.1.2.1.5 Test requirements

The BFI performance is accepted if the measured rate of undetected bad frames does not exceed the test limit error rate:

Test limit error rate: 0,041 %;

Minimum number of samples: 492 000 (excluding SID frames).

During loop back of SID frames no BFI shall be set.

14.1.2.2 Bad frame indication - TCH/HS - Frequency hopping and downlink DTX

14.1.2.2.1 Definition

The performance of the Bad Frame Indication (BFI) is a measure of the effectiveness of the MS under DTX conditions. It includes the effect of the 3 bit Cyclic Redundancy Check (CRC) and all other processing associated with the DTX function. The BFI is measured on a half rate speech TCH (TCH/HS) by counting the number of undetected bad frames whilst the input signal is a randomly modulated carrier.

14.1.2.2.2 Conformance requirement

On a half rate speech TCH (TCH/HS), when DTX is activated with frequency hopping through C0 where bursts comprising SID frames, SACCH frames and dummy bursts are received at a level 20 dB above the reference sensitivity level and with no transmissions at the other bursts of the TCH, the overall reception performance shall be such that, on average less than one undetected bad speech frame (false bad frame indication BFI) shall be measured in one minute for MS. 3GPP TS 05.05, subclause 6.4c.

14.1.2.2.3 Test purpose

1. To verify that the BFI performance in case of frequency hopping including the C0 radio frequency does not exceed the conformance requirement with an allowance for the statistical significance of the test.

2. To verify that on reception of a SID frame the BFI is not set.

14.1.2.2.4 Method of test

14.1.2.2.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/HS with a transmitted burst 20 dB above reference sensitivity. Random frequency hopping on two channels including the C0 radio frequency with ARFCNs with at least 5 channels separation shall be used, power control level set to maximum power.

The SS commands the MS to complete the traffic channel loop back and signal the bad frame indication.

NOTE: DTX is used during the test to prevent the MS dropping the call.

14.1.2.2.4.2 Procedure

a) The SS sets downlink DTX on.

b) The SS performs the measurement over at least the minimum number of samples of frames of TCH/HS information and checks the BFI of the looped back signal from the MS. The SS only transmits SID frames, SACCH frames and dummy bursts, with no transmission of TCH bursts. The SS records the number of frames where the bad frame indication is not set. During transmission by the SS of SID frames the SS checks that the BFI is not set.

NOTE 1: Further explanations on the mechanism of signalling the BFI to the SS will be found in clause 36.

NOTE 2: In some cases the MS decodes half SID frames correctly even if these are not transmitted completely. Therefore, in case that a MS detects a good SID frame, the SS has to consider the received bits in detail.

14.1.2.2.5 Test requirements

The BFI performance is accepted if the measured rate of undetected bad frames does not exceed the test limit error rate:

Test limit error rate: 0,041 %;

Minimum number of samples: 492 000 (excluding SID frames).

During loop back of SID frames no BFI shall be set.

14.1.3 Void

14.1.4 Void

14.1.5 Bad frame indication - TCH/AFS (Speech frame)

14.1.5.1 Bad frame indication - TCH/AFS - Random RF input

14.1.5.1.1 Definition

The performance of the Bad Frame Indication (BFI) is a measure of the effectiveness of the MS. It includes the effect of the 6 bits Cyclic Redundancy Check (CRC). The BFI is measured on a full rate speech TCH (TCH/AFS) by counting the number of undetected bad frames whilst the input signal is a randomly modulated carrier.

14.1.5.1.2 Conformance requirement

On a full rate speech TCH (TCH/AFS) with a random RF input, the overall reception performance shall be such that, on average, less than one undetected bad speech frame (false bad frame indication) in 60 s will be measured, meaning a rate of 0.0333% of undetected bad speech frames; 3GPP TS 05.05, subclause 6.4b.

14.1.5.1.3 Test purpose

1. To verify that the BFI performance does not exceed the conformance requirement with an allowance for the statistical significance of the test.

14.1.5.1.4 Method of test

14.1.5.1.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AFS with an ARFCN in the Mid ARFCN range, power control level set to maximum power. The active codec set (ACS) shall consist of one codec mode as AFS 12.2.

The SS commands the MS to complete the traffic channel loop back and signal the bad frame indication.

14.1.5.1.4.2 Procedure

a) The SS simulates a BSS with downlink DTX disabled. During the period when traffic frames would occur the SS transmits a GSM carrier modulated with random data at a level 11 dB above reference sensitivity level. The SACCH is transmitted normally at a level 20 dB above reference sensitivity. During transmission of SACCH or frames the random data is discontinued.

b) The SS transmits at least the minimum number of samples of frames of TCH/AFS information and checks the BFI of the looped back signal from the MS. The SS records the number of frames where the bad frame indication is not set

NOTE 1: Further explanations on the mechanism of signalling the BFI to the SS will be found in clause 36.

Maximum/Minimum Duration of Test

Statistical test method

Maximum: 280 minutes (GSM 700, T-GSM 810, GSM850, GSM900, DCS1800, PCS1900).

Minimum: 7 minutes (GSM 700, T-GSM 810, GSM850, GSM900, DCS1800, PCS1900).

Non-statistical test method

Maximum/minimum: 164 minutes (GSM 700, T-GSM 810, GSM850, GSM900, DCS1800, PCS1900).

14.1.5.1.5 Test requirements

Testing the Bad Frame Indication (BFI) performance can be done either in the classical way with a fixed minimum number of samples or using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with (BFI) performance not on the limit.

Both methods are based on a bad DUT factor M = 1.5.

14.1.5.1.5.1 Statistical testing of BFI performance with early decision

For more information on statistical testing of BFI performance, especially the definition of limit lines refer to Annex 6.2

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure 14-1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne ≥ 1 (inclusive artificial error)

For an early fail decision ne ≥ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

Table 14-4a: Statistical test limits for BFI performance

BFI TCH/AFS								
				Orig. BFI	Derived	Target number	Target test	Target test time
	Channel	bits per sec	frames per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
AFS 12.2	frames	12200	50	0,000333	0,000411	839575	16792	04:39:52

14.1.5.1.5.2 Fixed testing of BFI performance with minimum number of samples

The BFI performance is accepted if the measured rate of undetected bad frames does not exceed the test limit error rate:

Test limit error rate: 0,041 %;

Minimum number of samples: 492 000

14.1.6 Bad frame indication - TCH/AHS

14.1.6.1 Bad frame indication - TCH/AHS - Random RF input

14.1.6.1.1 Definition

The performance of the Bad Frame Indication (BFI) is a measure of the effectiveness of the MS. It includes the effect of the 6-bit Cyclic Redundancy Check (CRC). The BFI is measured on a half rate speech TCH (TCH/AHS) by counting the number of undetected bad frames whilst the input signal is a randomly modulated carrier.

14.1.6.1.2 Conformance requirement

On a half rate speech TCH (TCH/AHS) with a random RF input, the overall reception performance shall be such that, on average, less than one undetected bad speech frame (false bad frame indication) in 60 s will be measured, meaning a rate of 0.0333% of undetected bad speech frames; 3GPP TS 05.05, subclause 6.4b.

14.1.6.1.3 Test purpose

1. To verify that the BFI performance does not exceed the conformance requirement with an allowance for the statistical significance of the test.

14.1.6.1.4 Method of test

14.1.6.1.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AHS with an ARFCN in the Mid ARFCN range, power control level set to maximum power. The active codec set (ACS) shall consist of one codec mode as AHS 7.95.

14.1.6.1.4.2 Procedure

a) The SS simulates a BSS with downlink DTX disabled. During the periods when traffic frames would occur, the SS transmits a GSM carrier modulated with random data, at a level 11 dB above reference sensitivity level. The SACCH is transmitted normally, at a level 20 dB above reference sensitivity. During transmission of SACCH frames, the random data is discontinued.

b) The SS transmits at least the minimum number of samples of frames of TCH/AHS information and checks the BFI of the looped back signal from the MS. The SS records the number of frames where the bad frame indication is not set.

Statistical test method

Maximum: 280 minutes (GSM 700, T-GSM 810, GSM850, GSM900, DCS1800, PCS1900).

Minimum: 7 minutes (GSM 700, T-GSM 810, GSM850, GSM900, DCS1800, PCS1900).

Non-statistical test method

Maximum/minimum: 164 minutes (GSM 700, T-GSM 810, GSM850, GSM900, DCS1800, PCS1900).

14.1.6.1.5 Test requirements

Testing the Bad Frame Indication (BFI) performance can be done either in the classical way with a fixed minimum number of samples or using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with (BFI) performance not on the limit.

Both methods are based on a bad DUT factor M = 1.5.

14.1.6.1.5.1 Statistical testing of BFI performance with early decision

For more information on statistical testing of BFI performance, especially the definition of the limit lines refer to Annex 6.2

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure 14-1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne ≥ 1 (inclusive artificial error)

For an early fail decision ne ≥ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

Table 14-4b: Statistical test limits for BFI performance

BFI TCH/AHS								
				Orig. BFI	Derived	Target number	Target test	Target test time
	Channel	bits per sec	frames per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
AHS 7.95	frames	7950	50	0,000333	0,000411	839575	16792	04:39:52

14.1.6.1.5.2 Fixed testing of BFI performance with minimum number of samples

The BFI performance is accepted if the measured rate of undetected bad frames does not exceed the test limit error rate:

Test limit error rate: 0,041 %;

Minimum number of samples: 492 000.

14.1.7 Void

14.2 Reference sensitivity

14.2.1 Reference sensitivity - TCH/FS

14.2.1.1 Definition

The reference sensitivity is the signal level at the MS receiver input at which a certain BER and FER must be achieved.

For E-GSM 900 MS this test is only performed in the P-GSM band.

14.2.1.2 Conformance requirement

1. At reference sensitivity level, the TCH/FS FER shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 6.2.

2 At reference sensitivity level, the TCH/FS class I RBER shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 6.2.

3 At reference sensitivity level, the TCH/FS class II RBER shall meet the reference sensitivity, performance of table 1 in 3GPP TS 05.05 subclause 6.2.

4. At reference sensitivity level, the TCH/FS class II RBER shall meet the reference sensitivity, performance of table 1 in GSM under extreme conditions; 3GPP TS 05.05 subclause 6.2 and annex D subclauses D.2.1 and D.2.2.

14.2.1.3 Test purpose

NOTE: This test is performed under STATIC propagation conditions to allow implicit testing of the ability of the MS to hop over the full band. The tests under dynamic propagation conditions are better suited to test the reference sensitivity conformance but cannot test hopping over the full band due to limited bandwidth of available fading simulators.

1. To verify that the MS does not exceed conformance requirement 1 under STATIC and TUhigh propagation conditions with an allowance for the statistical significance of the test.

2. To verify that the MS does not exceed conformance requirement 2 under STATIC and TUhigh propagation conditions with an allowance for the statistical significance of the test.

3. To verify that the MS does not exceed conformance requirement 3 under STATIC, TUhigh, RA and HT propagation conditions with an allowance for the statistical significance of the test.

4. To verify that the MS does not exceed conformance requirement 4 under STATIC and TUhigh propagation conditions with an allowance for the statistical significance of the test.

14.2.1.4 Method of test

NOTE 1: The BA list sent on the BCCH and SACCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range 15 dBμVemf( ) to 35 dBμVemf( ).

NOTE 2: The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

NOTE 3: When frequency hopping is used, the traffic channel may fall on any of the ARFCNs defined in clause 6.

14.2.1.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/FS with an ARFCN in the Mid ARFCN range for GSM 400, GSM 700, T-GSM 810, GSM 850, DCS 1800 and PCS 1 900 and ARFCN 70 for GSM 900, power control level set to maximum power.

NOTE: For GSM 900 ARFCN 70 is tested since this is the 73rd harmonic of the 13 MHz clock normally used internally in a MS.

The SS transmits Standard Test Signal C1 on the traffic channel.

The SS commands the MS to create traffic channel loop back signalling erased frames.

14.2.1.4.2 Procedure

a) The fading function is set to TUhigh.

b) the SS sets the amplitude of the wanted signal to reference sensitivity level ( ).

c) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of class II, by examining sequences of at least the minimum number of samples of consecutive bits of class II. Bits are taken only from those frames not signalled as erased.

e) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

f) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

g) Steps a) to d) are repeated under extreme test conditions.

h) Steps a) to g) are repeated for TCH/FS with ARFCNs in the Low ARFCN range for GSM 400, GSM 700, T-GSM 810, GSM 850, DCS 1800 and PCS 1 900 and ARFCN 5 for GSM 900 and the High ARFCN range.

NOTE: For GSM 900 ARFCN 5 is tested since this is the 72nd harmonic of the 13 MHz clock normally used internally in a MS.

i) Steps b) to d) are repeated with the SS fading function set in turn to RA and HT.

j) Steps b) to g) are repeated, with the SS fading function set to static and the MS is commanded by the SS into hopping mode using the hopping sequence defined in clause 6.

The amplitude of the wanted signal is set according to step b). All the other time slots, except the active ones, are set to 20 dB above reference sensitivity level( ). This implicitly tests adjacent time slot rejection.

14.2.1.5 Test requirements

The error rates measured for different channels and under the different propagation conditions, under any combination of normal and extreme test voltages and ambient temperatures, shall not exceed the test limit error rate values given in table 14-5 or 14-6.

Table 14-5: Limits for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 sensitivity

Channels	Propagation conditions TUhigh		Propagation conditions RA		Propagation conditions HT		Static conditions	
	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
TCH/FS								
FER	6,742*α	8 900					0,122*α	164 000
class Ib(RBER)	0,42/α	1 000 000					0,41/α	20 000 000
class II(RBER)	8,333	120 000	7,5	24 000	9,333	60 000	2,439	8 200

Table 14-6: Limits for DCS 1 800 and PCS 1 900 sensitivity

Channels	Propagation conditions TUhigh		Propagation conditions RA		Propagation conditions HT		Static conditions	
	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
TCH/FS								
FER	4,478*α	13 400					0,122*α	164 000
class Ib(RBER)	0,32/α	1 500 000					0,41/α	20 000 000
class II(RBER)	8,333	60 000	7,5	24 000	9,333	30 000	2,439	8 200

Where α is a parameter which can range from 1 to 1.6. The value of α for a RBER test on TCH/FS class Ib bits under particular measurement conditions shall be the same as that determined in the FER test on TCH/FS under the same conditions.

14.2.1a Reference sensitivity - TCH/FS in TIGHTER configuration

14.2.1a.1 Definition

The reference sensitivity is the signal level at the MS receiver input at which a certain BER and FER must be achieved.

14.2.1a.2 Conformance requirement

3GPP TS 45.005 subclause 6.2.5

The reference performance for Tightened Link Level Performance (TIGHTER) specified in table 1w, shall be

For speech channels (TCH/FS, TCH/HS, TCH/EFS, TCH/AFSx, TCH/AHSx, TCH/WFSx) FER: ≤ 1 %

In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 1w at the corresponding signal level in dBm. The reference sensitivity level in section 6.2.1 shall be applied for TIGHTER MS.

14.2.1a.3 Test purpose

NOTE: This test is performed under STATIC propagation conditions to allow implicit testing of the ability of the MS to hop over the full band. The tests under dynamic propagation conditions are better suited to test the reference sensitivity conformance but cannot test hopping over the full band due to limited bandwidth of available fading simulators.

1 For TCH FS/FER, MS shall meet the reference sensitivity performance mentioned in 3GPP TS 45.005 sub clause 6.2.5, for reference sensitivity level mentioned in Table 1w according to propagation conditions.

2 At reference sensitivity level, the TCH/FS class Ib RBER shall meet the performance mentioned in table 1w in 3GPP TS 45.005.

3 At reference sensitivity level, the TCH/FS RBER2 shall meet the performance mentioned in table 1w in 3GPP TS 45.005.

14.2.1a.4 Method of test

NOTE 1: The BA list sent on the BCCH and SACCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range 15 dBµVemf( ) to 35 dBµVemf( ).

NOTE 2: The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

14.2.1a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/FS with an ARFCN in the Mid ARFCN range for GSM 400, GSM 700, T-GSM 810, GSM 850, DCS 1800 and PCS 1 900 and ARFCN 70 for GSM 900, power control level set to maximum power.

The SS transmits Standard Test Signal C1 on the traffic channel.

The SS commands the MS to create traffic channel loop back signalling erased frames.

Specific PICS Statements:

-

14.2.1a.4.2 Procedure

a) The fading function is set to TUhigh.

b) The SS sets the amplitude of the wanted signal to reference sensitivity as defined in Table 1w.

c) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of class II, by examining sequences of at least the minimum number of samples of consecutive bits of class II. Bits are taken only from those frames not signalled as erased.

e) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

f) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

g) Steps a) to f) are repeated for TCH/FS with ARFCNs in the Low ARFCN range for GSM 400, GSM 700, T-GSM 810, GSM 850, DCS 1800 and PCS 1 900 and ARFCN 5 for GSM 900 and the High ARFCN range.

NOTE: For GSM 900 ARFCN 5 is tested since this is the 72nd harmonic of the 13 MHz clock normally used internally in a MS.

h) Steps b) to d) are repeated with the SS fading function set in turn to RA and HT.

i) Steps b) to f) are repeated, with the SS fading function set to static and the MS is commanded by the SS into hopping mode using the hopping sequence defined in clause 6.

The amplitude of the wanted signal is set according reference signal level mentioned in Table 1w. All the other time slots, except the active ones, are set to 20 dB above reference sensitivity level( ).This implicitly tests adjacent time slot rejection.

14.2.1a.5 Test requirements

The error rates measured for different channels and under the different propagation conditions, under any combination of normal and extreme test voltages and ambient temperatures, shall not exceed the test limit error rate values given in table 14.2.1a.5-1 or 14.2.1a.5-2.

Table 14.2.1a.5-1: Limits for GSM 850 and GSM 900 sensitivity

Channels	Propagation conditions TUhigh		Propagation conditions RA		Propagation conditions HT		Static conditions	
	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
TCH/FS								
FER	1	8 900					1	164 000
class Ib(RBER)	0,06	1 000 000					0,07	20 000 000
class II(RBER)	4,1	120 000	6,55	24 000	5,49	60 000	6,58	8 200

Table 14.2.1a.5-2: Limits for DCS 1 800 and PCS 1 900 sensitivity

Channels	Propagation conditions TUhigh		Propagation conditions RA		Propagation conditions HT		Static conditions	
	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
TCH/FS								
FER	1	13 400					1	164 000
class Ib(RBER)	0,06	1 500 000					0,07	20 000 000
class II(RBER)	5,44	60 000	5,75	24 000	5,64	30 000	6,58	8 200

14.2.2 Reference sensitivity - TCH/HS (Speech frames)

14.2.2.1 Definition

The reference sensitivity level is the signal level at the MS receiver input at which a certain BER and FER and UFR for speech frames must be achieved.

14.2.2.2 Conformance requirement

1. At reference sensitivity level, the TCH/HS FER shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 6.2.

2 At reference sensitivity level, the TCH/HS class Ib RBER (BFI=0) shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 6.2.

3 At reference sensitivity level, the TCH/HS class II RBER (BFI=0) shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 6.2.

4. At reference sensitivity level, the TCH/HS UFR shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 6.2.

5. At reference sensitivity level, the TCH/HS class Ib RBER ((BFI or UFI)=0) shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 6.2.

14.2.2.3 Test purpose

1. To verify that the MS does not exceed conformance requirement 1 under TUhigh propagation conditions with an allowance for the statistical significance of the test.
2. To verify that the MS does not exceed conformance requirement 2 under TUhigh propagation conditions with an allowance for the statistical significance of the test.
3. To verify that the MS does not exceed conformance requirement 3 under TUhigh, RA and HT propagation conditions with an allowance for the statistical significance of the test.
4. To verify that the MS does not exceed conformance requirement 4 under TUhigh propagation conditions with an allowance for the statistical significance of the test.
5. To verify that the MS does not exceed conformance requirement 5 under TUhigh propagation conditions with an allowance for the statistical significance of the test.

14.2.2.4 Method of test

14.2.2.4.1 Initial conditions

The BA list sent on the BCCH and SACCH indicates at least six surrounding cells, with at least one near to each band edge. It is not necessary to generate any of these BCCHs, but if provided, the signal strengths of BCCHs shall be in the range 15 dBµVemf( ) to 35 dBµVemf( ).

The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

A call is set up according to the generic call set up procedure on a TCH/HS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The SS transmits Standard Test Signal C1 on the traffic channel.

14.2.2.4.2 Procedure

a) The SS commands the MS to create traffic channel loop back signalling erased frames using test loop A.

NOTE 1: Test loop A is defined in clause 36. Frames detected with BFI=1 are signalled as erased on the uplink.

b) The fading function is set to TUhigh.

c) The SS sets the amplitude of the wanted signal to reference sensitivity level ( ).

d) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

e) The SS determines the number of residual bit error events for the bits of class II, by examining sequences of at least the minimum number of samples of consecutive bits of class II. Bits are taken only from those frames not signalled as erased.

f) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

g) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

h) Steps d) and e) are repeated, with the SS fading function set in turn to RA and HT.

j) The SS increases the amplitude of the wanted signal to 20 dB above reference sensitivity level.

k) The SS commands the MS to open test loop A and close test loop D.

NOTE 2: Test loop D is defined in clause 36. Frames marked as erased (BFI=1) or unreliable (UFI=1) are signalled to the SS on the uplink.

l) The fading function is set to TUhigh.

m) The SS sets the amplitude of the wanted signal to reference sensitivity level ( ).

n) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the erased/unreliable frame indication.

p) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased/unreliable.

q) The SS also determines the unreliable frame events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased/unreliable.

14.2.2.5 Test requirements

The error rates measured for different channels and under the different propagation conditions, shall not exceed the test limit error rate values given in table 14-7 or 14-8.

Table 14-7: Limits for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 sensitivity

Channels	Propagation conditions TUhigh		Propagation conditions RA		Propagation conditions HT	
	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
TCH/HS (FER) TCH/HS Class Ib (BFI=0) TCH/HS Class II (BFI=0) TCH/HS (UFR) TCH/HS Class Ib ((BFI or UFI)=0)	4,598 0,404 7,725 6,250 0,269	13050 148500 25500 9600 227000	7,600	20000	8,500	20000

Table 14-8: Limits for DCS 1800 and PCS 1 900 sensitivity

Channels	Propagation conditions TUhigh		Propagation conditions RA		Propagation conditions HT	
	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
TCH/HS (FER) TCH/HS Class Ib (BFI=0) TCH/HS Class II (BFI=0) TCH/HS (UFR) TCH/HS Class Ib ((BFI or UFI)=0)	4,706 0,426 7,725 6,383 0,291	12750 141000 25500 9400 206000	7,600	20000	8,735	20000

14.2.2a Reference sensitivity - TCH/HS in TIGHTER configuration

14.2.2a.1 Definition

The reference sensitivity level is the signal level at the MS receiver input at which a certain BER and FER and UFR for speech frames must be achieved.

14.2.2a.2 Conformance requirement

3GPP TS 45.005 subclause 6.2.5

The reference performance for Tightened Link Level Performance (TIGHTER) specified in table 1w, shall be

For speech channels (TCH/FS, TCH/HS, TCH/EFS, TCH/AFSx, TCH/AHSx, TCH/WFSx) FER: ≤ 1 %

In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 1w at the corresponding signal level in dBm. The reference sensitivity level in section 6.2.1 shall be applied for TIGHTER MS.

14.2.2a.3 Test purpose

NOTE: This test is performed under STATIC propagation conditions to allow implicit testing of the ability of the MS to hop over the full band. The tests under dynamic propagation conditions are better suited to test the reference sensitivity conformance but cannot test hopping over the full band due to limited bandwidth of available fading simulators.

1. For TCH HS/FER, MS shall meet the reference sensitivity performance mentioned in 3GPP TS 45.005 sub clause 6.2.5, for reference sensitivity level mentioned in Table 1w according to propagation conditions.
2. At reference sensitivity level, the TCH/HS class Ib RBER shall meet the performance mentioned in table 1w in 3GPP TS 45.005.
3. At reference sensitivity level, the TCH/HS RBER2 shall meet the performance mentioned in table 1w in 3GPP TS 45.005.

14.2.2a.4 Method of test

NOTE 1: The BA list sent on the BCCH and SACCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range 15 dBμVemf( ) to 35 dBμVemf( ).

NOTE 2: The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

14.2. 2a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/HS with an ARFCN in the Mid ARFCN range for GSM 400, GSM 700, T-GSM 810, GSM 850, DCS 1800 and PCS 1 900 and ARFCN 70 for GSM 900, power control level set to maximum power.

The SS transmits Standard Test Signal C1 on the traffic channel.

The SS commands the MS to create traffic channel loop back signalling erased frames.

Specific PICS Statements:

-

14.2.2a.4.2 Procedure

a) The SS commands the MS to create traffic channel loop back signalling erased frames using test loop A.

NOTE 1: Test loop A is defined in clause 36. Frames detected with BFI=1 are signalled as erased on the uplink.

b) The fading function is set to TUhigh.

c) The SS sets the amplitude of the wanted signal to reference sensitivity as defined in Table 1w.

d) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

e) The SS determines the number of residual bit error events for the bits of class II, by examining sequences of at least the minimum number of samples of consecutive bits of class II. Bits are taken only from those frames not signalled as erased.

f) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

g) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

h) Steps d) and e) are repeated, with the SS fading function set in turn to RA and HT.

14.2.2a.5 Test requirements

The error rates measured for different channels and under the different propagation conditions shall not exceed the test limit error rate values given in table 14.2.2a.5-1 or 14.2.2a.5-2.

Table 14.2.2a.5-1: Limits for GSM 850 and GSM 900 sensitivity

Channels	Propagation conditions TUhigh		Propagation conditions RA		Propagation conditions HT	
	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
TCH/HS FER	1	13050				
class Ib(RBER)	0,24	148500				
class II(RBER)	5,09	25500	5,83	20000	5,12	20000

Table 14.2.2a.5-2: Limits for DCS 1800 and PCS 1900 sensitivity

Channels	Propagation conditions TUhigh		Propagation conditions RA		Propagation conditions HT	
	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
TCH/HS FER	1	12750				
class Ib(RBER)	0,21	141000				
class II(RBER)	5,95	25500	4,87	20000	5,26	20000

14.2.3 Reference sensitivity - FACCH/F

14.2.3.1 Definition

The reference sensitivity for control channels is the signal level at the MS receiver input at which a certain FER must be achieved.

14.2.3.2 Conformance requirement.

At reference sensitivity level, the FACCH/F FER shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 6.2.

14.2.3.3 Test purpose.

To verify that the MS does not exceed the conformance requirement under TUhigh propagation condition with an allowance for the statistical significance of the test.

14.2.3.4 Method of test

14.2.3.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/F with an ARFCN in the Low ARFCN range, power control level set to maximum power.

The SS transmits Standard Test Signal C1 on the traffic channel.

14.2.3.4.2 Procedure

a) The fading function is set to TUhigh.

b) The SS sets the amplitude of the wanted signal to reference sensitivity level ( ).

c) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Due to the low signal level the MS may not be able to acknowledge the Layer 2 frame with an RR frame and the SS will repeat the Layer 2 frame. Each repeated L2 frame will be counted and will indicate a frame erasure event.

d) The SS determines the frame erasure events during at least the minimum number of samples of FACCH/F frames.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.

14.2.3.5 Test Requirements

The error rates measured shall not exceed the test limit error rate values given in table 14-9.

Table 14-9: Limits for FACCH/F sensitivity

			GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900		DCS 1 800 and PCS 1 900	
Channels	**Type of measurements**	**Propagation**	**Test limit error rate %**	**Minimum No of samples**	**Test limit error rate %**	**Minimum No of samples**
FACCH/F	FER	TUhigh	8,961	6696	4,368	13736

14.2.3a Reference sensitivity - FACCH/F in TIGHTER configuration

14.2.3a.1 Definition

The reference sensitivity for control channels is the signal level at the MS receiver input at which a certain FER must be achieved.

14.2.3a.2 Conformance requirement.

3GPP TS 45.005 subclause 6.2.5

The reference performance for Tightened Link Level Performance (TIGHTER) specified in table 1w, shall be

- For signalling channels (SCH, FACCH/F, FACCH/H, SDCCH) FER: ≤ 5 %

14.2.3a.3 Test purpose.

For FACCH/F, MS shall meet the reference sensitivity performance mentioned in 3GPP TS 45.005 sub clause 6.2.5, for reference sensitivity level mentioned in Table 1w according to propagation conditions.

14.2.3a.4 Method of test

14.2.3a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/F with an ARFCN in the Low ARFCN range, power control level set to maximum power.

The SS transmits Standard Test Signal C1 on the traffic channel.

Specific PICS Statements:

-

14.2.3a.4.2 Procedure

a) The fading function is set to TUhigh.

b) The SS sets the amplitude of the wanted signal to reference sensitivity, as defined in Table 1w.

c) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Due to the low signal level the MS may not be able to acknowledge the Layer 2 frame with an RR frame and the SS will repeat the Layer 2 frame. Each repeated L2 frame will be counted and will indicate a frame erasure event.

d) The SS determines the frame erasure events during at least the minimum number of samples of FACCH/F frames.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.

14.2.3a.5 Test Requirements

The error rates measured shall not exceed the test limit error rate values given in table 14.2.3a.5-1.

Table 14.2.3a.5-1: Limits for FACCH/F sensitivity

			GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900		DCS 1 800 and PCS 1 900	
Channels	**Type of measurements**	**Propagation**	**Test limit error rate %**	**Minimum No of samples**	**Test limit error rate %**	**Minimum No of samples**
FACCH/F	FER	TUhigh	5	6696	5	13736

14.2.4 Reference sensitivity - FACCH/H

14.2.4.1 Definition

The reference sensitivity for control channels is the signal level at the MS receiver input at which a certain FER must be achieved.

14.2.4.2 Conformance requirement.

At reference sensitivity level, the FACCH/H FER shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 6.2.

14.2.4.3 Test purpose.

To verify that the MS does not exceed the conformance requirement under TUhigh propagation condition with an allowance for the statistical significance of the test.

14.2.4.4 Method of test

14.2.4.4.1 Initial conditions

A call is set up according to the generic call set up procedure on TCH/HS, TCH/H4.8, TCH/H2.4 or any TCH/AHS, whichever supported by the MS, with an ARFCN in the Mid ARFCN range, power control level set to maximum power.

The SS transmits Standard Test Signal C1 on the traffic channel.

14.2.4.4.2 Procedure

a) The fading function is set to TUhigh.

b) The SS sets the amplitude of the wanted signal to reference sensitivity level ( ).

c) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Due to the low signal level the MS may not be able to acknowledge the Layer 2 frame with an RR frame and the SS will repeat the Layer 2 frame. Each repeated L2 frame will be counted and will indicate a frame erasure event.

d) The SS determines the frame erasure events during at least the minimum number of samples of FACCH/H frames.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.

14.2.4.5 Test requirements

The error rates measured shall not exceed the test limit error rate values given in table 14-10.

Table 14-10: Limits for FACCH/H sensitivity

			GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900		DCS 1 800 and PCS 1 900	
Channels	**Type of measurements**	**Propagation**	**Test limit error rate %**	**Minimum No of samples**	**Test limit error rate %**	**Minimum No of samples**
FACCH/H	FER	TUhigh	7,728		8,064	

14.2.4a Reference sensitivity - FACCH/H in TIGHTER configuration

14.2.4a.1 Definition

The reference sensitivity for control channels is the signal level at the MS receiver input at which a certain FER must be achieved.

14.2.4a.2 Conformance requirement.

3GPP TS 45.005 subclause 6.2.5

The reference performance for Tightened Link Level Performance (TIGHTER) specified in table 1w, shall be

– For signalling channels (SCH, FACCH/F, FACCH/H, SDCCH) FER: ≤ 5 %

14.2.4a.3 Test purpose.

For FACCH/H, MS shall meet the reference sensitivity performance mentioned in 3GPP TS 45.005 sub clause 6.2.5, for reference sensitivity level mentioned in Table 1w according to propagation conditions.

14.2.4a.4 Method of test

14.2.4a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on TCH/HS with an ARFCN in the Mid ARFCN range, power control level set to maximum power.

The SS transmits Standard Test Signal C1 on the traffic channel.

Specific PICS Statements:

-

14.2.4a.4.2 Procedure

a) The fading function is set to TUhigh.

b) The SS sets the amplitude of the wanted signal to reference sensitivity level, as defined in Table 1w.

c) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Due to the low signal level the MS may not be able to acknowledge the Layer 2 frame with an RR frame and the SS will repeat the Layer 2 frame. Each repeated L2 frame will be counted and will indicate a frame erasure event.

d) The SS determines the frame erasure events during at least the minimum number of samples of FACCH/H frames.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.

14.2.4a.5 Test requirements

The error rates measured shall not exceed the test limit error rate values given in table 14.2.4a.5-1.

Table 14.2.4a.5-1: Limits for FACCH/H sensitivity

			GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900		DCS 1 800 and PCS 1 900	
Channels	**Type of measurements**	**Propagation**	**Test limit error rate %**	**Minimum No of samples**	**Test limit error rate %**	**Minimum No of samples**
FACCH/H	FER	TUhigh	5		5	

14.2.5 Reference sensitivity - full rate data channels

14.2.5.1 Definition

The reference sensitivity for data channels is the signal level at the MS receiver input at which a certain BER must be achieved.

14.2.5.2 Conformance Requirement.

1. At reference sensitivity level, the TCH/F9,6, TCH/F4,8 and TCH/F2,4 BER shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 6.2.

14.2.5.3 Test purpose

1. To verify that the MS does not exceed conformance requirement 1 under HT propagation condition with an allowance for the statistical significance of the test.

14.2.5.4 Method of test

14.2.5.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH with an ARFCN in the Mid ARFCN range. One of the supported TCH/(F9,6, F4,8, or F2,4) shall be used. The power control level is set to maximum power.

The SS transmits Standard Test Signal C1 on the traffic channel.

The SS commands the MS to create the traffic channel loop back signalling erased frames (subclause 36.2.1.1.1).

14.2.5.4.2 Procedure

a) The fading function is set to HT.

b) The SS sets the amplitude of the wanted signal level to reference sensitivity level ( ).

c) The SS compares transmitted data with received data for at least the minimum number of samples of consecutive bits and records every error bit as an error event.

d) The SS sets the wanted signal level to 28 dBμVemf.

e) The SS commands the MS to open the TCH loop.

f) The SS commands the MS to another of the supported data channels.

g) Steps b) to f) are repeated for all supported full rate data channels.

14.2.5.5 Test requirements

The Max-events measured for different channels shall not exceed the values given in table 14-11.

Table 14-11: Limits for full rate data channel sensitivity

			GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900		DCS 1 800 and PCS 1 900	
Channels	**Type of measurements**	**Propagation**	**Test limit error rate %**	**Minimum No of samples**	**Test limit error rate %**	**Minimum No of samples**
TCH/F9,6	BER	HT	0,778	180000	0,784	76500
TCH/F4,8	BER	HT	0,011	5350000	0,011	5350000
TCH/F2,4	BER	HT	0,001	11900000	0,001	11900000

14.2.6 Reference sensitivity - half rate data channels

14.2.6.1 Definition

The reference sensitivity for data channels is the signal level at the MS receiver input at which a certain BER must be achieved.

14.2.6.2 Conformance Requirement.

1. At reference sensitivity level, the TCH/H4,8 and TCH/H2,4 BER shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 6.2.

14.2.6.3 Test purpose

1. To verify that the MS does not exceed conformance requirement 1 under HT propagation condition with an allowance for the statistical significance of the test.

14.2.6.4 Method of test

14.2.6.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH with an ARFCN in the Mid ARFCN range. One of the supported TCH/(H4,8 or H2,4) shall be used. The power control level is set to maximum power.

The SS transmits Standard Test Signal C1 on the traffic channel.

The SS commands the MS to create the traffic channel loop back signalling erased frames (subclause 36.2.1.1.1).

14.2.6.4.2 Procedure

a) The fading function is set to HT.

b) The SS sets the amplitude of the wanted signal level to reference sensitivity level ( ).

c) The SS compares transmitted data with received data for at least the minimum number of samples of consecutive bits and records every error bit as an error event.

d) The SS sets the wanted signal level to 28 dBμVemf.

e) The SS commands the MS to open the TCH loop.

f) The SS commands the MS to another of the supported data channels.

g) Steps b) to f) are repeated for all supported data channels.

14.2.6.5 Test requirements

The Max-events measured for different channels shall not exceed the values given in table 14-12.

Table 14-12: Limits for half rate data channel sensitivity

			GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900		DCS 1 800 and PCS 1 900	
Channels	**Type of measurements**	**Propag-ation**	**Test limit error rate %**	**Minimum No of samples**	**Test limit error rate %**	**Minimum No of samples**
TCH/H4,8	BER	HT	0,778	180000	-	-
TCH/H2,4	BER	HT	0,011	5350000	-	-

14.2.7 Reference sensitivity - TCH/EFS

14.2.7.1 Definition

The reference sensitivity is the signal level at the MS receiver input at which a certain BER and FER must be achieved.

For E-GSM 900 MS this test is only performed in the P-GSM band.

14.2.7.2 Conformance requirement

1. At reference sensitivity level, the TCH/EFS FER shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 6.2.

2 At reference sensitivity level, the TCH/EFS class I RBER shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 6.2.

3 At reference sensitivity level, the TCH/EFS class II RBER shall meet the reference sensitivity, performance of table 1 in 3GPP TS 05.05 subclause 6.2.

4. At reference sensitivity level, the TCH/EFS class II RBER shall meet the reference sensitivity, performance of table 1 in GSM under extreme conditions; 3GPP TS 05.05, subclause 6.2 and annex D subclauses D.2.1 and D.2.2.

14.2.7.3 Test purpose

NOTE: This test is performed under STATIC propagation conditions to allow implicit testing of the ability of the MS to hop over the full band. The tests under dynamic propagation conditions are better suited to test the reference sensitivity conformance but cannot test hopping over the full band due to limited bandwidth of available fading simulators.

1. To verify that the MS does not exceed conformance requirement 1 under STATIC and TUhigh propagation conditions with an allowance for the statistical significance of the test.

2. To verify that the MS does not exceed conformance requirement 2 under STATIC and TUhigh propagation conditions with an allowance for the statistical significance of the test.

3. To verify that the MS does not exceed conformance requirement 3 under STATIC, TUhigh, RA and HT propagation conditions with an allowance for the statistical significance of the test.

4. To verify that the MS does not exceed conformance requirement 4 under STATIC and TUhigh propagation conditions with an allowance for the statistical significance of the test.

14.2.7.4 Method of test

NOTE 1: The BA list sent on the BCCH and SACCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range 15 dBmVemf( ) to 35 dBmVemf( ).

NOTE 2: The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

NOTE 3: When frequency hopping is used, the traffic channel may fall on any of the ARFCNs defined in clause 6.

14.2.7.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/EFS with an ARFCN in the Mid ARFCN range for GSM 400, GSM 700, T-GSM 810, GSM 850, DCS 1800 and PCS 1 900 and ARFCN 70 for GSM 900, power control level set to maximum power.

NOTE: For GSM 900 ARFCN 70 is tested since this is the 73rd harmonic of the 13 MHz clock normally used internally in a MS.

The SS transmits Standard Test Signal C1 on the traffic channel.

The SS commands the MS to create traffic channel loop back signalling erased frames.

14.2.7.4.2 Procedure

a) The fading function is set to TUhigh.

b) the SS sets the amplitude of the wanted signal to reference sensitivity level ( ).

c) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of class II, by examining sequences of at least the minimum number of samples of consecutive bits of class II. Bits are taken only from those frames not signalled as erased.

e) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

f) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

g) Steps a) to d) are repeated under extreme test conditions.

h) Steps a) to g) are repeated for TCH/EFS with ARFCNs in the Low ARFCN range for GSM 400, GSM 700, T-GSM 810, GSM 850, DCS 1800 and PCS 1 900 and ARFCN 5 for GSM 900 and the High ARFCN range.

NOTE: For GSM 900 ARFCN 5 is tested since this is the 72nd harmonic of the 13 MHz clock normally used internally in a MS.

i) Steps b) to d) are repeated with the SS fading function set in turn to RA and HT.

j) Steps b) to g) are repeated, with the SS fading function set to static and the MS is commanded by the SS into hopping mode using the hopping sequence defined in clause 6.

The amplitude of the wanted signal is set according to step b). All the other time slots, except the active ones, are set to 20 dB above reference sensitivity level( ). This implicitly tests adjacent time slot rejection.

14.2.7.5 Test requirements

The error rates measured for different channels and under the different propagation conditions, under any combination of normal and extreme test voltages and ambient temperatures, shall not exceed the test limit error rate values given in tables 14-4 or 14-13a, 14-13b.

Table 14-13a: Limits for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 sensitivity

Channels	Propagation conditions TUhigh		Propagation conditions RA		Propagation conditions HT		Static conditions	
	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
TCH/EFS								
FER	8,867	8900					0,122	164000
class Ib(RBER)	0,224	1000000					0,110	20000000
class II (RBER)	7,500	120000	7,500	24000	9,350	60000	2,439	8200

Table 14-13b: Limits for DCS 1 800 and PCS 1 900 sensitivity

Channels	Propagation conditions TUhigh		Propagation conditions RA		Propagation conditions HT		Static conditions	
	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
TCH/EFS								
FER	4,475	13400					0,122	164000
class Ib(RBER)	0,130	1500000					0,110	20000000
class II(RBER)	8,333	60000	7,500	24000	9,498	30000	2,439	8200

14.2.7a Reference sensitivity - TCH/EFS in TIGHTER configuration

14.2.7a.1 Definition

The reference sensitivity is the signal level at the MS receiver input at which a certain BER and FER must be achieved.

14.2.7a.2 Conformance requirement

3GPP TS 45.005 subclause 6.2.5

The reference performance for Tightened Link Level Performance (TIGHTER) specified in table 1w, shall be

For speech channels (TCH/FS, TCH/HS, TCH/EFS, TCH/AFSx, TCH/AHSx, TCH/WFSx) FER: ≤ 1 %

In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 1w at the corresponding signal level in dBm. The reference sensitivity level in section 6.2.1 shall be applied for TIGHTER MS.

14.2.7a.3 Test purpose

NOTE: This test is performed under STATIC propagation conditions to allow implicit testing of the ability of the MS to hop over the full band. The tests under dynamic propagation conditions are better suited to test the reference sensitivity conformance but cannot test hopping over the full band due to limited bandwidth of available fading simulators.

1. For TCH EFS/FER, MS shall meet the reference sensitivity performance mentioned in 3GPP TS 45.005 sub clause 6.2.5, for reference sensitivity level mentioned in Table 1w according to propagation conditions.

2. At reference sensitivity level, the TCH/EFS class Ib RBER shall meet the performance mentioned in table 1w in 3GPP TS 45.005.

3. At reference sensitivity level, the TCH/EFS RBER2 shall meet the performance mentioned in table 1w in 3GPP TS 45.005.

14.2.7a.4 Method of test

NOTE 1: The BA list sent on the BCCH and SACCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range 15 dBmVemf( ) to 35 dBmVemf( ).

NOTE 2: The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

14.2.7a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/EFS with an ARFCN in the Mid ARFCN range for GSM 400, GSM 700, T-GSM 810, GSM 850, DCS 1800 and PCS 1 900 and ARFCN 70 for GSM 900, power control level set to maximum power.

NOTE: For GSM 900 ARFCN 70 is tested since this is the 73rd harmonic of the 13 MHz clock normally used internally in a MS.

The SS transmits Standard Test Signal C1 on the traffic channel.

The SS commands the MS to create traffic channel loop back signalling erased frames.

Specific PICS Statements:

-

14.2.7a.4.2 Procedure

a) The fading function is set to TUhigh.

b) The SS sets the amplitude of the wanted signal to reference sensitivity as defined in Table 1w.

c) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of class II, by examining sequences of at least the minimum number of samples of consecutive bits of class II. Bits are taken only from those frames not signalled as erased.

e) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

f) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

g) Steps a) to d) are repeated under extreme test conditions.

h) Steps a) to g) are repeated for TCH/EFS with ARFCNs in the Low ARFCN range for GSM 400, GSM 700, T-GSM 810, GSM 850, DCS 1800 and PCS 1 900 and ARFCN 5 for GSM 900 and the High ARFCN range.

NOTE: For GSM 900 ARFCN 5 is tested since this is the 72nd harmonic of the 13 MHz clock normally used internally in a MS.

i) Steps b) to d) are repeated with the SS fading function set in turn to RA and HT.

j) Steps b) to g) are repeated, with the SS fading function set to static and the MS is commanded by the SS into hopping mode using the hopping sequence defined in clause 6.

The amplitude of the wanted signal is set according to step b). All the other time slots, except the active ones, are set to 20 dB above reference sensitivity level( ). This implicitly tests adjacent time slot rejection.

14.2.7a.5 Test requirements

The error rates measured for different channels and under the different propagation conditions, under any combination of normal and extreme test voltages and ambient temperatures, shall not exceed the test limit error rate values given in tables 14.2.7a.5-1, 14.2.7a.5-2.

Table 14.2.7a.5-1: Limits for GSM 850 and GSM 900 sensitivity

Channels	Propagation conditions TUhigh		Propagation conditions RA		Propagation conditions HT		Static conditions	
	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
TCH/EFS								
FER	1	8900					1	164000
class Ib(RBER)	0,03	1000000					0,03	20000000
class II (RBER)	3,29	120000	6,19	24000	5,34	60000	6,22	8200

Table 14.2.7a.5-2: Limits for DCS 1800 and PCS 1900 sensitivity

Channels	Propagation conditions TUhigh		Propagation conditions RA		Propagation conditions HT		Static conditions	
	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
TCH/EFS								
FER	1	13400					1	164000
class Ib(RBER)	0,04	1500000					0,03	20000000
class II(RBER)	4,92	60000	6,07	24000	6,85	30000	6,22	8200

14.2.8 Reference sensitivity - full rate data channels in multislot configuration

14.2.8.1 Definition

The reference sensitivity for data channels is the signal level at the MS receiver input at which a certain BER must be achieved.

14.2.8.2 Conformance Requirement.

1. At reference sensitivity level, the TCH/F9,6, TCH/F4,8 and TCH/F2,4 BER shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 6.2.

14.2.8.3 Test purpose

1. To verify that the MS does not exceed conformance requirement 1 in all multislot classes under HT propagation condition with an allowance for the statistical significance of the test.

14.2.8.4 Method of test

14.2.8.4.1 Initial conditions

A call is set up according to the generic call set up procedure for multislot HSCSD on a TCH with an ARFCN in the Mid ARFCN range. One of the supported TCH/(F9,6, F4,8, or F2,4) shall be used.

The SS sets the MS to operate in a worst case configuration where the overlapping of the transmitting and receiving timeslots are maximized. If it needs the use of timing advance, it is set to 63. If overlapping is not possible, transmitting and receiving timeslots should be as close as possible.

The power control level is set to maximum power.

The SS transmits Standard Test Signal C1 on all the channels.

The SS commands the MS to create the loop back of the closest channel to the transmitting timeslot.

14.2.8.4.2 Procedure

a) The fading function is set to HT.

b) The SS commands the MS to close the TCH loop.

c) The SS sets the amplitude of the wanted signal level to reference sensitivity level ( ) in all subchannels.

d) The SS compares transmitted data with received data in all channels for at least the minimum number of samples of consecutive bits and records every error bit as an error event.

e) The SS sets the wanted signal level to 28 dBmVemf.

f) The SS commands the MS to open the TCH loop.

g) The SS commands the MS to another of the supported data channels.

h) Steps b) to g) are repeated for all supported full rate data channels.

14.2.8.5 Test requirements

The Max-events measured for different channels shall not exceed the values given in table 14-15.

Table 14-15: Limits for full rate data channel sensitivity

			GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900		DCS 1 800 and PCS 1 900	
Channels	**Type of measurements**	**Propagation**	**Test limit error rate %**	**Minimum No of samples**	**Test limit error rate %**	**Minimum No of samples**
TCH/F9,6	BER	HT	0,778	180000	0,784	76500
TCH/F4,8	BER	HT	0,011	5350000	0,011	5350000
TCH/F2,4	BER	HT	0,001	11900000	0,001	11900000

14.2.9 Reference sensitivity - TCH/FS for MS supporting the R-GSM band

14.2.9.1 Definition

The reference sensitivity is the signal level at the MS receiver input at which a certain BER and FER must be achieved.

14.2.9.2 Conformance requirement

1. At reference sensitivity level, the TCH/FS FER shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 6.2.

2 At reference sensitivity level, the TCH/FS class I RBER shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 6.2.

3 At reference sensitivity level, the TCH/FS class II RBER shall meet the reference sensitivity, performance of table 1 in 3GPP TS 05.05 subclause 6.2.

4. At reference sensitivity level, the TCH/FS class II RBER shall meet the reference sensitivity, performance of table 1 in GSM under extreme conditions; 3GPP TS 05.05, subclause 6.2 and annex D subclauses D.2.1 and D.2.2.

14.2.9.3 Test purpose

NOTE: This test is performed under STATIC propagation conditions to allow implicit testing of the ability of the MS to hop over the full band. The tests under dynamic propagation conditions are better suited to test the reference sensitivity conformance but cannot test hopping over the full band due to limited bandwidth of available fading simulators.

1. To verify that the MS does not exceed conformance requirement 1 under STATIC and TUhigh propagation conditions with an allowance for the statistical significance of the test.

2. To verify that the MS does not exceed conformance requirement 2 under STATIC and TUhigh propagation conditions with an allowance for the statistical significance of the test.

3. To verify that the MS does not exceed conformance requirement 3 under STATIC, TUhigh, RA and HT propagation conditions with an allowance for the statistical significance of the test.

4. To verify that the MS does not exceed conformance requirement 4 under STATIC and TUhigh propagation conditions with an allowance for the statistical significance of the test.

14.2.9.4 Method of test

NOTE 1: The BA list sent on the BCCH and SACCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range 15 dBμVemf( ) to 35 dBμVemf( ).

NOTE 2: The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

NOTE 3: When frequency hopping is used, the traffic channel may fall on any of the ARFCNs defined in clause 6.

14.2.9.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/FS with ARFCN 70 for R-GSM 900, power control level set to maximum power.

NOTE: For R-GSM 900 ARFCN 70 is tested since this is the 73rd harmonic of the 13 MHz clock normally used internally in a MS.

The SS transmits Standard Test Signal C1 on the traffic channel.

The SS commands the MS to create traffic channel loop back signalling erased frames.

14.2.9.4.2 Procedure

a) The fading function is set to TUhigh.

b) the SS sets the amplitude of the wanted signal to reference sensitivity level ( ).

c) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of class II, by examining sequences of at least the minimum number of samples of consecutive bits of class II. Bits are taken only from those frames not signalled as erased.

e) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

f) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

g) Steps a) to d) are repeated under extreme test conditions.

h) Steps a) to g) are repeated for TCH/FS with ARFCN 5 and 964 for R-GSM 900 and the High ARFCN range.

NOTE: For R-GSM 900 ARFCN 5 and 964 are tested since they are the 72^{nd} and 71^{st} harmonic of the 13 MHz clock normally used internally in a MS.

i) Steps b) to d) are repeated with the SS fading function set in turn to RA and HT.

j) Steps b) to g) are repeated, with the SS fading function set to static and the MS is commanded by the SS into hopping mode using the hopping sequence defined in clause 6.

The amplitude of the wanted signal is set according to step b). All the other time slots, except the active ones, are set to 20 dB above reference sensitivity level( ). This implicitly tests adjacent time slot rejection.

14.2.9.5 Test requirements

The error rates measured for different channels and under the different propagation conditions, under any combination of normal and extreme test voltages and ambient temperatures, shall not exceed the test limit error rate values given in table 14-5b.

Table 14-5b: Limits for GSM 900 sensitivity

Channels	Propagation conditions TUhigh		Propagation conditions RA		Propagation conditions HT		Static conditions	
	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
TCH/FS								
FER	6,742*α	8900					0,122*α	164000
class Ib(RBER)	0,42/α	1000000					0,41/α	20000000
class II(RBER)	8,333	120000	7,5	24000	9,333	60000	2,439	8200

14.2.10 Reference sensitivity - TCH/AFS

14.2.10.1 Definition

The reference sensitivity is the signal level at the MS receiver input at which a certain BER and FER must be achieved.

For E-GSM 900 MS this test is only performed in the P-GSM band.

14.2.10.2 Conformance requirement

1. At reference sensitivity level, the TCH/AFS FER shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 6.2.
2. At reference sensitivity level, the TCH/AFS class Ib RBER shall meet the reference sensitivity, performance of table 1 in 3GPP TS 05.05 subclause 6.2.

14.2.10.3 Test purpose

NOTE: This test is not performed under STATIC propagation conditions because the performance requirements are too small to be accurately measured.

1. To verify that the MS does not exceed conformance requirement 1 under TUhigh propagation conditions with an allowance for the statistical significance of the test.
2. To verify that the MS does not exceed conformance requirement 2 under TUhigh propagation conditions with an allowance for the statistical significance of the test.

14.2.10.4 Method of test

NOTE 1: The BA list sent on the BCCH and SACCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range 15 dBμVemf( ) to 35 dBμVemf( ).

NOTE 2: The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

NOTE 3: When frequency hopping is used, the traffic channel may fall on any of the ARFCNs defined in clause 6.

14.2.10.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AFS with an ARFCN in the Mid ARFCN range for GSM 400, GSM 700, T-GSM 810, GSM 850, DCS 1800 and PCS 1 900 and ARFCN 70 for GSM 900, power control level set to maximum power.

NOTE: For GSM 900 ARFCN 70 is tested since this is the 73rd harmonic of the 13 MHz clock normally used internally in a MS.

The multirate configuration indicates the use of a codec set limited to 12,2 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel.

The SS commands the MS to create traffic channel loop back signalling erased frames.

14.2.10.4.2 Procedure

a) The fading function is set to TUhigh.

b) the SS sets the amplitude of the wanted signal to reference sensitivity level ( ).

c) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are taken only from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 10,2 kbit/s and steps a) to e) are repeated.

g) The SS uses a Channel Mode Modify procedure to change the active codec set to 7,4 kbit/s and steps a) to e) are repeated.

Maximum/Minimum Duration of Test

Statistical test method, pre Rel-5 MS

Maximum: 31 minutes (GSM850, GSM900), 83 minutes (DCS1800, PCS1900).

Minimum: 10 minutes (GSM850, GSM900), 5 minutes (DCS1800, PCS1900).

Statistical test method, Rel-5 onwards MS

Maximum: 31 minutes (GSM850, GSM900), 278 minutes (DCS1800, PCS1900).

Minimum: 10 minutes (GSM850, GSM900), 9 minutes (DCS1800, PCS1900).

14.2.10.5 Test requirements

Testing the reference sensitivity performance is performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with BER/BLER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of the limit lines refer to Annex 6.2

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14-36: Minimum test times due to TU high fading conditions

Full Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	428	244	201	190	95	90	s
	0:07:08	**0:04:04**	**0:03:21**	**0:03:10**	**0:01:35**	**0:01:30**	**hh:mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is done by comparing the result with the "derived test limit". In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne $\geq$ 1 (inclusive artificial error)

For an early fail decision ne $\geq$ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rates measured for different channels and under the different propagation conditions, shall be tested according to the values given in table 14-37 or 14-38.

Table 14-37: Statistical test limits for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 sensitivity

TU high no FH								
0.4 to 0.9 GHz			**frames per s**	**Orig. BER**	**Derived**	**Target number**	**Target test**	**Target test time**
	Channel	**bits per sec**	**clas1b per s**	**requirement**	**test limit**	**of samples**	**time (s)**	**(hh:mm:ss)**
AFS 12.2	frames	12200	50	0,049000	0,060466	5706	114	00:01:54
	Class1b	12200	8150	0,015000	0,018510	18639	2	00:00:02
AFS 10.2	frames	10200	50	0,021000	0,025914	13313	266	00:04:26
	Class1b	10200	6950	0,002300	0,002838	121556	17	00:00:17
AFS 7.4	frames	7400	50	0,004100	0,005059	68190	1364	00:22:44
	Class1b	7400	4350	0,000540	0,000666	517738	119	00:01:59

Table 14-38: Statistical test limits for DCS 1 800 and PCS 1 900 sensitivity

TU high no FH								
1.8 to 1.9 GHz			**frames per s**	**Orig. BER**	**Derived**	**Target number**	**Target test**	**Target test time**
	Channel	**bits per sec**	**clas1b per s**	**requirement**	**test limit**	**of samples**	**time (s)**	**(hh:mm:ss)**
AFS 12.2	frames	12200	50	Pre Rel-5: 0,030000 Rel-5: 0,020000	Pre Rel-5: 0,037020 Rel-5: 0,024680	Pre Rel-5: 9320 Rel-5: 13979	Pre Rel-5: 186 Rel-5: 280	Pre Rel-5: 00:03:06 Rel-5: 00:04:40
	Class1b	12200	8150	Pre Rel-5: 0,0150000 Rel-5: 0,014000	Pre Rel-5: 0,018510 Rel-5: 0,017276	Pre Rel-5: 18639 Rel-5: 19970	Pre Rel-5: 2 Rel-5: 2	Pre Rel-5: 00:00:02 Rel-5: 00:00:02
AFS 10.2	frames	10200	50	Pre Rel-5: 0,012000 Rel-5: 0,006500	Pre Rel-5: 0,014808 Rel-5: 0,008021	Pre Rel-5: 23299 Rel-5: 43012	Pre Rel-5: 466 Rel-5: 860	Pre Rel-5: 00:07:46 Rel-5: 00:14:20
	Class1b	10200	6950	Pre Rel-5: 0,001700 Rel-5: 0,001200	Pre Rel-5: 0,002098 Rel-5: 0,001481	Pre Rel-5: 164458 Rel-5: 232982	Pre Rel-5: 24 Rel-5: 34	Pre Rel-5: 00:00:24 Rel-5: 00:00:34
AFS 7.4	frames	7400	50	Pre Rel-5: 0,001300 Rel-5: 0,000360	Pre Rel-5: 0,001604 Rel-5: 0,000444	Pre Rel-5: 215061 Rel-5: 776607	Pre Rel-5: 4301 Rel-5: 15532	Pre Rel-5: 01:11:41 Rel-5: 04:18:52
	Class1b	7400	4350	Pre Rel-5: 0,000260 Rel-5: 0,000130	Pre Rel-5: 0,000321 Rel-5: 0,000160	Pre Rel-5: 1075302 Rel-5: 2150605	Pre Rel-5: 247 Rel-5: 494	Pre Rel-5: 00:04:07 Rel-5: 00:08:14

14.2.10a Reference sensitivity - TCH/AFS in TIGHTER configuration

14.2.10a.1 Definition

The reference sensitivity is the signal level at the MS receiver input at which a certain BER and FER must be achieved.

14.2.10a.2 Conformance requirement

3GPP TS 45.005 subclause 6.2.5

The reference performance for Tightened Link Level Performance (TIGHTER) specified in table 1w, shall be

For speech channels (TCH/FS, TCH/HS, TCH/EFS, TCH/AFSx, TCH/AHSx, TCH/WFSx) FER: ≤ 1 %

In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 1w at the corresponding signal level in dBm. The reference sensitivity level in section 6.2.1 shall be applied for TIGHTER MS.

14.2.10a.3 Test purpose

NOTE: This test is not performed under STATIC propagation conditions because the performance requirements are too small to be accurately measured.

1. For TCH AFS/FER, MS shall meet the reference sensitivity performance mentioned in 3GPP TS 45.005 sub clause 6.2.5, for reference sensitivity level mentioned in Table 1w according to propagation conditions.

2. For TCH/AFS class Ib RBER, MS shall meet the reference sensitivity performance mentioned in 3GPP TS 45.005 sub clause 6.2.5, for reference sensitivity level mentioned in Table 1w according to propagation conditions.

14.2.10a.4 Method of test

NOTE 1: The BA list sent on the BCCH and SACCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range 15 dBμVemf( ) to 35 dBμVemf( ).

NOTE 2: The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

14.2.10a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AFS with an ARFCN in the Mid ARFCN range for GSM 400, GSM 700, T-GSM 810, GSM 850, DCS 1800 and PCS 1 900 and ARFCN 70 for GSM 900, power control level set to maximum power.

NOTE: For GSM 900 ARFCN 70 is tested since this is the 73rd harmonic of the 13 MHz clock normally used internally in a MS.

The multirate configuration indicates the use of a codec set limited to 12,2 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel.

The SS commands the MS to create traffic channel loop back signalling erased frames.

Specific PICS Statements:

-

14.2.10a.4.2 Procedure

a) The fading function is set to TUhigh no FH.

b) The SS sets the amplitude of the wanted signal to reference sensitivity as defined in Table 1w.

c) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are taken only from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 10,2 kbit/s and steps a) to e) are repeated.

g) The SS uses a Channel Mode Modify procedure to change the active codec set to 7,4 kbit/s and steps a) to e) are repeated.

Maximum/Minimum Duration of Test

Maximum: 31 minutes (GSM850, GSM900), 278 minutes (DCS1800, PCS1900).

Minimum: 10 minutes (GSM850, GSM900), 9 minutes (DCS1800, PCS1900).

14.2.10a.5 Test requirements

Testing the reference sensitivity performance is performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with BER/BLER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of the limit lines refer to Annex 6.2

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

D_{pass} = D_{fail} = D and D = 0.0085%

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.2.10a.5-1: Minimum test times due to TU high fading conditions

Full Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	M
min test time	428	244	201	190	95	90	S
	0:07:08	**0:04:04**	**0:03:21**	**0:03:10**	**0:01:35**	**0:01:30**	**hh:mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is done by comparing the result with the “derived test limit”. In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne $\geq$ 1 (inclusive artificial error)

For an early fail decision ne $\geq$ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rates measured for different channels and under the different propagation conditions shall be tested according to the values given in table 14.2.10a.5-2 to 14.2.10a.5-3.

Table 14.2.10a.5-2 : Statistical test limits for GSM 850 and GSM 900 sensitivity

TU high no FH								
0.4 to 0.9GHz			**frames per s**	**Orig. BER**	**Derived**	**Target number**	**Target test**	**Target test time**
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
AFS 12.2	frames	12200	50	0,049000	0,060466	5706	114	00:01:54
	Class1b	12200	8150	0,015000	0,018510	18639	2	00:00:02
AFS 10.2	frames	10200	50	0,021000	0,025914	13313	266	00:04:26
	Class1b	10200	6950	0,002300	0,002838	121556	17	00:00:17
AFS 7.4	frames	7400	50	0,004100	0,005059	68190	1364	00:22:44
	Class1b	7400	4350	0,000540	0,000666	517738	119	00:01:59

Table 14.2.10a.5-3 : Statistical test limits for DCS 1 800 and PCS 1 900 sensitivity

TU high no FH								
1.8 to 1.9 GHz			**frames per s**	**Orig. BER**	**Derived**	**Target number**	**Target test**	**Target test time**
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
AFS 12.2	frames	12200	50	0,020000	0,024680	13979	280	00:04:40
	Class1b	12200	8150	0,014000	0,017276	19970	2	00:00:02
AFS 10.2	frames	10200	50	0,006500	0,008021	43012	860	00:14:20
	Class1b	10200	6950	0,001200	0,001481	232982	34	00:00:34
AFS 7.4	frames	7400	50	0,000360	0,000444	776607	15532	04:18:52
	Class1b	7400	4350	0,000130	0,000160	2150605	494	00:08:14

14.2.11 to 14.2.17 Void

14.2.18 Reference sensitivity - TCH/AHS

14.2.18.1 Definition

The reference sensitivity level is the signal level at the MS receiver input at which a certain BER and FER for speech frames must be achieved.

14.2.18.2 Conformance requirement

1. At reference sensitivity level, the TCH/AHS FER shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 6.2.

2 At reference sensitivity level, the TCH/AHS class Ib RBER (BFI=0) shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 6.2.

3 At reference sensitivity level, the TCH/AHS class II RBER (BFI=0) shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 6.2.

14.2.18.3 Test purpose

1. To verify that the MS does not exceed conformance requirement 1 under TUhigh propagation conditions with an allowance for the statistical significance of the test.

2. To verify that the MS does not exceed conformance requirement 2 under TUhigh propagation conditions with an allowance for the statistical significance of the test.

3. To verify that the MS does not exceed conformance requirement 3 under TUhigh, RA and HT propagation conditions with an allowance for the statistical significance of the test.

14.2.18.4 Method of test

14.2.18.4.1 Initial conditions

The BA list sent on the BCCH and SACCH indicates at least six surrounding cells, with at least one near to each band edge. It is not necessary to generate any of these BCCHs, but if provided, the signal strengths of BCCHs shall be in the range 15 dBµVemf( ) to 35 dBµVemf( ).

The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

A call is set up according to the generic call set up procedure on a TCH/AHS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The multirate configuration indicates the use of a codec set limited to 5,15 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel.

14.2.18.4.2 Procedure

a) The SS commands the MS to create traffic channel loop back signalling erased frames.

NOTE: Frames detected with BFI=1 are signalled as erased on the uplink.

b) The fading function is set to TUHigh.

c) The SS sets the amplitude of the wanted signal to reference sensitivity level ( ).

d) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

e) The SS determines the number of residual bit error events for the bits of class II, by examining sequences of at least the minimum number of samples of consecutive bits of class II. Bits are taken only from those frames not signalled as erased.

f) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

g) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

h) The SS uses a Channel Mode Modify procedure to change the active codec set to 4,75 kbit/s and steps d) to g) are repeated.

i) The fading function is set to HT.

j) The SS uses a Channel Mode Modify procedure to change the active codec set to 7,4 kbit/s and steps d) to g) are repeated.

k) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,9 kbit/s and steps d) to g) are repeated.

l) The fading function is set to RA.

m) The SS uses a Channel Mode Modify procedure to change the active codec set to 7,95 kbit/s and steps d) to g) are repeated.

n) The SS uses a Channel Mode Modify procedure to change the active codec set to 6,7 kbit/s and steps d) to g) are repeated.

Maximum/Minimum Duration of Test

Pre Rel-5 MS

Maximum: 24 minutes (GSM850), 23 minutes (GSM900), 15 minutes (DCS1800, PCS1900).

Minimum: 23 minutes (GSM850), 22 minutes (GSM900), 12 minutes (DCS1800, PCS1900).

Rel-5 onwards MS

Maximum: 24 minutes (GSM850), 23 minutes (GSM900), 17 minutes (DCS1800, PCS1900).

Minimum: 23 minutes (GSM850), 22 minutes (GSM900), 12 minutes (DCS1800, PCS1900).

14.2.18.5 Test requirements

Testing the reference sensitivity performance is performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with BER/BLER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 6.2

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure 14-1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14-39: Minimum test times due to TU high fading conditions

Half Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	855	489	403	380	190	180	s
	0:14:15	**0:08:09**	**0:06:43**	**0:06:20**	**0:03:10**	**0:03:00**	**hh.mm:ss**

Table 14-40: Minimum test times due to HT 100 fading conditions

Half Rate 100 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	428	244	201	190	95	90	s
	0:07:08	**0:04:04**	**0:03:21**	**0:03:10**	**0:01:35**	**0:01:30**	

Table 14-x: Minimum test times due to RA 130 fading conditions

Half Rate 130 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	-	-	-	-	73	69	s
	-	**-**	**-**	**-**	**0:01:13**	**0:01:09**	

Table 14-41: Minimum test times due to RA 250 fading conditions

Half Rate 250 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	171	98	81	76	-	-	s
	0:02:51	**0:01:38**	**0:01:21**	**0:01:16**	**-**	**-**	**hh:mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is done by comparing the result with the “derived test limit”. In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne $\geq$ 1 (inclusive artificial error)

For an early fail decision ne $\geq$ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rates measured for different channels and under the different propagation conditions, shall be tested according to the values given in table 14-42 or 14-43.

Table 14-42: Statistical test limits for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900: fading TU high

TU high no FH								
0.4 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
			clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
	Channel	bits per sec	class II per s					

AHS 5.15	frames	5150	50	0,025000	0,030850	11183	224	00:03:44
	Class1b	5150	2100	0,005100	0,006293	54819	26	00:00:26
	Class II	5150	600	0,063000	0,077742	4438	7	00:00:07
AHS 4.75	frames	4750	50	0,012000	0,014808	23298	466	00:07:46
	Class1b	4750	2200	0,001700	0,002098	164458	75	00:01:15
	Class II	4750	600	0,064000	0,078976	4368	7	00:00:07

Table 14-43: Statistical test limits for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900: fading RA 250

RA 250 no FH								
0.4 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
			clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
	Channel	bits per sec	clas II per s					
AHS 7.95	frames	7950	50					
	Class1b	7950	2800					
	Class II	7950	1800	Pre Rel-5: 0,059000 Rel-5: 0,047000	Pre Rel-5: 0,072806 Rel-5: 0,057998	Pre Rel-5: 4739 Rel-5: 5948	Pre Rel-5: 3 Rel-5: 3	Pre Rel-5: 00:00:03 Rel-5: 00:00:03
AHS 6.7	frames	6700	50					
	Class1b	6700	2750					
	Class II	6700	1200	Pre Rel-5: 0,065000 Rel-5: 0,055000	Pre Rel-5: 0,080210 Rel-5: 0,067870	Pre Rel-5: 4302 Rel-5: 5083	Pre Rel-5: 4 Rel-5: 4	Pre Rel-5: 00:00:04 Rel-5: 00:00:04

Table 14-44: Statistical test limits for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900: fading HT 100

HT 100 no FH								
0.4 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
			clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
	Channel	bits per sec	clas II per s					
AHS 7.4	frames	7400	50					
	Class1b	7400	2950					
	Class II	7400	1400	Pre Rel-5: 0,069000 Rel-5: 0,060000	Pre Rel-5: 0,085146 Rel-5: 0,074040	Pre Rel-5: 4052 Rel-5: 4660	Pre Rel-5: 3 Rel-5: 3	Pre Rel-5: 00:00:03 Rel-5: 00:00:03
AHS 5.9	frames	5900	50					
	Class1b	5900	2350					
	Class II	5900	800	Pre Rel-5: 0,083000 Rel-5: 0,068000	Pre Rel-5: 0.102422 Rel-5: 0,083912	Pre Rel-5: 3369 Rel-5: 4111	Pre Rel-5: 4 Rel-5: 5	Pre Rel-5: 00:00:04 Rel-5: 00:00:05

Table 14-45: Statistical test limits for DCS 1 800 and PCS 1 900 sensitivity: fading TU high

TU high no FH								
1.8 and 1.9 GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
			clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
	Channel	bits per sec	class II per s					
AHS 5.15	frames	5150	50	0,026000	0,032084	10753	215	00:03:35
	Class1b	5150	2100	0,005300	0,006540	52751	25	00:00:25
	Class II	5150	600	0,063000	0,077742	4438	7	00:00:07
AHS 4.75	frames	4750	50	Pre Rel-5: 0,017000 Rel-5: 0,012000	Pre Rel-5: 0,020978 Rel-5: 0,014808	Pre Rel-5: 16446 Rel-5: 23298	Pre Rel-5: 329 Rel-5: 466	Pre Rel-5: 00:05:29 Rel-5: 00:07:46
	Class1b	4750	2200	Pre Rel-5: 0,002500 Rel-5: 0,001800	Pre Rel-5: 0,003085 Rel-5: 0,002221	Pre Rel-5: 111832 Rel-5: 155321	Pre Rel-5: 51 Rel-5: 71	Pre Rel-5: 00:00:51 Rel-5: 00:01:11
	Class II	4750	600	0,065000	0,080210	4301	7	00:00:07

Table 14-46: Statistical test limits for DCS 1 800 and PCS 1 900 sensitivity: fading RA 130

RA 130 no FH								
1.8 and 1.9 GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
			clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
	Channel	bits per sec	clas II per s					
AHS 7.95	frames	7950	50					
	Class1b	7950	2800					
	Class II	7950	1800	Pre Rel-5: 0,059000 Rel-5: 0,048000	Pre Rel-5: 0,072806 Rel-5: 0,059232	Pre Rel-5: 4739 Rel-5: 5825	Pre Rel-5: 3 Rel-5: 3	Pre Rel-5: 00:00:03 Rel-5: 00:00:03
AHS 6.7	frames	6700	50					
	Class1b	6700	2750					
	Class II	6700	1250	Pre Rel-5: 0,065000 Rel-5: 0,055000	Pre Rel-5: 0,080210 Rel-5: 0,067870	Pre Rel-5: 4302 Rel-5: 5083	Pre Rel-5: 3 Rel-5: 4	Pre Rel-5: 00:00:03 Rel-5: 00:00:04

Table 14-47: Statistical test limits for DCS 1 800 and PCS 1 900 sensitivity: fading HT 100

HT 100 no FH								
1.8 and 1.9 GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
			clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
	Channel	bits per sec	clas II per s					
AHS 7.4	frames	7400	50					
	Class1b	7400	2950					
	Class II	7400	1400	Pre Rel-5: 0,071000 Rel-5: 0,060000	Pre Rel-5: 0,087614 Rel-5: 0,074040	Pre Rel-5: 3938 Rel-5: 4660	Pre Rel-5: 3 Rel-5: 3	Pre Rel-5: 00:00:03 Rel-5: 00:00:03
AHS 5.9	frames	5900	50					
	Class1b	5900	2350					
	Class II	5900	800	Pre Rel-5: 0,084000 Rel-5: 0,068000	Pre Rel-5: 0,103656 Rel-5: 0,083912	Pre Rel-5: 3329 Rel-5: 4111	Pre Rel-5: 4 Rel-5: 5	Pre Rel-5: 00:00:04 Rel-5: 00:00:05

14.2.18a Reference sensitivity - TCH/AHS in TIGHTER configuration

14.2.18a.1 Definition

The reference sensitivity level is the signal level at the MS receiver input at which a certain BER and FER for speech frames must be achieved.

14.2.18a.2 Conformance requirement

3GPP TS 45.005 subclause 6.2.5

The reference performance for Tightened Link Level Performance (TIGHTER) specified in table 1w, shall be

For speech channels (TCH/FS, TCH/HS, TCH/EFS, TCH/AFSx, TCH/AHSx, TCH/WFSx) FER: $\leq$ 1 %

In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 1w at the corresponding signal level in dBm. The reference sensitivity level in section 6.2.1 shall be applied for TIGHTER MS.

14.2.18a.3 Test purpose

1. For TCH AHS/FER, MS shall meet the reference sensitivity performance mentioned in 3GPP TS 45.005 sub clause 6.2.5, for reference sensitivity level mentioned in Table 1w according to propagation conditions.
2. At reference sensitivity level, the TCH/AHS class Ib RBER (BFI=0) shall meet the performance mentioned in table 1w in 3GPP TS 45.005.
3. At reference sensitivity level, the TCH/AHS class II RBER (BFI=0) shall meet the performance mentioned in table 1w in 3GPP TS 45.005.

14.2.18a.4 Method of test

14.2.18a.4.1 Initial conditions

The BA list sent on the BCCH and SACCH indicates at least six surrounding cells, with at least one near to each band edge. It is not necessary to generate any of these BCCHs, but if provided, the signal strengths of BCCHs shall be in the range 15 dBµVemf( ) to 35 dBµVemf( ).

The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

A call is set up according to the generic call set up procedure on a TCH/AHS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The multirate configuration indicates the use of a codec set limited to 5,15 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel.

14.2.18a.4.2 Procedure

a) The SS commands the MS to create traffic channel loop back signalling erased frames.

NOTE: Frames detected with BFI=1 are signalled as erased on the uplink.

b) The fading function is set to TUHigh.

c) The SS sets the amplitude of the wanted signal to reference sensitivity as defined in Table 1w.

d) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

e) The SS determines the number of residual bit error events for the bits of class II, by examining sequences of at least the minimum number of samples of consecutive bits of class II. Bits are taken only from those frames not signalled as erased.

f) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

g) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

h) The SS uses a Channel Mode Modify procedure to change the active codec set to 4,75 kbit/s and steps d) to g) are repeated.

i) The fading function is set to HT.

j) The SS uses a Channel Mode Modify procedure to change the active codec set to 7,4 kbit/s and steps d) to e) are repeated.

k) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,9 kbit/s and steps d) to e) are repeated.

l) The fading function is set to RA.

m) The SS uses a Channel Mode Modify procedure to change the active codec set to 7,95 kbit/s and steps d) to e) are repeated.

n) The SS uses a Channel Mode Modify procedure to change the active codec set to 6,7 kbit/s and steps d) to e) are repeated.

Maximum/Minimum Duration of Test

Maximum: 24 minutes (GSM850), 23 minutes (GSM900), 17 minutes (DCS1800, PCS1900).

Minimum: 23 minutes (GSM850), 22 minutes (GSM900), 12 minutes (DCS1800, PCS1900).

14.2.18a.5 Test requirements

Testing the reference sensitivity performance is performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with BER/BLER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 6.2

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure 14-1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.2.18a.5-1: Minimum test times due to TU high fading conditions

Half Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	855	489	403	380	190	180	s
	0:14:15	**0:08:09**	**0:06:43**	**0:06:20**	**0:03:10**	**0:03:00**	**hh.mm:ss**

Table 14.2.18a.5-2: Minimum test times due to HT 100 fading conditions

Half Rate 100 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	428	244	201	190	95	90	s
	0:07:08	**0:04:04**	**0:03:21**	**0:03:10**	**0:01:35**	**0:01:30**	

Table 14.2.18a.5-3: Minimum test times due to RA 130 fading conditions

Half Rate 130 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	-	-	-	-	73	69	s
	-	**-**	**-**	**-**	**0:01:13**	**0:01:09**	

Table 14.2.18a.5-4: Minimum test times due to RA 250 fading conditions

Half Rate 250 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	171	98	81	76	-	-	s
	0:02:51	**0:01:38**	**0:01:21**	**0:01:16**	**-**	**-**	**hh:mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is done by comparing the result with the "derived test limit". In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne $\geq$ 1 (inclusive artificial error)

For an early fail decision ne $\geq$ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rates measured for different channels and under the different propagation conditions shall be tested according to the values given in tables below:

Table 14.2.18a.5-5: Statistical test limits for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900: fading TU high

TU high no FH								
0.4 to 0.9 GHz			**frames per s**	**Orig. BER**	**Derived**	**Target number**	**Target test**	**Target test time**
			clas1b per s	**requirement**	**test limit**	**of samples**	**time (s)**	**(hh:mm:ss)**
	Channel	**bits per sec**	**class II per s**					
AHS 5.15	frames	5150	50	0,025000	0,030850	11183	224	00:03:44
	Class1b	5150	2100	0,005100	0,006293	54819	26	00:00:26
	Class II	5150	600	0,063000	0,077742	4438	7	00:00:07
AHS 4.75	frames	4750	50	0,012000	0,014808	23298	466	00:07:46
	Class1b	4750	2200	0,001700	0,002098	164458	75	00:01:15
	Class II	4750	600	0,064000	0,078976	4368	7	00:00:07

Table 14.2.18a.5-6: Statistical test limits for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900: fading RA 250

RA 250 no FH								
0.4 to 0.9 GHz			**frames per s**	**Orig. BER**	**Derived**	**Target number**	**Target test**	**Target test time**
			clas1b per s	**requirement**	**test limit**	**of samples**	**time (s)**	**(hh:mm:ss)**
	Channel	**bits per sec**	**clas II per s**					
AHS 7.95	frames	7950	50	0.0100	0.012340	27957	559	00:09:19
	Class1b	7950	2800	0.0044	0.005429	63541	23	00:00:23
	Class II	7950	1800	0.0191	0.023569	14638	8	00:00:08
AHS 6.7	frames	6700	50	0.0100	0.012340	27957	559	00:09:31
	Class1b	6700	2750	0.0029	0.003578	96406	35	00:00:35
	Class II	6700	1200	0.0342	0.042202	8175	7	00:00:07

Table 14.2.18a.5-7: Statistical test limits for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900: fading HT 100

HT 100 no FH								
0.4 to 0.9 GHz			**frames per s**	**Orig. BER**	**Derived**	**Target number**	**Target test**	**Target test time**
			clas1b per s	**requirement**	**test limit**	**of samples**	**time (s)**	**(hh:mm:ss)**
	Channel	**bits per sec**	**clas II per s**					
AHS 7.4	frames	7400	50	0.0100	0.012340	27957	559	00:09:19
	Class1b	7400	2950	0.0023	0.002838	121556	41	00:00:41
	Class II	7400	1400	0.0237	0.029245	11797	8	00:00:08
AHS 5.9	frames	5900	50	0.0100	0.012340	27957	559	00:09:31
	Class1b	5900	2350	0.0017	0.002097	164458	70	00:01:10
	Class II	5900	800	0.0408	0.050347	6852	9	00:00:09

Table 14.2.18a.5-8: Statistical test limits for DCS 1800 and PCS 1900 sensitivity: fading TU high

TU high no FH								
1.8 and 1.9 GHz			**frames per s**	**Orig. BER**	**Derived**	**Target number**	**Target test**	**Target test time**
			clas1b per s	**requirement**	**test limit**	**of samples**	**time (s)**	**(hh:mm:ss)**
	Channel	**bits per sec**	**class II per s**					
AHS 5.15	frames	5150	50	0,026000	0,032084	10753	215	00:03:35
	Class1b	5150	2100	0,005300	0,006540	52751	25	00:00:25
	Class II	5150	600	0,063000	0,077742	4438	7	00:00:07
AHS 4.75	frames	4750	50	0,012000	0,014808	23298	466	00:07:46
	Class1b	4750	2200	0,001800	0,002221	155321	71	00:01:11
	Class II	4750	600	0,065000	0,080210	4301	7	00:00:07

Table 14.2.18a.5-9: Statistical test limits for DCS 1800 and PCS 1900 sensitivity: fading RA 130

RA 130 no FH								
1.8 and 1.9 GHz			**frames per s**	**Orig. BER**	**Derived**	**Target number**	**Target test**	**Target test time**
			clas1b per s	**requirement**	**test limit**	**of samples**	**time (s)**	**(hh:mm:ss)**
	Channel	**bits per sec**	**clas II per s**					
AHS 7.95	frames	7950	50	0.0100	0.012340	27957	559	00:09:19
	Class1b	7950	2800	0,004	0.004936	69895	24	00:00:24
	Class II	7950	1800	0,018	0.022221	15532	9	00:00:09
AHS 6.7	frames	6700	50	0.0100	0.012340	27957	559	00:09:19
	Class1b	6700	2750	0,003	0.003702	93193	33	00:00:33
	Class II	6700	1200	0,03	0.03702	9319	8	00:00:08

Table 14.2.18a.5-10: Statistical test limits for DCS 1800 and PCS 1900 sensitivity: fading HT 100

HT 100 no FH								
1.8 and 1.9 GHz			**frames per s**	**Orig. BER**	**Derived**	**Target number**	**Target test**	**Target test time**
			clas1b per s	**requirement**	**test limit**	**of samples**	**time (s)**	**(hh:mm:ss)**
	Channel	**bits per sec**	**clas II per s**					
AHS 7.4	frames	7400	50	0.0100	0.012340	27957	559	00:09:19
	Class1b	7400	2950	0.0023	0.002838	121556	41	00:00:41
	Class II	7400	1400	0.0258	0.031837	10836	8	00:00:08
AHS 5.9	frames	5900	50	0.0100	0.012340	27957	559	00:09:31
	Class1b	5900	2350	0.0019	0.002344	147147	63	00:01:03
	Class II	5900	800	0.0426	0.052568	6563	8	00:00:08

14.2.19 Reference sensitivity - TCH/AFS-INB

14.2.19.1 Definition

The reference sensitivity is the signal level at the MS receiver input at which a certain FER for in band signalling codewords or frames must be achieved.

For E-GSM 900 MS this test is only performed in the P-GSM band.

14.2.19.2 Conformance requirement

1. At reference sensitivity level, the TCH/AFS-INB FER shall meet the reference sensitivity performance of table 1 in 3GPP TS 45.005 subclause 6.2.

The delays associated with Loop I remain constant for all of the following circumstances:

- For a given MS implementation.
- For the duration of the MS being powered on.

3GPP TS 44.014 subclause 5.1.7a.1.

14.2.19.3 Test purpose

NOTE: This test is not performed under STATIC propagation conditions because the performance requirements are too small to be accurately measured.

1. To verify that the MS does not exceed conformance requirement 1 under TUhigh propagation conditions with an allowance for the statistical significance of the test.

14.2.19.4 Method of test

NOTE 1: The BA list sent on the BCCH and SACCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range 15 dBμVemf( ) to 35 dBμVemf( ).

NOTE 2: The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

14.2.19.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AFS with an ARFCN in the Mid ARFCN range for GSM 400, GSM 700, T-GSM 810, GSM 850, DCS 1800 and PCS 1 900 and ARFCN 70 for GSM 900, power control level set to maximum power.

NOTE: For GSM 900 ARFCN 70 is tested since this is the 73rd harmonic of the 13 MHz clock normally used internally in a MS.

The multirate configuration indicates the use of the following set of codecs modes:

Codec Mode	TCH/AFS in kbit/s
CODEC_MODE_4	12,2
CODEC_MODE_3	7,95
CODEC_MODE_2	5,9
CODEC_MODE_1	4,75

The Initial Codec Mode shall be set to the lowest codec mode (CODEC_MODE_1).

The following decision threshold and hysteresis values in terms of normalized carrier to interference ratio (C/I_{norm}), shall apply for Codec Mode Command / Request (MC, MR):

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_4	18,5 dB	+ ∞
CODEC_MODE_3	12,5 dB	20,5 dB
CODEC_MODE_2	6,5 dB	14,5 dB
CODEC_MODE_1	– ∞	8,5 dB

The SS transmits Standard Test Signal C1 on the traffic channel using the Initial Codec Mode (ICM).

The SS continuously sends a CMC corresponding to the highest codec mode (CODEC_MODE_4).

The SS commands the MS to loop back in band signalling codewords by closing a Loop I.

14.2.19.4.2 Procedure

a) The fading function is set to TUhigh.

b) The SS sets the amplitude of the wanted signal to reference sensitivity level ( ).

c) The SS shall change the Codec Mode Indication and Codec Mode Command to the neighbour mode every 22 speech frames (440 ms) by following a scanning pattern (1->2->3->4->4->3->2->1). CMI should initially be increased. CMC should initially be decreased. The CMI/CMC pattern shall be repeated until the minimum required number of frame samples has been sent to the MS.

d) The SS compares the in band signalling codewords/frames it sends to the MS with the in band signalling codewords/frames which are looped back from the receiver after demodulation and decoding, and checks for in band signalling (CMI/CMC) frame errors.

e) The SS determines the frame error events by examining sequences of at least the minimum number of samples of consecutive frames. All frames should be considered when computing the frame error rate: those corresponding to a downlink CMI/CMC transitions and those without downlink CMI/CMC transitions.

NOTE: The delays associated with Loop I are not specified, and will be MS implementation dependant. Loop I should be considered as having two separate parts (DL CMC -> UL CMI and DL CMI -> UL CMR). The delays associated with the two parts may differ. The SS should ensure that the correctly looped inband bits are compared. The delays associated with Loop I will remain constant for the duration of the test, thus every UL frame received by the SS will have only one possible expected value.

Maximum/Minimum Duration of Test

Maximum/minimum: 50 minutes (GSM850, GSM900, DCS1800, PCS1900).

14.2.19.5 Test requirements

The frame error rates measured for different channels shall not exceed the test limit error rate values given in table 14.2.19-1 or 14.2.19-2.

Table 14.2.19-1: Limits for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 sensitivity

Channels	Propagation conditions Tuhigh	
	Test limit error rate %	Minimum No. of samples
TCH/AFS-INB (FER)	0.047	150000

Table 14.2.19-2: Limits for DCS 1 800 and PCS 1 900 sensitivity

Channels	Propagation conditions TUhigh	
	Test limit error rate %	Minimum No. of samples
TCH/AFS-INB (FER)	0.015	150000

14.2.20 Reference sensitivity - TCH/AHS-INB

14.2.20.1 Definition

The reference sensitivity level is the signal level at the MS receiver input at which a certain FER for in band signalling codewords or frames must be achieved.

14.2.20.2 Conformance requirement

1. At reference sensitivity level, the TCH/AHS-INB FER shall meet the reference sensitivity performance of table 1 in 3GPP TS 45.005 subclause 6.2.

The delays associated with Loop I remain constant for all of the following circumstances:

- For a given MS implementation.
- For the duration of the MS being powered on.

3GPP TS 44.014 subclause 5.1.7a.1.

14.2.20.3 Test purpose

1. To verify that the MS does not exceed conformance requirement 1 under TUhigh propagation conditions with an allowance for the statistical significance of the test.

14.2.20.4 Method of test

14.2.20.4.1 Initial conditions

The BA list sent on the BCCH and SACCH indicates at least six surrounding cells, with at least one near to each band edge. It is not necessary to generate any of these BCCHs, but if provided, the signal strengths of BCCHs shall be in the range 15 dBµVemf( ) to 35 dBµVemf( ).

The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

A call is set up according to the generic call set up procedure on a TCH/AHS with an ARFCN in the mid ARFCN range, power control level set to maximum power and with the following sets of codec modes:

Codec Mode	TCH/AHS in kbit/s
CODEC_MODE_4	7,95
CODEC_MODE_3	6,7
CODEC_MODE_2	5,9
CODEC_MODE_1	4.75

The Initial Codec Mode shall be set to the lowest codec mode (CODEC_MODE_1).

The following decision threshold and hysteresis values in terms of normalized carrier to interference ratio (C/I_{norm}), shall apply for Codec Mode Command / Request (MC, MR):

MC'/MR'	THR_MC_Dn(MC')/ THR_MR_Dn(MR')	THR_MC_Up(MC')/ THR_MR_Up(MR')
CODEC_MODE_4	16,0 dB	$+\infty$
CODEC_MODE_3	12,0 dB	18,0 dB
CODEC_MODE_2	8,0 dB	14,0 dB
CODEC_MODE_1	$-\infty$	10,0 dB

The SS transmits Standard Test Signal C1 on the traffic channel using the Initial Codec Mode (ICM).

The SS continuously sends a CMC corresponding to the highest codec mode (CODEC_MODE_4).

14.2.20.4.2 Procedure

a) The SS commands the MS to loop back in band signalling codewords by closing a Loop I.

b) The fading function is set to TUhigh.

c) The SS sets the amplitude of the wanted signal to reference sensitivity level ( ).

d) The SS shall change the Codec Mode Indication and Codec Mode Command at to the neighbour mode every 22 speech frames (440 ms) by following a scanning pattern (1->2->3->4->4->3->2->1). CMI should initially be increased. CMC should initially be decreased. The CMI/CMC pattern shall be repeated until the minimum required number of frame samples has been sent to the MS.

e) The SS compares the in band signalling codewords/frames it sends to the MS with the in band signalling codewords/frames which are looped back from the receiver after demodulation and decoding, and checks for in band signalling (CMI/CMC) frame errors.

f) The SS determines the frame error events by examining sequences of at least the minimum number of samples of consecutive frames. All frames should be considered when computing the frame error rate: those corresponding to a downlink CMI/CMC transitions and those without downlink CMI/CMC transitions.

NOTE: The delays associated with Loop I are not specified, and will be MS implementation dependant. Loop I should be considered as having two separate parts (DL CMC -> UL CMI and DL CMI -> UL CMR). The delays associated with the two parts may differ. The SS should ensure that the correctly looped inband bits are compared. The delays associated with Loop I will remain constant for the duration of the test, thus every UL frame received by the SS will have only one possible expected value.

Maximum/Minimum Duration of Test

Maximum/minimum: 25 minutes (GSM850, GSM900), 28 minutes (DCS1800, PCS1900).

14.2.20.5 Test requirements

The error rates measured for different channels and under the different propagation conditions, shall not exceed the test limit error rate values given in table 14.2.20-1 or 14.2.20-2.

Table 14.2.20-1: Limits for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 sensitivity

Channels	Propagation conditions TUhigh	
	Test limit error rate %	Minimum No. of samples
TCH/AHS-INB (FER)	0.806	74000

Table 14.2.20-2: Limits for DCS 1800 and PCS 1 900 sensitivity

Channels	Propagation conditions TUhigh	
	Test limit error rate %	Minimum No. of samples
TCH/AHS-INB (FER)	0.717	83000

14.2.21 Reference sensitivity – O-TCH/AHS

14.2.21.1 Definition

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14.2.21.2 Conformance requirement

For 8-PSK modulated speech channels for AMR, associated control channels and inband signalling, the minimum input signal level for which the reference performance shall be met is specified in table 1g

For all classes of MS supporting 8-PSK speech channels, an additional +2 dB adjustment applies for 8-PSK modulated speech channels.

The reference performance shall be:

For speech channels (O-TCH/AHSy) FER ≤ 1%

All other requirements in tables 1f and 1g shall be fulfilled at this input level for reference performance.

3GPP TS 45.005, subclause 6.2.

14.2.21.3 Test purpose

To verify that the MS does not exceed conformance requirement for FER and class 1b RBER under HT100 propagation conditions with an allowance for the statistical significance of the test, for channel combinations O-TCH/AHS10.2 and O-TCH/AHS 5.15

14.2.21.4 Method of test

14.2.21.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a O-TCH/AFS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 10,2 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.2.21.4.2 Procedure

a) The fading function is set to HT100.

b) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14.2.21-2 or 14.2.21-3.

c) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,15 kbit/s and steps b) to e) are repeated.

Maximum/Minimum Duration of Test

Maximum: 19 minutes (GSM850), 19 minutes (GSM900), 19 minutes (DCS1800), 19 minutes (PCS1900).

Minimum: 6 minutes (GSM850), 6 minutes (GSM900), 3 minutes (DCS1800), 3 minutes (PCS1900).

14.2.21.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7.

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. $D = 0.000085$ wrong decision probability per test step.

2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure A7.1.3.1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.2.21-1: Minimum test times due to HT 100 fading conditions

Half Rate 100 km/h					
Frequency	0,85	0,9	1,8	1,9	GHz
Wavelength	0,35	0,33	0,17	0,16	m
min test time	201	190	95	90	s
	0:03:21	**0:03:10**	**0:01:35**	**0:01:30**	

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the "derived test limit". In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne $\geq$ 1 (inclusive artificial error)

For an early fail decision ne $\geq$ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14.2.21-2 and 14.2.21.3.

Table 14.2.21-2: Statistical test limits for GSM 700, T-GSM 810, GSM 850 and GSM 900 O-TCH/AFS reference sensitivity

HT100 / No FH								
0.8 to 0.9 GHz		**C_{lev} (dBm)**	**Samples per second**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time (s)**	**Target test time (hh:mm:ss)**
AHS 10.2	Frames	-91.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		6950	0,001900	0,002345	147121	21	00:00:21
AHS 5.15	Frames	-95.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		2700	0,001100	0,001357	254237	94	00:01:34

Table 14.2.21-3: Statistical test limits for DCS 1 800 and PCS 1 900 O-TCH/AFS reference sensitivity

HT100 / No FH								
1.8 to 1.9GHz		**C_{lev} (dBm)**	**Samples per second**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time (s)**	**Target test time (hh:mm:ss)**
AHS 10.2	Frames	-91.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		6950	0,002000	0,002468	139789	20	00:00:20
AHS 5.15	Frames	-95.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		2700	0,001200	0,001408	232982	86	00:01:26

14.2.22 Reference sensitivity – O-TCH/WFS

14.2.22.1 Definition

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14.2.22.2 Conformance requirement

For 8-PSK modulated speech channels for AMR, associated control channels and inband signalling, the minimum input signal level for which the reference performance shall be met is specified in table 1g

For all classes of MS supporting 8-PSK speech channels, an additional +2 dB adjustment applies for 8-PSK modulated speech channels.

The reference performance shall be:

For speech channels (O-TCH/WFSy) FER $\leq$ 1%

All other requirements in tables 1f and 1g shall be fulfilled at this input level for reference performance.

Correction values for 8-PSK modulated signals:

for GSM 400, GSM 900, GSM 850, T_GSM 810 and GSM 700 small MS	0 dB
for other GSM 400, GSM 900, GSM 850, T_GSM 810 and GSM 700 MS	-2 dB
for DCS 1 800 and PCS 1900 class 1 or class 2 MS	0 dB
for other DCS 1 800 and PCS 1900 MS	-2 dB

3GPP TS 45.005, subclause 6.2.

14.2.22.3 Test purpose

To verify that the MS does not exceed conformance requirement for FER and class 1b RBER under HT100 propagation conditions with an allowance for the statistical significance of the test, for channel combinations O-TCH/WFS15.85 and O-TCH/WFS 6.60

14.2.22.4 Method of test

14.2.22.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a O-TCH/WFS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 15,85 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.2.22.4.2 Procedure

a) The fading function is set to HT100.

b) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14.2.22-2 or 14.2.22-3. The level is corrected by the appropriate value in the table above.

c) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 6.60 kbit/s and steps b) to e) are repeated.

Maximum/Minimum Duration of Test

Maximum: 19 minutes (GSM850), 19 minutes (GSM900), 19 minutes (DCS1800), 19 minutes (PCS1900).

Minimum: 6 minutes (GSM850), 6 minutes (GSM900), 3 minutes (DCS1800), 3 minutes (PCS1900).

14.2.22.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7.

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure A7.1.3.1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.2.22-1: Minimum test times due to HT 100 fading conditions

Full Rate 100 km/h				
Frequency (GHz)	0,85	0,9	1,8	1,9
Wavelength (m)	0,35	0,33	0,17	0,16
min test time (s)	101	95	48	45
	0:01:41	**0:01:35**	**0:00:48**	**0:00:45**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the “derived test limit”. In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne ≥ 1 (inclusive artificial error)

For an early fail decision ne ≥ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14.2.22-2 and 14.2.22.3

Table 14.2.22-2: Statistical test limits for GSM 700, T-GSM 810, GSM 850 and GSM 900 O-TCH/WFS reference sensitivity

HT100 / No FH								
0.8 to 0.9GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
WFS15.85	Frames	-95.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		12250	0,005000	0.006170	55915	5	00:00:05
WFS 6.60	Frames	-99.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		3900	0,002700	0.003332	103547	27	00:00:27

Table 14.2.22-3: Statistical test limits for DCS 1 800 and PCS 1 900 O-TCH/WFS reference sensitivity

HT100 / No FH								
1.8 to 1.9GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
WFS15.85	Frames	-95.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		12250	0,006000	0.007404	46596	4	00:00:04
WFS 6.60	Frames	-99.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		3900	0,003000	0.003702	69894	18	00:00:18

14.2.23 Reference sensitivity – O-TCH/WHS

14.2.23.1 Definition

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14.2.23.2 Conformance requirement

For 8-PSK modulated speech channels for AMR, associated control channels and inband signalling, the minimum input signal level for which the reference performance shall be met is specified in table 1g

For all classes of MS supporting 8-PSK speech channels, an additional +2 dB adjustment applies for 8-PSK modulated speech channels.

The reference performance shall be:

For speech channels (O-TCH/WHSy) FER ≤ 1%

All other requirements in tables 1f and 1g shall be fulfilled at this input level for reference performance.

Correction values for 8-PSK modulated signals:

for GSM 400, GSM 900, GSM 850, T-GSM 810 and GSM 700 small MS	0 dB
for other GSM 400, GSM 900, GSM 850, T-GSM 810 and GSM 700 MS	-2 dB
for DCS 1 800 and PCS 1900 class 1 or class 2 MS	0 dB
for other DCS 1 800 and PCS 1900 MS	-2 dB

3GPP TS 45.005, subclause 6.2.

14.2.23.3 Test purpose

To verify that the MS does not exceed conformance requirement for FER and class 1b RBER under HT100 propagation conditions with an allowance for the statistical significance of the test, for channel combinations O-TCH/WHS12.65 and O-TCH/WHS 8.85.

14.2.23.4 Method of test

14.2.23.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a O-TCH/WHS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 12,65 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.2.23.4.2 Procedure

a) The fading function is set to HT100.

b) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14.2.23-2 or 14.2.23-3. The level is corrected by the appropriate value in the table above.

c) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 8.85 kbit/s and steps b) to e) are repeated.

Maximum/Minimum Duration of Test

Maximum: 19 minutes (GSM850), 19 minutes (GSM900), 19 minutes (DCS1800), 19 minutes (PCS1900).

Minimum: 7 minutes (GSM850), 7 minutes (GSM900), 3 minutes (DCS1800), 3 minutes (PCS1900).

14.2.23.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7.

Wrong decision risk F for one single error rate test:

$$F_{pass} = F_{fail} = F \qquad \text{and} \qquad F = 0.2\%$$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure A7.1.3.1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.2.23-1: Minimum test times due to HT 100 fading conditions

Half Rate 100 km/h				
Frequency (GHz)	0,85	0,9	1,8	1,9
Wavelength (m)	0,35	0,33	0,17	0,16
min test time (s)	201	190	95	90
	0:03:21	**0:03:10**	**0:01:35**	**0:01:30**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the “derived test limit”. In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne $\geq$ 1 (inclusive artificial error)

For an early fail decision ne $\geq$ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14.2.23-2 and 14.2.23.3

Table 14.2.23-2: Statistical test limits for GSM 850 and GSM 900 O-TCH/WHS reference sensitivity

HT100 / No FH								
0.8 to 0.9 GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
WHS12.65	Frames	-90.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		9050	0,004000	0.004936	69895	8	00:00:08
WHS 8.85	Frames	-92.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		5650	0,001300	0.001604	215087	38	00:00:38

Table 14.2.23-3: Statistical test limits for DCS 1 800 and PCS 1 900 O-TCH/WHS reference sensitivity

HT100 / No FH								
1.8 to 1.9 GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
WHS12.65	Frames	-90.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		9050	0,004400	0.005430	63536	7	00:00:07
WHS 8.85	Frames	-92.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		5650	0,001500	0.001851	186386	33	00:00:33

14.2.24 Reference sensitivity - TCH/WFS

14.2.24.1 Definition

The reference sensitivity is the signal level at the MS receiver input at which a certain BER and FER must be achieved.

For E-GSM 900 MS this test is only performed in the P-GSM band.

14.2.24.2 Conformance requirement

At reference sensitivity level, the TCH/WFS class Ib RBER shall meet the reference sensitivity, performance of table 1f in 3GPP TS 45.005 subclause 6.2.

At reference sensitivity level ,the TCH/WFS FER shall meet the reference performance stated in 3GPP TS 45.005 subclause 6.2.

The reference performance shall be:

For speech channels (TCH/WHSy) FER $\leq$ 1%

The levels shall be corrected by the following values:

	MS, GMSK modulated signals	
-	for DCS 1 800 class 1 or class 2 MS	+2/+4 dB**
-	for DCS 1 800 class 3 MS	+2 dB
-	for GSM 400, GSM 900, GSM 850, T_GSM 810 and GSM 700 small MS	+2 dB
-	for other GSM 400, GSM 900, GSM 850, T_GSM 810 and GSM 700 MS	0 dB
	for PCS 1900 class 1 or class 2 MS	+2 dB
	for other PCS 1900 MS	0 dB

** For DCS 1 800 class 1 and class 2 MS, a correction offset of +2dB shall apply for the reference sensitivity performance as specified in table 1a for the normal conditions defined in Annex D and an offset of +4 dB shall be used to determine all other MS performances.

The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 1f, except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60.

3GPP TS 45.005 subclause 6.2

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP TS 45.005 subclause 2

14.2.24.3 Test purpose

1. To verify that the MS does not exceed conformance requirement at the maximum implemented codec rate under propagation condition TUhigh (for GSM700, T-GSM 810, GSM 850, GSM 900, DCS 1800 and PCS 1900) with no frequency hopping, RAhigh with no frequency hoping (for GSM700, T-GSM 810, GSM 850 and GSM 900),

HThigh with no frequency hoping (for GSM700, T-GSM 810, GSM 850,GSM 900, DCS1800 and PCS 1900), and STATIC (for GSM700, T-GSM 810, GSM 850 and GSM900) with no frequency hopping with an allowance for the statistical significance of the test.

2. To verify that the MS does not exceed conformance requirement for the remaining implemented codec rates under propagation condition TUhigh with no frequency hopping with an allowance for the statistical significance of the test.

14.2.24.4 Method of test

NOTE 1: The BA list sent on the BCCH and SACCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range 15 dBµVemf( ) to 35 dBµVemf( ).

NOTE 2: The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

NOTE 3: When frequency hopping is used, the traffic channel may fall on any of the ARFCNs defined in clause 6.

14.2.24.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/WFS with an ARFCN in the Mid ARFCN range for GSM700, T-GSM 810, GSM 850, DCS 1800 and PCS 1 900 and ARFCN 70 for GSM 900, power control level set to maximum power.

NOTE: For GSM 900 ARFCN 70 is tested since this is the 73^{rd} harmonic of the 13 MHz clock normally used internally in a MS.

The multirate configuration indicates the use of a codec set limited to 6.60 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel.

The SS commands the MS to create traffic channel loop back signalling erased frames.

14.2.24.4.2 Procedure

a) The fading function is set to TUhigh.

b) the SS sets the amplitude of the wanted signal to reference sensitivity level from table 2f in TS 45.005 based on the current active codec set, fading function of the SS and band. The level shall be corrected by the value in the table above describing the reference performance level correction factors for packet switched channels.

c) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are taken only from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 8.85 kbit/s and steps b) to e) are repeated.

g) The SS uses a Channel Mode Modify procedure to change the active codec set to 12.65 kbit/s and steps b) to e) are repeated.

h) The fading function is set to HThigh and steps b) to e) are repeated.

i) If DCS 1800 or PCS 1900 then skip steps j) and k).

j) The fading function is set to RAhigh and steps b) to e) are repeated.

k) The fading function is set to STATIC and steps b) to e) are repeated.

Maximum/Minimum Duration of Test

- Maximum: 15 minutes (GSM700, GSM850, GSM900) or 10 minutes (DCS1800, PCS1900).
- Minimum: 15 minutes (GSM700, GSM850, GSM900) or 10 minutes (DCS1800, PCS1900).

14.2.24.5 Test requirements

Testing the reference sensitivity performance is performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with BER/BLER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of the limit lines refer to Annex 6.2

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.2.24-1: Minimum test times due to TU high fading conditions

Full Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	428	244	201	190	95	90	s
	0:07:08	**0:04:04**	**0:03:21**	**0:03:10**	**0:01:35**	**0:01:30**	**hh:mm:ss**
Full Rate 60 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	356	204	168	158	79	75	s
	0:05:56	**0:03:24**	**0:02:48**	**0:02:38**	**0:01:19**	**0:01:15**	**hh:mm:ss**

Table 14.2.24-2: Minimum test times due to RA high fading conditions

Full Rate 250 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	-	-	m
min test time	86	49	40	38	-	-	S
	0:1:26	**0:0:49**	**0:0:40**	**0:0:38**	**-**	**-**	**hh:mm:ss**
Full Rate 300 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	-	-	m
min test time	71	41	34	32	-	-	S
	0:1:11	**0:0:41**	**0:0:34**	**0:0:32**	**-**	**-**	**hh:mm:ss**

Table 14.2.24-3: Minimum test times due to HT high fading conditions

Full Rate 100 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	214	122	101	95	48	45	S
	0:3:34	**0:2:02**	**0:1:41**	**0:1:35**	**0:0:48**	**0:0:45**	**hh:mm:ss**
Full Rate 120 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	-	-	m
min test time	178	102	84	79	-	-	S
	0:2:58	**0:1:42**	**0:1:24**	**0:1:19**	**-**	**-**	**hh:mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is done by comparing the result with the "derived test limit". In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne $\geq$ 1 (inclusive artificial error)

For an early fail decision ne $\geq$ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rates measured for different channels and under the different propagation conditions shall be tested according to the values given in tables 14.2.24-4 through 14.2.24-9.

For STATIC channel conditions the target number of samples indicated in table 14.2.24-4 shall be taken.

Table 14.2.24-4: Statistical test limits for GSM 700, T-GSM 810, GSM 850 and GSM 900 STATIC

0.4 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	Bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
WFS 12.65	Frames	12650	50	0.010000	0.012340	27958	560	00:09:20
	Class1b	12650	9050	0,005000	0,006170	55916	6	00:00:06

Table 14.2.24-5: Statistical test limits for GSM 700, T-GSM 810, GSM 850 and GSM 900 RA High no FH

0.4 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
WFS 12.65	Frames	12650	50	0.010000	0.012340	27958	560	00:09:20
	Class1b	12650	9050	0,007200	0,008885	38830	4	00:00:04

Table 14.2.24-6: Statistical test limits for GSM 700, T-GSM 810, GSM 850 and GSM 900 HT High no FH

0.4 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
WFS 12.65	Frames	12650	50	0.010000	0.012340	27958	560	00:09:20
	Class1b	12650	9050	0,006200	0,007651	45093	5	00:00:05

Table 14.2.24-7: Statistical test limits for GSM 700, T-GSM 810, GSM 850 and GSM 900 TU high no FH

0.4 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
WFS 12.65	frames	12650	50	0.010000	0.012340	27958	560	00:09:20
	Class1b	12650	9050	0,003500	0,004319	79880	9	00:00:09
WFS 8.85	frames	8850	50	0.010000	0.012340	27958	560	00:09:20
	Class1b	8850	5650	0,003800	0,004689	73573	13	00:00:13
WFS 6.60	frames	6600	50	0.010000	0.012340	27958	560	00:09:20
	Class1b	6600	3900	0,001500	0,001851	186386	48	00:00:48

Table 14.2.24-8: Statistical test limits for DCS 1 800 and PCS 1 900 HT High no FH

0.4 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
WFS 12.65	Frames	12650	50	0.010000	0.012340	27958	560	00:09:20
	Class1b	12650	9050	0,006600	0,008144	42360	5	00:00:05

Table 14.2.24-9: Statistical test limits for DCS 1 800 and PCS 1 900 TU high no FH

1.8 and 1.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
WFS 12.65	Frames	12650	50	0.010000	0.012340	27958	560	00:09:20
	Class1b	12650	9050	0,006200	0,007651	45093	5	00:00:05
WFS 8.85	Frames	8850	50	0.010000	0.012340	27958	560	00:09:20
	Class1b	8850	5650	0,005900	0,007281	47386	8	00:00:08
WFS 6.60	Frames	6600	50	0.010000	0.012340	27958	560	00:09:20
	Class1b	6600	3900	0,001700	0,002098	164458	42	00:00:42

14.2.24a Reference sensitivity - TCH/WFS in TIGHTER configuration

14.2.24a.1 Definition

The reference sensitivity is the signal level at the MS receiver input at which a certain BER and FER must be achieved.

14.2.24a.2 Conformance requirement

3GPP TS 45.005 subclause 6.2.5

The reference performance for Tightened Link Level Performance (TIGHTER) specified in table 1w, shall be

For speech channels (TCH/FS, TCH/HS, TCH/EFS, TCH/AFSx, TCH/AHSx, TCH/WFSx) FER: ≤ 1 %

In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 1w at the corresponding signal level in dBm. The reference sensitivity level in section 6.2.1 shall be applied for TIGHTER MS.

14.2.24a.3 Test purpose

1. For TCH WFS/FER, MS shall meet the reference sensitivity performance mentioned in 3GPP TS 45.005 sub clause 6.2.5, for reference sensitivity level mentioned in Table 1w according to propagation conditions.
2. At reference sensitivity level, the TCH/WFS class Ib RBER shall meet the performance mentioned in table 1w in 3GPP TS 45.005.

14.2.24a.4 Method of test

NOTE 1: The BA list sent on the BCCH and SACCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range 15 dBµVemf( ) to 35 dBµVemf( ).

NOTE 2: The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

14.2.24a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/WFS with an ARFCN in the Mid ARFCN range for GSM700, T-GSM 810, GSM 850, DCS 1800 and PCS 1 900 and ARFCN 70 for GSM 900, power control level set to maximum power.

NOTE: For GSM 900 ARFCN 70 is tested since this is the 73rd harmonic of the 13 MHz clock normally used internally in a MS.

The multirate configuration indicates the use of a codec set limited to 6.60 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel.

The SS commands the MS to create traffic channel loop back signalling erased frames.

14.2.24a.4.2 Procedure

a) The fading function is set to TUhigh.

b) The SS sets the amplitude of the wanted signal to reference sensitivity level from table 1w in TS 45.005 based on the current active codec set, fading function of the SS and band. The level shall be corrected by the value in the table above describing the reference performance level correction factors for packet switched channels.

c) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are taken only from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 8.85 kbit/s and steps b) to e) are repeated.

g) The SS uses a Channel Mode Modify procedure to change the active codec set to 12.65 kbit/s and steps b) to e) are repeated.

h) The fading function is set to HThigh. The SS uses a Channel Mode Modify procedure to change the active codec set to 6.60 kbit/s and steps b) to g) are repeated.

i) If DCS 1800 or PCS 1900 then skip steps j) and k).

j) The fading function is set to RAhigh. The SS uses a Channel Mode Modify procedure to change the active codec set to 6.60 kbit/s and steps b) to g) are repeated.

k) The fading function is set to STATIC. The SS uses a Channel Mode Modify procedure to change the active codec set to 6.60 kbit/s and steps b) to g) are repeated.

Maximum/Minimum Duration of Test

- Maximum: 15 minutes (GSM700, GSM850, GSM900) or 10 minutes (DCS1800, PCS1900).
- Minimum: 15 minutes (GSM700, GSM850, GSM900) or 10 minutes (DCS1800, PCS1900).

14.2.24a.5 Test requirements

Testing the reference sensitivity performance is performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with BER/BLER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of the limit lines refer to Annex 6.2

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.2.24a-1: Minimum test times due to TU high fading conditions

Full Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	428	244	201	190	95	90	s
	0:07:08	**0:04:04**	**0:03:21**	**0:03:10**	**0:01:35**	**0:01:30**	**hh:mm:ss**
Full Rate 60 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	356	204	168	158	79	75	s
	0:05:56	**0:03:24**	**0:02:48**	**0:02:38**	**0:01:19**	**0:01:15**	**hh:mm:ss**

Table 14.2.24a-2: Minimum test times due to RA high fading conditions

Full Rate 250 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	-	-	m
min test time	86	49	40	38	-	-	S
	0:1:26	**0:0:49**	**0:0:40**	**0:0:38**	**-**	**-**	**hh:mm:ss**
Full Rate 300 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	-	-	m
min test time	71	41	34	32	-	-	S
	0:1:11	**0:0:41**	**0:0:34**	**0:0:32**	**-**	**-**	**hh:mm:ss**

Table 14.2.24a-3: Minimum test times due to HT high fading conditions

Full Rate 100 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	214	122	101	95	48	45	S
	0:3:34	**0:2:02**	**0:1:41**	**0:1:35**	**0:0:48**	**0:0:45**	**hh:mm:ss**
Full Rate 120 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	-	-	m
min test time	178	102	84	79	-	-	S
	0:2:58	**0:1:42**	**0:1:24**	**0:1:19**	**-**	**-**	**hh:mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is done by comparing the result with the "derived test limit". In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne $\geq$ 1 (inclusive artificial error)

For an early fail decision ne $\geq$ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rates measured for different channels and under the different propagation conditions shall be tested according to the values given in tables 14.2.24a-4 through 14.2.24a-9.

For STATIC channel conditions the target number of samples indicated in table 14.2.24a-4 shall be taken.

Table 14.2.24a-4: Statistical test limits for GSM 850 and GSM 900 STATIC

0.4 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	Bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
WFS 12.65	Frames	12650	50	0.0100	0.012340	27958	560	00:09:20
	Class1b	12650	9050	0.0050	0.006170	55916	6	00:00:06
WFS 8.85	Frames	8850	50	0.0100	0.012340	27958	560	00:09:20
	Class1b	8850	5650	0.0050	0.006170	55916	10	00:00:10
WFS 6.60	Frames	6600	50	0.0100	0.012340	27958	560	00:09:20
	Class1b	6600	3900	0.0024	0.002961	116491	30	00:00:30

Table 14.2.24a-5: Statistical test limits for GSM 850 and GSM 900 RA High no FH

0.4 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
WFS 12.65	Frames	12650	50	0.0100	0.012340	27958	560	00:09:20
	Class1b	12650	9050	0.0072	0.008884	38830	4	00:00:04
WFS 8.85	Frames	8850	50	0.0100	0.012340	27958	560	00:09:20
	Class1b	8850	5650	0.0072	0.008884	38830	7	00:00:07
WFS 6.60	Frames	6600	50	0.0100	0.012340	27958	560	00:09:20
	Class1b	6600	3900	0.0019	0.002344	14714	38	00:00:38

Table 14.2.24a-6: Statistical test limits for GSM 850 and GSM 900 HT High no FH

0.4 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
WFS 12.65	Frames	12650	50	0.0100	0.012340	27958	560	00:09:20
	Class1b	12650	9050	0.0062	0.007650	45093	5	00:00:05
WFS 8.85	Frames	8850	50	0.0100	0.012340	27958	560	00:09:20
	Class1b	8850	5650	0.0062	0.007650	45093	8	00:00:08
WFS 6.60	Frames	6600	50	0.0100	0.012340	27958	560	00:09:20
	Class1b	6600	3900	0.0024	0.002961	116491	30	00:00:30

Table 14.2.24a-7: Statistical test limits for GSM 850 and GSM 900 TU high no FH

0.4 to 0.9 GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
WFS 12.65	frames	12650	50	0.0100	0.012340	27958	560	00:09:20
	Class1b	12650	9050	0.0035	0.004319	79880	9	00:00:09
WFS 8.85	frames	8850	50	0.0100	0.012340	27958	560	00:09:20
	Class1b	8850	5650	0.0038	0.004689	73573	13	00:00:13
WFS 6.60	frames	6600	50	0.0100	0.012340	27958	560	00:09:20
	Class1b	6600	3900	0.0015	0.001851	186386	48	00:00:48

Table 14.2.24a-8: Statistical test limits for DCS 1800 and PCS 1900 HT High no FH

1.8 and 1.9 GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
WFS 12.65	Frames	12650	50	0.0100	0.012340	27958	560	00:09:20
	Class1b	12650	9050	0.0066	0.008144	42360	5	00:00:05
WFS 8.85	Frames	8850	50	0.0100	0.012340	27958	560	00:09:20
	Class1b	8850	5650	0.0058	0.007157	48203	9	00:00:09
WFS 6.60	Frames	6600	50	0.0100	0.012340	27958	560	00:09:20
	Class1b	6600	3900	0.0025	0.003085	111831	29	00:00:29

Table 14.2.24a-9: Statistical test limits for DCS 1800 and PCS 1900 TU high no FH

1.8 and 1.9 GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
WFS 12.65	Frames	12650	50	0.0100	0.012340	27958	560	00:09:20
	Class1b	12650	9050	0.0062	0.0076508	45093	5	00:00:05
WFS 8.85	Frames	8850	50	0.0100	0.012340	27958	560	00:09:20
	Class1b	8850	5650	0.0059	0.0072806	47386	8	00:00:08
WFS 6.60	Frames	6600	50	0.0100	0.012340	27958	560	00:09:20
	Class1b	6600	3900	0.0017	0.0020978	164458	42	00:00:42

14.2.25 Reference sensitivity – Repeated FACCH/F

14.2.25.1 Definition

The reference sensitivity for control channels is the signal level at the MS receiver input at which a certain FER must be achieved.

14.2.25.2 Conformance requirement.

For Repeated Downlink FACCH and Repeated SACCH (see 3GPP TS 44.006), the minimum input signal level for which the reference performance shall be met is specified in table 1i, according to the propagation condition and type of equipment. The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 1i, except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60.

3GPP TS 45.005 subclause 6.2.

The reference performance for Repeated Downlink FACCH and Repeated SACCH shall be FER ≤ 5%.

3GPP TS 45.005 subclause 6.2.

When calculating FER, a FACCH frame and its repetition or a SACCH frame and its repetition respectively, shall be counted as one frame and a frame erasure shall be counted when neither the FACCH frame nor its repetition or neither the SACCH frame nor its repetition respectively, could be successfully decoded.

3GPP TS 45.005 subclause 6.2.

The reference performance levels for Repeated Downlink FACCH and Repeated SACCH shall be corrected according to the values in the table below, describing the reference performance level correction factors for packet switched channels:

	MS, GMSK modulated signals	
-	for DCS 1 800 class 1 or class 2 MS	+2/+4 dB**
-	for DCS 1 800 class 3 MS	+2 dB
-	for GSM 400 small MS, GSM 900 small MS GSM 850 small MS and GSM 700 small MS	+2 dB
-	for other GSM 400, GSM 900 MS and GSM 850 MS and GSM 700 MS	0 dB
	for PCS 1900 class 1 or class 2 MS	+2 dB
	for other PCS 1900 MS	0 dB

** For DCS 1 800 class 1 and class 2 MS, a correction offset of +2dB shall apply for the reference sensitivity performance as specified in table 1a for the normal conditions defined in Annex D and an offset of +4 dB shall be used to determine all other MS performances.

3GPP TS 45.005 subclause 6.2

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP TS 45.005 subclause 2.

14.2.25.3 Test purpose.

To verify that the MS does not exceed the conformance requirement under TUhigh propagation condition with an allowance for the statistical significance of the test.

14.2.25.4 Method of test

14.2.25.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/F with an ARFCN in the Low ARFCN range, power control level set to maximum power.

The SS shall use Repeated FACCH for command and response frames for the duration of the test.

Each pair of FACCHs are counted as a single sample.

The SS transmits Standard Test Signal C1 on the traffic channel.

14.2.25.4.2 Procedure

a) The fading function is set to TUhigh.

b) The SS sets the amplitude of the wanted signal to –104dBm + Corr, (where Corr is the correction factor from the table above)

c) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Due to the low signal level the MS may not be able to acknowledge an RR frame and the L2 entity of the SS will repeat the Layer 2 frame. Each retransmitted L2 frame will be counted and will indicate a frame erasure event.

d) The SS determines the frame erasure events during at least the minimum number of samples of FACCH/F frames.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.

Maximum/Minimum Duration of Test

Maximum: 12 minutes.

Minimum: 10 minutes (GSM700, GSM850, GSM900), 5 minutes (DCS1800, PCS900)

14.2.25.5 Test Requirements

The error rates measured shall not exceed the test limit error rate values given in table 14.2.25-2.

For more information on statistical testing of FER performance, especially the definitions of limit lines refer to Annex A7.

Table 14.2.25-1: Minimum test times due to TU high fading conditions

Full Rate 50 km/h						
Frequency	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	-	0,35	0,33	0,17	0,16	m
min test time	-	604	570	285	270	s
	-	00:10:04	00:09:30	00:04:45	00:04:30	**hh:mm:ss**
Full Rate 60 km/h						
Frequency	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,43	-	-	-	-	m
min test time	611	-	-	-	-	s
	00:10:11	**-**	**-**	**-**	**-**	**hh:mm:ss**

NOTE: Minimum test time calculation due to fading is based on the best rate 50/3 frame relation in table 14.2.25-3

Table 14.2.25-2: Test Limits for Repeated FACCH/F sensitivity

Channel	Type of measurement	Propagation condition	Original FER requirement	Derived test limit %	Target number of samples
FACCH/F	FER	TUhigh/No FH	5,00	6,17	5592

Table 14.2.25-3: Maximum test times

Maximum test time (best rate 50/3 per second) (s)	Maximum test time (best rate 50/3 per second) (hh:mm:ss)	Maximum test time (worst rate 50/6 per second) (s)	Maximum test time (worst rate 50/6 per second) (hh:mm:ss)
336	00:05:36	671	00:11:11

14.2.26 Reference sensitivity – Repeated SACCH

14.2.26.1 Definition

The reference sensitivity for control channels is the signal level at the MS receiver input at which a certain FER must be achieved.

14.2.26.2 Conformance requirement.

For Repeated Downlink FACCH and Repeated SACCH (see 3GPP TS 44.006), the minimum input signal level for which the reference performance shall be met is specified in table 1i, according to the propagation condition and type of equipment. The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 1i, except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60.

3GPP TS 45.005 subclause 6.2.

The reference performance for Repeated Downlink FACCH and Repeated SACCH shall be FER ≤ 5%.

3GPP TS 45.005 subclause 6.2.

When calculating FER, a FACCH frame and its repetition or a SACCH frame and its repetition respectively, shall be counted as one frame and a frame erasure shall be counted when neither the FACCH frame nor its repetition or neither the SACCH frame nor its repetition respectively, could be successfully decoded.

3GPP TS 45.005 subclause 6.2.

The reference performance levels for Repeated Downlink FACCH and Repeated SACCH shall be corrected according to the values in the table below, describing the reference performance level correction factors for packet switched channels:

	MS, GMSK modulated signals	
-	for DCS 1 800 class 1 or class 2 MS	+2/+4 dB**
-	for DCS 1 800 class 3 MS	+2 dB
-	for GSM 400 small MS, GSM 900 small MS GSM 850 small MS and GSM 700 small MS	+2 dB
-	for other GSM 400, GSM 900 MS and GSM 850 MS and GSM 700 MS	0 dB
	for PCS 1900 class 1 or class 2 MS	+2 dB
	for other PCS 1900 MS	0 dB

** For DCS 1 800 class 1 and class 2 MS, a correction offset of +2dB shall apply for the reference sensitivity performance as specified in table 1a for the normal conditions defined in Annex D and an offset of +4 dB shall be used to determine all other MS performances.

3GPP TS 45.005 subclause 6.2

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP TS 45.005 subclause 2.

14.2.26.3 Test purpose.

To verify that the MS does not exceed the conformance requirement under TUhigh propagation condition with an allowance for the statistical significance of the test.

14.2.26.4 Method of test

For details on Repeated SACCH Layer 1 test method, please refer to Annex 10.

14.2.26.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/F with an ARFCN in the Low ARFCN range, power control level is set to maximum power.

The SS shall use Repeated SACCH for all SACCH block on the downlink for the duration of the test.

Each pair of SACCH blocks (i.e. one Repeated SACCH block-pair) shall be counted as a single sample.

The SS shall send different PCL for each sample following Table 14.2.26-1 for the duration of the test.

The SS transmits Standard Test Signal C1 on the traffic channel

14.2.26.4.2 Procedure

a) The fading function is set to TUhigh/NoFH.

b) The SS sets the amplitude of the wanted signal to –104dBm + Corr, (where Corr is the correction factor from the table above).

c) Following the reception of the last burst of the MS UL SACCH corresponding to the second SACCH block of a repeated SACCH interval, the SS shall compute the PCL value to use in the SS DL SACCH blocks for the next repeated SACCH interval using Table 14.2.26-1.

   i) The first two columns of Table 14.2.26-1 are inputs, the last column is a output.

   ii) SACCH blocks are grouped into sets of 2 consecutive SACCH blocks which is called a repeated SACCH interval.

   iii) Last commanded PCL by SS refers to the PCL used in the DL SACCH L1 headers for repeated SACCH interval N

   iv) Corresponding reported MS PCL refers to the PCL reported in the UL SACCH L1 header of second SACCH block on repeated SACCH interval N

   v) Next commanded PCL by SS refers to the PCL that the SS will use in the DL SACCH L1 headers for repeated SACCH interval N+1.

Table 14.2.26-1: Power Control Level Used by SS

Last commanded PCL by SS	Corresponding Reported MS PCL	Next commanded PCL by SS
7	7	8
7	8	9
7	9	8
8	7	9
8	8	9
8	9	7
9	7	8
9	8	7
9	9	7

d) The SS compares the MS reported PCL in the uplink SACCH L1 header of the Repeated SACCH block against the expected PCL (based on the previously commanded PCL in the downlink SACCH L1 header taking into account round-trip delays). If the MS reported PCL in the uplink SACCH L1 header is different than the expected PCL, this will invoke a frame erasure event.

e) The SS determines the frame erasure events during at least the minimum number of samples of SACCH frames.

NOTE: These frames will be consecutive and it is expected that the statistical significance of the tests will not be unduly degraded.

Maximum/Minimum Duration of Test (hh:mm)

Maximum: 02:43 (GSM700)

Minimum: 01:12 (PCS 1900)

14.2.26.5 Test Requirements

The error rates measured shall not exceed the test limit error rate values given in table 14.2.26-2.

For more information on statistical testing of FER performance, especially the definitions of limit lines refer to Annex A7.

Table 14.2.25-1: Minimum test times due to TU high fading conditions

Full Rate 50 km/h						
Frequency	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	-	0,35	0,33	0,17	0,16	m
min test time	-	9676	9138	4569	4329	s
	-	**02:41:16**	**02:32:18**	**01:16:09**	**01:12:09**	**hh:mm:ss**
Full Rate 60 km/h						
Frequency	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,43	-	-	-	-	m
min test time	9791	-	-	-	-	s
	02:43:11	**-**	**-**	**-**	**-**	**hh:mm:ss**

NOTE: Minimum test time calculation due to fading is based on the 960 ms schedule for two SACCH frames

Table 14.2.26-2: Test Limits for Repeated SACCH sensitivity

Channel	Type of measurement	Propagation condition	Original FER requirement	Derived test limit %	Target number of samples
SACCH	FER	TUhigh/No FH	5,00	6,17	5592

Table 14.2.26-3: Maximum test times

Maximum test time (best rate 2/2 per second) (s)	Maximum test time (best rate 2/2 per second) (hh:mm:ss)
5368	01:29:28

14.2.27 Reference sensitivity - TCH/FS – DARP Phase II

14.2.27.1 Definition

The reference sensitivity is the signal level at the MS receiver input at which a certain BER and FER must be achieved.

14.2.27.2 Conformance requirement

For Downlink Advanced Receiver Performance – phase II, the minimum input signal level for which the reference performance shall be met is specified in table 1j, according to the propagation condition and type of equipment. The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 1j, except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60.

The reference performance for Downlink Advanced Receiver Performance – phase II, shall be

- For speech channels (TCH/FS, TCH/AFSx, TCH/AHSx) FER: $\leq$ 1 %
- For packet switched channels (PDTCH) BLER: $\leq$ 10 %

In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 1j at the corresponding signal level in dbm.

3GPP TS 45.005, subclause 6.2.

14.2.27.3 Test purpose

To verify that the MS supporting DARP Ph2 does not exceed conformance requirement for FER, Rber1b and Rber2 under TUhigh/(Corr.=0,AGI=0) and HThigh/(Corr.=0,7,AGI=-6dB) propagation conditions with an allowance for the statistical significance of the test, for channel combination TCH/FS.

14.2.27.4 Method of test

14.2.27.4.1 Initial conditions

Connect the SS to the MS antenna connectors according to Annex A1.1.6.

A call is set up according to the generic call set up procedure on a TCH/FS with an ARFCN in the Mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.The SS transmits Standard Test Signal C1 on the traffic channel.

The SS commands the MS to create traffic channel loop back signalling erased frames.

Specific PICS Statements:

-

PIXIT Statements:

-

14.2.27.4.2 Procedure

a) The fading function is set to TU high/(Corr.=0, AGI=0).

b) the SS sets the amplitude of the wanted signal to reference sensitivity level from table 1j in TS 45.005.

c) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of class II, by examining sequences of at least the minimum number of samples of consecutive bits of class II. Bits are taken only from those frames not signalled as erased.

e) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

f) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

g) Steps b) to f) are repeated with the SS fading function set in turn to HT high/(Corr.=0,7, AGI=-6dB).Maximum/Minimum Duration of Test

- Maximum: 20 minutes (GSM700, GSM850, GSM900) or 20 minutes (DCS1800, PCS1900).

- Minimum: 6 minutes (GSM700, GSM850, GSM900) or 3 minutes (DCS1800, PCS1900).

14.2.27.5 Test requirements

The error rates measured shall not exceed the test limit error rate values given in table 14.2.27-3 through 14.2.27-6.

For more information on statistical testing of FER and BER/BLER performance, especially the definition of limit lines refer to Annex A7.

Table 14.2.27-1: Minimum test times due to TU high fading conditions

Full Rate 50 km/h						
Frequency	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	-	0,35	0,33	0,17	0,16	M
min test time	-	201	190	95	90	S
	-	**0:03:21**	**0:03:10**	**0:01:35**	**0:01:30**	**hh:mm:ss**
Full Rate 60 km/h						
Frequency	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,43	-	-	-	-	m
min test time	204	-	-	-	-	s
	0:03:24	**-**	**-**	**-**	**-**	**hh:mm:ss**

Table 14.2.27-2: Minimum test times due to HT high fading conditions

Full Rate 100 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	214	122	101	95	48	45	S
	0:3:34	**0:2:02**	**0:1:41**	**0:1:35**	**0:0:48**	**0:0:45**	**hh:mm:ss**
Full Rate 120 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	-	-	m
min test time	178	102	84	79	-	-	S
	0:2:58	**0:1:42**	**0:1:24**	**0:1:19**	**-**	**-**	**hh:mm:ss**

Table 14.2.27-3: Statistical test limits for GSM 700, T-GSM 810, GSM 850 and GSM 900 TU high no FH/ (Corr.=0, AGI=0).

0.4 to 0.9GHz			Frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	Class x per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
TCH/FS	FER	13000	50	0,010000	0.012340	27958	560	00:09:20
	Rber1b	13000	9100	0,000700	0,000863	399769	44	00:00:44
	Rber2	13000	3900	0,047900	0,059109	5837	2	00:00:02

Table 14.2.27-4: Statistical test limits for GSM 700, T-GSM 810, GSM 850 and GSM 900 HT high no FH/ (Corr.=0,7, AGI=-6dB).

0.4 to 0.9GHz			Frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	Class x per s	requirement	Test limit	of samples	time (s)	(hh:mm:ss)
TCH/FS	FER	13000	50	0,010000	0.012340	27958	560	00:09:20
	Rber1b	13000	9100	0,000800	0,000987	349544	39	00:00:39
	Rber2	13000	3900	0,060900	0,075151	4591	2	00:00:02

Table 14.2.27-5: Statistical test limits for DCS 1 800 and PCS 1 900 TU high no FH/ (Corr.=0, AGI=0).

1.8 and 1.9GHz			Frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	Class x per s	requirement	Test limit	of samples	time (s)	(hh:mm:ss)
TCH/FS	FER	13000	50	0.010000	0.012340	27958	560	00:09:20
	Rber1b	13000	9100	0,000800	0,000987	349544	39	00:00:39
	Rber2	13000	3900	0,060100	0,074163	4652	2	00:00:02

Table 14.2.27-6: Statistical test limits for DCS 1 800 and PCS 1 900 HT high no FH/ (Corr.=0,7, AGI=-6dB).

1.8 and 1.9GHz			Frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	Class x per s	requirement	Test limit	of samples	time (s)	(hh:mm:ss)
TCH/FS	FER	13000	50	0,010000	0.012340	27958	560	00:09:20
	Rber1b	13000	9100	0,000900	0,001111	310532	35	00:00:35
	Rber2	13000	3900	0,060600	0,074780	4614	2	00:00:02

14.2.28 Reference sensitivity TCH/HS in VAMOS configuration

14.2.28.1 Definition

The reference sensitivity is the signal level at the MS receiver input at which a certain BER and FER must be achieved.

14.2.28.2 Conformance requirement

The reference performance in *VAMOS Mode*, shall be

- For half rate speech channels (TCH/HS, TCH/AHSx) FER: ≤ 1 %

3GPP TS 45.005 subclause 6.2.1a

For speech channels in *VAMOS Mode*, and their associated control channels, the minimum input signal level for which the reference performance shall be met is specified in table 1s, 1t, 1u and 1v according to the propagation condition and type of equipment. The levels are given for VAMOS I MS, VAMOS II MS and normal BTS separately.

3GPP TS 45.005 subclause 6.2.1a

In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 1s, 1t, 1u and 1v at the corresponding signal level in dBm.

3GPP TS 45.005 subclause 6.2.1a

14.2.28.3 Test purpose

1. To verify that the MS does not exceed conformance requirements under propagation condition TUhigh with no frequency hopping with an allowance for the statistical significance of the test.

14.2.28.4 Method of test

NOTE 1: The BA list sent on the BCCH and SACCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range 15 dBµVemf( ) to 35 dBµVemf( ).

NOTE 2: The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

14.2.28.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/HS with an ARFCN in the Mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The SS transmits a Standard Test Signal C1 (AQPSK) (wanted signal) on the active VAMOS subchannel (subchannel 2) using trainings sequence 5 from TSC set 2. The other VAMOS subchannel (subchannel 1) uses trainings sequences 5 from TSC set 1.

The SS commands the MS to create traffic channel loop back signalling erased frames.

Specific PICS Statements:

- VAMOS type I supported (TSPC_VAMOS_Type1)
- VAMOS type II supported (TSPC_VAMOS_Type2)

14.2.28.4.2 Procedure

a) The fading function is set to TUhigh.

b) The SS sets SCPIR_DL to +4 dB.

c) Depending of the indicated VAMOS type the SS sets the amplitude of the wanted signal to reference sensitivity level specified by level in table 14.2.28-1 through 14.2.28-4.

d) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

e) The SS determines the number of residual bit error events for the bits of class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are taken only from those frames not signalled as erased.

f) The SS determines the number of residual bit error events for the bits of class II, by examining sequences of at least the minimum number of samples of consecutive bits of class II. Bits are taken only from those frames not signalled as erased.

g) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

h) The SS repeats steps c) to g) with SCPIR_DL values 0 dB and -4 dB.

i) For MS indicating VAMOS type II support, step c) to g) shall be repeated with SCPIR_DL values -8 dB and -10 dB.

14.2.28.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7 (A7.1.3.2).

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.2.28-0: Minimum test times due to TU high fading conditions

Fading speed 50km/h				
Frequency /MHz	850	900	1800	1900
Wave length / m	0,35	0,33	0,17	0,16
Min. Test time /s	403	380	190	180
hh:mm:ss	00:06:43	00:06:20	00:03:10	00:03:00

The error rates measured for different SCPIR and under propagation condition shall not exceed the test limit error rate values given in table 14.2.28-1 through 14.2.28-4 depending on the indicated VAMOS type.

Table 14.2.28-1: Limits for GSM 850 and GSM 900 sensitivity VAMOS I

Channel	SCPIR_DL / dB	Level / dBm	Error rate	Samples per second	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/HS	4	-99	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	3650	0,0031	0,003825	90187	00:00:25
			RBER2	850	0,0570	0,070338	4905	00:00:06
	0	-96,5	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	3650	0,0020	0,002468	139789	00:00:39
			RBER2	850	0,0610	0,075274	4583	00:00:06
	-4	-92,5	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	3650	0,0020	0,002468	139789	00:00:39
			RBER2	850	0,0560	0,069104	4992	00:00:06

Table 14.2.28-2: Limits for DCS 1 800 and PCS 1 900 sensitivity VAMOS I

Channel	SCPIR_DL / dB	Level / dBm	Error rate	Samples per second	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/HS	4	-98,5	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	3650	0,0027	0,003332	103548	00:00:29
			RBER2	850	0,0540	0,066636	5177	00:00:07
	0	-96	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	3650	0,0027	0,003332	103548	00:00:29
			RBER2	850	0,0530	0,065402	5275	00:00:07
	-4	-92,5	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	3650	0,0020	0,002468	139789	00:00:39
			RBER2	850	0,0550	0,067870	5083	00:00:06

Table 14.2.28-3: Limits for GSM 850 and GSM 900 sensitivity VAMOS II

Channel	SCPIR_DL / dB	Level / dBm	Error rate	Samples per second	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/HS	4	-100	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	3650	0,0012	0,001481	232982	00:01:04
			RBER2	850	0,0527	0,065032	5305	00:00:07
	0	-97,5	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	3650	0,0012	0,001481	232982	00:01:04
			RBER2	850	0,0494	0,060960	5659	00:00:07
	-4	-96,5	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	3650	0,0011	0,001357	254162	00:01:10
			RBER2	850	0,0484	0,059726	5776	00:00:07
	-8	-93,5	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	3650	0,0015	0,001851	186386	00:00:52
			RBER2	850	0,0565	0,069721	4948	00:00:06
	-10	-91,5	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	3650	0,0015	0,001851	186386	00:00:52
			RBER2	850	0,0598	0,073793	4675	00:00:06

Table 14.2.28-4: Limits for DCS 1 800 and PCS 1 900 sensitivity VAMOS II

Channel	SCPIR_DL / dB	Level / dBm	Error rate	Samples per second	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/HS	4	-99	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	3650	0,0023	0,002838	121556	00:00:34
			RBER2	850	0,0601	0,074163	4652	00:00:06
	0	-97	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	3650	0,0017	0,002098	164458	00:00:46
			RBER2	850	0,0557	0,068734	5019	00:00:06
	-4	-95,5	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	3650	0,0020	0,002468	139789	00:00:39
			RBER2	850	0,0550	0,067870	5083	00:00:06
	-8	-91,5	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	3650	0,0021	0,002591	133133	00:00:37
			RBER2	850	0,0568	0,070091	4922	00:00:06
	-10	-90	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	3650	0,0023	0,002838	121556	00:00:34
			RBER2	850	0,0598	0,073793	4675	00:00:06

14.2.29 Reference sensitivity TCH/EFS in VAMOS configuration

14.2.29.1 Definition

The reference sensitivity is the signal level at the MS receiver input at which a certain BER and FER must be achieved.

14.2.29.2 Conformance requirement

The reference performance in *VAMOS Mode*, shall be

- For full rate speech channels (TCH/FS, TCH/AFSx, TCH/EFS, TCH/WFSx) FER: ≤ 1 %

3GPP TS 45.005 subclause 6.2.1a

For speech channels in *VAMOS Mode*, and their associated control channels, the minimum input signal level for which the reference performance shall be met is specified in table 1s, 1t, 1u and 1v according to the propagation condition and type of equipment. The levels are given for VAMOS I MS, VAMOS II MS and normal BTS separately.

3GPP TS 45.005 subclause 6.2.1a

In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 1s, 1t, 1u and 1v at the corresponding signal level in dBm.

3GPP TS 45.005 subclause 6.2.1a

14.2.29.3 Test purpose

1. To verify that the MS does not exceed conformance requirements under propagation condition TUhigh with no frequency hopping with an allowance for the statistical significance of the test.

14.2.29.4 Method of test

NOTE 1: The BA list sent on the BCCH and SACCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range 15 dBμVemf( ) to 35 dBμVemf( ).

NOTE 2: The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

14.2.29.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/EFS with an ARFCN in the Mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The SS transmits a Standard Test Signal C1 (AQPSK) (wanted signal) on the active VAMOS subchannel (subchannel 2) using trainings sequence 5 from TSC set 2. The other VAMOS subchannel (subchannel 1) uses trainings sequences 5 from TSC set 1.

The SS commands the MS to create traffic channel loop back signalling erased frames.

Specific PICS Statements:

- VAMOS type I supported (TSPC_VAMOS_Type1)
- VAMOS type II supported (TSPC_VAMOS_Type2)

14.2.29.4.2 Procedure

a) The fading function is set to TUhigh.

b) The SS sets SCPIR_DL to +4 dB.

c) Depending of the indicated VAMOS type the SS sets the amplitude of the wanted signal to reference sensitivity level specified by level in table 14.2.29-1 through 14.2.29-4.

d) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

e) The SS determines the number of residual bit error events for the bits of class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are taken only from those frames not signalled as erased.

f) The SS determines the number of residual bit error events for the bits of class II, by examining sequences of at least the minimum number of samples of consecutive bits of class II. Bits are taken only from those frames not signalled as erased.

g) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

h) The SS repeats steps c) to g) with SCPIR_DL values 0 dB and -4 dB.

i) For MS indicating VAMOS type II support, step c) to g) shall be repeated with SCPIR_DL values -8 dB and -10 dB.

14.2.29.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7 (A 7.1.3.2)

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.2.29-0: Minimum test times due to TU high fading conditions

Fading speed 50km/h				
Frequency/MHz	850	900	1800	1900
Wave length / m	0,35	0,33	0,17	0,16
Min. Test time /s	201	190	95	90
hh:mm:ss	00:03:21	00:03:10	00:01:35	00:01:30

The error rates measured for different SCPIR and under propagation condition shall not exceed the test limit error rate values given in table 14.2.29-1 through 14.2.29-4 depending on the indicated VAMOS type.

Table 14.2.29-1: Limits for GSM 850 and GSM 900 sensitivity VAMOS I

Channel	SCPIR_DL / dB	Level / dBm	Error rate	Samples per second	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/EFS	4	-97,5	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	6000	0,0004	0,000494	698947	00:01:57
			RBER2	3700	0,0360	0,044424	7766	00:00:03
	0	-95	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	6000	0,0005	0,000617	559157	00:01:34
			RBER2	3700	0,0420	0,051828	6657	00:00:02
	-4	-92	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	6000	0,0005	0,000617	559157	00:01:34
			RBER2	3700	0,0401	0,049483	6972	00:00:02

Table 14.2.29-2: Limits for DCS 1 800 and PCS 1 900 sensitivity VAMOS I

Channel	SCPIR_DL / dB	Level / dBm	Error rate	Samples per second	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/EFS	4	-98,5	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	6000	0,0005	0,000617	559157	00:01:34
			RBER2	3700	0,0450	0,055530	6213	00:00:02
	0	-96	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	6000	0,0005	0,000617	559157	00:01:34
			RBER2	3700	0,0530	0,065402	5275	00:00:02
	-4	-92,5	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	6000	0,0010	0,001234	279579	00:00:47
			RBER2	3700	0,0500	0,061700	5592	00:00:02

Table 14.2.29-3: Limits for GSM 850 and GSM 900 sensitivity VAMOS II

Channel	SCPIR_DL / dB	Level / dBm	Error rate	Samples per second	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/EFS	4	-99	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	6000	0,0003	0,000370	931929	00:02:36
			RBER2	3700	0,0431	0,053185	6487	00:00:02
	0	-97	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	6000	0,0003	0,000370	931929	00:02:36
			RBER2	3700	0,0393	0,048496	7114	00:00:02
	-4	-96	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	6000	0,0006	0,000740	465964	00:01:18
			RBER2	3700	0,0421	0,051951	6641	00:00:02
	-8	-92,5	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	6000	0,0004	0,000494	698947	00:01:57
			RBER2	3700	0,0452	0,055777	6185	00:00:02
	-10	-90,5	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	6000	0,0003	0,000370	931929	00:02:36
			RBER2	3700	0,0481	0,059355	5812	00:00:02

Table 14.2.29-4: Limits for DCS 1 800 and PCS 1 900 sensitivity VAMOS II

Channel	SCPIR_DL / dB	Level / dBm	Error rate	Samples per second	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/EFS	4	-99,5	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	6000	0,0007	0,000864	399398	00:01:07
			RBER2	3700	0,0518	0,063921	5397	00:00:02
	0	-98	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	6000	0,0006	0,000740	465964	00:01:18
			RBER2	3700	0,0513	0,063304	5450	00:00:02
	-4	-96	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	6000	0,0006	0,000740	465964	00:01:18
			RBER2	3700	0,0509	0,062811	5493	00:00:02
	-8	-92,5	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	6000	0,0006	0,000740	465964	00:01:18
			RBER2	3700	0,0566	0,069844	4940	00:00:02
	-10	-90,5	FER	50	0,0100	0,012340	27958	00:09:20
			RBER1b	6000	0,0006	0,000740	465964	00:01:18
			RBER2	3700	0,0614	0,075768	4553	00:00:02

14.2.30 Reference sensitivity TCH/AFS in VAMOS configuration

14.2.30.1 Definition

The reference sensitivity is the signal level at the MS receiver input at which a certain BER and FER must be achieved.

14.2.30.2 Conformance requirement

The reference performance in *VAMOS Mode*, shall be

- For full rate speech channels (TCH/FS, TCH/AFSx, TCH/EFS, TCH/WFSx) FER: ≤ 1 %

3GPP TS 45.005 subclause 6.2.1a

For speech channels in *VAMOS Mode*, and their associated control channels, the minimum input signal level for which the reference performance shall be met is specified in table 1s, 1t, 1u and 1v according to the propagation condition and type of equipment. The levels are given for VAMOS I MS, VAMOS II MS and normal BTS separately.

3GPP TS 45.005 subclause 6.2.1a

In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 1s, 1t, 1u and 1v at the corresponding signal level in dBm.

3GPP TS 45.005 subclause 6.2.1a

14.2.30.3 Test purpose

1. To verify that the MS does not exceed conformance requirements under propagation condition TUhigh with no frequency hopping with an allowance for the statistical significance of the test.

14.2.30.4 Method of test

NOTE 1: The BA list sent on the BCCH and SACCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range 15 dBμVemf( ) to 35 dBμVemf( ).

NOTE 2: The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

14.2.30.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AFS with an ARFCN in the Mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 12.20 kbit/s.

The SS transmits a Standard Test Signal C1 (AQPSK) (wanted signal) on the active VAMOS subchannel (subchannel 2) using trainings sequence 5 from TSC set 2. The other VAMOS subchannel (subchannel 1) uses trainings sequences 5 from TSC set 1.

The SS commands the MS to create traffic channel loop back signalling erased frames.

Specific PICS Statements:

- VAMOS type I supported (TSPC_VAMOS_Type1)
- VAMOS type II supported (TSPC_VAMOS_Type2)

14.2.30.4.2 Procedure

a) The fading function is set to TUhigh.

b) The SS sets SCPIR_DL to +4 dB.

c) Depending of the indicated VAMOS type the SS sets the amplitude of the wanted signal to reference sensitivity level from table 1s for VAMOS I or table 1t for VAMOS II in TS 45.005.

d) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

e) The SS determines the number of residual bit error events for the bits of class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are taken only from those frames not signalled as erased.

f) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

g) The SS repeats steps c) to f) with SCPIR_DL values 0 dB and -4 dB.

h) For MS indicating VAMOS type II support, step c) to f) shall be repeated with SCPIR_DL values -8 dB and -10 dB.

i) The SS uses a Channel Mode Modify procedure to change the active codec set to 4.75 kbit/s and steps b) to h) are repeated.

Maximum/Minimum Duration of Test

- Maximum (VAMOS type I): 56 minutes (GSM850, GSM900) or 56 minutes (DCS1800, PCS1900).
- Minimum (VAMOS type I): 19 minutes (GSM850, GSM900) or 9 minutes (DCS1800, PCS1900).
- Maximum (VAMOS type II): 94 minutes (GSM850, GSM900) or 94 minutes (DCS1800, PCS1900).
- Minimum (VAMOS type II): 32 minutes (GSM850, GSM900) or 15 minutes (DCS1800, PCS1900).

14.2.30.5 Test requirements

Testing the reference sensitivity performance is performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with BER/BLER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of the limit lines refer to Annex 7.1 (A7.1.3.2)

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.2.30-1: Minimum test times due to TU high fading conditions

Full Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	428	244	201	190	95	90	s
	0:07:08	0:04:04	0:03:21	0:03:10	0:01:35	0:01:30	hh:mm:ss

The error rates measured for different channels and under the different propagation conditions shall be tested according to the values given in tables 14.2.30-2 through 14.2.30-5.

Reference sensitivity tests with a frequency condition noted as "@+/-ndB" are performed for SCPIR_DL ndB (see 3GPP TS 45.005).

Table 14.2.30-2: Statistical test limits for GSM 850 and GSM 900 TU high no FH VAMOS I

0.4 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
AFS 12.2	frames@+4dB	12200	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@+4dB	12200	8150	0.006000	0.007404	46596	6	00:00:06
AFS 4.75	frames@+4dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@+4dB	4750	2800	0.001000	0.001234	279579	100	00:01:40
AFS 12.2	frames@0dB	12200	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@0dB	12200	8150	0.005000	0.006170	55916	7	00:00:07
AFS 4.75	frames@0dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@0dB	4750	2800	0.001500	0.001851	186386	67	00:01:07
AFS 12.2	frames@-4dB	12200	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-4dB	12200	8150	0.006000	0.007404	46596	6	00:00:06
AFS 4.75	frames@-4dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-4dB	4750	2800	0.001700	0.002098	164458	59	00:00: 59

Table 14.2.30-3: Statistical test limits for DCS 1 800 and PCS 1 900 TU high no FH VAMOS I

1.8 and 1.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
AFS 12.2	frames@+4dB	12200	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@+4dB	12200	8150	0.007000	0.008638	39940	5	00:00:05
AFS 4.75	frames@+4dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@+4dB	4750	2800	0.001700	0.002098	164442	59	00:00: 59
AFS 12.2	frames@0dB	12200	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@0dB	12200	8150	0.009000	0.011106	31064	4	00:00:04
AFS 4.75	frames@0dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@0dB	4750	2800	0.001500	0.001851	186386	67	00:01:7
AFS 12.2	frames@-4dB	12200	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-4dB	12200	8150	0.007000	0.008638	39940	5	00.00.05
AFS 4.75	frames@-4dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-4dB	4750	2800	0.002000	0.002468	139789	50	00:00:50

Table 14.2.30-4: Statistical test limits for GSM 850 and GSM 900 TU high no FH VAMOS II

0.4 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
AFS 12.2	frames@+4dB	12200	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@+4dB	12200	8150	0.007400	0.009132	37781	5	00:00:05
AFS 4.75	frames@+4dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@+4dB	4750	2800	0.001100	0.001357	254162	91	00:01:31
AFS 12.2	frames@0dB	12200	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@0dB	12200	8150	0.006200	0.007651	45093	6	00:00:06
AFS 4.75	frames@0dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@0dB	4750	2800	0.001700	0.002098	164458	59	00:00: 59
AFS 12.2	frames@-4dB	12200	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-4dB	12200	8150	0.004600	0.005676	60778	8	00:00:08
AFS 4.75	frames@-4dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-4dB	4750	2800	0.001500	0.001851	186386	67	00:01:07
AFS 12.2	frames@-8dB	12200	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-8dB	12200	8150	0.005100	0.006293	54819	7	00:00:07
AFS 4.75	frames@-8dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-8dB	4750	2800	0.001500	0.001851	186386	67	00:01:07
AFS 12.2	frames@-10dB	12200	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-10dB	12200	8150	0.009300	0.011476	30062	4	00:00:04
AFS 4.75	frames@-10dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-10dB	4750	2800	0.001100	0.001357	254162	91	00:01:31

Table 14.2.30-5: Statistical test limits for DCS 1 800 and PCS 1 900 TU high no FH VAMOS II

1.8 and 1.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
AFS 12.2	frames@+4dB	12200	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@+4dB	12200	8150	0.009400	0.011600	29742	4	00:00:04
AFS 4.75	frames@+4dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@+4dB	4750	2800	0.002000	0.002468	139789	50	00:00:50
AFS 12.2	frames@0dB	12200	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@0dB	12200	8150	0.010600	0.013080	26375	3	00:00:03
AFS 4.75	frames@0dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@0dB	4750	2800	0.001700	0.002098	164458	59	00:00:59
AFS 12.2	frames@-4dB	12200	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-4dB	12200	8150	0.007700	0.009502	36309	5	00:00:05
AFS 4.75	frames@-4dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-4dB	4750	2800	0.001800	0.002221	155321	56	00:00:56
AFS 12.2	frames@-8dB	12200	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-8dB	12200	8150	0.009200	0.011353	30389	4	00:00:04
AFS 4.75	frames@-8dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-8dB	4750	2800	0.001600	0.001974	174737	63	00:01:03
AFS 12.2	frames@-10dB	12200	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-10dB	12200	8150	0.009400	0.011600	29742	4	00:00:04
AFS 4.75	frames@-10dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-10dB	4750	2800	0.002000	0.002468	139789	50	00:00:50

14.2.31 Reference sensitivity TCH/AHS in VAMOS configuration

14.2.31.1 Definition

The reference sensitivity is the signal level at the MS receiver input at which a certain BER and FER must be achieved.

14.2.31.2 Conformance requirement

The reference performance in *VAMOS Mode*, shall be

- For half rate speech channels (TCH/HS, TCH/AHSx) FER: ≤ 1 %

3GPP TS 45.005 subclause 6.2.1a

For speech channels in *VAMOS Mode*, and their associated control channels, the minimum input signal level for which the reference performance shall be met is specified in table 1s, 1t, 1u and 1v according to the propagation condition and type of equipment. The levels are given for VAMOS I MS, VAMOS II MS and normal BTS separately.

3GPP TS 45.005 subclause 6.2.1a

In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 1s, 1t, 1u and 1v at the corresponding signal level in dBm.

3GPP TS 45.005 subclause 6.2.1a

14.2.31.3 Test purpose

1. To verify that the MS does not exceed conformance requirements under propagation condition TUhigh with no frequency hopping with an allowance for the statistical significance of the test.

14.2.31.4 Method of test

NOTE 1: The BA list sent on the BCCH and SACCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range 15 dBμVemf( ) to 35 dBμVemf( ).

NOTE 2: The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

14.2.31.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AHS with an ARFCN in the Mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 7.4 kbit/s.

The SS transmits a Standard Test Signal C1 (AQPSK) (wanted signal) on the active VAMOS subchannel (subchannel 2) using trainings sequence 5 from TSC set 2. The other VAMOS subchannel (subchannel 1) uses trainings sequences 5 from TSC set 1.

The SS commands the MS to create traffic channel loop back signalling erased frames.

Specific PICS Statements:

- VAMOS type I supported (TSPC_VAMOS_Type1)
- VAMOS type II supported (TSPC_VAMOS_Type2)

14.2.31.4.2 Procedure

a) The fading function is set to TUhigh.

b) The SS sets SCPIR_DL to +4 dB.

c) Depending of the indicated VAMOS type the SS sets the amplitude of the wanted signal to reference sensitivity level from table 1s for VAMOS I or table 1t for VAMOS II in TS 45.005.

d) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

e) The SS determines the number of residual bit error events for the bits of class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are taken only from those frames not signalled as erased.

f) The SS determines the number of residual bit error events for the bits of class II, by examining sequences of at least the minimum number of samples of consecutive bits of class II. Bits are taken only from those frames not signalled as erased.

g) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

h) The SS repeats steps c) to g) with SCPIR_DL values 0 dB and -4 dB.

i) For MS indicating VAMOS type II support, step c) to g) shall be repeated with SCPIR_DL values -8 dB and -10 dB.

j) The SS uses a Channel Mode Modify procedure to change the active codec set to 4.75 kbit/s and steps b) to i) are repeated.

Maximum/Minimum Duration of Test

- Maximum (VAMOS type I): 56 minutes (GSM850, GSM900) or 56 minutes (DCS1800, PCS1900).
- Minimum (VAMOS type I): 39 minutes (GSM850, GSM900) or 18 minutes (DCS1800, PCS1900).
- Maximum (VAMOS type II): 94 minutes (GSM850, GSM900) or 94 minutes (DCS1800, PCS1900).
- Minimum (VAMOS type II): 65 minutes (GSM850, GSM900) or 30 minutes (DCS1800, PCS1900).

14.2.31.5 Test requirements

Testing the reference sensitivity performance is performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with BER/BLER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of the limit lines refer to Annex 7.1 (A.7.1.3.2)

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.2.31-1: Minimum test times due to TU high fading conditions

Half Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	855	489	403	380	190	180	s
	0:14:15	0:08:09	0:06:43	0:06:20	0:03:10	0:03:00	hh:mm:ss

The error rates measured for different channels and under the different propagation conditions shall be tested according to the values given in tables 14.2.31-2 through 14.2.31-5 depending on the indicated VAMOS type.

Reference sensitivity tests with a frequency condition noted as "@+/-ndB" are performed for SCPIR_DL ndB (see 3GPP TS 45.005).

Table 14.2.31-2: Statistical test limits for GSM 850 and GSM 900 TU high no FH VAMOS I

0.4 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
			clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
	Channel	bits per sec	class II per s					
AHS 7.4	frames@+4dB	7400	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@+4dB	7400	2950	0.001500	0.001851	186386	64	00:01:04
	Class II@+4dB	7400	1400	0.018000	0.022212	15532	12	00:00:12
AHS 4.75	frames@+4dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@+4dB	4750	2200	0.002000	0.002468	139789	64	00:01:04
	Class II@+4dB	4750	600	0.058800	0.072559	4755	8	00:00:08
AHS 7.4	frames@0dB	7400	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@0dB	7400	2950	0.002000	0.002468	139789	48	00:00:48
	Class II@0dB	7400	1400	0.023000	0.028382	12156	9	00:00:09
AHS 4.75	frames@0dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@0dB	4750	2200	0.002000	0.002468	139789	64	00:01:04
	Class II@0dB	4750	600	0.066000	0.081444	4236	8	00:00:08
AHS 7.4	frames@-4dB	7400	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-4dB	7400	2950	0.001700	0.002098	164458	56	00:00: 56
	Class II@-4dB	7400	1400	0.02000	0.024680	13979	10	00:00:10
AHS 4.75	frames@-4dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-4dB	4750	2200	0.002000	0.002468	139789	64	00:01:04
	Class II@-4dB	4750	600	0.06740	0.083172	4148	7	00:00:07

Table 14.2.31-3: Statistical test limits for DCS 1 800 and PCS 1 900 TU high no FH VAMOS I

1.8 and 1.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
			clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
	Channel	bits per sec	class II per s					
AHS 7.4	frames@+4dB	7400	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@+4dB	7400	2950	0.001500	0.001851	186386	63	00:01: 03
	Class II@+4dB	7400	1400	0.017000	0.02098	16446	12	00:00:12
AHS 4.75	frames@+4dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@+4dB	4750	2200	0.001600	0.001974	174737	79	00:01:19
	Class II@+4dB	4750	600	0.059000	0.072806	4739	8	00:00:08
AHS 7.4	frames@0dB	7400	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@0dB	7400	2950	0.002000	0.002468	139789	47	00:00:47
	Class II@0dB	7400	1400	0.023000	0.028382	12156	9	00:00:09
AHS 4.75	frames@0dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@0dB	4750	2200	0.001500	0.001851	186386	85	00:01: 25
	Class II@0dB	4750	600	0.059000	0.072806	4739	8	00:00:08
AHS 7.4	frames@-4dB	7400	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-4dB	7400	2950	0.002000	0.002468	139789	47	00:00:47
	Class II@-4dB	7400	1400	0.020000	0.024680	13979	10	00:00:10
AHS 4.75	frames@-4dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-4dB	4750	2200	0.002000	0.002468	139789	64	00:01:04
	Class II@-4dB	4750	600	0.060000	0.074040	4660	8	00:00:08

Table 14.2.31-4: Statistical test limits for GSM 850 and GSM 900 TU high no FH VAMOS II

0.4 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
			clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
	Channel	bits per sec	class II per s					
AHS 7.4	frames@+4dB	7400	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@+4dB	7400	2950	0.002600	0.003208	107530	36	00:00:36
	Class II@+4dB	7400	1400	0.026700	0.032948	10471	7	00:00:07
AHS 4.75	frames@+4dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@+4dB	4750	2200	0.001200	0.001481	232982	106	00:01:46
	Class II@+4dB	4750	600	0.06100	0.075274	4583	8	00:00:08
AHS 7.4	frames@0dB	7400	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@0dB	7400	2950	0.002200	0.002715	127081	44	00:00:44
	Class II@0dB	7400	1400	0.024100	0.029739	11601	8	00:00:08
AHS 4.75	frames@0dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@0dB	4750	2200	0.001900	0.002345	147147	67	00:01: 07
	Class II@0dB	4750	600	0.066300	0.081814	4217	7	00:00:07
AHS 7.4	frames@-4dB	7400	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-4dB	7400	2950	0.001200	0.001481	232982	79	00:01:19
	Class II@-4dB	7400	1400	0.019100	0.023569	14638	10	00:00:10
AHS 4.75	frames@-4dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-4dB	4750	2200	0.001400	0.001728	199699	91	00:01:31
	Class II@-4dB	4750	600	0.060100	0.074163	4652	8	00:00:08
AHS 7.4	frames@-8dB	7400	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-8dB	7400	2950	0.002300	0.002838	121556	41	00:00:41
	Class II@-8dB	7400	1400	0.027700	0.034182	10093	7	00:00:07
AHS 4.75	frames@-8dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-8dB	4750	2200	0.001600	0.001974	174737	80	00:01:20
	Class II@-8dB	4750	600	0.062000	0.076508	4509	7	00:00:07
AHS 7.4	frames@-10dB	7400	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-10dB	7400	2950	0.002500	0.003085	111831	38	00:00:38
	Class II@-10dB	7400	1400	0.029500	0.036403	9477	7	00:00:07
AHS 4.75	frames@-10dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-10dB	4750	2200	0.001300	0.001604	215060	98	00:01:38
	Class II@-10dB	4750	600	0.06900	0.085146	4052	7	00:00:07

Table 14.2.31-5: Statistical test limits for DCS 1 800 and PCS 1 900 TU high no FH VAMOS II

1.8 and 1.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
			clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
	Channel	bits per sec	class II per s					
AHS 7.4	frames@+4dB	7400	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@+4dB	7400	2950	0.001700	0.002098	164458	56	00:00:56
	Class II@+4dB	7400	1400	0.019000	0.023446	14715	11	00:00:11
AHS 4.75	frames@+4dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@+4dB	4750	2200	0.001700	0.002098	164458	75	00:01:15
	Class II@+4dB	4750	600	0.061200	0.075521	4568	8	00:00:08
AHS 7.4	frames@0dB	7400	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@0dB	7400	2950	0.002400	0.002962	116491	39	00:00: 39
	Class II@0dB	7400	1400	0.023500	0.028999	11897	8	00:00:08
AHS 4.75	frames@0dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@0dB	4750	2200	0.001500	0.001851	186386	85	00:01:25
	Class II@0dB	4750	600	0.057900	0.071449	4829	9	00:00:09
AHS 7.4	frames@-4dB	7400	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-4dB	7400	2950	0.001600	0.001974	174737	60	00:01:00
	Class II@-4dB	7400	1400	0.017900	0.022089	15619	12	00:00:12
AHS 4.75	frames@-4dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-4dB	4750	2200	0.001200	0.001481	232982	106	00:01:46
	Class II@-4dB	4750	600	0.057600	0.071078	4854	9	00:00:09
AHS 7.4	frames@-8dB	7400	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-8dB	7400	2950	0.001800	0.002221	155321	53	00:00:53
	Class II@-8dB	7400	1400	0.024600	0.030356	11365	8	00:00: 08
AHS 4.75	frames@-8dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-8dB	4750	2200	0.001500	0.001851	186386	85	00:01:25
	Class II@-8dB	4750	600	0.065500	0.080827	4268	8	00:00:08
AHS 7.4	frames@-10dB	7400	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-10dB	7400	2950	0.002200	0.002715	127081	43	00:00: 43
	Class II@-10dB	7400	1400	0.028500	0.035169	9810	7	00:00: 07
AHS 4.75	frames@-10dB	4750	50	0.010000	0.012340	27958	560	00:09:20
	Class1b@-10dB	4750	2200	0.001500	0.001851	186386	85	00:01:25
	Class II@-10dB	4750	600	0.066000	0.081444	4236	8	00:00:08

14.2.32 Reference sensitivity TCH/WFS in VAMOS configuration

14.2.32.1 Definition

The reference sensitivity is the signal level at the MS receiver input at which a certain BER and FER must be achieved.

For E-GSM 900 MS this test is only performed in the P-GSM band.

14.2.32.2 Conformance requirement

1. At reference sensitivity level, the TCH/WFS FER shall meet the reference performance stated in 3GPP TS 45.005 subclause 6.2.1.a

   The reference performance shall be:

   For speech channels (TCH/WFSy) FER ≤ 1%

2. For MS supporting VAMOS type I, at reference sensitivity level, the TCH/WFS class Ib RBER shall meet the reference sensitivity, performance of table 1s in 3GPP TS 45.005 subclause 6.2.1.a

3. For MS supporting VAMOS type II, at reference sensitivity level, the TCH/WFS class Ib RBER shall meet the reference sensitivity, performance of table 1t in 3GPP TS 45.005 subclause 6.2.1.a

14.2.32.3 Test purpose

1. To verify that the MS does not exceed conformance requirements under propagation condition TUhigh with no frequency hopping with an allowance for the statistical significance of the test.

14.2.32.4 Method of test

NOTE 1: The BA list sent on the BCCH and SACCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range 15 dBμVemf( ) to 35 dBμVemf( ).

NOTE 2: The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

14.2.32.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/WFS with an ARFCN in the Mid ARFCN range for GSM700, T-GSM 810, GSM 850, DCS 1800 and PCS 1 900 and ARFCN 70 for GSM 900, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

NOTE: For GSM 900 ARFCN 70 is tested since this is the 73rd harmonic of the 13 MHz clock normally used internally in a MS.

The multirate configuration indicates the use of a codec set limited to 6.60 kbit/s.

The SS transmits a Standard Test Signal C1 (AQPSK) (wanted signal) on the active VAMOS subchannel (subchannel 2) using trainings sequence 5 from TSC set 2. The other VAMOS subchannel (subchannel 1) uses trainings sequences 5 from TSC set 1.

The SS commands the MS to create traffic channel loop back signalling erased frames.

Specific PICS Statements:

- VAMOS type I supported (TSPC_VAMOS_Type1)
- VAMOS type II supported (TSPC_VAMOS_Type2)

14.2.32.4.2 Procedure

a) The fading function is set to TUhigh.

b) The SS sets SCPIR_DL to +4 dB.

c) Depending of the indicated VAMOS type the SS sets the amplitude of the wanted signal to reference sensitivity level from table 1s for VAMOS I or table 1t for VAMOS II in TS 45.005.

d) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

e) The SS determines the number of residual bit error events for the bits of class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are taken only from those frames not signalled as erased.

f) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

g) The SS sets SCPIR_DL to 0 dB and steps c) to f) are repeated.

h) The SS sets SCPIR_DL to -4 dB and steps c) to f) are repeated.

i) For MS indicating VAMOS type II support, steps c) to f) are repeated for SCPIR_DL -8 dB and -10 dB.

j) The SS uses a Channel Mode Modify procedure to change the active codec set to 12.65 kbit/s and steps b) to i) are repeated.

Maximum/Minimum Duration of Test

- Maximum: 15 minutes (GSM700, GSM850, GSM900) or 10 minutes (DCS1800, PCS1900).
- Minimum: 15 minutes (GSM700, GSM850, GSM900) or 10 minutes (DCS1800, PCS1900).

14.2.32.5 Test requirements

Testing the reference sensitivity performance is performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with BER/BLER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of the limit lines refer to Annex 7.1

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.2.32-1: Minimum test times due to TU high fading conditions

Full Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	428	244	201	190	95	90	s
	0:07:08	**0:04:04**	**0:03:21**	**0:03:10**	**0:01:35**	**0:01:30**	**hh:mm:ss**
Full Rate 60 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	356	204	168	158	79	75	s
	0:05:56	**0:03:24**	**0:02:48**	**0:02:38**	**0:01:19**	**0:01:15**	**hh:mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is done by comparing the result with the "derived test limit". In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne $\geq$ 1 (inclusive artificial error)

For an early fail decision ne $\geq$ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rates measured for different channels and under the different propagation conditions shall be tested according to the values given in tables 14.2.32-2 through 14.2.32-3.

Table 14.2.32-2: Statistical test limits for GSM 850 and GSM 900 TU high no FH VAMOS I

	0. 85 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
SCPIR_DL		Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
+4 dB	WFS 12.65	frames	12650	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	12650	9050	0.004000	0.0049	69895	8	00:00:08
	WFS 6.60	frames	6600	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	6600	3900	0.002000	0.0025	139789	36	00:00:36
0 dB	WFS 12.65	frames	12650	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	12650	9050	0.004000	0.0049	69895	8	00:00:08
	WFS 6.60	frames	6600	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	6600	3900	0.002600	0.0032	107530	28	00:00: 28
-4 dB	WFS 12.65	frames	12650	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	12650	9050	0.003000	0.0037	93193	10	00:00:10
	WFS 6.60	frames	6600	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	6600	3900	0.002300	0.0028	121556	31	00:00:31

Table 14.2.32-3: Statistical test limits for DCS 1 800 and PCS 1 900 TU high no FH VAMOS I

	1.8 and 1.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
SCPIR_DL		Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
+4 dB	WFS 12.65	frames	12650	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	12650	9050	0.006000	0.0074	46596	5	00:00:05
	WFS 6.60	frames	6600	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	6600	3900	0.002500	0.00308	111831	29	00:00:29
0 dB	WFS 12.65	frames	12650	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	12650	9050	0.007000	0.0086	39940	4	00:00:04
	WFS 6.60	frames	6600	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	6600	3900	0.003600	0.0044	77661	20	00:00:20
-4 dB	WFS 12.65	frames	12650	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	12650	9050	0.005000	0.0062	55916	6	00:00:06
	WFS 6.60	frames	6600	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	6600	3900	0.003200	0.0039	87368	22	00:00:22

Table 14.2.32-4: Statistical test limits for GSM 850 and GSM 900 TU high no FH VAMOS II

	0.4 to 0.9 GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
SCPIR_DL		Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
+4 dB	WFS 12.65	frames	12650	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	12650	9050	0.003500	0.0043	79880	9	00:00:09
	WFS 6.60	frames	6600	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	6600	3900	0.002500	0.0031	111831	29	00:00:29
0 dB	WFS 12.65	frames	12650	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	12650	9050	0.005100	0.0063	54819	6	00:00:06
	WFS 6.60	frames	6600	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	6600	3900	0.002400	0.0030	116491	30	00:00:30
-4 dB	WFS 12.65	frames	12650	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	12650	9050	0.003600	0.0044	77661	9	00:00:09
	WFS 6.60	frames	6600	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	6600	3900	0.001700	0.0021	164458	42	00:00:42
-8 dB	WFS 12.65	frames	12650	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	12650	9050	0.003800	0.0047	73573	8	00:00:08
	WFS 6.60	frames	6600	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	6600	3900	0.002700	0.0033	103548	27	00:00:27
-10 dB	WFS 12.65	frames	12650	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	12650	9050	0.006600	0.0081	42360	5	00:00:05
	WFS 6.60	frames	6600	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	6600	3900	0.001700	0.0021	164458	42	00:00:42

Table 14.2.32-5: Statistical test limits for DCS 1 800 and PCS 1 900 TU high no FH VAMOS II

	1.8 and 1.9 GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
SCPIR_DL		Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
+4 dB	WFS 12.65	frames	12650	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	12650	9050	0.005300	0.0065	52751	6	00:00:06
	WFS 6.60	frames	6600	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	6600	3900	0.003300	0.0041	84721	22	00:00:22
0 dB	WFS 12.65	frames	12650	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	12650	9050	0.008200	0.0101	34095	4	00:00:04
	WFS 6.60	frames	6600	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	6600	3900	0.003100	0.0038	90187	23	00:00:23
-4 dB	WFS 12.65	frames	12650	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	12650	9050	0.005900	0.0073	47386	5	00:00:05
	WFS 6.60	frames	6600	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	6600	3900	0.001800	0.0022	155321	40	00:00:40
-8 dB	WFS 12.65	frames	12650	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	12650	9050	0.006400	0.0079	43684	5	00:00:05
	WFS 6.60	frames	6600	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	6600	3900	0.002400	0.0030	116491	30	00:00:30
-10 dB	WFS 12.65	frames	12650	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	12650	9050	0.007200	0.0089	38830	4	00:00:04
	WFS 6.60	frames	6600	50	0.010000	0.0123	27958	560	00:09:20
		Class1b	6600	3900	0.002600	0.0032	107530	28	00:00:28

14.2.33 Reference sensitivity FACCH/F performance in VAMOS configuration

14.2.33.1 Definition

The reference sensitivity for control channels is the signal level at the MS receiver input at which a certain FER must be achieved.

14.2.33.2 Conformance requirement.

1. For MS supporting VAMOS type I, at reference sensitivity level, the FACCH/F FER shall meet the reference sensitivity, performance of table 1s in 3GPP TS 45.005 subclause 6.2.1.a
2. For MS supporting VAMOS type II, at reference sensitivity level, the FACCHF FER shall meet the reference sensitivity, performance of table 1t in 3GPP TS 45.005 subclause 6.2.1.a

14.2.33.3 Test purpose.

To verify that the MS does not exceed the conformance requirement under TUhigh propagation condition with an allowance for the statistical significance of the test.

14.2.33.4 Method of test

14.2.33.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/F with an ARFCN in the Low ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The SS transmits a Standard Test Signal C1 (AQPSK) (wanted signal) on the active VAMOS subchannel (subchannel 2) using trainings sequence 5 from TSC set 2. The other VAMOS subchannel (subchannel 1) uses trainings sequences 5 from TSC set 1.

Specific PICS Statements:

- VAMOS type I supported (TSPC_VAMOS_Type1)
- VAMOS type II supported (TSPC_VAMOS_Type 2)

14.2.33.4.2 Procedure

a) The fading function is set to TUhigh.

b) The SS sets SCPIR to +4 dB.

c) Depending of the indicated VAMOS type the SS sets the amplitude of the wanted signal to reference sensitivity level from table 1s for VAMOS I or table 1t for VAMOS II in TS 45.005.

d) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Due to the low signal level the MS may not be able to acknowledge the Layer 2 frame with an RR frame and the SS will repeat the Layer 2 frame. Each repeated L2 frame will be counted and will indicate a frame erasure event.

e) The SS determines the frame erasure events during at least the minimum number of samples of FACCH/F frames.

f) The SS sets SCPIR to 0 dB and steps c) to e) are repeated.

g) The SS sets SCPIR to -4 dB and steps c) to e) are repeated.

h) For MS indicating VAMOS type II support, steps c) to e) are repeated for SCPIR -8 dB and -10 dB.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.

14.2.33.5 Test Requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7 (A7.1.3.2)

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.20.7-1: Minimum test times due to TU high fading conditions

Fading speed 50km/h				
Frequency/MHz	850	900	1800	1900
Wave length / m	0,35	0,33	0,17	0,16
Min. Test time /s	629	594	297	281
hh:mm:ss	00:10:29	00:09:54	00:04:57	00:04:41

The error rates measured shall not exceed the test limit error rate values given in table 14.2.33-2and 14.2.33-3.

Table 14.2.33-2: Limits for FACCH/F sensitivity (VAMOS type I MS)

GSM 900 / 850								
Channel	**SCPIR_DL /dB**	**C_{lev} /dBm**	**Samples per s**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time /s**	**Target test time (hh:mm:ss)**
FACCH/F	4	-100	16	0.05	0.0617	5592	350	00:05: 50
	0	-97						
	-4	-93,5						
GSM 1800 / 1900								
FACCH/F	4	-100,5						
	0	-98						
	-4	-94,5						

Table 14.2.33-3: Limits for FACCH/F sensitivity (VAMOS type II MS)

GSM 900 / 850								
Channel	**SCPIR_DL /dB**	**C_{lev} /dBm**	**Samples per s**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time /s**	**Target test time (hh:mm:ss)**
FACCH/F	4	-100	16	0.05	0.0617	5592	350	00: 05:50
	0	-97,5						
	-4	-96						
	-8	-93,5						
	-10	--91,5						
GSM 1800 / 1900								
FACCH/F	4	-100,5						
	0	-98,5						
	-4	-97						
	-8	-94						
	-10	-92						

14.2.34 Reference sensitivity – FACCH/H Performance in VAMOS configuration

14.2.34.1 Definition

The reference sensitivity for control channels is the signal level at the MS receiver input at which a certain FER must be achieved.

14.2.34.2 Conformance requirement.

The reference performance in *VAMOS Mode* shall be:

- For full rate speech channels (TCH/FS, TCH/AFSx, TCH/EFS, TCH/WFSx) FER: ≤ 1 %
- For half rate speech channels (TCH/HS, TCH/AHSx) FER: ≤ 1 %
- For signalling channels (FACCH/F, FACCH/H, SACCH) FER: ≤ 5 %

For speech channels in *VAMOS Mode*, and their associated control channels, the minimum input signal level for which the reference performance shall be met is specified in table 1s, 1t, 1u and 1v according to the propagation condition and type of equipment. The levels are given for VAMOS I MS, VAMOS II MS and normal BTS separately. For other BTS equipment, the levels in table 1v shall be corrected by the values in the table 6.2-4. The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 1s for VAMOS I MS, 1t and 1u for VAMOS II MS and 1v for BTS, except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60.

In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 1s, 1t, 1u and 1v at the corresponding signal level in dBm.

14.2.34.3 Test purpose.

To verify during Reference sensitivity – FACCH/H test, the MS does not exceed the conformance requirement under TUhigh propagation condition with an allowance for the statistical significance of the test.

14.2.34.4 Method of test

14.2.34.4.1 Initial conditions

A call is set up according to the generic call set up procedure on TCH/HS or any TCH/AHS, whichever supported by the MS, with an ARFCN in the Mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The SS transmits a Standard Test Signal C1 (AQPSK) (wanted signal) on the active VAMOS subchannel (subchannel 2) using trainings sequence 5 from TSC set 2. The other VAMOS subchannel (subchannel 1) uses trainings sequences 5 from TSC set 1.

Specific PICS Statements:

- VAMOS type 1 supported (TSPC_VAMOS_Type1)
- VAMOS type II supported (TSPC_VAMOS_Type 2)

14.2.34.4.2 Procedure

a) The fading function is set to TUhigh.

b) The SS sets SCPIR to +4 dB.

c) Depending of the indicated VAMOS type the SS sets the amplitude of the wanted signal to reference sensitivity level from table 1s for VAMOS I or table 1t for VAMOS II in TS 45.005.

d) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Due to the low signal level the MS may not be able to acknowledge the Layer 2 frame with an RR frame and the SS will repeat the Layer 2 frame. Each repeated L2 frame will be counted and will indicate a frame erasure event.

e) The SS determines the frame erasure events during at least the minimum number of samples of FACCH/H frames.

f) The SS sets SCPIR to 0 dB and steps c) to e) are repeated.

g) The SS sets SCPIR to -4 dB and steps c) to e) are repeated.

h) For MS indicating VAMOS type II support, steps c) to e) are repeated for SCPIR -8 dB and -10 dB

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.

14.2.34.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7 (A7.1.3.2)

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.2.34.-1: Minimum test times due to TU high fading conditions

Fading speed 50km/h				
Frequency /MHz	850	900	1800	1900
Wave length / m	0,35	0,33	0,17	0,16
Min. Test time /s	629	594	297	281
hh:mm:ss	00:10:29	00:09:54	00:04:57	00:04:41

The error rates measured shall not exceed the test limit error rate values given in table 14-2-34-1 and 14-2-34-2.

Table 14.2.34-2: Limits for FACCH/H sensitivity (VAMOS type I MS)

GSM 900 / 850									
Channel	**SCPIR_DL /dB**	**C_{lev} /dBm**	**Samples per s**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time /s**	**Target test time (hh:mm:ss)**
FACCH/H	4	-100	16	0.05	0.0617	5592	350	00: 05: 50
	0	-97						
	-4	-94						
VDTS-1 (GSM 1800 / 1900)								
FACCH/H	4	-100						
	0	-97						
	-4	-94						

Table 14.2.34-3: Limits for FACCH/H sensitivity (VAMOS type II MS)

GSM 900 / 850								
Channel	**SCPIR_DL /dB**	**C_{lev} /dBm**	**Samples per s**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time /s**	**Target test time (hh:mm:ss)**
FACCH/H	4	-100	16	0.05	0.0617	5592	350	00:05:50
	0	-98						
	-4	-96,5						
	-8	-93,5						
	-10	-91,5						
GSM 1800 / 1900								
FACCH/H	4	-100						
	0	-98						
	-4	-96,5						
	-8	-93						
	-10	-91						

14.2.35 Reference sensitivity SACCH performance in VAMOS configuration

14.2.35.1 Definition

The reference sensitivity for control channels is the signal level at the MS receiver input at which a certain FER must be achieved.

14.2.35.2 Conformance requirement.

3GPP TS 45.005 subclause 6.2.1a

The reference performance in *VAMOS Mode* shall be:

For signalling channels (FACCH/F, FACCH/H, SACCH) FER: ≤ 5 %

For speech channels in *VAMOS Mode*, and their associated control channels, the minimum input signal level for which the reference performance shall be met is specified in table 1s, 1t, 1u and 1v according to the propagation condition and type of equipment. The levels are given for VAMOS I MS, VAMOS II MS and normal BTS separately.

14.2.35.3 Test purpose

To verify that the MS does not exceed the conformance requirement under TUhigh propagation condition with an allowance for the statistical significance of the test.

14.2.35.4 Method of test

14.2.35.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/F with an ARFCN in the Low ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The SS transmits a Standard Test Signal C1 (AQPSK) (wanted signal) on the active VAMOS subchannel (subchannel 2) using trainings sequence 5 from TSC set 2. The other VAMOS subchannel (subchannel 1) uses trainings sequences 5 from TSC set 1.

Specific PICS Statements:

- VAMOS type I supported (TSPC_VAMOS_Type1)
- VAMOS type II supported (TSPC_VAMOS_Type 2)

14.2.35.4.2 Procedure

Note: The test procedure is derived from 51.010-10 annex 10 and adapted to single SACCH reception.

a) The fading function is set to TUhigh.

b) The SS sets SCPIR_DL to +4 dB.

c) Depending on the indicated VAMOS type the SS sets the level of the wanted signal specified by C_{lev} in table 14.2.36-3 or table 14.2.36-4.

d) Following the reception of the last burst of the MS UL SACCH corresponding to the second SACCH block of a SACCH interval, the SS shall compute the PCL value to use in the SS DL SACCH blocks for the next SACCH interval using Table 14.2.35-1.

   i) The first two columns of Table 14.2.35-1 are inputs, the last column is a output.

   ii) Last commanded PCL by SS refers to the PCL used in the DL SACCH L1 header of SACCH block N

   iii) Corresponding reported MS PCL refers to the PCL reported in the UL SACCH L1 header of SACCH

   block N

   iv) Next commanded PCL by SS refers to the PCL that the SS will use in the DL SACCH L1 headers for SACCH block N+1.

Table 14.2.35-1: Power Control Level Used by SS

Last commanded PCL by SS	Corresponding Reported MS PCL	Next commanded PCL by SS
7	7	8
7	8	9
7	9	8
8	7	9
8	8	9
8	9	7
9	7	8
9	8	7
9	9	7

f) The SS determines the frame erasure events during at least the minimum number of samples of SACCH frames.

g) The SS sets SCPIR_DL to 0 dB and steps c) to f) are repeated.

h) The SS sets SCPIR_DL to -4 dB and steps c) to f) are repeated.

i) For MS indicating VAMOS type II support, steps c) to f) are repeated for SCPIR -8 dB and -10 dB.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.

14.2.35.5 Test Requirements

Testing should be performed using statistical methods that could lead to an early pass/fail decision with test time significantly reduced for MS with FER not on the limit.

For information on statistical testing refer to Annex 7 (A7.1.3.2).

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.2.35-2: Minimum test times due to TU50 fading conditions

Full Rate @ 50km/h				
Frequency /MHz	850	900	1800	1900
Wave length / m	0,35	0,33	0,17	0,16
Min. Test time /s	4835	4566	2283	2163
hh:mm:ss	01:20:35	01:16:06	00:38:03	00:36:03

NOTE: Minimum test time calculation due to fading based on the 480ms schedule

The error rates measured shall not exceed the test limit error rate values given in table 14.2.35-3 and 14.2.35-4 depending on the indicated VAMOS type.

Table 14.2.35-3: Limits for SACCH (VAMOS I MS)

(GSM 900 / 850)								
Channel	SCPIR_DL /dB	C_{lev} /dBm	Samples per s	Orig. BER requirement	Derived test limit	Target number of samples	Target test time /s	Target test time (hh:mm:ss)
SACCH	4	-100	2.08	0.05	0.0617	5592	2688	00:44:48
	0	-97						
	-4	-93,5						
(GSM 1800 / 1900)								
SACCH	4	-100						
	0	-97						
	-4	-93,5						

Table 14.2.35-4: Limits for SACCH (VAMOS II MS)

(GSM 900 / 850)									
Channel	SCPIR_DL /dB	C_{lev} /dBm	Samples per s	Orig. BER requirement	Derived test limit	Target number of samples	Target test time /s	Target test time (hh:mm:ss)
SACCH	4	-100	2.08	0.05	0.0617	5592	2688	00:44:48
	0	-97,5						
	-4	-96						
	-8	-93						
	-10	-91						
(GSM 1800 / 1900)								
SACCH	4	-100						
	0	-97,5						
	-4	-96						
	-8	-92,5						
	-10	-90,5						

14.2.36 Reference sensitivity – Repeated SACCH in VAMOS configuration

14.2.36.1 Definition

The reference sensitivity for control channels is the signal level at the MS receiver input at which a certain FER must be achieved.

14.2.36.2 Conformance requirement

- The reference performance for the Repeated Associated control channel performance in *VAMOS mode* shall be according to subclause 6.2.4.

3GPP TS 45.005 subclause 6.2.4

- For Repeated Downlink FACCH and Repeated SACCH (see 3GPP TS 44.006), the minimum input signal level for which the reference performance shall be met is specified in table 1i, 1s, 1t, 1u and 1v, according to the propagation condition and type of equipment. The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 1i, 1s, 1t, 1u and 1v, except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60.

3GPP TS 45.005 subclause 6.2.4

- The reference performance for Repeated Downlink FACCH and Repeated SACCH

shall be FER ≤ 5%.

3GPP TS 45.005 subclause 6.2.4

- When calculating FER, a FACCH frame and its repetition or a SACCH frame and its repetition respectively, shall be counted as one frame and a frame erasure shall be counted when neither the FACCH frame nor its repetition or neither the SACCH frame nor its repetition respectively, could be successfully decoded.

3GPP TS 45.005 subclause 6.2.4

14.2.36.3 Test purpose.

To verify that the MS does not exceed the conformance requirement under TU50 /NoFH propagation condition with an allowance for the statistical significance of the test.

14.2.36.4 Method of test

For details on Repeated SACCH Layer 1 test method, please refer to Annex 10.

14.2.36.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/F with an ARFCN in the mid ARFCN range. The power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The SS transmits a Standard Test Signal C1 (AQPSK) (wanted signal) on the active VAMOS subchannel (subchannel 2) using trainings sequence 5 form TSC set 2. The other VAMOS subchannel (subchannel 1) uses trainings sequences 5 from TSC set 1.

The SCPIR_DL is set to 0 dB.

The SS shall use Repeated SACCH for all SACCH block on the downlink for the duration of the test.

Each pair of SACCH blocks (i.e. one Repeated SACCH block-pair) shall be counted as a single sample.

The SS shall send different PCL for each sample following Table 14.2.36-1 for the duration of the test.

Specific PICS Statements:

- VAMOS type I supported (TSPC_VAMOS_Type1)
- VAMOS type II supported (TSPC_VAMOS_Type 2)

14.2.36.4.2 Procedure

a) The fading profile is set to TU50/NoFH.

b) Depending on the indicated VAMOS type the SS sets the level of the wanted signal specified by C_{lev} in table 14.2.36-3 or table 14.2.36-4.

c) Following the reception of the last burst of the MS UL SACCH corresponding to the second SACCH block of a repeated SACCH interval, the SS shall compute the PCL value to use in the SS DL SACCH blocks for the next repeated SACCH interval using Table 14.2.36-1.

   i) The first two columns of Table 14.2.36-1 are inputs, the last column is a output.

   ii) SACCH blocks are grouped into sets of 2 consecutive SACCH blocks which is called a repeated SACCH interval.

   iii) Last commanded PCL by SS refers to the PCL used in the DL SACCH L1 headers for repeated SACCH interval N

   iv) Corresponding reported MS PCL refers to the PCL reported in the UL SACCH L1 header of second SACCH block on repeated SACCH interval N

   v) Next commanded PCL by SS refers to the PCL that the SS will use in the DL SACCH L1 headers for repeated SACCH interval N+1.

Table 14.2.36-1: Power Control Level Used by the SS

Last commanded PCL by SS	Corresponding Reported MS PCL	Next commanded PCL by SS
7	7	8
7	8	9
7	9	8
8	7	9
8	8	9
8	9	7
9	7	8
9	8	7
9	9	7

d) The SS compares the MS reported PCL in the uplink SACCH L1 header of the Repeated SACCH block against the expected PCL (based on the previously commanded PCL in the downlink SACCH L1 header taking into account round-trip delays). If the MS reported PCL in the uplink SACCH L1 header is different than the expected PCL, this will invoke a frame erasure event.

e) The SS determines the frame erasure events during at least the minimum number of samples of SACCH frames.

14.2.36.5 Test Requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER not on the limit.

For information on statistical testing refer to Annex 7 (A7.1.3.2)

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.2.36-2: Minimum test times due to TU50 fading conditions

TCH/F @ 50 km/h				
Frequency /MHz	850	900	1800	1900
Wave length / m	0,35	0,33	0,17	0,16
Min. Test time /s	9676	9138	4569	4329
hh:mm:ss	02:41:16	02:32:18	01:16:09	01:12:09

NOTE: Minimum test time calculation due to fading is based on the 960 ms schedule for two SACCH frames

The error rates measured shall not exceed the test limit error rate values given in table 14.2.36-3 or 14.2.36-4 depending on the indicated VAMOS type.

Table 14.2.36-3: Test Limits for Repeated SACCH sensitivity (VAMOS type I MS)

GSM 900 / 850									
Channel	**SCPIR_DL /dB**	**C_{lev} /dBm**	**Samples per s**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time /s**	**Target test time (hh:mm:ss)**
SACCH	0	-100,5	1,04	0.05	0.0617	5592	5377	01:29:37
GSM 1800 / 1900								
SACCH	0	-100,5						

Table 14.2.36-4: Test Limits for Repeated SACCH sensitivity (VAMOS type II MS)

GSM 900 / 850								
Channel	**SCPIR_DL /dB**	**Clev /dBm**	**Samples per s**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time /s**	**Target test time (hh:mm:ss)**
SACCH	0	-102,5	1,04	0.05	0.0617	5592	5377	01:29:37
GSM 1800 / 1900								
SACCH	0	-102,5						

14.2.37 Reference sensitivity – Repeated FACCH/F in VAMOS configuration

14.2.37.1 Definition

The reference sensitivity for control channels is the signal level at the MS receiver input at which a certain FER must be achieved.

14.2.37.2 Conformance requirement.

- The reference performance for the Repeated Associated control channel performance in *VAMOS mode* shall be according to subclause 6.2.4.

3GPP TS 45.005 subclause 6.2.4

- For Repeated Downlink FACCH and Repeated SACCH (see 3GPP TS 44.006), the minimum input signal level for which the reference performance shall be met is specified in table 1i, 1s, 1t, 1u and 1v, according to the propagation condition and type of equipment. The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 1i, 1s, 1t, 1u and 1v, except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60.

3GPP TS 45.005 subclause 6.2.4

- The reference performance for Repeated Downlink FACCH and Repeated SACCH shall be FER $\leq$ 5%.

3GPP TS 45.005 subclause 6.2.4

- When calculating FER, a FACCH frame and its repetition or a SACCH frame and its repetition respectively, shall be counted as one frame and a frame erasure shall be counted when neither the FACCH frame nor its repetition or neither the SACCH frame nor its repetition respectively, could be successfully decoded.

3GPP TS 45.005 subclause 6.2.4

14.2.37.3 Test purpose.

To verify that the MS does not exceed the conformance requirement under TU50 /NoFH propagation condition with an allowance for the statistical significance of the test.

14.2.37.4 Method of test

14.2.37.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/F with an ARFCN in the Mid ARFCN range, power control level set to maximum power.

The SS transmits a Standard Test Signal C1 (AQPSK) (wanted signal) on the active VAMOS subchannel (subchannel 2) using trainings sequence 5 form TSC set 2. The other VAMOS subchannel (subchannel 1) uses trainings sequences 5 from TSC set 1.

The SCPIR_DL is set to 0 dB.

The SS shall use Repeated FACCH for command and response frames for the duration of the test.

Each pair of FACCH blocks shall be counted as a single sample.

Specific PICS Statements:

- VAMOS type I supported (TSPC_VAMOS_Type1)
- VAMOS type II supported (TSPC_VAMOS_Type 2)

14.2.37.4.2 Procedure

a) The fading function is set to TU50 /NoFH.

b) Depending on the indicated VAMOS type the SS sets the level of the wanted signal specified by C_{lev} in table 14.2.37-2 or table 14.2.37-3.

c) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Due to the low signal level the MS may not be able to acknowledge an RR frame and the L2 entity of the SS will repeat the Layer 2 frame. Each retransmitted L2 frame will be counted and will indicate a frame erasure event.

d) The SS determines the frame erasure events during at least the minimum number of samples of FACCH/F frames.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.

14.2.37.5 Test Requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER not on the limit.

For information on statistical testing refer to Annex 7 (A7.1.3.2)

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.2.37-1: Minimum test times due to TU50 fading conditions

TCH/F @ 50 km/h				
Frequency /MHz	850	900	1800	1900
Wave length / m	0,35	0,33	0,17	0,16
Min. Test time /s	604	570	285	270
hh:mm:ss	00:10:04	00:09:30	00:04:45	00:04:30

NOTE: Minimum test time calculation due to fading is based on the best rate 50/3 frame relation in table 14.2.37-4

The error rates measured shall not exceed the test limit error rate values given in table 14.2.37-2 or table 14.2.37-3 depending of the indicated VAMOS type.

Table 14.2.37-2: Test Limits for Repeated FACCH/F sensitivity (VAMOS type I MS)

GSM 900 / 850					
Channel	**SCPIR_DL /dB**	**C_{lev} /dBm**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**
FACCH/F	0	-98,5	0.05	0.0617	5592
GSM 1800 / 1900					
FACCH/F	0	-99			

Table 14.2.37-3: Test Limits for Repeated FACCH/F sensitivity (VAMOS type II MS)

GSM 900 / 850					
Channel	**SCPIR_DL /dB**	**C_{lev} /dBm**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**
FACCH/F	0	-101	0.05	0.0617	5592
GSM 1800 / 1900					
FACCH/F	0	-101,5			

Table 14.2.37-4: Maximum test times

Maximum test time (best rate 50/3 per second) (s)	Maximum test time (best rate 50/3 per second) (hh:mm:ss)	Maximum test time (worst rate 50/6 per second) (s)	Maximum test time (worst rate 50/6 per second) (hh:mm:ss)
336	00:05:36	671	00:11:11

14.3 Usable receiver input level range

14.3.1 Definition

The usable receiver input level range is the range of the radio frequency input level of a specified modulated signal over which bit error ratio or frame erasure ratios stay between specified limits.

14.3.2 Conformance requirement

1. The receiver input level range requirements of 3GPP TS 05.05 subclause 6.1 for TCH/FS class II RBER under static and EQ propagation conditions shall be met:

   1.1 Under normal conditions.

   1.2 Under extreme conditions.

14.3.3 Test purpose

1. To verify that the MS does not exceed the conformance requirement with an allowance for the statistical significance of the test:

   1.1 Under normal conditions.

   1.2 Under extreme conditions.

14.3.4 Method of test

14.3.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/FS with an ARFCN in the Mid ARFCN range, power control level set to maximum.

The SS transmits Standard Test Signal C1 on the TCH/FS.

The SS commands the MS to create traffic channel loop back signalling erased frames (subclause 36.2.1.1.2).

14.3.4.2 Procedure

a) The SS compares the data that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding.

   The SS tests the bit error ratio for the non-protected bits of TCH/FS class II, by examining sequences of at least the minimum number of samples of consecutive bits of class II. The number of error events is recorded.

b) Step a) is repeated with the amplitude of the wanted signal increased to an input level at the receiver input of 73 dBμVemf( ).

c) Step a) is repeated with the amplitude of the wanted signal increased to an input level at the receiver input of:

GSM 400	98 dBμVemf( )
GSM 700	98 dBμVemf( )
T-GSM 810	98 dBμVemf( )
GSM 850	98 dBμVemf( )
GSM 900	98 dBμVemf( )
DCS 1 800	90 dBμVemf( )
PCS 1 900	90 dBμVemf( )

d) The SS fading function is set to EQ.

e) Step a) is repeated with the amplitude of the wanted signal set to respectively 20 dB above reference sensitivity level( ) and 73dBμVemf( ) at the receiver input.

f) The test is repeated under extreme test conditions.

14.3.5 Test requirements

The error rate measured in this test shall not exceed the test limit error rate values given in table 14-14. This shall apply for any combination of normal and extreme test voltages and ambient temperature, for the different propagation conditions and for any level of input signal to the receiver.

Table 14-14: Limits for input level range

	GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900		DCS 1 800 and PCS 1 900	
Propagation conditions	**Test limit error rate %**	**Minimum No. of samples**	**Test limit error rate %**	**Minimum No. of samples**
Static <=73 dBμVemf( )	0,012	1640000	0,012	1 640 000
Static 98 dBμVemf( )	0,122	164000		
Static 90 dBμVemf( )			0,122	164 000
EQ	3,25	120000	3,25	60 000

14.4 Co-channel rejection

14.4.1 Co-channel rejection - TCH/FS

14.4.1.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.4.1.2 Conformance requirement

1. At reference co-channel interference the TCH/FS FER shall meet the reference interference performance of table 2 in 3GPP TS 05.05 subclause 6.3.

2. At reference co-channel interference the TCH/FS class Ib BER shall meet the reference interference performance of table 2 in 3GPP TS 05.05 subclause 6.3.

3. At reference co-channel interference the TCH/FS class II BER shall meet the reference interference performance of table 2 in 3GPP TS 05.05 subclause 6.3.

14.4.1.3 Test purpose

1. To verify that the MS does not exceed conformance requirement 1 under propagation condition TUlow with no frequency hopping with an allowance for the statistical significance of the test.

2. To verify that the MS does not exceed conformance requirement 2 under propagation condition TUlow with no frequency hopping, with an allowance for the statistical significance of the test.

3. To verify that the MS does not exceed conformance requirement 3 under propagation condition TUlow with no frequency hopping with an allowance for the statistical significance of the test.

4. To verify that the non-DARP capable MS does not exceed conformance requirement 1 under propagation condition TUhigh with frequency hopping with an allowance for the statistical significance of the test.

5. To verify that the non-DARP capable MS does not exceed conformance requirement 2 under propagation condition TUhigh with frequency hopping with an allowance for the statistical significance of the test.

6. To verify that the non-DARP capable MS does not exceed conformance requirement 3 under propagation condition TUhigh with frequency hopping with an allowance for the statistical significance of the test.

14.4.1.4 Method of test

14.4.1.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/FS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36.1.2.1.1.1).

Specific PICS Statements:

- DARP phase 1 supported (TSPC_DARP_Phase1)
- DARP phase 2 supported (TSPC_DARP_Phase2)

PIXIT Statements:

-

14.4.1.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Its amplitude is 9 dB below that of the wanted signal.

   The fading characteristic of the wanted and the interfering signal is TUlow.

b) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

c) The SS determines the number of residual bit error events for the bits of class II, by examining at least the minimum number of samples of consecutive bits of class II. Bits are taken only from those frames not signalled as erased.

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased.

f) For the non-DARP capable MS, steps a) to e) are repeated except that in step a) both the wanted and interfering signal are TUhigh hopping and the SS commands the MS into hopping mode. A hopping pattern covering at least 10 frequencies in a range not exceeding 5 MHz is used. The hopping band is centred around an ARFCN in the Mid ARFCN range.

14.4.1.5 Test requirements

The error rate measured in this test shall not exceed the test limit error rate values given in table 14-15.

Table 14-15: Limits for co-channel rejection

Channel	Type of measurement	Propagation condition	Test limit error rate %	Minimum No. of samples
TCH/FS	FER	TUlow/No FH	24*α	25 000
TCH/FS Class Ib	RBER	TUlow/No FH	2,091/α	3 300 000
TCH/FS Class II	RBER	TUlow/No FH	4,3	2 000 000
TCH/FS	FER	TUhigh/FH	3,371*α	17 800
TCH/FS class Ib	RBER	TUhigh/FH	0,215/α	2 000 000
TCH/FS class II	RBER	TUhigh/FH	8,333	1 200 000

The parameter α can range from 1 to 1.6. The value of α for the RBER test on TCH/FS class Ib bits under particular measurement conditions shall be the same as that determined in the FER test on TCH/FS under the same conditions.

14.4.1a Co-channel rejection - TCH/FS in TIGHTER configuration

14.4.1a.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.4.1a.2 Conformance requirement

3GPP TS 45.005 subclause 6.3.5

A MS indicating support for TIGHTER Capability (see 3GPP TS 24.008) shall fulfil the requirements in table 2ad for cochannel interference (C/Ic).

The reference performance shall be:

Table 6.3-6 Reference performance for TIGHTER

For speech channels (TCH/FS, TCH/HS, TCH/EFS, TCH/AFSx, TCH/AHSx, TCH/WFSx)	FER:	≤ 1 %

In addition to table 6.3-6, for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 2ad at the corresponding interference ratio C/Ic.

14.4.1a.3 Test purpose

1. For TCH/FS FER, MS shall meet the reference interference performance mentioned in 3GPP TS 45.005 sub clause 6.3.5, for co-channel interference ratio mentioned in table 2ad according to propagation conditions.
2. At reference co-channel interference the TCH/FS class Ib BER shall meet the reference interference performance of table 2ad in 3GPP TS 45.005.
3. At reference co-channel interference the TCH/FS class II BER shall meet the reference interference performance of table 2ad in 3GPP TS 45.005.

14.4.1a.4 Method of test

14.4.1a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/FS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal) at the level -93 dBm + Ir + Corr, where:

Ir = the interference ratio according to table 2ad\

Corr = the correction factor for reference performance according to table 6.2-4.

The SS commands the MS to create the traffic channel loop back, signalling erased frames.

Specific PICS Statements:

-

PIXIT Statements:

-

14.4.1a.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal) 7 dB below that of the wanted signal.

The fading characteristic of the wanted and the interfering signal is TUlow.

b) The SS compares the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding and checks the frame erasure indication.

c) The SS determines the number of residual bit error events for the bits of class II, by examining at least the minimum number of samples of consecutive bits of class II. Bits are taken only from those frames not signalled as erased.

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased.

14.4.1a.5 Test requirements

The error rate measured in this test shall not exceed the test limit error rate values given in table 14.4.1a.5-1 and 14.4.1a.5-2.

Table 14.4.1a.5-1: Limits for GSM 850 and GSM 900 co-channel rejection

Channels	Propagation conditions TUlow/NoFH	
	Test limit error rate %	Minimum No. of samples
TCH/FS FER class Ib(RBER) class II(RBER)	 1 0,05 0,6	 25 000 3 300 000 2 000 000

Table 14.4.1a.5-2: Limits for DCS 1 800 and PCS 1 900 co-channel rejection

Channels	Propagation conditions TUlow/NoFH	
	Test limit error rate %	Minimum No. of samples
TCH/FS FER class Ib(RBER) class II(RBER)	 1 0,05 0,6	 25 000 3 300 000 2 000 000

14.4.2 Co-channel rejection - TCH/HS

14.4.2.1 Definition

-

14.4.2.2 Conformance requirement

1. At reference co channel interference, the TCH/HS FER (shall meet the reference interference performance of table 2 in 3GPP TS 05.05 subclause 6.3.

2. At reference co channel interference, the TCH/HS class Ib BER (BFI=0) shall meet the reference interference performance of table 2 in 3GPP TS 05.05 subclause 6.3.

3. At reference co channel interference, the TCH/HS class II BER (BFI=0) shall meet the reference interference performance of table 2 in 3GPP TS 05.05 subclause 6.3.

4. At reference co channel interference, the TCH/HS UFR shall meet the reference interference performance of table 2 in 3GPP TS 05.05 subclause 6.3.

5. At reference co channel interference, the TCH/HS class Ib RBER ((BFI or UFI)=0) shall meet the reference interference performance of table 2 in 3GPP TS 05.05 subclause 6.3.

14.4.2.3 Test purpose

1. To verify that the MS does not exceed conformance requirement 1, under propagation conditions TUhigh with frequency hopping, with an allowance for the statistical significance of the test.

2. To verify that the MS does not exceed conformance requirement 1, under propagation conditions TUhigh with frequency hopping, with an allowance for the statistical significance of the test.

3. To verify that the MS does not exceed conformance requirement 1, under propagation conditions TUhigh with frequency hopping, with an allowance for the statistical significance of the test.

4. To verify that the MS does not exceed conformance requirement 4, under propagation condition TUhigh with frequency hopping, with an allowance for the statistical significance of the test.

5. To verify that the MS does not exceed conformance requirement 4, under propagation condition TUhigh with frequency hopping, with an allowance for the statistical significance of the test.

14.4.2.4 Method of test

14.4.2.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/HS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

14.4.2.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Its amplitude is 9 dB below that of the wanted signal.

b) The fading characteristic of the wanted and the interfering signal is set to TUhigh. The SS commands the MS into hopping mode. A hopping pattern covering at least 10 frequencies in a range not exceeding 5 MHz is used. The hopping pattern is centred around an ARFCN in the Mid ARFCN range.

c) The SS commands the MS to create traffic channel loop back signalling erased frames using test loop A.

NOTE 1: Test loop A is defined in clause 36. Frames marked with BFI=1 are signalled as erased on the uplink.

d) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

e) The SS determines the number of residual bit error events for the bits of class II, by examining at least the minimum number of samples of consecutive bits of class II. Bits are taken only from those frames not signalled as erased.

f) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

g) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased.

h) The SS commands the MS to open test loop A and close test loop D.

NOTE 2: Test loop D is defined in clause 36. Frames marked as erased (BFI=1), or unreliable (UFI=1), are signalled to the SS on the uplink.

j) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the erased/unreliable frame indication.

k) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased/unreliable.

l) The SS also determines the unreliable frame events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased/unreliable.

14.4.2.5 Test requirements

The error rate measured in this test shall not exceed the test limit error rate values given in table 14-16 or table 14-17.

Table 14-16: Limits for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 co-channel rejection

Channel/Type of measurement	Propagation condition	Test limit error rate %	Minimum No. of samples
TCH/HS FER	TUhigh/FH	5,607	10 700
TCH/HS Class Ib RBER (BFI=0)	TUhigh/FH	0,325	184 700
TCH/HS Class II RBER (BFI=0)	TUhigh/FH	7,961	25 500
TCH/HS UFR	TUhigh/FH	6,834	8 780
TCH/HS Class Ib RBER ((BFI or UFI)=0)	TUhigh/FH	0,235	255 000

Table 14-17: Limits for DCS 1800 and PCS 1 900 co-channel rejection

Channel/Type of measurement	Propagation condition	Test limit error rate %	Minimum No. of samples
TCH/HS FER	TUhigh/FH	5,607	10 700
TCH/HS Class Ib RBER (BFI=0)	TUhigh/FH	0,325	184 700
TCH/HS Class II RBER (BFI=0)	TUhigh/FH	7,961	25 500
TCH/HS UFR	TUhigh/FH	6,834	8 780
TCH/HS Class Ib RBER ((BFI or UFI)=0)	TUhigh/FH	0,235	255 000

14.4.2a Co-channel rejection - TCH/HS in TIGHTER configuration

14.4.2a.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.4.2a.2 Conformance requirement

3GPP TS 45.005 subclause 6.3.5

A MS indicating support for TIGHTER Capability (see 3GPP TS 24.008) shall fulfil the requirements in table 2ad for cochannel interference (C/Ic).

The reference performance shall be:

Table 6.3-6 Reference performance for TIGHTER

For speech channels (TCH/FS, TCH/HS, TCH/EFS, TCH/AFSx, TCH/AHSx, TCH/WFSx)	FER:	≤ 1 %

In addition to table 6.3-6, for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 2ad at the corresponding interference ratio C/Ic.

14.4.2a.3 Test purpose

1. For TCH/HS FER, MS shall meet the reference interference performance mentioned in 3GPP TS 45.005 sub clause 6.3.5, for co-channel interference ratio mentioned in table 2ad according to propagation conditions.

2. At reference co channel interference, the TCH/HS class Ib BER shall meet the reference interference performance of table 2ad in 3GPP TS 45.005.

3. At reference co channel interference, the TCH/HS class II BER shall meet the reference interference performance of table 2ad in 3GPP TS 45.005.

14.4.2a.4 Method of test

14.4.2a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/HS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal) at the level -93 dBm + Ir + Corr, where:

Ir = the interference ratio according to table 2ad\

Corr = the correction factor for reference performance according to table 6.2-4.

Specific PICS Statements:

-

14.4.2a.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal) 0 dB below that of the wanted signal.

b) The fading characteristic of the wanted and the interfering signal is set to TUhigh. The SS commands the MS into hopping mode. A hopping pattern covering at least 10 frequencies in a range not exceeding 5 MHz is used. The hopping pattern is centred around an ARFCN in the Mid ARFCN range.

c) The SS commands the MS to create traffic channel loop back signalling erased frames using test loop A.

NOTE 1: Test loop A is defined in clause 36. Frames marked with BFI=1 are signalled as erased on the uplink.

d) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

e) The SS determines the number of residual bit error events for the bits of class II, by examining at least the minimum number of samples of consecutive bits of class II. Bits are taken only from those frames not signalled as erased.

f) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

g) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased.

14.4.2a.5 Test requirements

The error rate measured in this test shall not exceed the test limit error rate values given in table 14.4.2a.5-1or table 14.4.2a.5-2.

Table 14.4.2a.5-1: Limits for GSM 850 and GSM 900 co-channel rejection

Channels	Propagation conditions TUhigh		Propagation conditions RA	
	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
TCH/HS				
FER	1	10 700		
class Ib(RBER)	0,24	184 700		
class II(RBER)	4,16	25 500	5,19	24 000

Table 14.4.2a.5-2: Limits for DCS 1 800 and PCS 1 900 co-channel rejection

Channels	Propagation conditions TUhigh		Propagation conditions RA	
	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
TCH/HS				
FER	1	10 700		
class Ib(RBER)	0,24	184 700		
class II(RBER)	4,08	25 500	5,13	24 000

14.4.3 Void

14.4.4 Co-channel rejection - FACCH/F

14.4.4.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.4.4.2 Conformance requirement

At reference co channel interference the FACCH/F FER shall meet the reference interference performance of table 2 in 3GPP TS 05.05 subclause 6.3).

14.4.4.3 Test purpose

To verify that the MS does not exceed the conformance requirement under propagation condition TUlow with an allowance for the statistical significance of the test.

14.4.4.4 Method of test

14.4.4.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/F with an ARFCN in the mid ARFCN range. The power control level is set to maximum power.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

14.4.4.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Its amplitude is 9 dB below that of the wanted signal.

   The fading characteristic of the wanted and the interfering signal is TUlow.

b) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Due to the co-channel interference, the MS may not be able to acknowledge the Layer 2 frame. Each repeated L2 frame indicates a frame erasure event. The SS determines the number of frame erasure events during at least the minimum number of samples of FACCH/F frames.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.

14.4.4.5 Test requirements

The error rate measured in this test shall not exceed the test limit error rate values given in table 14-19.

Table 14-19: Limits for co-channel rejection

Channel	Type of measurement	Propagation condition	Test limit error rate %	Minimum No. of samples
FACCH/F	FER	TUlow/No FH	24	25 000

14.4.4a Co-channel rejection - FACCH/F in TIGHTER configuration

14.4.4a.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.4.4a.2 Conformance requirement

3GPP TS 45.005 subclause 6.3.5

A MS indicating support for TIGHTER Capability (see 3GPP TS 24.008) shall fulfil the requirements in table 2ad for cochannel interference (C/Ic).

The reference performance shall be:

Table 6.3-6: Reference performance for TIGHTER

For signalling channels (FACCH/F, FACCH/H, SDCCH)	FER:	$\leq$ 5 %

14.4.4a.3 Test purpose

For FACCH/F FER, MS shall meet the reference interference performance mentioned in 3GPP TS 45.005 sub clause 6.3.5, for co-channel interference ratio mentioned in table 2ad according to propagation conditions.

14.4.4a.4 Method of test

14.4.4a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/F with an ARFCN in the mid ARFCN range. The power control level is set to maximum power.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

14.4.4a.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Its amplitude is set according to the specified reference interference ratio as in table 2ad.

   The fading characteristic of the wanted and the interfering signal is TUlow no FH.

b) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Due to the co-channel interference, the MS may not be able to acknowledge the Layer 2 frame. Each repeated L2 frame indicates a frame erasure event. The SS determines the number of frame erasure events during at least the minimum number of samples of FACCH/F frames.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.

14.4.4a.5 Test requirements

The error rate measured in this test shall not exceed the test limit error rate values given in table 14.4.4a.5-1.

Table 14.4.4a.5-1: Limits for co-channel rejection

Channel	Type of measurement	Propagation condition	Test limit error rate %	Minimum No. of samples
FACCH/F	FER	TUlow/No FH	5	25 000

14.4.5 Co-channel rejection - FACCH/H

14.4.5.1 Definition

-

14.4.5.2 Conformance requirement

At reference co channel interference the FACCH/H FER shall meet the reference interference performance of table 2 in 3GPP TS 05.05 subclause 6.3).

14.4.5.3 Test purpose

To verify that the MS does not exceed the conformance requirement under propagation condition TUlow with an allowance for the statistical significance of the test.

14.4.5.4 Method of test

14.4.5.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH with an ARFCN in the mid ARFCN range. For MS supporting half rate speech this shall be a TCH/HS. For MS not supporting TCH/HS one of the supported TCH/(AHS, H4,8, or H2,4) shall be used. The power control level is set to maximum power.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

14.4.5.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Its amplitude is 9 dB below that of the wanted signal.

   The fading characteristic of the wanted and the interfering signal is TUlow.

b) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Due to the co-channel interference, the MS may not be able to acknowledge the Layer 2 frame. Each repeated L2 frame indicates a frame erasure event. The SS determines the number of frame erasure events during at least the minimum number of samples of FACCH/H frames.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degrade.

14.4.5.5 Test requirements

The error rate measured in this test shall not exceed the test limit error rate values given in table 14-20.

Table 14-20: Limits for co-channel rejection

Channel	Type of measurement	Propagation condition	Test limit error rate %	Minimum No. of samples
FACCH/H	FER	TUlow/No FH	24,000	25 000

14.4.5a Co-channel rejection - FACCH/H in TIGHTER configuration

14.4.5a.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.4.5a.2 Conformance requirement

3GPP TS 45.005 subclause 6.3.5

A MS indicating support for TIGHTER Capability (see 3GPP TS 24.008) shall fulfil the requirements in table 2ad for cochannel interference (C/Ic).

The reference performance shall be:

Table 6.3-6: Reference performance for TIGHTER

For signalling channels (FACCH/F, FACCH/H, SDCCH)	FER:	≤ 5 %

14.4.5a.3 Test purpose

For FACCH/H FER, MS shall meet the reference interference performance mentioned in 3GPP TS 45.005 sub clause 6.3.5, for co-channel interference ratio mentioned in table 2ad according to propagation conditions.

14.4.5a.4 Method of test

14.4.5a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH with an ARFCN in the mid ARFCN range. For MS supporting half rate speech this shall be a TCH/HS. For MS not supporting TCH/HS one of the supported TCH/(AHS, H4,8, or H2,4) shall be used. The power control level is set to maximum power.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

14.4.5a.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Its amplitude is set according to the specified reference interference ratio as in table 2ad.

   The fading characteristic of the wanted and the interfering signal is TUlow no FH.

b) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Due to the co-channel interference, the MS may not be able to acknowledge the Layer 2 frame. Each repeated L2 frame indicates a frame erasure event. The SS determines the number of frame erasure events during at least the minimum number of samples of FACCH/H frames.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degrade.

14.4.5a.5 Test requirements

The error rate measured in this test shall not exceed the test limit error rate values given in table 14.4.5a.5-1.

Table 14.4.5a.5-1: Limits for co-channel rejection

Channel	Type of measurement	Propagation condition	Test limit error rate %	Minimum No. of samples
FACCH/H	FER	TUlow/No FH	5	25 000

14.4.6 Co-channel rejection - TCH/EFS

14.4.6.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.4.6.2 Conformance requirement

1. At reference co-channel interference the TCH/EFS FER shall meet the reference interference performance of table 2 in 3GPP TS 05.05 subclause 6.3.
2. At reference co-channel interference the TCH/EFS class Ib BER shall meet the reference interference performance of table 2 in 3GPP TS 05.05 subclause 6.3.
3. At reference co-channel interference the TCH/EFS class II BER shall meet the reference interference performance of table 2 in 3GPP TS 05.05 subclause 6.3.

14.4.6.3 Test purpose

1. To verify that the MS does not exceed conformance requirement 1 under propagation condition TUhigh with frequency hopping and TUlow with no frequency hopping with an allowance for the statistical significance of the test.
2. To verify that the MS does not exceed conformance requirement 2 under propagation condition TUhigh with frequency hopping and TUlow with no frequency hopping, with an allowance for the statistical significance of the test.
3. To verify that the MS does not exceed conformance requirement 3 under propagation condition TUhigh with frequency hopping and TUlow with no frequency hopping with an allowance for the statistical significance of the test.

14.4.6.4 Method of test

14.4.6.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/EFS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36.1.2.1.1.1).

14.4.6.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Its amplitude is 9 dB below that of the wanted signal.

   The fading characteristic of the wanted and the interfering signal is TUlow.

b) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

c) The SS determines the number of residual bit error events for the bits of class II, by examining at least the minimum number of samples of consecutive bits of class II. Bits are taken only from those frames not signalled as erased.

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased.

f) Steps a) to e) are repeated except that in step a) both the wanted and interfering signal are TUhigh hopping and the SS commands the MS into hopping mode. A hopping pattern covering at least 10 frequencies in a range not exceeding 5 MHz is used. The hopping pattern is centred around an ARFCN in the Mid ARFCN range.

14.4.6.5 Test requirements

The error rate measured in this test shall not exceed the test limit error rate values given in table 14-21.

Table 14-21: Limits for co-channel rejection

Channel	Type of measurement	Propagation condition	Test limit error rate %	Minimum No. of samples
TCH/EFS	FER	TUlow/No FH	24	25 000
TCH/EFS Class Ib	RBER	TUlow/No FH	0,209	3 300 000
TCH/EFS Class II	RBER	TUlow/No FH	3,039	2 000 000
TCH/EFS	FER	TUhigh/FH	3,357	17 800
TCH/EFS class Ib	RBER	TUhigh/FH	0,115	2 000 000
TCH/EFS class II	RBER	TUhigh/FH	8,333	1 200 000

14.4.6a Co-channel rejection - TCH/EFS in TIGHTER configuration

14.4.6a.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.4.6a.2 Conformance requirement

3GPP TS 45.005 subclause 6.3.5

A MS indicating support for TIGHTER Capability (see 3GPP TS 24.008) shall fulfil the requirements in table 2ad for cochannel interference (C/Ic).

The reference performance shall be:

Table 6.3-6: Reference performance for TIGHTER

For speech channels (TCH/FS, TCH/HS, TCH/EFS, TCH/AFSx, TCH/AHSx, TCH/WFSx)	FER:	≤ 1 %

In addition to table 6.3-6, for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 2ad at the corresponding interference ratio C/Ic.

14.4.6a.3 Test purpose

1. For TCH/EFS FER, MS shall meet the reference interference performance mentioned in 3GPP TS 45.005 sub clause 6.3.5, for co-channel interference ratio mentioned in table 2ad according to propagation conditions.

2. At reference co-channel interference the TCH/EFS class Ib BER shall meet the reference interference performance of table 2ad in 3GPP TS 45.005.

3. At reference co-channel interference the TCH/EFS class II BER shall meet the reference interference performance of table 2ad in 3GPP TS 45.005.

14.4.6a.4 Method of test

14.4.6a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/EFS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36.1.2.1.1.1).

14.4.6a.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Its amplitude is set according to the specified reference interference ratio as in table 2ad.

   The fading characteristic of the wanted and the interfering signal is TUlow no FH.

b) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

c) The SS determines the number of residual bit error events for the bits of class II, by examining at least the minimum number of samples of consecutive bits of class II. Bits are taken only from those frames not signalled as erased.

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased.

f) Steps a) to e) are repeated except that in step a) both the wanted and interfering signal are TUhigh hopping and the SS commands the MS into hopping mode. A hopping pattern covering at least 10 frequencies in a range not exceeding 5 MHz is used. The hopping pattern is centred around an ARFCN in the Mid ARFCN range.

14.4.6a.5 Test requirements

The error rate measured in this test shall not exceed the test limit error rate values given in table 14.4.6a.5-1 and 14.4.6a.5-2.

Table 14.4.6a.5-1: Limits for GSM 850 and GSM 900 co-channel rejection

Channels	Propagation conditions TUhigh/FH		Propagation conditions TUlow/No FH	
	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
TCH/EFS				
FER	1	17 800	1	25 000
class Ib(RBER)	0,09	2 000 000	0,19	3 300 000
class II(RBER)	4,92	1 200 000	0,62	2 000 000

Table 14.4.6a.5-2: Limits for DCS 1 800 and PCS 1 900 co-channel rejection

Channels	Propagation conditions TUhigh/FH		Propagation conditions TUlow/No FH	
	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
TCH/EFS				
FER	1	17 800	1	25 000
class Ib(RBER)	0,09	2 000 000	0,19	3 300 000
class II(RBER)	4,54	1 200 000	0,62	2 000 000

14.4.7 Receiver performance in the case of frequency hopping and co-channel interference on one carrier

14.4.7.1 Definition

The GSM receiver is specified to be able to handle one out of four carriers being strongly interfered with, if frequency hopping is applied. This is used in networks to increase the capacity.

14.4.7.2 Conformance Requirement

Under the following conditions:

- a useful signal, cyclic frequency hopping over four carriers under static conditions, with equal input levels 20 dB above reference sensitivity level;

- a random, continuous, GMSK-modulated interfering signal on only one of the carriers at a level 10 dB higher than the useful signal,

the FER for TCH/FS shall be less than 5%; 3GPP TS 05.05 subclause 6.6.

14.4.7.3 Test Purpose

To verify that the MS does not exceed the conformance requirement with an allowance for the statistical significance of the test.

14.4.7.4 Method Of Test

14.4.7.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/FS channel in hopping mode, power control level set to maximum power. A cyclic hop pattern covering four frequencies with a minimum carrier distance of 600 kHz is used.

The SS transmits Standard Test Signal C1 on the traffic channel with a power level 20 dB above reference sensitivity level (wanted signal). No fading is applied.

The SS commands the MS to create the traffic channel loop back, signalling erased frames.

14.4.7.4.2 Test Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal) on one of the hopping frequencies of the wanted signal, and on the timeslot used by the wanted signal. The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Its amplitude is 10 dB above that of the wanted signal. No fading characteristics are applied.

b) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

c) The SS determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased.

14.4.7.5 Test requirements

The error rate measured in this test shall not exceed the test limit error rate value given in the following table.

Channel	Type of measurement	Propagation condition	Test limit error rate (%)	Minimum No. of samples
TCH/FS	FER	Static	6.1	3 300

14.4.8 Co-channel rejection - TCH/AFS

14.4.8.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.4.8.2 Conformance requirement

1. At reference co-channel interference the TCH/AFS FER shall meet the reference interference performance of table 2 in 3GPP TS 05.05 subclause 6.3.

2. At reference co-channel interference the TCH/AFS class Ib BER shall meet the reference interference performance of table 2 in 3GPP TS 05.05 subclause 6.3.

14.4.8.3 Test purpose

1. To verify that the MS does not exceed conformance requirement 1 under propagation condition TUhigh with frequency hopping and TUlow with no frequency hopping with an allowance for the statistical significance of the test.

2. To verify that the MS does not exceed conformance requirement 2 under propagation condition TUhigh with frequency hopping and TUlow with no frequency hopping, with an allowance for the statistical significance of the test.

14.4.8.4 Method of test

14.4.8.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AFS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 7,95 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

Specific PICS Statements:

- DARP phase 1 supported (TSPC_DARP_Phase1)
- DARP phase 2 supported (TSPC_DARP_Phase2)

PIXIT Statements:

-

14.4.8.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

    The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. The interference ratio is set to the reference interference ratio (+9 dB), meaning that the amplitude of the interferer is 9 dB below that of the wanted signal.

    The fading characteristic of the wanted and the interfering signal is TUlow (TU3 for T-GSM 810, GSM850 and GSM900, TU1,5 for GSM1800 and GSM1900).

b) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

c) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

d) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased.

e) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,9 kbit/s and steps b) to d) are repeated.

f) The interference ratio is set to 3 dB below the reference interference ratio (+9 dB - 3 dB), meaning that the amplitude of the interferer is 6 dB below that of the wanted signal.

g) The SS uses a Channel Mode Modify procedure to change the active codec set to 4,75 kbit/s and steps b) to d) are repeated.

h) If the MS is DARP capable, the following steps are omitted.

i) The SS commands the MS into hopping mode. A hopping pattern covering at least 10 frequencies in a range not exceeding 5 MHz is used. The hopping pattern is centred on an ARFCN in the Mid ARFCN range. The interference ratio is set to the reference interference ratio (+9 dB), meaning that the amplitude of the interferer is 9 dB below that of the wanted signal. The fading characteristic of the wanted and the interfering signal is TUHigh (TU50 for T-GSM 810, GSM850 and GSM900, GSM1800 and GSM1900).

j) The SS uses a Channel Mode Modify procedure to change the active codec set to 12,2 kbit/s and steps b) to d) are repeated.

k) The SS uses a Channel Mode Modify procedure to change the active codec set to 10,2 kbit/s and steps b) to d) are repeated.

l) The SS uses a Channel Mode Modify procedure to change the active codec set to 7,4 kbit/s and steps b) to d) are repeated.

m) The interference ratio is set to 3 dB below the reference interference ratio (+9 dB - 3 dB), meaning that the amplitude of the interferer is 6 dB below that of the wanted signal.

n) The SS uses a Channel Mode Modify procedure to change the active codec set to 6,7 kbit/s and steps b) to d) are repeated.

o) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,15 kbit/s and steps b) to d) are repeated.

Maximum/Minimum Duration of Test

Non-DARP MS

- Maximum: 3 hours (GSM850, GSM900), 4 hours (DCS1800, PCS1900).
- Minimum: 1 hour (GSM850, GSM900, DCS1800, PCS1900).

DARP MS

- Maximum/minimum: 42 minutes (GSM850, GSM900, DCS1800, PCS1900).

14.4.8.5 Test requirements

Testing the Co-channel interference performance is performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with BER/BLER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex A7.

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure 14-1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed for fading profiles greater than 5km/h, and 250 wavelengths are crossed for fading profiles less than or equal to 5km/h. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14-48: Minimum test times due to TU low fading conditions

Full Rate 3 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelenth	0,75	0,43	0,35	0,33	-	-	m
min test time	1800	1029	847	800	-	-	S
	0:30:00	**0:17:09**	**0:14:07**	**0:13:20**	**-**	**-**	**hh:mm:ss**
Full Rate 1,5 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelenth	-	-	-	-	0,17	0,16	m
min test time	-	-	-	-	800	758	s
	-	**-**	**-**	**-**	**0:13:20**	**0:12:38**	**hh:mm:ss**

Table 14-49: Minimum test times due to TU high fading conditions

Full Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	428	244	201	190	95	90	s
	0:07:08	**0:04:04**	**0:03:21**	**0:03:10**	**0:01:35**	**0:01:30**	**hh:mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is done by comparing the result with the "derived test limit". In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne ≥ 1 (inclusive artificial error)

For an early fail decision ne ≥ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14-49 or 14-50.

Co-channel rejection tests with a frequency condition noted as "@-ndB" are performed for an interference ratio n dB below the reference interference ratio (see 3GPP TS 45.005).

Table 14-49: Statistical test limits for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 TU low no FH

TU low no FH								
0.4 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
AFS 7.95	frames	7950	50	0,130000	0,160420	2151	43	00:00:43
	Class1b	7950	4200	0,006600	0,008144	42360	10	00:00:10
AFS 5.9	frames	5900	50	0,100000	0,123400	2796	56	00:00:56
	Class1b	5900	3150	0,003800	0,004689	73573	23	00:00:23
AFS 4.75	frames @-3dB	4750	50	0,170000	0,209780	1645	33	00:00:33
	Class1b@-3dB	4750	2800	0,006200	0,007651	45093	16	00:00:16

Table 14-50: Statistical test limits for GSM 400, GSM 700, GSM 850 and GSM 900 TU high with FH

TU high FH								
0.4 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
AFS 12.2	frames	12200	50	0,035000	0,043190	7988	160	00:02:40
	Class1b	12200	8150	0,017000	0,020978	16446	2	00:00:02
AFS 10.2	frames	10200	50	0,014000	0,017276	19970	399	00:06:39
	Class1b	10200	6950	0,002100	0,002591	133133	19	00:00:19
AFS 7.4	frames	7400	50	0,001600	0,001974	174737	3495	00:58:15

	Class1b	7400	4350	0,000320	0,000395	873683	201	00:03:21
AFS 6.7	Frames@ -3dB	6700	50	0,012000	0,014808	23298	466	00:07:46
	Class1b@ -3dB	6700	3950	0,006000	0,007404	46596	12	00:00:12
AFS 5.15	frames @-3dB	5150	50	0,004700	0,005800	59485	1190	00:19:50
	Class1b@-3dB	5150	2700	0,001100	0,001357	254162	94	00:01:34

Table 14-51: Statistical test limits for DCS 1 800 and PCS 1 900 TU low no FH

TU low no FH								
1.8 and 1.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
AFS 7.95	frames	7950	50	0,130000	0,160420	2151	43	00:00:43
	Class1b	7950	4200	0,006700	0,008268	41728	10	00:00:10
AFS 5.9	frames	5900	50	0,100000	0,123400	2796	56	00:00:56
	Class1b	5900	3150	0,003800	0,004689	73573	23	00:00:23
AFS 4.75	frames @-3dB	4750	50	0,170000	0,209780	1645	33	00:00:33
	Class1b@-3dB	4750	2800	0,006100	0,007527	45833	16	00:00:16

Table 14-52: Statistical test limits for DCS 1 800 and PCS 1 900 TU high with FH

TU high FH								
1.8 and 1.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
AFS 12.2	frames	12200	50	0,027000	0,033318	10355	207	00:03:27
	Class1b	12200	8150	0,016000	0,019744	17474	2	00:00:02
AFS 10.2	frames	10200	50	0,009800	0,012093	28528	571	00:09:31
	Class1b	10200	6950	0,001700	0,002098	164458	24	00:00:24
AFS 7.4	frames	7400	50	0,000830	0,001024	336842	6737	01:52:17
	Class1b	7400	4350	0,000200	0,000247	1397893	321	00:05:21
AFS 6.7	Frames @-3dB	6700	50	0,008200	0,010119	34094	682	00:11:22
	Class1b@-3dB	6700	3950	0,005100	0,006293	54819	14	00:00:14
AFS 5.15	frames @-3dB	5150	50	0,002600	0,003208	107530	2151	00:35:51
	Class1b@-3dB	5150	2700	0,000720	0,000888	388304	144	00:02:24

14.4.8a Co-channel rejection - TCH/AFS in TIGHTER configuration

14.4.8a.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.4.8a.2 Conformance requirement

3GPP TS 45.005 subclause 6.3.5

A MS indicating support for TIGHTER Capability (see 3GPP TS 24.008) shall fulfil the requirements in table 2ad for co channel interference (C/Ic).

The reference performance shall be:

Table 6.3-6: Reference performance for TIGHTER

For speech channels (TCH/FS, TCH/HS, TCH/EFS, TCH/AFSx, TCH/AHSx, TCH/WFSx)	FER:	≤ 1 %

In addition to table 6.3-6, for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 2ad at the corresponding interference ratio C/Ic.

14.4.8a.3 Test purpose

1. For TCH/AFS FER, MS shall meet the reference interference performance mentioned in 3GPP TS 45.005 sub clause 6.3.5, for co-channel interference ratio mentioned in table 2ad according to propagation conditions.

2. At reference co-channel interference the TCH/AFS class Ib BER shall meet the reference interference performance of table 2ad in 3GPP TS 45.005.

14.4.8a.4 Method of test

14.4.8a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AFS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 7,95 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

Specific PICS Statements:

-

PIXIT Statements:

-

14.4.8a.4.2 Procedure

a) The fading characteristic of the wanted and the interfering signal is TUlow no FH.

b) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Its amplitude is set according to the specified reference interference ratio as in table 2ad.

c) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,9 kbit/s and steps c) to e) are repeated.

g) The SS uses a Channel Mode Modify procedure to change the active codec set to 4,75 kbit/s and steps c) to e) are repeated.

14.4.8a.5 Test requirements

Testing the Co-channel interference performance is performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with BER/BLER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definitions of limit lines refer to Annex A7.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.4.8a.5-1: Minimum test times due to TU low fading conditions

Full Rate 3 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelenth	0,75	0,43	0,35	0,33	-	-	M
min test time	1800	1029	847	800	-	-	S
	0:30:00	**0:17:09**	**0:14:07**	**0:13:20**	**-**	**-**	**hh:mm:ss**
Full Rate 1,5 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelenth	-	-	-	-	0,17	0,16	M
min test time	-	-	-	-	800	758	S
	-	**-**	**-**	**-**	**0:13:20**	**0:12:38**	**hh:mm:ss**

The error rate measured in this test shall be tested according to the values given in tables 14.4.8a.5-3 and 14.4.8a.5-4.

Table 14.4.8a.5-3: Statistical test limits for GSM 850 and GSM 900 TU low no FH

TU low no FH								
0.4 to 0.9GHz			**frames per s**	**Orig. BER**	**Derived**	**Target number**	**Target test**	**Target test time**
	Channel	**bits per sec**	**clas1b per s**	**requirement**	**test limit**	**of samples**	**time (s)**	**(hh:mm:ss)**
AFS 7.95	frames	7950	50	0,010000	0.012340	27958	560	00:09:20
	Class1b	7950	4200	0.001100	0.001357	254163	61	00:01: 01
AFS 5.9	frames	5900	50	0,010000	0.012340	27958	560	00:09: 20
	Class1b	5900	3150	0.000500	0.000617	559158	178	00:02:58
AFS 4.75	frames	4750	50	0,010000	0.012340	27958	560	00:09:20
	Class1b	4750	2800	0.000600	0.000740	465965	167	00:02:47

Table 14.4.8a.5-4: Statistical test limits for DCS 1800 and PCS 1900 TU low no FH

TU low no FH								
1.8 and 1.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
AFS 7.95	frames	7950	50	0.010000	0.012340	27958	560	00:09: 20
	Class1b	7950	4200	0.001000	0.001234	279579	67	00:01:07
AFS 5.9	frames	5900	50	0.010000	0.012340	27958	560	00:09: 20
	Class1b	5900	3150	0.000700	0.000864	399399	127	00:02:07
AFS 4.75	frames	4750	50	0.010000	0.012340	27958	560	00:09: 20
	Class1b	4750	2800	0.000600	0.000740	465965	167	00:02:47

14.4.9 to 14.4.15 Void

14.4.16 Co-channel rejection - TCH/AHS

14.4.16.1 Definition

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14.4.16.2 Conformance requirement

1. At reference co channel interference, the TCH/AHS FER shall meet the reference interference performance of table 2 in 3GPP TS 05.05 subclause 6.3.

2. At reference co channel interference, the TCH/AHS class Ib BER (BFI=0) shall meet the reference interference performance of table 2 in 3GPP TS 05.05 subclause 6.3.

3. At reference co channel interference, the TCH/AHS class II BER (BFI=0) shall meet the reference interference performance of table 2 in 3GPP TS 05.05 subclause 6.3.

14.4.16.3 Test purpose

1. To verify that the MS does not exceed conformance requirement 1, under propagation conditions TUhigh without frequency hopping, with an allowance for the statistical significance of the test.

2. To verify that the MS does not exceed conformance requirement 2, under propagation conditions TUhigh without frequency hopping, with an allowance for the statistical significance of the test.

3. To verify that the MS does not exceed conformance requirement 3, under propagation conditions TUhigh without frequency hopping, with an allowance for the statistical significance of the test.

14.4.16.4 Method of test

14.4.16.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AHS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The multirate configuration indicates the use of a codec set limited to 7,95 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

14.4.16.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. The interference ratio is set to 3 dB above the reference interference ratio (+9 dB + 3 dB), meaning that the amplitude of the interferer is 12 dB below that of the wanted signal.

b) The fading characteristic of the wanted and the interfering signal is set to TUhigh. The SS commands the MS into non hopping mode.

c) The SS commands the MS to create traffic channel loop back signalling erased frames.

NOTE: Frames marked with BFI=1 are signalled as erased on the uplink.

d) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

e) The SS determines the number of residual bit error events for the bits of class II, by examining at least the minimum number of samples of consecutive bits of class II. Bits are taken only from those frames not signalled as erased.

f) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

g) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased.

h) The SS uses a Channel Mode Modify procedure to change the active codec set to 7,4 kbit/s and steps b) to g) are repeated.

i) The SS uses a Channel Mode Modify procedure to change the active codec set to 6,7 kbit/s and steps b) to g) are repeated.

j) The interference ratio is set to the reference interference ratio (+9 dB), meaning that the amplitude of the interferer is 9 dB below that of the wanted signal. The SS uses a Channel Mode Modify procedure to change the active codec set to 5,9 kbit/s and steps b) to g) are repeated.

k) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,15 kbit/s and steps b) to g) are repeated.

l) The SS uses a Channel Mode Modify procedure to change the active codec set to 4,75 kbit/s and steps b) to g) are repeated.

Maximum/Minimum Duration of Test

Statistical test method, pre Rel-5 MS

Maximum: 40 minutes (GSM850), 38 minutes (GSM900), 20 minutes (DCS1800), 19 minutes (PCS1900).

Minimum: 40 minutes (GSM850), 38 minutes (GSM900), 19 minutes (DCS1800), 18 minutes (PCS1900).

Statistical test method, Rel-5 onwards MS

Maximum: 40 minutes (GSM850), 38 minutes (GSM900), 21 minutes (DCS1800), 20 minutes (PCS1900).

Minimum: 40 minutes (GSM850), 38 minutes (GSM900), 19 minutes (DCS1800), 18 minutes (PCS1900).

14.4.16.5 Test requirements

Testing the Co-channel interference performance is performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with BER/BLER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 6.2

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure 14-1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14-53: Minimum test times due to TU high fading conditions

Half Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	855	489	403	380	190	180	s
	0:14:15	**0:08:09**	**0:06:43**	**0:06:20**	**0:03:10**	**0:03:00**	

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is done by comparing the result with the "derived test limit". In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne ≥ 1 (inclusive artificial error)

For an early fail decision ne ≥ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14-54 or 14-55.

Co-channel rejection tests with a frequency condition noted as "@+ndB" are performed for an interference ratio n dB above the reference interference ratio (see 3GPP TS 45.005).

Table 14-54: Statistical test limits for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900

TU high no FH								
0.4 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
			clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
	Channel	bits per sec	class II per s					
AHS 7.95	frames @+3dB	7950	50	0,067000	0,082678	4173	83	00:01:23
	Class1b @+3dB	7950	2800	0,010000	0,012340	27958	10	00:00:10
	Class II @+3dB	7950	1800	0,032000	0,039488	8737	5	00:00:05
AHS 7.4	frames @+3dB	7400	50	0,047000	0,057998	5948	119	00:01:59
	Class1b @+3dB	7400	2950	0,005100	0,006293	54819	19	00:00:19
	Class II @+3dB	7400	1400	0,033000	0,040722	8472	6	00:00:06
AHS 6.7	frames @+3dB	6700	50	0,023000	0,028382	12156	243	00:04:03
	Class1b @+3dB	6700	2750	0,003900	0,004813	71687	26	00:00:26
	Class II @+3dB	6700	1200	0,036000	0,044424	7766	6	00:00:06
AHS 5.9	frames	5900	50	0,071000	0,087614	3938	79	00:01:19
	Class1b	5900	2350	0,005700	0,007034	49049	21	00:00:21
	Class II	5900	800	0,065000	0,080210	4301	5	00:00:05
AHS 5.15	frames	5150	50	0,033000	0,040722	8472	169	00:02:49
	Class1b	5150	2100	0,006000	0,007404	46596	22	00:00:22
	Class II	5150	600	0,069000	0,085146	4052	7	00:00:07
AHS 4.75	frames	4750	50	Pre Rel-5: 0,025000 Rel-5: 0,018000	Pre Rel-5: 0,030850 Rel-5: 0,022212	Pre Rel-5: 11184 Rel-5: 15532	Pre Rel-5: 224 Rel-5: 311	Pre Rel-5: 00:03:44 Rel-5: 00:05:11
	Class1b	4750	2200	Pre Rel-5: 0,002900 Rel-5: 0,002200	Pre Rel-5: 0,003579 Rel-5: 0,002715	Pre Rel-5: 96407 Rel-5: 127081	Pre Rel-5: 44 Rel-5: 58	Pre Rel-5: 00:00:44 Rel-5: 00:00:58
	Class II	4750	600	Pre Rel-5: 0,075000 Rel-5: 0,070000	Pre Rel-5: 0,092550 Rel-5: 0,086380	Pre Rel-5: 3228 Rel-5: 3994	Pre Rel-5: 6 Rel-5: 7	Pre Rel-5: 00:00:06 Rel-5: 00:00:07

Table 14-55: Statistical test limits for DCS 1 800 and PCS 1 900

TU high no FH								
1.8 and 1.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
			clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
	Channel	bits per sec	class II per s					
AHS 7.95	frames @+3dB	7950	50	0,067000	0,082678	4173	83	00:01:23
	Class1b @+3dB	7950	2800	0,010000	0,012340	27958	10	00:00:10
	Class II @+3dB	7950	1800	Pre Rel-5: 0,033000 Rel-5: 0,031000	Pre Rel-5: 0,040722 Rel-5: 0,038254	Pre Rel-5: 8473 Rel-5: 9019	Pre Rel-5: 5 Rel-5: 5	Pre Rel-5: 00:00:05 Rel-5: 00:00:05
AHS 7.4	frames @+3dB	7400	50	Pre Rel-5: 0,054000 Rel-5: 0,049000	Pre Rel-5: 0,066636 Rel-5: 0,060466	Pre Rel-5: 5178 Rel-5: 5706	Pre Rel-5: 104 Rel-5: 114	Pre Rel-5: 00:01:44 Rel-5: 00:01:54
	Class1b @+3dB	7400	2950	Pre Rel-5: 0,006000 Rel-5: 0,005100	Pre Rel-5: 0,007404 Rel-5: 0,006293	Pre Rel-5: 46597 Rel-5: 54819	Pre Rel-5: 16 Rel-5: 19	Pre Rel-5: 00:00:16 Rel-5: 00:00:19
	Class II @+3dB	7400	1400	Pre Rel-5: 0,035000 Rel-5: 0,033000	Pre Rel-5: 0,043190 Rel-5: 0,040722	Pre Rel-5: 7988 Rel-5: 8472	Pre Rel-5: 6 Rel-5: 6	Pre Rel-5: 00:00:06 Rel-5: 00:00:06
AHS 6.7	frames @+3dB	6700	50	0,025000	0,030850	11183	224	00:03:44
	Class1b @+3dB	6700	2750	0,003800	0,004689	73573	27	00:00:27
	Class II @+3dB	6700	1200	Pre Rel-5: 0,039000 Rel-5: 0,035000	Pre Rel-5: 0,048126 Rel-5: 0,043190	Pre Rel-5: 7169 Rel-5: 7988	Pre Rel-5: 6 Rel-5: 7	Pre Rel-5: 00:00:06 Rel-5: 00:00:07
AHS 5.9	frames	5900	50	0,077000	0,095018	3631	73	00:01:13
	Class1b	5900	2350	0,006000	0,007404	46596	20	00:00:20
	Class II	5900	800	Pre Rel-5: 0,069000 Rel-5: 0,064000	Pre Rel-5: 0,085146 Rel-5: 0,078976	Pre Rel-5: 4052 Rel-5: 4368	Pre Rel-5: 5 Rel-5: 5	Pre Rel-5: 00:00:05 Rel-5: 00:00:05
AHS 5.15	frames	5150	50	0,038000	0,046892	7357	147	00:02:27

	Class1b	5150	2100	0,006600	0,008144	42360	20	00:00:20
	Class II	5150	600	0,068000	0,083912	4111	7	00:00:07
AHS 4.75	frames	4750	50	Pre Rel-5: 0,028000 Rel-5: 0,021000	Pre Rel-5: 0,034552 Rel-5: 0,025914	Pre Rel-5: 9985 Rel-5: 13313	Pre Rel-5: 200 Rel-5: 266	Pre Rel-5: 00:03:20 Rel-5: 00:04:26
	Class1b	4750	2200	0,002500	0,003085	111831	51	00:00:51
	Class II	4750	600	Pre Rel-5: 0,075000 Rel-5: 0,070000	Pre Rel-5: 0,09255 Rel-5: 0,086380	Pre Rel-5: 3728 Rel-5: 3994	Pre Rel-5: 6 Rel-5: 7	Pre Rel-5: 00:00:06 Rel-5: 00:00:07

14.4.16.5.2 Fixed testing of BER/BLER performance with minimum number of samples

The error rate measured in this test shall not exceed the test limit error rate values given in table 14-16 or table 14-17.

Table 14-16: Fixed limits for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 co-channel rejection

Channel	Propagation condition	Test limit error rate %	Minimum No. of samples
TCH/AHS 7.95 (FER)	TUhigh/No FH@+3dB	8.44	8960
TCH/AHS 7.95 Class Ib (RBER)	TUhigh/No FH@+3dB	1.62	60000
TCH/AHS 7.95 Class II (RBER)	TUhigh/No FH@+3dB	4.032	18750
TCH/AHS 7.4 (FER)	TUhigh/No FH@+3dB	6.048	12500
TCH/AHS 7.4 Class Ib (RBER)	TUhigh/No FH@+3dB	0.643	117650
TCH/AHS 7.4 Class II (RBER)	TUhigh/No FH@+3dB	4.158	18200
TCH/AHS 6.7 (FER)	TUhigh/No FH@+3dB	2.898	23000
TCH/AHS 6.7 Class Ib (RBER)	TUhigh/No FH@+3dB	0.491	136000
TCH/AHS 6.7 Class II (RBER)	TUhigh/No FH@+3dB	4.536	15000
TCH/AHS 5.9 (FER)	TUhigh/No FH	8.946	8450
TCH/AHS 5.9 Class Ib (RBER)	TUhigh/No FH	0.718	105270
TCH/AHS 5.9 Class II (RBER)	TUhigh/No FH	8.19	9230
TCH/AHS 5.15 (FER)	TUhigh/No FH	4.158	18190
TCH/AHS 5.15 Class Ib (RBER)	TUhigh/No FH	0.756	100000
TCH/AHS 5.15 Class II (RBER)	TUhigh/No FH	8.694	8700
TCH/AHS 4.75 (FER)	TUhigh/No FH	Pre Rel-5: 3.15 Rel-5: 2.268	Pre Rel-5: 24000 Rel-5: 33333
TCH/AHS 4.75 Class Ib (RBER)	TUhigh/No FH	Pre Rel-5: 0.365 Rel-5: 0.277	Pre Rel-5: 206900 Rel-5: 272730
TCH/AHS 4.75 Class II (RBER)	TUhigh/No FH	Pre Rel-5: 9.45 Rel-5: 8.82	Pre Rel-5: 8000 Rel-5: 8580

Table 14-17: Fixed limits for DCS 1800 and PCS 1 900 co-channel rejection

Channel	Propagation condition	Test limit error rate %	Minimum No. of samples
TCH/AHS 7.95 (FER)	TUhigh/No FH@+3dB	8.442	8960
TCH/AHS 7.95 Class Ib (RBER)	TUhigh/No FH@+3dB	1.26	60000
TCH/AHS 7.95 Class II (RBER)	TUhigh/No FH@+3dB	Pre Rel-5: 4.158 Rel-5: 3.906	Pre Rel-5: 18190 Rel-5: 19355
TCH/AHS 7.4 (FER)	TUhigh/No FH@+3dB	Pre Rel-5: 6.804 Rel-5: 6.174	Pre Rel-5: 11120 Rel-5: 12250
TCH/AHS 7.4 Class Ib (RBER)	TUhigh/No FH@+3dB	Pre Rel-5: 0.756 Rel-5: 0.63	Pre Rel-5: 100000 Rel-5: 117730
TCH/AHS 7.4 Class II (RBER)	TUhigh/No FH@+3dB	Pre Rel-5: 4.41 Rel-5: 4.158	Pre Rel-5: 17150 Rel-5: 18200
TCH/AHS 6.7 (FER)	TUhigh/No FH@+3dB	3.15	24000
TCH/AHS 6.7 Class Ib (RBER)	TUhigh/No FH@+3dB	0.479	157900
TCH/AHS 6.7 Class II (RBER)	TUhigh/No FH@+3dB	Pre Rel-5: 4.914 Rel-5: 4.41	Pre Rel-5: 15390 Rel-5: 17150
TCH/AHS 5.9 (FER)	TUhigh/No FH	9.702	7800
TCH/AHS 5.9 Class Ib (RBER)	TUhigh/No FH	0.756	100000
TCH/AHS 5.9 Class II (RBER)	TUhigh/No FH	Pre Rel-5: 8.694 Rel-5: 8.064	Pre Rel-5: 8700 Rel-5: 9375
TCH/AHS 5.15 (FER)	TUhigh/No FH	4.788	15800
TCH/AHS 5.15 Class Ib (RBER)	TUhigh/No FH	0.831	90910
TCH/AHS 5.15 Class II (RBER)	TUhigh/No FH	8.568	8830
TCH/AHS 4.75 (FER)	TUhigh/No FH	Pre Rel-5: 3.528 Rel-5: 2.646	Pre Rel-5: 21430 Rel-5: 28580
TCH/AHS 4.75 Class Ib (RBER)	TUhigh/No FH	0.315	240000
TCH/AHS 4.75 Class II (RBER)	TUhigh/No FH	Pre Rel-5: 9.45 Rel-5: 8.82	Pre Rel-5: 8000 Rel-5: 8580

14.4.16a Co-channel rejection - TCH/AHS in TIGHTER configuration

14.4.16a.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.4.16a.2 Conformance requirement

3GPP TS 45.005 subclause 6.3.5

A MS indicating support for TIGHTER Capability (see 3GPP TS 24.008) shall fulfil the requirements in table 2ad for co channel interference (C/Ic).

The reference performance shall be:

Table 6.3-6: Reference performance for TIGHTER

For speech channels (TCH/FS, TCH/HS, TCH/EFS, TCH/AFSx, TCH/AHSx, TCH/WFSx)	FER:	≤ 1 %

In addition to table 6.3-6, for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 2ad at the corresponding interference ratio C/Ic.

14.4.16a.3 Test purpose

1. For TCH/AHS FER, MS shall meet the reference interference performance mentioned in 3GPP TS 45.005 sub clause 6.3.5, for co-channel interference ratio mentioned in table 2ad according to propagation conditions.
2. At reference co-channel interference the TCH/AHS class Ib BER shall meet the reference interference performance of table 2ad in 3GPP TS 45.005.
3. At reference co-channel interference the TCH/AHS class II BER shall meet the reference interference performance of table 2ad in 3GPP TS 45.005.

14.4.16a.4 Method of test

14.4.16a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AHS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The multirate configuration indicates the use of a codec set limited to 7,95 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

14.4.16a.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Its amplitude is set according to the specified reference interference ratio as in table 2ad.

b) The fading characteristic of the wanted and the interfering signal is set to TUhigh. The SS commands the MS into non hopping mode.

c) The SS commands the MS to create traffic channel loop back signalling erased frames.

NOTE: Frames marked with BFI=1 are signalled as erased on the uplink.

d) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

e) The SS determines the number of residual bit error events for the bits of class II, by examining at least the minimum number of samples of consecutive bits of class II. Bits are taken only from those frames not signalled as erased.

f) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

g) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased.

h) The SS uses a Channel Mode Modify procedure to change the active codec set to 7,4 kbit/s and steps b) to g) are repeated.

i) The SS uses a Channel Mode Modify procedure to change the active codec set to 6,7 kbit/s and steps b) to g) are repeated.

j) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,9 kbit/s and steps b) to g) are repeated.

k) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,15 kbit/s and steps b) to g) are repeated.

l) The SS uses a Channel Mode Modify procedure to change the active codec set to 4,75 kbit/s and steps b) to g) are repeated.

Maximum/Minimum Duration of Test

Maximum: 40 minutes (GSM850), 38 minutes (GSM900), 21 minutes (DCS1800), 20 minutes (PCS1900).

Minimum: 40 minutes (GSM850), 38 minutes (GSM900), 19 minutes (DCS1800), 18 minutes (PCS1900).

14.4.16a.5 Test requirements

Testing the Co-channel interference performance is performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with BER/BLER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 6.2

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.4.16a.5-1: Minimum test times due to TU high fading conditions

Half Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	855	489	403	380	190	180	s
	0:14:15	**0:08:09**	**0:06:43**	**0:06:20**	**0:03:10**	**0:03:00**	

The error rate measured in this test shall be tested according to the values given in table's 14.4.16a.5-2 or 14.4.16a.5-3.

Table 14.4.16a.5-2: Statistical test limits for GSM 850 and GSM 900

TU high no FH								
0.4 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
			clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
	Channel	bits per sec	class II per s					
AHS 7.95	frames @+3dB	7950	50	0,067000	0,082678	4173	83	00:01:23
	Class1b @+3dB	7950	2800	0,010000	0,012340	27958	10	00:00:10
	Class II @+3dB	7950	1800	0,032000	0,039488	8737	5	00:00:05
AHS 7.4	frames @+3dB	7400	50	0,048000	0,057998	5948	119	00:01:59
	Class1b @+3dB	7400	2950	0,005100	0,006293	54819	19	00:00:19
	Class II @+3dB	7400	1400	0,033000	0,040722	8472	6	00:00:06
AHS 6.7	frames @+3dB	6700	50	0,023000	0,028382	12156	243	00:04:03
	Class1b @+3dB	6700	2750	0,003900	0,004813	71687	26	00:00:26
	Class II @+3dB	6700	1200	0,036000	0,044424	7766	6	00:00:06
AHS 5.9	frames	5900	50	0,071000	0,087614	3938	79	00:01:19
	Class1b	5900	2350	0,005700	0,007034	49049	21	00:00:21
	Class II	5900	800	0,065000	0,080210	4301	5	00:00:05
AHS 5.15	frames	5150	50	0,033000	0,040722	8472	169	00:02:49
	Class1b	5150	2100	0,006000	0,007404	46596	22	00:00:22
	Class II	5150	600	0,069000	0,085146	4052	7	00:00:07
AHS 4.75	frames	4750	50	0,018000	0,022212	15532	311	00:05:11
	Class1b	4750	2200	0,002200	0,002715	127081	58	00:00:58
	Class II	4750	600	0,070000	0,086380	3994	7	00:00:07

Table 14.4.16a.5-3: Statistical test limits for DCS 1 800 and PCS 1 900

TU high no FH								
1.8 and 1.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
			clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
	Channel	bits per sec	class II per s					
AHS 7.95	frames @+3dB	7950	50	0,067000	0,082678	4173	83	00:01:23
	Class1b @+3dB	7950	2800	0,010000	0,012340	27958	10	00:00:10
	Class II @+3dB	7950	1800	0,031000	0,038254	9019	5	00:00:05
AHS 7.4	frames @+3dB	7400	50	0,049000	0,060466	5706	114	00:01:54
	Class1b @+3dB	7400	2950	0,005100	0,006293	54819	19	00:00:19
	Class II @+3dB	7400	1400	0,033000	0,040722	8472	6	00:00:06
AHS 6.7	frames @+3dB	6700	50	0,025000	0,030850	11183	224	00:03:44
	Class1b @+3dB	6700	2750	0,003800	0,004689	73573	27	00:00:27
	Class II @+3dB	6700	1200	0,035000	0,043190	7988	7	00:00:07
AHS 5.9	frames	5900	50	0,077000	0,095018	3631	73	00:01:13
	Class1b	5900	2350	0,006000	0,007404	46596	20	00:00:20
	Class II	5900	800	0,064000	0,078976	4368	5	00:00:05
AHS 5.15	frames	5150	50	0,038000	0,046892	7357	147	00:02:27
	Class1b	5150	2100	0,006600	0,008144	42360	20	00:00:20
	Class II	5150	600	0,068000	0,083912	4111	7	00:00:07
AHS 4.75	frames	4750	50	0,021000	0,025914	13313	266	00:04:26
	Class1b	4750	2200	0,002500	0,003085	111831	51	00:00:51
	Class II	4750	600	0,070000	0,086380	3994	7	00:00:07

14.4.17 Co-channel rejection - TCH/AFS-INB

14.4.17.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.4.17.2 Conformance requirement

1. At reference co-channel interference the TCH/AFS-INB FER shall meet the reference interference performance of table 2 in 3GPP TS 45.005 subclause 6.3.

The delays associated with Loop I remain constant for all of the following circumstances:

- For a given MS implementation.
- For the duration of the MS being powered on.

3GPP TS 44.014 subclause 5.1.7a.1.

14.4.17.3 Test purpose

1. To verify that the MS does not exceed conformance requirement 1 under propagation condition TUhigh with frequency hopping and TUlow with no frequency hopping with an allowance for the statistical significance of the test.

14.4.17.4 Method of test

14.4.17.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AFS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The multirate configuration indicates the use of the following set of codecs modes:

Codec Mode	TCH/AFS in kbit/s
CODEC_MODE_4	12,2
CODEC_MODE_3	7,95
CODEC_MODE_2	5,9
CODEC_MODE_1	4,75

The Initial Codec Mode shall be set to the lowest codec mode (CODEC_MODE_1).

The following decision threshold and hysteresis values in terms of normalized carrier to interference ratio (C/I_{norm}), shall apply for Codec Mode Command / Request (MC, MR):

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_4	18,5 dB	+ ∞
CODEC_MODE_3	12,5 dB	20,5 dB
CODEC_MODE_2	6,5 dB	14,5 dB
CODEC_MODE_1	– ∞	8,5 dB

The SS transmits Standard Test Signal C1 on the traffic channel using the Initial Codec Mode (ICM).

The SS continuously sends a CMC corresponding to the highest codec mode (CODEC_MODE_4).

The SS commands the MS to loop back in band signalling code words by closing a Loop I.

Specific PICS Statements:

- AMR half rate speech supported (TSPC_AddInfo_Half_rate_version_3)

PIXIT Statements:

-

14.4.17.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Its amplitude is 6 dB below that of the wanted signal (9 dB – 3 dB less attenuation on the interfering signal).

   The fading characteristic of the wanted and the interfering signal is TUlow.

b) The SS shall change the Codec Mode Indication and Codec Mode Command at to the neighbour mode every 22 speech frames (440 ms) by following a scanning pattern (1->2->3->4->4->3->2->1). CMI should initially be increased. CMC should initially be decreased. The CMIC/MC shall be repeated until the minimum required number of frame samples has been sent to the MS.

c) The SS compares the in band signalling code words/frames it sends to the MS with the in band signalling code words/frames which are looped back from the receiver after demodulation and decoding, and checks for in band signalling (CMI/CMC) frame errors.

d) The SS determines the frame error events by examining sequences of at least the minimum number of samples of consecutive frames. All frames should be considered when computing the frame error rate: those corresponding to a downlink CMI/CMC transitions and those without downlink CMI/CMC transitions.

e) If the MS does not support AMR half rate speech, then steps a) to d) are repeated except that in step a) both the wanted and interfering signal are TUhigh hopping and the SS commands the MS into hopping mode. A hopping pattern covering at least 10 frequencies in a range not exceeding 5 MHz is used. The hopping pattern is centred around an ARFCN in the Mid ARFCN range.

NOTE: The delays associated with Loop I are not specified, and will be MS implementation dependant. Loop I should be considered as having two separate parts (DL CMC -> UL CMI and DL CMI -> UL CMR). The delays associated with the two parts may differ. The SS should ensure that the correctly looped in band bits are compared. The delays associated with Loop I will remain constant for the duration of the test, thus every UL frame received by the SS will have only one possible expected value.

Maximum/Minimum Duration of Test

MS supporting AMR half rate speech:

Maximum/minimum: 14 minutes (GSM850, GSM900).

Maximum/minimum: 6 minutes (DCS1800, PCS1900).

MS not supporting AMR half rate speech:

Maximum/minimum: 72 minutes (GSM850, GSM900).

Maximum/minimum: 84 minutes (DCS1800, PCS1900).

14.4.17.5 Test requirements

The frame error rate measured in this test shall not exceed the test limit error rate values given in table 14.4.17-1 or 14.4.17-2.

Co-channel rejection tests with a frequency condition noted as "@ndB" are performed with the interfering frequency transmitted with an additional n dB attenuation, see 3GPP TS 45.005.

Table 14.4.17-1: Limits for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 co-channel rejection

Channel	Propagation condition	Test limit error rate %	Minimum No. of samples
TCH/AFS-INB (FER)	TUlow/No FH@-3 dB	4.319	7988
TCH/AFS-INB (FER)	TUhigh/FH@-3 dB	0.197	174737

Table 14.4.17-2: Limits for DCS 1800 and PCS 1 900 co-channel rejection

Channel	Propagation condition	Test limit error rate %	Minimum No. of samples
TCH/AFS-INB (FER)	Tulow/No FH@-3dB	4.319	7988
TCH/AFS-INB (FER)	TUhigh/FH@-3 dB	0.148	232982

14.4.18 Co-channel rejection - TCH/AHS-INB

14.4.18.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.4.18.2 Conformance requirement

1. At reference co channel interference, the TCH/AHS-INB shall meet the reference interference performance of table 2 in 3GPP TS 45.005 subclause 6.3.

The delays associated with Loop I remain constant for all of the following circumstances:

- For a given MS implementation.

- For the duration of the MS being powered on.

3GPP TS 44.014 subclause 5.1.7a.1.

14.4.18.3 Test purpose

1. To verify that the MS does not exceed conformance requirement 1, under propagation conditions TUhigh without frequency hopping, with an allowance for the statistical significance of the test.

14.4.18.4 Method of test

14.4.18.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AHS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The multirate configuration indicates the use of the following set of codecs modes:

Codec Mode	TCH/AHS in kbit/s
CODEC_MODE_4	7,95
CODEC_MODE_3	6,7
CODEC_MODE_2	5,9
CODEC_MODE_1	4.75

The Initial Codec Mode shall be set to the lowest codec mode (CODEC_MODE_1).

The following decision threshold and hysteresis values in terms of normalized carrier to interference ratio (C/I_{norm}), shall apply for Codec Mode Command / Request (MC, MR):

MC'/MR'	THR_MC_Dn(MC')/ THR_MR_Dn(MR')	THR_MC_Up(MC')/ THR_MR_Up(MR')
CODEC_MODE_4	16,0 dB	$+\infty$
CODEC_MODE_3	12,0 dB	18,0 dB
CODEC_MODE_2	8,0 dB	14,0 dB
CODEC_MODE_1	$-\infty$	10,0 dB

The SS transmits Standard Test Signal C1 on the traffic channel using the Initial Codec Mode (ICM).

The SS continuously sends a CMC corresponding to the highest codec mode (CODEC_MODE_4).

14.4.18.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Its amplitude is 9 dB below that of the wanted signal.

b) The fading characteristic of the wanted and the interfering signal is set to TUhigh. The SS commands the MS into non hopping mode.

c) The SS commands the MS to loop back band signalling code words by closing a Loop I.

d) The SS shall change the Codec Mode Indication and Codec Mode Command at to the neighbour mode every 22 speech frames (440 ms) by following a scanning pattern (1->2->3->4->4->3->2->1). CMI should initially be increased. CMC should initially be decreased. The CMICMC pattern shall be repeated until the minimum required number of frame samples has been sent to the MS.

e) The SS compares the in band signalling code words/frames it sends to the MS with the in band signalling code words/frames which are looped back from the receiver after demodulation and decoding, and checks for in band signalling (CMI/CMC) frame errors.

f) The SS determines the frame error events by examining sequences of at least the minimum number of samples of consecutive frames. All frames should be considered when computing the frame error rate: those corresponding to a downlink CMI/CMC transitions and those without downlink CMI/CMC transitions.

NOTE: The delays associated with Loop I are not specified, and will be MS implementation dependant. Loop I should be considered as having two separate parts (DL CMC -> UL CMI and DL CMI -> UL CMR). The delays associated with the two parts may differ. The SS should ensure that the correctly looped in band bits are compared. The delays associated with Loop I will remain constant for the duration of the test, thus every UL frame received by the SS will have only one possible expected value.

Maximum/Minimum Duration of Test

Maximum/minimum: 26 minutes (GSM850, GSM900), 25 minutes (DCS1800, PCS1900).

14.4.18.5 Test requirements

The frame error rate measured in this test shall not exceed the test limit error rate values given in table 14.4.18-1 or table 14.4.18-2.

Table 14.4.18-1: Limits for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 co-channel rejection

Channel	Propagation condition	Test limit error rate %	Minimum No. of samples
TCH/AHS-INB (FER)	TUhigh/No FH	0.784	76000

Table 14.4.18-2: Limits for DCS 1800 and PCS 1 900 co-channel rejection

Channel	Propagation condition	Test limit error rate %	Minimum No. of samples
TCH/AHS-INB (FER)	TUhigh/No FH	0.795	75000

14.4.19 Co-channel rejection - O-TCH/AHS

14.4.19.1 Definition

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14.4.19.2 Conformance requirement

For 8-PSK modulated channels, speech channels (AMR and AMR-WB), the minimum interference ratio for which the reference performance for co channel interference (C/Ic) shall be met is specified in table 2k

For 8-PSK modulated speech channels (AMR and AMR-WB), ECSD channels and 8-PSK modulated packet-switched channels, the wanted input signal level shall be: - 93 dBm + Ir + Corr, where:

Ir = the interference ratio according to tables 2b and 2c for packets switched channels, tables 2d and 2e for ECSD and table 2k for speech (AMR and AMR-WB) and associated control channels.
Corr = the correction factor for reference performance according to subclause 6.2

For all classes of MS supporting 8-PSK speech channels, an additional +2 dB adjustment applies for 8-PSK modulated speech channels.

The reference performance is the same as defined in subclause 6.2

The reference performance shall be:

For speech channels (O-TCH/AHSy) FER ≤ 1%

3GPP TS 45.005, subclauses 6.2, 6.3.

14.4.19.3 Test purpose

To verify that the MS does not exceed conformance requirement for FER and class 1b RBER under TU50 propagation conditions with an allowance for the statistical significance of the test, for channel combinations O-TCH/AHS12.2, O-TCH/AHS7.95, O-TCH/AHS5.9 and O-TCH/AHS4.75.

14.4.19.4 Method of test

14.4.19.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a O-TCH/AHS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 12,2 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.4.19.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal). The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal.

b) The fading characteristic of the wanted and the interfering signals are set to TU50.

c) The SS sets the level of the interfering signal to –91dBm.

d) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14.4.19-2 or 14.4.19-3.

e) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

f) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

g) The SS uses a Channel Mode Modify procedure to change the active codec set to 7,95 kbit/s and steps c) to f) are repeated.

h) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,9 kbit/s and steps c) to f) are repeated.

i) The SS uses a Channel Mode Modify procedure to change the active codec set to 4,75 kbit/s and steps c) to f) are repeated.

Maximum/Minimum Duration of Test

Maximum: 38 minutes (GSM850), 38 minutes (GSM900), 38 minutes (DCS1800), 38 minutes (PCS1900).

Minimum: 26 minutes (GSM850), 26 minutes (GSM900), 13 minutes (DCS1800), 13 minutes (PCS1900).

14.4.19.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7.

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

D_{pass} = D_{fail} = D and D = 0.0085%

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure A7.1.3.1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.4.19-1: Minimum test times due to TU high fading conditions

Half Rate 50 km/h					
Frequency	0,85	0,9	1,8	1,9	GHz
Wavelength	0,35	0,33	0,17	0,16	m
min test time	403	380	190	180	s
	0:06:43	**0:06:20**	**0:03:10**	**0:03:00**	

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the "derived test limit". In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne ≥ 1 (inclusive artificial error)

For an early fail decision ne ≥ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14.4.19-2 and 14.4.19.3

Table 14.4.19-2: Statistical test limits for T-GSM 810, GSM 850 and GSM 900 O-TCH/AHS co-channel interference

TU50 / No FH								
0.8 to 0.9GHz		**C_{lev} (dBm)**	**Samples per second**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time (s)**	**Target test time (hh:mm:ss)**
AHS 12.2	Frames	-74.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		8150	0,003000	0,003702	93192	12	00:00:12
AHS 7.95	Frames	-76.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		4200	0,000600	0,000740	466216	111	00:01:51
AHS 5.9	Frames	-78.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		3150	0,001600	0,001974	174772	56	00:00:56
AHS 4.75	Frames	-79.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		2800	0,000900	0,001111	310531	111	00:01:51

Table 14.4.19-3: Statistical test limits for DCS 1 800 and PCS 1 900 O-TCH/AHS co-channel interference

TU50 / No FH								
1.8 to 1.9GHz		**C_{lev} (dBm)**	**Samples per second**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time (s)**	**Target test time (hh:mm:ss)**
AHS 10.2	Frames	-74.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		8150	0,003000	0,003702	93192	12	00:00:12
AHS 5.15	Frames	-76.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		4200	0,000700	0,000864	399305	96	00:01:36
AHS 5.15	Frames	-78.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		3150	0,001500	0,001851	186385	60	00:01:00
AHS 5.15	Frames	-79.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		2800	0,001000	0,001234	279578	100	00:01:40

14.4.20 Co-channel rejection – O-TCH/AHS-INB

14.4.20.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.4.20.2 Conformance requirement

1. At reference co channel interference, the O-TCH/AHS-INB shall meet the reference interference performance of table 2k in 3GPP TS 45.005 subclause 6.3.

14.4.20.3 Test purpose

1. To verify that the MS does not exceed conformance requirement 1, under propagation conditions TUhigh without frequency hopping, with an allowance for the statistical significance of the test.

14.4.20.4 Method of test

14.4.20.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a O-TCH/AHS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of the following set of codecs modes:

Codec Mode	TCH/AHS in kbit/s
CODEC_MODE_4	7,95
CODEC_MODE_3	6,7
CODEC_MODE_2	5,9
CODEC_MODE_1	4.75

The Initial Codec Mode shall be set to the lowest codec mode (CODEC_MODE_1).

The following decision threshold and hysteresis values in terms of normalized carrier to interference ratio (C/I_{norm}), shall apply for Codec Mode Command / Request (MC, MR):

MC'/MR'	THR_MC_Dn(MC')/ THR_MR_Dn(MR')	THR_MC_Up(MC')/ THR_MR_Up(MR')
CODEC_MODE_4	16,0 dB	$+\infty$
CODEC_MODE_3	12,0 dB	18,0 dB
CODEC_MODE_2	8,0 dB	14,0 dB
CODEC_MODE_1	$-\infty$	10,0 dB

The SS transmits Standard Test Signal C1 using 8-PSK on the traffic channel using the Initial Codec Mode (ICM).

The SS continuously sends a CMC corresponding to the highest codec mode (CODEC_MODE_4).

14.4.20.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 using 8-PSK (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Its amplitude is 9 dB below that of the wanted signal.

b) The fading characteristic of the wanted and the interfering signal is set to TUhigh. The SS commands the MS into non hopping mode.

c) The SS commands the MS to loop back band signalling code words by closing a Loop I.

d) The SS shall change the Codec Mode Indication and Codec Mode Command at to the neighbour mode every 22 speech frames (440 ms) by following a scanning pattern (1->2->3->4->4->3->2->1). CMI should initially be increased. CMC should initially be decreased. The CMICMC pattern shall be repeated until the minimum required number of frame samples has been sent to the MS.

e) The SS compares the in band signalling code words/frames it sends to the MS with the in band signalling code words/frames which are looped back from the receiver after demodulation and decoding, and checks for in band signalling (CMI/CMC) frame errors.

f) The SS determines the frame error events by examining sequences of at least the minimum number of samples of consecutive frames. All frames should be considered when computing the frame error rate: those corresponding to a downlink CMI/CMC transitions and those without downlink CMI/CMC transitions.

NOTE: The delays associated with Loop I are not specified, and will be MS implementation dependant. Loop I should be considered as having two separate parts (DL CMC -> UL CMI and DL CMI -> UL CMR). The delays associated with the two parts may differ. The SS should ensure that the correctly looped in band bits are compared.

Maximum/Minimum Duration of Test

Maximum/minimum: 102 seconds (GSM850, GSM900), 98 seconds (DCS1800, PCS1900).

14.4.20.5 Test requirements

The frame error rate measured in this test shall not exceed the test limit error rate values given in table 14.4.20-1 or table 14.4.20-2.

Table 14.4.20-1: Limits for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 co-channel rejection

Channel	Propagation condition	Test limit error rate %	Minimum No. of samples
TCH/AHS-INB (FER)	TUhigh/No FH	11.760	5102

Table 14.4.20-2: Limits for DCS 1800 and PCS 1 900 co-channel rejection

Channel	Propagation condition	Test limit error rate %	Minimum No. of samples
TCH/AHS-INB (FER)	TUhigh/No FH	12.320	4870

14.4.21 Co-channel rejection – O-FACCH/H

14.4.21.1 Definition

-

14.4.21.2 Conformance requirement

At reference co channel interference the O-FACCH/H FER shall meet the reference interference performance of table 2k in 3GPP TS 45.005 subclause 6.3).

14.4.21.3 Test purpose

To verify that the MS does not exceed the conformance requirement under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.4.21.4 Method of test

14.4.21.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a O-TCH/WHS or O-TCH/AHS (as supported by MS) with an ARFCN in the mid ARFCN range. The power control level is set to maximum power.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

Specific PICS Statements:

- Support of GSM speech half rate version 4 (O-TCH/WHS) (TSPC_O-TCH_WHS)
- Support of GSM speech half rate version 6 (O-TCH/AHS) (TSPC_O-TCH_AHS)

PIXIT Statements:

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14.4.21.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Its amplitude is 10 dB below that of the wanted signal for GSM 800 and GSM 900, and9.5dB below that of the wanted signal for GSM 1800 and GSM 1900.

   The fading characteristic of the wanted and the interfering signal is TU50.

d) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Due to the co-channel interference, the MS may not be able to acknowledge the Layer 2 frame. Each repeated L2 frame indicates a frame erasure event. The SS determines the number of frame erasure events during at least the minimum number of samples of FACCH/H frames.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degrade.

14.4.21.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7.

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure A7.1.3.1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.4.30-1: Minimum test times due to TU 50 fading conditions

Half Rate 50 km/h				
Frequency (GHz)	0,85	0,9	1,8	1,9
Wavelength (m)	0,35	0,33	0,17	0,16
Min test time (s)	403	380	190	180
	0:06:43	**0:06:20**	**0:03:10**	**0:03:00**

If the minimum test time due to multipath conditions exceeds the time taken for obtaining the minimum number of samples, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the “derived test limit”. In this case early pass/fail decisions are obsolete.

If the time taken for obtaining the minimum number of samples exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne $\geq$ 1 (inclusive artificial error)

For an early fail decision ne $\geq$ 7

When the minimum number of samples have been obtained the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in table 14.4.30-2.

Table 14.4.30-2: Limits for co-channel rejection

Channel	Type of measurement	Propagation condition	Original BER requirement	Derived test limit	Minimum No. of samples
O-FACCH/H	FER	TUhigh/No FH	0,050000	0,061700	5592

14.4.22 to 14.4.23 Void

14.4.24 Co-channel interference - O-TCH/WFS

14.4.24.1 Definition

The co-channel interference performance is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.4.24.2 Conformance requirement

The reference interference performance (for co channel, C/Ic, or adjacent channel, C/Ia) in terms of frame erasure, bit error or residual bit error rates (whichever appropriate) is specified in table 2, according to the type of channel and the propagation condition. The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 2, except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60. The actual interference ratio is defined as the interference ratio for which this performance is met. The actual interference ratio shall be less than a specified limit, called the reference interference ratio. The reference interference ratio shall be, for BTS and all types of MS:

-	for co channel interference	C/Ic	=	9 dB

For GMSK modulated channels, packet switched and ECSD and speech channels (AMR-WB), and for 8-PSK modulated channels, packet switched and ECSD and speech channels (AMR and AMR-WB), the minimum interference ratio for which the reference performance for co channel interference (C/Ic) shall be met is specified in table 2a, 2d, 2e and 2j (GMSK), 2b and 2c, 2d and 2e, and 2k (8-PSK) respectively, according to the type of channel, the propagation condition and type of equipment.

For 8-PSK modulated speech channels (AMR and AMR-WB), ECSD channels and 8-PSK modulated packet-switched channels, the wanted input signal level shall be: - 93 dBm + Ir + Corr, where:

> Ir = the interference ratio according to tables 2b and 2c for packets switched channels, tables 2d and 2e for ECSD and table 2k for speech (AMR and AMR-WB) and associated control channels.
> Corr = the correction factor for reference performance according to subclause 6.2

The levels shall be corrected by the following values:

MS, 8-PSK modulated signals	
for GSM 400, GSM 900, GSM 850 and GSM 700 small MS	0 dB
for other GSM 400, GSM 900, GSM 850 and GSM 700 MS	-2 dB
for DCS 1 800 and PCS 1900 class 1 or class 2 MS	0 dB
for other DCS 1 800 and PCS 1900 MS	-2 dB

For GMSK modulated speech channels for wideband AMR, and for 8-PSK modulated speech channels for AMR, associated control channels and in band signalling, the minimum input signal level for which the reference performance shall be met is specified in table 1f and 1g respectively for normal BTS, according to the type of channel and the propagation condition. The reference performance shall be:

-	for speech channels (O-TCH/AHSy, O-TCH/WFSy, O-TCH/WHSy)	FER	:	≤ 1%

where y denotes the codec rate. All other requirements in tables 1f and 1g shall be fulfilled at this input level for reference performance.

For other equipment than normal BTS, the levels shall be corrected by the values in the table below, describing the reference performance level correction factors for packet switched channels. Furthermore, for all classes of MS supporting 8-PSK speech channels, an additional +2 dB adjustment applies for 8-PSK modulated speech channels.

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP 45.005 clauses 2, 6.2 and 6.3

NOTE: The tables 1 and 2 mentioned above can be found in 3GPP 45.005 clause 6.7

14.4.24.3 Test purpose

To verify that the MS does not exceed conformance requirement for FER and class 1b RBER under TUhigh propagation conditions with an allowance for the statistical significance of the test, for channel combinations O-TCH/WFS 8.85 and O-TCH/WFS23.85.

14.4.24.4 Method of test

14.4.24.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a O-TCH/WFS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 8,85 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.4.24.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal). The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal.

b) The fading characteristic of the wanted and the interfering signals are set to TUhigh.

c) The SS sets the level of the interfering signal to (-93 + Corr +2) dBm (where Corr is the correction factor from 14.4.24.2). Throughout the test the C/I (interference ratio) shall be set by modifying the wanted signal.

d) The interference ratio is set to C/Ic from table 14.4.24-2 or 14.4.24-3.

e) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

f) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

The SS uses a Channel Mode Modify procedure to change the active codec set to 23.85 kbit/s and steps c) to f) are repeated.

Maximum/Minimum Duration of Test

Maximum: 20 minutes (GSM700, T-GSM 810, GSM850 and GSM900), 20 minutes (DCS1800 and PCS1900).

Minimum: 7 minutes (GSM700, T-GSM 810, GSM850 and GSM900), 4 minutes (DCS1800 and PCS1900).

14.4.24.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7.

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure A7.1.3.1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.4.24-1: Minimum test times due to TU 50 fading conditions

Full Rate 50 km/h				
Frequency (GHz)	0,85	0,9	1,8	1,9
Wavelength (m)	0,35	0,33	0,17	0,16
Min test time (s)	201	190	95	90
	0:03:21	**0:03:10**	**0:01:35**	**0:01:30**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the "derived test limit". In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne ≥ 1 (inclusive artificial error)

For an early fail decision ne ≥ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14.4.24-2 and 14.4.24.3.

Table 14.4.24-2: Statistical test limits for GSM 700, T-GSM 810, GSM 850 and GSM 900 O-TCH/WHS co-channel interference

TUhigh / No FH								
0.4 to 0.9GHz		C/Ic dB	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
WFS 8.85	Frames	10.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		5650	0,002200	0,002715	127072	23	00:00:23
WFS23.85	Frames	16.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		19450	0,001500	0,001851	186386	10	00:00:10

Table 14.4.24-3: Statistical test limits for DCS 1 800 and PCS 1 900 O-TCH/WHS co-channel interference

TUhigh / No FH								
1.8 to 1.9GHz		C/Ic dB	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
WFS 8.85	Frames	9.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		5650	0,002800	0,003455	99856	18	00:00:18
WFS23.85	Frames	14.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		19450	0,002000	0,002468	139790	8	00:00:08

14.4.25 Co-channel interference – O-TCH/WHS

14.4.25.1 Definition

The co-channel interference performance is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.4.25.2 Conformance requirement

For 8-PSK modulated channels, speech channels (AMR and AMR-WB), the minimum interference ratio for which the reference performance for co channel interference (C/Ic) shall be met is specified in table 2k

For 8-PSK modulated speech channels (AMR and AMR-WB), ECSD channels and 8-PSK modulated packet-switched channels, the wanted input signal level shall be: - 93 dBm + Ir + Corr, where:

> Ir = the interference ratio according to tables 2b and 2c for packets switched channels, tables 2d and 2e for ECSD and table 2k for speech (AMR and AMR-WB) and associated control channels.
> Corr = the correction factor for reference performance according to subclause 6.2

The levels shall be corrected by the following values:

MS, 8-PSK modulated signals	
for GSM 400, GSM 900, GSM 850 and GSM 700 small MS	0 dB
for other GSM 400, GSM 900, GSM 850 and GSM 700 MS	-2 dB
for DCS 1 800 and PCS 1900 class 1 or class 2 MS	0 dB
for other DCS 1 800 and PCS 1900 MS	-2 dB

For all classes of MS supporting 8-PSK speech channels, an additional +2 dB adjustment applies for 8-PSK modulated speech channels.

The reference performance is the same as defined in subclause 6.2.

The reference performance shall be:

-	for speech channels (O-TCH/AHSy, O-TCH/WFSy, O-TCH/WHSy)	FER	:	≤ 1%

where y denotes the codec rate. All other requirements in tables 1f and 1g shall be fulfilled at this input level for reference performance.

3GPP TS 45.005, subclauses 6.2, 6.3.

14.4.25.3 Test purpose

To verify that the MS does not exceed conformance requirement for FER and class 1b RBER under TU50 propagation conditions with an allowance for the statistical significance of the test, for channel combinations O-TCH/WHS12.65 and O-TCH/WHS 6.60.

14.4.25.4 Method of test

14.4.25.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a O-TCH/WHS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 12,65 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.4.25.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal). The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal.

b) The fading characteristic of the wanted and the interfering signals are set to TU50.

c) The SS sets the level of the interfering signal to (-93 + Corr +2) dBm (where Corr is the correction factor from 14.4.25.2). Throughout the test the C/I (interference ratio) shall be set by modifying the wanted signal.

d) The interference ratio is set to C/Ic from table 14.4.25-2 or 14.4.25-3.

e) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

g) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

h) The SS uses a Channel Mode Modify procedure to change the active codec set to 6.60 kbit/s and steps c) to f) are repeated.

Maximum/Minimum Duration of Test

Maximum: 19 minutes (GSM850), 19 minutes (GSM900), 19 minutes (DCS1800), 19 minutes (PCS1900).

Minimum: 14 minutes (GSM850), 13 minutes (GSM900), 7 minutes (DCS1800), 6 minutes (PCS1900).

14.4.25.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7.

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure A7.1.3.1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.4.25-1: Minimum test times due to TU 50 fading conditions

Half Rate 50 km/h				
Frequency (GHz)	0,85	0,9	1,8	1,9
Wavelength (m)	0,35	0,33	0,17	0,16
Min test time (s)	403	380	190	180
	0:06:43	**0:06:20**	**0:03:10**	**0:03:00**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the "derived test limit". In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne ≥ 1 (inclusive artificial error)

For an early fail decision ne ≥ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14.4.25-2 and 14.4.25.3.

Table 14.4.25-2: Statistical test limits for T-GSM 810, GSM 850 and GSM 900 O-TCH/WHS co-channel interference

TU50 / No FH								
0.8 to 0.9GHz		C/Ic dB	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
WHS12.65	Frames	17.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		9050	0,002700	0,003332	103542	12	00:00:12
WHS 6.60	Frames	13.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		3900	0,001200	0,001481	232951	60	00:01:00

Table 14.4.25-3: Statistical test limits for DCS 1 800 and PCS 1 900 O-TCH/WHS co-channel interference

TU50 / No FH									
1.8 to 1.9GHz		C/Ic dB	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
WHS12.65	Frames	16.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		9050	0,003000	0,003702	93193	11	00:00:11
WHS 6.60	Frames	13.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		3900	0,001200	0,001481	232951	60	00 :01:00

14.4.26 Co-channel rejection - O-TCH/WFS-INB

14.4.26.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.4.26.2 Conformance requirement

For GMSK modulated speech channels for wideband AMR, and for 8-PSK modulated speech channels for AMR, associated control channels and in band signalling, the minimum input signal level for which the reference performance shall be met is specified in table 1f and 1g respectively for normal BTS, according to the type of channel and the propagation condition. The reference performance shall be:

-	for speech channels (TCH/WFSy)	FER	:	≤ 1%
-	for speech channels (O-TCH/AHSy, O-TCH/WFSy, O-TCH/WHSy)	FER	:	≤ 1%
-	for fast associated control channels (O-FACCH/F, O-FACCH/H)	FER	:	≤ 5%
-	for in band signalling channels (TCH/WFS-INB, O-TCH/AHS-INB, O-TCH/WFS-INB, O-TCH/WHS-INB)	FER	:	≤ 0,5%
-	for EVSIDUR and EVRFR	FER	:	≤ 1%

where y denotes the codec rate. All other requirements in tables 1f and 1g shall be fulfilled at this input level for reference performance.

For other equipment than normal BTS, the levels shall be corrected by the values in the table below, describing the reference performance level correction factors for packet switched channels. Furthermore, for all classes of MS supporting 8-PSK speech channels, an additional +2 dB adjustment applies for 8-PSK modulated speech channels.

3GPP TS 45.005; Subclause 6.2

The reference interference performance (for co channel, C/Ic, or adjacent channel, C/Ia) in terms of frame erasure, bit error or residual bit error rates (whichever appropriate) is specified in table 2, according to the type of channel and the propagation condition. The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 2, except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60. The actual interference ratio is defined as the interference ratio for which this performance is met. The actual interference ratio shall be less than a specified limit, called the reference interference ratio. The reference interference ratio shall be, for BTS and all types of MS:

-	for co channel interference	C/Ic	=	9 dB
-	for adjacent (200 kHz) interference	C/Ia1	=	-9 dB
-	for adjacent (400 kHz) interference	C/Ia2	=	-41 dB
-	for adjacent (600 kHz) interference	C/Ia3	=	-49 dB

For 8-PSK modulated speech channels (AMR and AMR-WB), ECSD channels and 8-PSK modulated packet-switched channels, the wanted input signal level shall be: - 93 dBm + Ir + Corr, where:

Ir = the interference ratio according to tables 2b and 2c for packets switched channels, tables 2d and 2e for ECSD and table 2k for speech (AMR and AMR-WB) and associated control channels.
Corr = the correction factor for reference performance according to subclause 6.2

The levels shall be corrected by the following values:

MS, 8-PSK modulated signals	
for GSM 400, GSM 900, GSM 850 and GSM 700 small MS	0 dB
for other GSM 400, GSM 900, GSM 850 and GSM 700 MS	-2 dB
for DCS 1 800 and PCS 1900 class 1 or class 2 MS	0 dB
for other DCS 1 800 and PCS 1900 MS	-2 dB

3GPP TS 45.005; Subclause 6.3

The delays associated with Loop I remain constant for all of the following circumstances:

- For a given MS implementation.
- For the duration of the MS being powered on.

3GPP TS 44.014 subclause 5.1.7a.1.

14.4.26.3 Test purpose

To verify that the MS does not exceed conformance requirement under propagation condition TU high without frequency hopping with an allowance for the statistical significance of the test.

14.4.26.4 Method of test

14.4.26.4.1 Initial conditions

A call is set up according to the generic call set up procedure on O-TCH/WFS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The multirate configuration indicates the use of the following set of codecs modes:

Codec Mode	O-TCH/WFS in kbit/s
CODEC_MODE_4	23,85
CODEC_MODE_3	12,65
CODEC_MODE_2	8,85
CODEC_MODE_1	6,60

The Initial Codec Mode shall be set to the lowest codec mode (CODEC_MODE_1).

The following decision threshold and hysteresis values in terms of normalised carrier to interference ratio (C/I_{norm}), shall apply for Codec Mode Command / Request (MC, MR):

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_4	18,5 dB	+∞
CODEC_MODE_3	12,5 dB	20,5 dB
CODEC_MODE_2	6,5 dB	14,5 dB
CODEC_MODE_1	-∞	8,5 dB

The SS transmits Standard Test Signal C1 on the traffic channel using the Initial Codec Mode (ICM).

The SS continuously sends a CMC corresponding to the highest codec mode (CODEC_MODE_4).

The SS commands the MS to loop back in band signalling code words by closing a Loop I.

14.4.26.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Its amplitude is set to (-93 + Corr +2) dBm (where Corr is the correction factor from 14.4.26.2). The C/I (interference ratio) shall be set by modifying the wanted signal..

The interference ratios C/Ic for the specific frequency bands are set according table 14.4.26-1 or 14.4.26-2.

The fading characteristic of the wanted and the interfering signal is TU high.

b) The SS shall change the Codec Mode Indication and Codec Mode Command at to the neighbour mode every 22 speech frames (440 ms) by following a scanning pattern (1->2->3->4->4->3->2->1). CMI should initially be increased. CMC should initially be decreased. The CMIC/MC shall be repeated until the minimum required number of frame samples has been sent to the MS.

c) The SS compares the in band signalling code words/frames it sends to the MS with the in band signalling code words/frames which are looped back from the receiver after demodulation and decoding, and checks for in band signalling (CMI/CMC) frame errors.

d) The SS determines the frame error events by examining sequences of at least the minimum number of samples of consecutive frames. All frames should be considered when computing the frame error rate: those corresponding to a downlink CMI/CMC transitions and those without downlink CMI/CMC transitions.

NOTE: The delays associated with Loop I are not specified, and will be MS implementation dependant. Loop I should be considered as having two separate parts (DL CMC -> UL CMI and DL CMI -> UL CMR). The delays associated with the two parts may differ. The SS should ensure that the correctly looped in band bits are compared. The delays associated with Loop I will remain constant for the duration of the test, thus every UL frame received by the SS will have only one possible expected value.

Maximum/Minimum Duration of Test

Maximum/minimum: 19 minutes.

14.4.26.5 Test requirements

The frame error rate measured in this test shall not exceed the test limit error rate values given in table 14.4.26-1.

Table 14.4.26-1: Limits for T-GSM 810, GSM 850 and GSM 950 O-TCH/WFS-INB co-channel rejection

Channel	Propagation condition	C/Ic dB	Test limit error rate %	Minimum No. of samples
O-TCH/WFS-INB (FER)	TU high/No FH	7.0	0.617	55916

Table 14.4.26-2: Limits for DCS 1800 and PCS 1900 O-TCH/WFS-INB co-channel rejection

Channel	Propagation condition	C/Ic dB	Test limit error rate %	Minimum No. of samples
O-TCH/WFS-INB (FER)	TU high/No FH	6.5	0.617	55916

14.4.27 Void

14.4.28 Co-channel rejection - TCH/WFS

14.4.28.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.4.28.2 Conformance requirement

At reference co-channel interference the TCH/WFS class Ib BER shall meet the reference interference performance of table 2j in 3GPP TS 45.005 subclause 6.3.

The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 2j, except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60.

For packet switched and AMR-WB speech, GMSK modulated channels the wanted input signal level shall be: -93 dBm + Ir + Corr, where:

> Ir = the interference ratio according to table 2a and table 2j for the packet switched and AMR-WB speech channels respectively
> Corr = the correction factor for reference performance according to subclause 6.2.

3GPP TS 45.005 subclause 6.3

The levels shall be corrected by the following values:

	MS, GMSK modulated signals	
-	for DCS 1 800 class 1 or class 2 MS	+2/+4 dB**
-	for DCS 1 800 class 3 MS	+2 dB
-	for GSM 400 small MS, GSM 900 small MS GSM 850 small MS and GSM 700 small MS	+2 dB
-	for other GSM 400, GSM 900 MS and GSM 850 MS and GSM 700 MS	0 dB
	for PCS 1900 class 1 or class 2 MS	+2 dB
	for other PCS 1900 MS	0 dB

** For DCS 1 800 class 1 and class 2 MS, a correction offset of +2dB shall apply for the reference sensitivity performance as specified in table 1a for the normal conditions defined in Annex D and an offset of +4 dB shall be used to determine all other MS performances.

3GPP TS 45.005 subclause 6.2

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP TS 45.005 subclause 2

14.4.28.3 Test purpose

1. To verify that the MS does not exceed conformance requirement at the maximum implemented codec rate under propagation condition TUhigh (for GSM 700, T-GSM 810, GSM 850, GSM 900, DCS 1800 and PSC 1900) with no frequency hopping, RAhigh with no frequency hoping (for GSM 700, T-GSM 810, GSM 850 and GSM 900), and TUlow (for GSM 700, T-GSM 810, GSM 850 and GSM900) with no frequency hopping with an allowance for the statistical significance of the test.

2. To verify that the MS does not exceed conformance requirement for the remaining implemented codec rates under propagation condition TUhigh with no frequency hopping with an allowance for the statistical significance of the test.

14.4.28.4 Method of test

14.4.28.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/WFS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 6.60 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

Specific PICS statements:

- TSPC_Type_SmallMS
- TSPC_Type_DCS_Class1
- TSPC_Type_DCS_Class2
- TSPC_Type_DCS_Class3
- TSPC_Type_PCS_Class1
- TSPC_Type_PCS_Class2

PIXIT statements:

-

14.4.28.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. The unwanted signal shall be set to (-93 + Corr) dB (where Corr is the correction factor from 14.4.28.2). Throughout the test the C/I (interference ratio) shall be set by modifying the wanted signal.

   The interference ratio is set to C/Ic from table 14.4.28-6 or 14.4.28-7.

   The fading characteristic of the wanted and the interfering signal is TUHigh non-hoping (TU50 for T-GSM 810, GSM 850 and GSM 900, TU60 for GSM 700).

b) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

c) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

d) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully if it is not signalled as erased.

e) The SS uses a Channel Mode Modify procedure to change the active codec set to 8.85 kbit/s, and the interference ratio is adjust to C/Ic from table 14.4.28-6 or 14.4.28-7. Steps b) to d) are repeated.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 12.65 kbit/s, and the interference radio adjust to C/Ic from table 14.4.28-6 or 14.4.28-7.. Steps b) to d) are repeated.

h) If DCS 1800 or PCS 1900 then skip steps i) and j).

i) The fading characteristic of the wanted and the interfering signal is set to TULow non-hoping (TU3 for T-GSM 810, GSM 850 and GSM 900, TU3.6 for GSM 700), and the interference ratio adjusted to C/Ic from table 14.4.28-4. Steps b) to d) are repeated.

j) The fading characteristic of the wanted and the interfering signal is set to RAHigh non-hoping (RA250 for T-GSM 810, GSM 850 and GSM 900, RA300 for GSM 700) and the interference ratio adjusted to C/Ic from table 14.4.28-5. Steps b) to d) are repeated.

Maximum/Minimum Duration of Test

- Maximum: 30 minutes (GSM 700), 25 minutes (GSM850, GSM900) or 5 minutes (DCS1800, PCS1900).
- Minimum: 30 minutes (GSM 700), 25 minutes, (GSM850, GSM900) or 5 minutes (DCS1800, PCS1900).

14.4.28.5 Test requirements

Testing the Co-channel interference performance is performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with BER/BLER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex A7.

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure 14-1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed for fading profiles greater than 5km/h, and 250 wavelengths are crossed for fading profiles less than or equal to 5km/h. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.4.28-1: Minimum test times due to TU low fading conditions

Full Rate 3 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	-	-	m
min test time	1800	1029	847	800	-	-	S
	0:30:00	**0:17:09**	**0:14:07**	**0:13:20**	**-**	**-**	**hh:mm:ss**
Full Rate 3.6km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	-	-	m
min test time	1500	857	706	667	-	-	S
	0:25:00	**0:14:17**	**0:11:46**	**0:11:07**	**-**	**-**	**hh:mm:ss**

Table 14.4.28-2: Minimum test times due to TU high fading conditions

Full Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	428	244	201	190	95	90	s
	0:07:08	**0:04:04**	**0:03:21**	**0:03:10**	**0:01:35**	**0:01:30**	**hh:mm:ss**
Full Rate 60 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	356	204	168	158	79	75	s
	0:05:56	**0:03:24**	**0:02:48**	**0:02:38**	**0:01:19**	**0:01:15**	hh:mm:ss

Table 14.4.28-3: Minimum test times due to RA high fading conditions

Full Rate 250 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	-	-	m
min test time	86	49	40	38	-	-	S
	0:1:26	**0:0:49**	**0:0:40**	**0:0:38**	**-**	**-**	**hh:mm:ss**
Full Rate 300 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	-	-	m
min test time	71	41	34	32	-	-	S
	0:1:11	**0:0:41**	**0:0:34**	**0:0:32**	**-**	**-**	**hh:mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is done by comparing the result with the "derived test limit". In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne ≥ 1 (inclusive artificial error)

For an early fail decision ne ≥ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14.4.28-4 through 14.4.28-7.

Table 14.4.28-4: Statistical test limits for GSM 700, T-GSM 810, GSM 850 and GSM 900 TU low no FH

0.4 to 0.9GHz		C/Ic (dB)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
WFS 12.65	frames	21.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	9050	0,000800	0,000987	349473	39	00:00:39

Table 14.4.28-5: Statistical test limits for GSM 700, T-GSM 810, GSM 850 and GSM 900 RA High no FH

0.4 to 0.9GHz		C/Ic (dB)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
WFS 12.65	frames	12,5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	9050	0,006300	0,007774	44378	5	00:00:05

Table 14.4.28-6: Statistical test limits for GSM 700, T-GSM 810, GSM 850 and GSM 900 TU high no FH

0.4 to 0.9GHz		C/Ic (dB)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
WFS 12.65	frames	14.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	9050	0,004000	0,004936	69895	8	00:00:08
WFS 8.85	frames	11.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	5650	0,004200	0,005183	66566	12	00:00:12
WFS 6.60	frames	10.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	3900	0,001600	0,001974	174737	45	00:00:45

Table 14.4.28-7: Statistical test limits for DCS 1 800 and PCS 1 900 TU high no FH

0.4 to 0.9GHz		C/Ic (dB)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
WFS 12.65	frames	13,0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	9050	0,006300	0,007774	44378	5	00:00:05
WFS 8.85	frames	10,0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	5650	0,006400	0,007898	43684	8	00:00:08
WFS 6.60	frames	9,0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	3900	0,002700	0,003332	103548	27	00:00:27

14.4.28a Co-channel rejection - TCH/WFS in TIGHTER configuration

14.4.28a.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.4.28a.2 Conformance requirement

3GPP TS 45.005 subclause 6.3.5

A MS indicating support for TIGHTER Capability (see 3GPP TS 24.008) shall fulfil the requirements in table 2ad for co channel interference (C/Ic).

The reference performance shall be:

Table 6.3-6: Reference performance for TIGHTER

For speech channels (TCH/FS, TCH/HS, TCH/EFS, TCH/AFSx, TCH/AHSx, TCH/WFSx)	FER:	≤ 1 %

14.4.28a.3 Test purpose

1. For TCH/WFS FER, MS shall meet the reference interference performance mentioned in 3GPP TS 45.005 sub clause 6.3.5, for co-channel interference ratio mentioned in table 2ad according to propagation conditions.

2. At reference co-channel interference the TCH/WFS class Ib BER shall meet the reference interference performance of table 2ad in 3GPP TS 45.005.

14.4.28a.4 Method of test

14.4.28a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/WFS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 6.60 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

Specific PICS statements:

-

PIXIT statements:

-

14.4.28a.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. The unwanted signal shall be set to -93 dBm + Corr (where Corr is the correction factor from 3GPP TS 45.005 subclause 6.2) and throughout the test the C/I (interference ratio) shall be set by modifying the wanted signal.

   The interference ratio is set to C/Ic from table 14.4.28a-6 or 14.4.28a-7.

   The fading characteristic of the wanted and the interfering signal is TUHigh non-hopping.

b) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

c) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

d) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully if it is not signalled as erased.

e) The SS uses a Channel Mode Modify procedure to change the active codec set to 8.85 kbit/s, and the interference ratio is adjust to C/Ic from table 14.4.28a-6 or 14.4.28a-7. Steps b) to d) are repeated.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 12.65 kbit/s, and the interference radio adjust to C/Ic from table 14.4.28a-6 or 14.4.28a-7. Steps b) to d) are repeated.

h) If DCS 1800 or PCS 1900 then skip steps i) and j).

i) The fading characteristic of the wanted and the interfering signal is set to TULow non-hoping and the interference ratio adjusted to C/Ic from table 14.4.28a-4. Steps b) to d) are repeated.

j) The fading characteristic of the wanted and the interfering signal is set to RAHigh non-hoping and the interference ratio adjusted to C/Ic from table 14.4.28a-5. Steps b) to d) are repeated.

Maximum/Minimum Duration of Test

- Maximum: 25 minutes (GSM850, GSM900) or 5 minutes (DCS1800, PCS1900).
- Minimum: 25 minutes, (GSM850, GSM900) or 5 minutes (DCS1800, PCS1900).

14.4.28a.5 Test requirements

Testing the Co-channel interference performance is performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with BER/BLER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex A7.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.4.28a-1: Minimum test times due to TU low fading conditions

Full Rate 3 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	-	-	m
min test time	1800	1029	847	800	-	-	S
	0:30:00	**0:17:09**	**0:14:07**	**0:13:20**	**-**	**-**	**hh:mm:ss**
Full Rate 3.6km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	-	-	m
min test time	1500	857	706	667	-	-	S
	0:25:00	**0:14:17**	**0:11:46**	**0:11:07**	**-**	**-**	**hh:mm:ss**

Table 14.4.28a-2: Minimum test times due to TU high fading conditions

Full Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	428	244	201	190	95	90	s
	0:07:08	**0:04:04**	**0:03:21**	**0:03:10**	**0:01:35**	**0:01:30**	**hh:mm:ss**
Full Rate 60 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	356	204	168	158	79	75	s
	0:05:56	**0:03:24**	**0:02:48**	**0:02:38**	**0:01:19**	**0:01:15**	hh:mm:ss

Table 14.4.28a-3: Minimum test times due to RA high fading conditions

Full Rate 250 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	-	-	m
min test time	86	49	40	38	-	-	S
	0:1:26	**0:0:49**	**0:0:40**	**0:0:38**	**-**	**-**	**hh:mm:ss**
Full Rate 300 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	-	-	m
min test time	71	41	34	32	-	-	S
	0:1:11	**0:0:41**	**0:0:34**	**0:0:32**	**-**	**-**	**hh:mm:ss**

The error rate measured in this test shall be tested according to the values given in tables 14.4.28a-4 through 14.4.28a-7.

Table 14.4.28a-4: Statistical test limits for GSM 850 and GSM 900 TU low no FH

0.4 to 0.9GHz		C/Ic (dB)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
WFS 12.65	frames	14.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	9050	0,000800	0,000987	349473	39	00:00:39

Table 14.4.28a-5: Statistical test limits for GSM 850 and GSM 900 RA High no FH

0.4 to 0.9GHz		C/Ic (dB)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
WFS 12.65	frames	12.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	9050	0,006300	0,007774	44378	5	00:00:05

Table 14.4.28a-6: Statistical test limits for GSM 850 and GSM 900 TU high no FH

0.4 to 0.9GHz		C/Ic (dB)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
WFS 12.65	frames	8,5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	9050	0,004000	0,004936	69895	8	00:00:08
WFS 8.85	frames	5,5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	5650	0,004200	0,005183	66566	12	00:00:12
WFS 6.60	frames	4,5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	3900	0,001600	0,001974	174737	45	00:00:45

Table 14.4.28a-7: Statistical test limits for DCS 1 800 and PCS 1 900 TU high no FH

0.4 to 0.9GHz		C/Ic (dB)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
WFS 12.65	frames	7.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	9050	0,006300	0,007774	44378	5	00:00:05
WFS 8.85	frames	4.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	5650	0,006400	0,007898	43684	8	00:00:08
WFS 6.60	frames	3.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	3900	0,002700	0,003332	103548	27	00:00:27

14.4.29 Co-channel interference - TCH/WFS-INB

14.4.29.1 Definition

The co-channel interference is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.4.29.2 Conformance requirement

At reference co-channel interference the TCH/WFS-INB FER shall meet the reference interference performance of TCH/AFS-INB FER, as stated in NOTE 5 in table 2j in 3GPP TS 45.005 subclause 6.3.

The delays associated with Loop I remain constant for all of the following circumstances:

- For a given MS implementation.
- For the duration of the MS being powered on.

NOTE: While a Loop I is active, it is expected that the SS transmit a valid downlink signal including speech frames channel encoded according to the DL CMI.

3GPP TS 44.014 subclause 5.1.7a.1.

The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 2j, except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60.

3GPP TS 45.005 subclause 6.3

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP TS 45.005 subclause 2.

14.4.29.3 Test purpose

1. To verify that the MS does not exceed conformance requirement at the maximum implemented codec rate under propagation condition TUhigh (for GSM 700, T-GSM 810, GSM 850, GSM 900, DCS 1800 and PSC 1900) with no frequency hopping with an allowance for the statistical significance of the test.
2. To verify that the MS does not exceed conformance requirement for the remaining implemented codec rates under propagation condition TUhigh with no frequency hopping with an allowance for the statistical significance of the test.

14.4.29.4 Method of test

14.4.29.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/WFS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The multirate configuration indicates the use of the following set of codecs modes:

Codec Mode	TCH/WFS in kbit/s
CODEC_MODE_3	12.65
CODEC_MODE_2	8.85
CODEC_MODE_1	6.6

The Initial Codec Mode shall be set to the lowest codec mode (CODEC_MODE_1).

The following decision threshold and hysteresis values in terms of normalized carrier to interference ratio (C/I_{norm}), shall apply for Codec Mode Command / Request (MC, MR):

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	18,5 dB	$+\infty$
CODEC_MODE_2	12,5 dB	20,5 dB
CODEC_MODE_1	$-\infty$	14.5 dB

The SS transmits Standard Test Signal C1 on the traffic channel using the Initial Codec Mode (ICM).

The SS continuously sends a CMC corresponding to the highest codec mode (CODEC_MODE_3).

The SS commands the MS to loop back in band signalling code words by closing a Loop I.

Specific PICS Statements

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PIXIT Statements

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14.4.29.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Its amplitude is 6 dB below that of the wanted signal (9 dB – 3 dB less attenuation on the interfering signal).

   The fading characteristic of the wanted and the interfering signal is TUHigh non-hoping (TU50 for T-GSM 810, GSM 850 and GSM 900, TU60 for GSM 700).

b) The SS shall change the Codec Mode Indication and Codec Mode Command at to the neighbour mode every 22 speech frames (440 ms) by following a scanning pattern (1->2->3->3->2->1). CMI should initially be increased. CMC should initially be decreased. The CMI/CMC shall be repeated until the minimum required number of frame samples has been sent to the MS.

c) The SS compares the in band signalling code words/frames it sends to the MS with the in band signalling code words/frames which are looped back from the receiver after demodulation and decoding, and checks for in band signalling (CMI/CMC) frame errors.

d) The SS determines the frame error events by examining sequences of at least the minimum number of samples of consecutive frames. All frames should be considered when computing the frame error rate: those corresponding to a downlink CMI/CMC transitions and those without downlink CMI/CMC transitions.

NOTE: The delays associated with Loop I are not specified, and will be MS implementation dependant. Loop I should be considered as having two separate parts (DL CMC -> UL CMI and DL CMI -> UL CMR). The delays associated with the two parts may differ. The SS should ensure that the correctly looped in band bits are compared. The delays associated with Loop I will remain constant for the duration of the test, thus every UL frame received by the SS will have only one possible expected value.

Maximum/Minimum Duration of Test

Maximum/minimum: 45 minutes (GSM 700, GSM850, GSM900).

Maximum/minimum: 80 minutes (DCS1800, PCS1900).

14.4.29.5 Test requirements

The frame error rate measured in this test shall not exceed the test limit error rate values given in table 14.4.29-1 or 14.4.29-2.

Co-channel rejection tests with a frequency condition noted as "@ndB" are performed with the interfering frequency transmitted with an additional n dB attenuation, see 3GPP TS 45.005.

Table 14.4.29-1: Limits for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 co-channel rejection

Channel	Propagation condition	Test limit error rate %	Minimum No. of samples
TCH/WFS-INB (FER)	TUhigh/No FH@-3 dB	0.271	127081

Table 14.4.29-2: Limits for DCS 1800 and PCS 1 900 co-channel rejection

Channel	Propagation condition	Test limit error rate %	Minimum No. of samples
TCH/WFS-INB (FER)	TUhigh/No FH@-3 dB	0.148	232982

14.4.30 Co-channel interference - O-FACCH/F

14.4.30.1 Definition

The co-channel interference performance is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.4.30.2 Conformance requirement

The reference interference performance (for co channel, C/Ic, or adjacent channel, C/Ia) in terms of frame erasure, bit error or residual bit error rates (whichever appropriate) is specified in table 2, according to the type of channel and the propagation condition. The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 2, except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60. The actual interference ratio is defined as the interference ratio for which this performance is met.

For GMSK modulated channels, packet switched and ECSD and speech channels (AMR-WB), and for 8-PSK modulated channels, packet switched and ECSD and speech channels (AMR and AMR-WB), the minimum interference ratio for which the reference performance for co channel interference (C/Ic) shall be met is specified in table 2a, 2d, 2e and 2j (GMSK), 2b and 2c, 2d and 2e, and 2k (8-PSK) respectively, according to the type of channel, the propagation condition and type of equipment.

For 8-PSK modulated speech channels (AMR and AMR-WB), ECSD channels and 8-PSK modulated packet-switched channels, the wanted input signal level shall be: - 93 dBm + Ir + Corr, where:

Ir = the interference ratio according to tables 2b and 2c for packets switched channels, tables 2d and 2e for ECSD and table 2k for speech (AMR and AMR-WB) and associated control channels.
Corr = the correction factor for reference performance according to subclause 6.2

For GMSK modulated speech channels for wideband AMR, and for 8-PSK modulated speech channels for AMR, associated control channels and in band signalling, the minimum input signal level for which the reference performance shall be met is specified in table 1f and 1g respectively for normal BTS, according to the type of channel and the propagation condition. The reference performance shall be:

-	for fast associated control channels (O-FACCH/F, O-FACCH/H)	FER	:	≤ 5%

For other equipment than normal BTS, the levels shall be corrected by the values in the table below, describing the reference performance level correction factors for packet switched channels. Furthermore, for all classes of MS supporting 8-PSK speech channels, an additional +2 dB adjustment applies for 8-PSK modulated speech channels.

3GPP 45.005 clauses 6.2 and 6.3

NOTE: The tables 1 and 2 mentioned above can be found in 3GPP 45.005 clause 6.7

14.4.30.3 Test purpose

To verify that the MS does not exceed the conformance requirement under propagation condition TUlow with an allowance for the statistical significance of the test, for channel combinations O-TCH/WFS 12.65.

14.4.30.4 Method of test

14.4.30.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a O-TCH/WFS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The multirate configuration indicates the use of a codec set limited to 12,65 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

14.4.30.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Its amplitude is 15,5 dB below that of the wanted signal.

   The fading characteristic of the wanted and the interfering signal is TUlow.

d) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Due to the co-channel interference, the MS may not be able to acknowledge the Layer 2 frame. Each repeated L2 frame indicates a frame erasure event. The SS determines the number of frame erasure events during at least the minimum number of samples of FACCH/F frames.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.

14.4.30.5 Test requirements

The error rate measured in this test shall not exceed the test limit error rate values given in table 14.4.30-1.

Table 14.4.30-1: Limits for co-channel rejection

Channel	Type of measurement	Propagation condition	Test limit error rate %	Minimum No. of samples
O-FACCH/F	FER	TUlow/No FH	18	25 000

14.4.31 Co-channel rejection – Repeated FACCH/F

14.4.31.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.4.31.2 Conformance requirement

The reference performance for Repeated Downlink FACCH and Repeated SACCH shall be FER ≤ 5%.

3GPP TS 45.005 subclause 6.2

When calculating FER, a FACCH frame and its repetition or a SACCH frame and its repetition respectively, shall be counted as one frame and a frame erasure shall be counted when neither the FACCH frame nor its repetition or neither the SACCH frame nor its repetition respectively, could be successfully decoded.

3GPP TS 45.005 subclause 6.2.

For Repeated Downlink FACCH and Repeated SACCH (see 3GPP TS 44.006), the minimum interference ratio for which the reference performance for co channel interference (C/Ic) shall be met is specified in table 2p according to the propagation condition and type of equipment. The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 2a, 2b, 2c, 2d, 2e, 2j, 2k, 2m and 2p except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60.

3GPP TS 45.005 subclause 6.3

For Repeated Downlink FACCH and Repeated SACCH (see 3GPP TS 44.006), the wanted input signal level shall be: -93 dBm + Ir + Corr, where:

Ir = the interference ratio according to table 2p.
Corr = the correction factor for reference performance according to subclause 6.2

3GPP TS 45.005 subclause 6.3

The levels shall be corrected by the following values:

	MS, GMSK modulated signals	
-	for DCS 1 800 class 1 or class 2 MS	+2/+4 dB**
-	for DCS 1 800 class 3 MS	+2 dB
-	for GSM 400 small MS, GSM 900 small MS GSM 850 small MS and GSM 700 small MS	+2 dB
-	for other GSM 400, GSM 900 MS and GSM 850 MS and GSM 700 MS	0 dB
	for PCS 1900 class 1 or class 2 MS	+2 dB
	for other PCS 1900 MS	0 dB

**NOTE: For DCS 1 800 class 1 and class 2 MS, a correction offset of +2dB shall apply for the reference sensitivity performance as specified in table 1a for the normal conditions defined in Annex D and an offset of +4 dB shall be used to determine all other MS performances.

3GPP TS 45.005 subclause 6.2

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP TS 45.005 subclause 2.

14.4.31.3 Test purpose

To verify that the MS does not exceed the conformance requirements under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.4.31.4 Method of test

14.4.31.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/F with an ARFCN in the mid ARFCN range. The power control level is set to maximum power.

The SS shall use Repeated FACCH for command and response frames for the duration of the test.

Each pair of FACCHs are counted as a single sample.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

Specific PICS statements:

- TSPC_Type_SmallMS
- TSPC_Type_DCS_Class1
- TSPC_Type_DCS_Class2
- TSPC_Type_DCS_Class3
- TSPC_Type_PCS_Class1
- TSPC_Type_PCS_Class2

PIXIT statements:

-

14.4.31.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. The unwanted signal shall be set to (-93 + Corr) dB (where Corr is the correction factor from the table above). Throughout the test the C/I (interference ratio) shall be set by modifying the wanted signal.

   The fading characteristic of the wanted and the interfering signal is TUhigh.

b) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Due to the co-channel interference, the MS may not be able to acknowledge an RR frame and the L2 entity of the SS will repeat the Layer 2 frame. Each retransmitted L2 frame indicates a frame erasure event. The SS determines the number of frame erasure events during at least the minimum number of samples of FACCH/F frames.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.

Maximum/Minimum Duration of Test

Maximum: 12 minutes.

Minimum: 10 minutes (GSM700, GSM850, GSM900), 5 minutes (DCS1800, PCS900)

14.4.31.5 Test requirements

The error rate measured in this test shall not exceed the test limit error rate values given in table 14.4.31-2

For more information on statistical testing of FER performance, especially the definitions of limit lines refer to Annex A7.

Table 14.4.31-1: Minimum test times due to TU high fading conditions

Full Rate 50 km/h						
Frequency	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	-	0,35	0,33	0,17	0,16	m
min test time	-	604	570	285	270	s
	-	00:10:04	00:09:30	00:04:45	00:04:30	**hh:mm:ss**
Full Rate 60 km/h						
Frequency	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,43	-	-	-	-	m
min test time	611	-	-	-	-	s
	00:10:11	**-**	**-**	**-**	**-**	**hh:mm:ss**

NOTE: Minimum test time calculation due to fading is based on the best 50/3 frame rate relation in table 14.4.31-3

Table 14.4.31-2: Test Limits for Repeated FACCH/F sensitivity

Channel	Type of measurement	Propagation condition	Original FER requirement	Derived test limit %	Target number of samples
FACCH/F	FER	TUhigh/No FH	5,00	6,17	5592

Table 14.4.31-3: Maximum test times

Maximum test time (best rate 50/3 per second) (s)	Maximum test time (best rate 50/3 per second) (hh:mm:ss)	Maximum test time (worst rate 50/6 per second) (s)	Maximum test time (worst rate 50/6 per second) (hh:mm:ss)
336	00:05:36	671	00:11:11

14.4.32 Co-channel rejection – Repeated SACCH

14.4.32.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.4.32.2 Conformance requirement

The reference performance for Repeated Downlink FACCH and Repeated SACCH shall be FER ≤ 5%.

3GPP TS 45.005 subclause 6.2

When calculating FER, a FACCH frame and its repetition or a SACCH frame and its repetition respectively, shall be counted as one frame and a frame erasure shall be counted when neither the FACCH frame nor its repetition or neither the SACCH frame nor its repetition respectively, could be successfully decoded.

3GPP TS 45.005 subclause 6.2.

For Repeated Downlink FACCH and Repeated SACCH (see 3GPP TS 44.006), the minimum interference ratio for which the reference performance for co channel interference (C/Ic) shall be met is specified in table 2p according to the propagation condition and type of equipment. The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 2a, 2b, 2c, 2d, 2e, 2j, 2k, 2m and 2p except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60.

3GPP TS 45.005 subclause 6.3

For Repeated Downlink FACCH and Repeated SACCH (see 3GPP TS 44.006), the wanted input signal level shall be: -93 dBm + Ir + Corr, where:

Ir = the interference ratio according to table 2p.
Corr = the correction factor for reference performance according to subclause 6.2

3GPP TS 45.005 subclause 6.3

The levels shall be corrected by the following values:

	MS, GMSK modulated signals	
-	for DCS 1 800 class 1 or class 2 MS	+2/+4 dB**
-	for DCS 1 800 class 3 MS	+2 dB
-	for GSM 400 small MS, GSM 900 small MS GSM 850 small MS and GSM 700 small MS	+2 dB
-	for other GSM 400, GSM 900 MS and GSM 850 MS and GSM 700 MS	0 dB
	for PCS 1900 class 1 or class 2 MS	+2 dB
	for other PCS 1900 MS	0 dB

**NOTE: For DCS 1 800 class 1 and class 2 MS, a correction offset of +2dB shall apply for the reference sensitivity performance as specified in table 1a for the normal conditions defined in Annex D and an offset of +4 dB shall be used to determine all other MS performances.

3GPP TS 45.005 subclause 6.2

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP TS 45.005 subclause 2.

14.4.32.3 Test purpose

To verify that the MS does not exceed the conformance requirements under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.4.32.4 Method of test

For details on Repeated SACCH Layer 1 test method, please refer to Annex 10.

14.4.32.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/F with an ARFCN in the mid ARFCN range. The power control level is set to maximum power.

The SS shall use Repeated SACCH for all SACCH block on the downlink for the duration of the test.

Each pair of SACCH blocks (i.e. one Repeated SACCH block-pair) shall be counted as a single sample.

The SS shall send different PCL for each sample following Table 14.4.32-1 for the duration of the test.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

Specific PICS statements:

- TSPC_Type_SmallMS
- TSPC_Type_DCS_Class1
- TSPC_Type_DCS_Class2
- TSPC_Type_DCS_Class3
- TSPC_Type_PCS_Class1
- TSPC_Type_PCS_Class2

PIXIT statements:

-

14.4.32.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. The unwanted signal shall be set to (-93 + Corr) dB (where Corr is the correction factor from 14.4.32.2). Throughout the test the C/I (interference ratio) shall be set by modifying the wanted signal.

   The fading characteristic of the wanted and the interfering signal is TUhigh/NoFH.

b) Following the reception of the last burst of the MS UL SACCH corresponding to the second SACCH block of a repeated SACCH interval, the SS shall compute the PCL value to use in the SS DL SACCH blocks for the next repeated SACCH interval using Table 14.4.32-1.

   i) The first two columns of Table 14.4.32-1 are inputs, the last column is a output.

   ii) SACCH blocks are grouped into sets of 2 consecutive SACCH blocks which is called a repeated SACCH interval.

   iii) Last commanded PCL by SS refers to the PCL used in the DL SACCH L1 headers for repeated SACCH interval N

   iv) Corresponding reported MS PCL refers to the PCL reported in the UL SACCH L1 header of second SACCH block on repeated SACCH interval N

   v) Next commanded PCL by SS refers to the PCL that the SS will use in the DL SACCH L1 headers for repeated SACCH interval N+1..

Table 14.4.32-1: Power Control Level Used by SS

Last commanded PCL by SS	Corresponding Reported MS PCL	Next commanded PCL by SS
7	7	8
7	8	9
7	9	8
8	7	9
8	8	9
8	9	7
9	7	8
9	8	7
9	9	7

c) The SS compares the MS reported PCL in the uplink SACCH L1 header of the Repeated SACCH block against the expected PCL (based on the previously commanded PCL in the downlink SACCH L1 header taking into account round-trip delays). If the MS reported PCL in the uplink SACCH L1 header is different than the expected PCL, this will invoke a frame erasure event.

d) The SS determines the frame erasure events during at least the minimum number of samples of SACCH frames.

NOTE: These frames will be consecutive and it is expected that the statistical significance of the tests will not be unduly degraded.

Maximum/Minimum Duration of Test (hh:mm)

Maximum: 02:43 (GSM700)

Minimum: 01:12 (PCS 1900)

14.4.32.5 Test requirements

The error rate measured in this test shall not exceed the test limit error rate values given in table 14.4.32-2.

For more information on statistical testing of FER performance, especially the definitions of limit lines refer to Annex A7.

Table 14.2.25-1: Minimum test times due to TU high fading conditions

Full Rate 50 km/h						
Frequency	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	-	0,35	0,33	0,17	0,16	m
min test time	-	9676	9138	4569	4329	s
	-	**02:41:16**	**02:32:18**	**01:16:09**	**01:12:09**	**hh:mm:ss**
Full Rate 60 km/h						
Frequency	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,43	-	-	-	-	m
min test time	9791	-	-	-	-	s
	02:43:11	**-**	**-**	**-**	**-**	**hh:mm:ss**

NOTE: Minimum test time calculation due to fading is based on the 960 ms schedule for two SACCH frames

Table 14.4.32-2: Test Limits for Repeated SACCH sensitivity

Channel	Type of measurement	Propagation condition	Original FER requirement	Derived test limit %	Target number of samples
SACCH	FER	TUhigh/No FH	5,00	6,17	5592

Table 14.4.32-3: Minimum/Maximum test times

Minimum test time (best rate 2/2 per second) (s)	Minimum test time (best rate 2/2 per second) (hh:mm:ss)
5368	01:29:28

14.5 Adjacent channel rejection

14.5.1 Adjacent channel rejection - speech channels

14.5.1.1 TCH/FS

14.5.1.1.1 Definition

The adjacent channel selectivity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted signal in the adjacent channel.

The adjacent channel can be adjacent in the RF spectrum or in time. There are therefore two types of adjacent channel selectivity:

1) Adjacent RF channel selectivity which is specifically tested in this subclause.

2) Adjacent Time Slot selectivity, which is implicitly tested in test 14.2.1.

14.5.1.1.2 Conformance requirement

1. With adjacent channel interference at 200 kHz above and below the wanted signal and signal level 9 dB above the wanted signal level:

   1.1 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, the FER for TCH/FS shall be within the requirements of table 2 in 3GPP TS 05.05 subclause 6.3.

   1.2 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, the Class Ib RBER shall be within the requirements of table 2 in 3GPP TS 05.05 subclause 6.3.

   1.3 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, the Class II RBER shall be within the requirements of table 2 in 3GPP TS 05.05 subclause 6.3.

   1.4 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, the Class II RBER shall be within the requirements of table 2 in 3GPP TS 05.05 under extreme test conditions; 3GPP TS 05.05 subclause 6.3 and annex D subclauses D.2.1 and D.2.2.

2. For adjacent channel interference at 400 kHz above and below the wanted signal frequency and signal level 41 dB above the wanted signal level:

   2.1 For a TUhigh faded wanted signal and a static adjacent channel interferer, the FER for TCH/FS shall be better than:

   GSM 400, GSM 700, GSM 850 and GSM 900: $10,2*\alpha$ %; 3GPP TS 05.05, subclause 6.3;

   DCS 1 800 and PCS 1 900: $5,1*\alpha$ %; 3GPP TS 05.05, subclause 6.3.

   2.2 For a TUhigh faded wanted signal and a static adjacent channel interferer, the Class Ib RBER shall be better than:

GSM 400, GSM 700, GSM 850 and GSM 900: 0,72/α %; 3GPP TS 05.05, subclause 6.3;

DCS 1 800 and PCS 1 900: 0,45/α %; 3GPP TS 05.05, subclause 6.3.

2.3 For a TUhigh faded wanted signal and a static adjacent channel interferer, the Class II RBER shall be better than:

GSM 400, GSM 700, GSM 850 and GSM 900: 8,8 %; 3GPP TS 05.05, subclause 6.3;

DCS 1 800 and PCS 1 900: 8,9 %; 3GPP TS 05.05, subclause 6.3.

2.4 For a TUhigh faded wanted signal and a static adjacent channel interferer, the Class II RBER shall be better than:

GSM 400, GSM 700, GSM 850 and GSM 900: 8,8 %;

DCS 1 800 and PCS 1 900: 8,9 %.

under extreme test conditions; 3GPP TS 05.05, subclause 6.3, annex D subclauses D.2.1 and D.2.2.

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.5.1.1.3 Test purpose

1 To verify that with a TUhigh adjacent channel interferer at 200 kHz above and below the wanted TUhigh signal frequency and signal level 9 dB above the wanted signal level:

1.1 Conformance requirement 1.1 is met with an allowance for the statistical significance of the test.

1.2 Conformance requirement 1.2 is met with an allowance for the statistical significance of the test.

1.3 Conformance requirement 1.3 is met with an allowance for the statistical significance of the test.

1.4 Conformance requirement 1.4 is met with an allowance for the statistical significance of the test.

2. To verify that with a static adjacent channel interferer at 400 kHz above and below a TUhigh wanted signal frequency and signal level 41 dB above the wanted signal level:

2.1 Conformance requirement 2.1 is met with an allowance for the statistical significance of the test.

2.2 Conformance requirement 2.2 is met with an allowance for the statistical significance of the test.

2.3 Conformance requirement 2.3 is met with an allowance for the statistical significance of the test.

2.4 Conformance requirement 2.4 is met with an allowance for the statistical significance of the test.

14.5.1.1.4 Method of test

14.5.1.1.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/FS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The SS commands the MS to create the traffic channel loop back signalling erased frames.

The SS transmits Standard Test Signal C1 on the TCH (wanted signal).

14.5.1.1.4.2 Procedure

a) In addition to the wanted signal, the SS transmits an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal.

The fading characteristic of the wanted and the unwanted signal is set to TUhigh.

The unwanted signal is transmitted at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to 9dB above that of the wanted signal.

b) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

c) The SS tests the frame erasure compliance for the TCH/FS by examining at least the minimum number of samples of consecutive frames. The number of frame erasure events is recorded.

d) The SS determines the number of residual bit error events for the bits of the class Ib and class II, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib and class II, Bits are only taken from those frames for which no bad frame indication was given.

e) The measurement of steps c) and d) is repeated with the unwanted signal on a frequency at the same displacement from, but below, the frequency of the wanted signal.

f) The measurement of steps c) to e) shall be repeated for a displacement of the unwanted signal of 400 kHz, and with the amplitude of the unwanted signal 41 dB above the level of the wanted input signal, and the unwanted signal static.

g) Steps c) to f) are repeated for class II BER under extreme test conditions.

14.5.1.1.5 Test requirements

Table 14-22: Limits for adjacent channel selectivity

			GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900		DCS 1 800 and PCS 1 900	
Interference at	**Channel**	**Type of measurement**	**Test limit error rate %**	**Minimum No. of samples**	**Test limit error rate %**	**Minimum No. of samples**
200 kHz	TCH/FS	FER	6,742*α	8 900	3,371*α	17 800
	class Ib	RBER	0,420/α	1 000 000	0,270/α	2 000 000
	class II	RBER	8,333	600 000	8,333	1 200 000
400 kHz	TCH/FS	FER	11,461*α	8 900	5,714*α	10 500
	class Ib	RBER	0,756/α	1 000 000	0,483/α	1 200 000
	class II	RBER	9,167	600 000	9,167	720 000

The error rates measured in this test shall not exceed the test limit error rate given in table 14-22. This shall apply for any combination of normal and extreme test voltages and ambient temperature, and with the interfering signals at either side of the wanted frequency.

The parameter α can range from 1 to 1,6. The value of α for the RBER test on TCH/FS class Ib bits under particular measurement conditions shall be the same as that determined in the FER test on TCH/FS under the same conditions.

NOTE: A static unwanted signal is used to avoid a potential problem with the implementation of the fading simulator.

14.5.1.1a Adjacent Channel Interference - TCH/FS in TIGHTER configuration

14.5.1.1a.1 Definition

The adjacent channel selectivity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted signal in the adjacent channel.

The adjacent channel can be adjacent in the RF spectrum or in time. There are therefore two types of adjacent channel selectivity:

1) Adjacent RF channel selectivity which is specifically tested in this subclause.

2) Adjacent Time Slot selectivity, which is implicitly tested in test 14.2.1.

14.5.1.1a.2 Conformance requirement

3GPP TS 45.005 subclause 6.3.3

Table 6.3-1a: Reference interference ratio requirements in adjacent channels for Packet-switched (Normal symbol-rate), Enhanced circuit-switched data, Wideband AMR and 8-PSK modulated AMR channels, speech and associated control channels in VAMOS mode, TIGHTER – MS

		Modulation of wanted signal				
		GMSK	8-PSK	16-QAM	32-QAM	AQPSK
for adjacent (200 kHz) interference	C/Ia1 =	C/Ic - 18 dB, see table 2af for TIGHTER MS	See table 2l for speech, see tables 2g, 2i, 2n and 2w for other channels, see table 2af for TIGHTER MS	See table 2w, see table 2af for TIGHTER MS	See table 2w, see table 2af for TIGHTER MS	See table 2aa and 2ab
for adjacent (400 kHz) interference	C/Ia2 =	C/Ic - 50 dB	C/Ic - 50 dB	C/Ic - 48 dB	C/Ic - 48 dB	[Note 1]
for adjacent (600 kHz) interference	C/Ia3 =	C/Ic - 58 dB	C/Ic - 58 dB			
NOTE 1: The adjacent channel interference @ 400 kHz requirement (C/Ia2) does not apply to channels in VAMOS mode.						

NOTE: The C/Ia3 figure is given for information purposes and will not require testing. It was calculated for the case of an equipment with an antenna connector, operating at output power levels of +33 dBm and below. Rejection of signals at 600 kHz is specified in subclause 5.1.

3GPP TS 45.005 subclause 6.3.4

For all adjacent channel (200 kHz) requirements specified in table 2af for TIGHTER MS, the wanted signal level shall be: -75 dBm + Iar + Corr, where:

Iar = the adjacent channel (200 kHz) interference ratio according to table 2af
Corr = the correction factor for reference performance according to table 6.2-4.

14.5.1.1a.3 Test purpose

1. For TCH/FS FER, MS shall meet the reference interference performance mentioned in 3GPP TS 45.005 sub clause 6.3.3, for adjacent-channel interference ratio mentioned in table 2af according to propagation conditions.

2. At reference adjacent-channel interference, the TCH/FS class Ib BER shall meet the reference interference performance of table 2af in 3GPP TS 45.005.

3. At reference adjacent-channel interference, the TCH/FS class II BER shall meet the reference interference performance of table 2af in 3GPP TS 45.005.

14.5.1.1a.4 Method of test

14.5.1.1a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/FS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The SS commands the MS to create the traffic channel loop back signalling erased frames.

The SS transmits Standard Test Signal C1 on the TCH (wanted signal).

14.5.1.1a.4.2 Procedure

a) In addition to the wanted signal, the SS transmits an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal.

The fading characteristic of the wanted and the unwanted signal is set to TUhigh no FH.

The unwanted signal is transmitted at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set according to the specified reference interference ratio as in table 2af.

b) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

c) The SS tests the frame erasure compliance for the TCH/FS by examining at least the minimum number of samples of consecutive frames. The number of frame erasure events is recorded.

d) The SS determines the number of residual bit error events for the bits of the class Ib and class II, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib and class II, Bits are only taken from those frames for which no bad frame indication was given.

e) The measurement of steps c) and d) is repeated with the unwanted signal on a frequency at the same displacement from, but below, the frequency of the wanted signal.

f) The measurement of steps c) to e) shall be repeated for a displacement of the unwanted signal of 400 kHz, and with the amplitude of the unwanted signal 41 dB above the level of the wanted input signal, and the unwanted signal static.

g) Steps c) to f) are repeated for class II BER under extreme test conditions.

14.5.1.1a.5 Test requirements

Table 14.5.1.1a-1: Limits for adjacent channel selectivity

			GSM 850 and GSM 900		DCS 1 800 and PCS 1 900	
Interference at	**Channel**	**Type of measurement**	**Test limit error rate %**	**Minimum No. of samples**	**Test limit error rate %**	**Minimum No. of samples**
200 kHz	TCH/FS class Ib class II	FER RBER RBER	1 0.07 4.12	8 900 1 000 000 600 000	1 0.07 5.87	17 800 2 000 000 1 200 000
400 kHz	TCH/FS class Ib class II	FER RBER RBER	11,461*α 0,756/α 9,167	8 900 1 000 000 600 000	5,714*α 0,483/α 9,167	10 500 1 200 000 720 000

14.5.1.2 TCH/AFS

14.5.1.2.1 Definition

The adjacent channel selectivity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted signal in the adjacent channel.

The adjacent channel can be adjacent in the RF spectrum or in time. There are therefore two types of adjacent channel selectivity:

1) Adjacent RF channel selectivity, which is specifically tested in this subclause.

2) Adjacent Time Slot selectivity, which is not tested in this subclause.

14.5.1.2.2 Conformance requirement

1. With adjacent channel interference at 200 kHz above and below the wanted signal and signal level 9 dB above the wanted signal level:

   1.1 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, the FER for TCH/AFS shall be within the requirements of table 2 in 3GPP TS 05.05; 3GPP TS 05.05, 6.3.

   1.2 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, the Class Ib and Class II RBER shall be within the requirements of table 2 in 3GPP TS 05.05; 3GPP TS 05.05, 6.3.

2. For adjacent channel interference at 400 kHz above and below the wanted signal frequency and signal level 41 dB above the wanted signal level:

   2.1 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, the FER for TCH/AFS shall be within the requirements of table 2 in 3GPP TS 05.05; 3GPP TS 05.05, 6.3.

   1.2 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, the Class Ib and Class II RBER shall be within the requirements of table 2 in 3GPP TS 05.05; 3GPP TS 05.05, 6.3.

14.5.1.2.3 Test purpose

1 To verify that with a TUhigh adjacent channel interferer at 200 kHz above and below the wanted TUhigh signal frequency and the interfering signal at a level resulting in the specified interference ratio:

   1.1 Conformance requirement 1.1 is met with an allowance for the statistical significance of the test.

   1.2 Conformance requirement 1.2 is met with an allowance for the statistical significance of the test.

2. To verify that with a TUhigh adjacent channel interferer at 400 kHz above and below a TUhigh wanted signal frequency and the interfering signal at a level resulting in the specified interference ratio:

   2.1 Conformance requirement 2.1 is met with an allowance for the statistical significance of the test.

   2.2 Conformance requirement 2.2 is met with an allowance for the statistical significance of the test.

14.5.1.2.4 Method of test

14.5.1.2.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AFS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The multirate configuration indicates the use of a codec set limited to 12.2 kbit/s.

The SS commands the MS to create the traffic channel loop back signalling erased frames.

The SS transmits Standard Test Signal C1 on the TCH (wanted signal).

14.5.1.2.4.2 Procedure

a) In addition to the wanted signal, the SS transmits an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal.

   The fading characteristic of the wanted and the unwanted signal is set to TUHigh.

   The unwanted signal is transmitted at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set according to the specified reference interference ratio (-9 dB for 200 kHz offset), meaning 9 dB above that of the wanted signal.

b) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

c) The SS tests the frame erasure compliance for the TCH/AFS by examining at least the minimum number of samples of consecutive frames. The number of frame erasure events is recorded.

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib, Bits are only taken from those frames for which no bad frame indication was given.

e) The unwanted signal is moved to a nominal frequency 200 kHz below the nominal frequency of the wanted signal. Its amplitude is set according to the specified reference interference ratio (-9 dB-3 dB for 200 kHz offset), meaning 12 dB above that of the wanted signal.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 7.95 kbit/s and steps b) to d) are repeated.

g) The unwanted signal is moved to a nominal frequency 400 kHz above the nominal frequency of the wanted signal. Its amplitude is set to 3 dB below the reference interference ratio ((-41 dB - 3 dB) for 400 kHz offset), meaning 44 dB above that of the wanted signal.

h) The SS uses a Channel Mode Modify procedure to change the active codec set to 5.9 kbit/s and steps b) to d) are repeated.

i) The unwanted signal is moved to a nominal frequency 400 kHz below the nominal frequency of the wanted signal. Its amplitude is set to 3 dB below the reference interference ratio ((-41 dB - 3 dB) for 400 kHz offset), meaning 44 dB above that of the wanted signal.

j) The SS uses a Channel Mode Modify procedure to change the active codec set to 4.75 kbit/s and steps b) to d) are repeated.

Maximum/Minimum Duration of Test

Pre Rel-5 MS

Maximum: 16 minutes (GSM850, GSM900), 42 minutes (DCS1800, PCS1900).

Minimum: 14 minutes (GSM850, GSM900), 7 minutes (DCS1800, PCS1900).

Rel-5 onwards MS

Maximum: 23 minutes (GSM850, GSM900), 125 minutes (DCS1800, PCS1900).

Minimum: 14 minutes (GSM850, GSM900), 17 minutes (DCS1800, PCS1900).

14.5.1.2.5 Test requirements

Testing the adjacent channel interference performance is performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with BER/BLER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of the limit lines refer to Annex 6.2

Wrong decision risk F for one single error ratio test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14-56: Minimum test times due to TU high fading conditions

Full Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
990 Waves	743	424	349	330	165	156	m
min net test time	53	31	25	24	12	11	s @ 50km/h
min test time	428	244	201	190	95	90	s
	0:07:08	**0:04:04**	**0:03:21**	**0:03:10**	**0:01:35**	**0:01:30**	**hh:mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is done by comparing the result with the "derived test limit". In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne $\geq$ 1 (inclusive artificial error)

For an early fail decision ne $\geq$ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rates measured for different channels and under the different propagation conditions shall be tested according to the values given in table 14-57 or 14-58. Adjacent channel rejection tests with a frequency condition noted as "@-ndB" are performed for an interference ratio n dB below the reference interference ratio (see 3GPP TS 05.05). Where an entry in the table is '-', this combination should not be tested.

Table 14-57: Statistical test limits for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 adjacent channel rejection

TU high no FH								
0.4 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
AFS 12.2	frames	12200	50	0,060000	0,074040	4660	93	00:01:33
	Class1b	12200	8150	0,017000	0,020978	16446	2	00:00:02
AFS 7.95	frames @-3dB	7950	50	Pre Rel-5: 0,075000 Rel-5: 0,053000	Pre Rel-5: 0,092550 Rel-5: 0,065402	Pre Rel-5: 3728 Rel-5: 5275	Pre Rel-5: 75 Rel-5: 106	Pre Rel-5: 00:01:15 Rel-5: 00:01:46
	Class1b @-3dB	7950	4200	Pre Rel-5: 0,015000 Rel-5: 0,010000	Pre Rel-5: 0,018510 Rel-5: 0,012340	Pre Rel-5: 18639 Rel-5: 27958	Pre Rel-5: 4 Rel-5: 7	Pre Rel-5: 00:00:04 Rel-5: 00:00:07
AFS 5.9	frames @-3dB	5900	50	Pre Rel-5: 0,032000 Rel-5:	Pre Rel-5: 0,039488 Rel-5:	Pre Rel-5: 8737 Rel-5:	Pre Rel-5: 175 Rel-5:	Pre Rel-5: 00:02:55 Rel-5:

				0,020000	0,024680	13979	280	00:04:40
	Class1b @-3dB	5900	3150	Pre Rel-5: 0,002900 Rel-5: 0,002300	Pre Rel-5: 0,003579 Rel-5: 0,002838	Pre Rel-5: 96407 Rel-5: 121556	Pre Rel-5: 31 Rel-5: 39	Pre Rel-5: 00:00:31 Rel-5: 00:00:39
AFS 4.75	frames @-3dB	4750	50	Pre Rel-5: 0,017000 Rel-5: 0,008200	Pre Rel-5: 0,020978 Rel-5: 0,010119	Pre Rel-5: 16446 Rel-5: 34095	Pre Rel-5: 329 Rel-5: 682	Pre Rel-5: 00:05:29 Rel-5: 00:11:22
	Class1b @-3dB	4750	2800	Pre Rel-5: 0,001500 Rel-5: 0,001100	Pre Rel-5: 0,001851 Rel-5: 0,001357	Pre Rel-5: 186386 Rel-5: 254162	Pre Rel-5: 67 Rel-5: 91	Pre Rel-5: 00:01:07 Rel-5: 00:01:31

Table 14-58: Statistical test limits for DCS 1 800 and PCS 1 900 adjacent channel rejection

TU high no FH								
1.8 to 1.9 GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
AFS 12.2	frames	12200	50	Pre Rel-5: 0,035000 Rel-5: 0,027000	Pre Rel-5: 0,043190 Rel-5: 0,033318	Pre Rel-5: 7898 Rel-5: 10355	Pre Rel-5: 160 Rel-5: 207	Pre Rel-5: 00:02:40 Rel-5: 00:03:27
	Class1b	12200	8150	Pre Rel-5: 0,018000 Rel-5: 0,016000	Pre Rel-5: 0,022212 Rel-5: 0,019744	Pre Rel-5: 15533 Rel-5: 17474	Pre Rel-5: 2 Rel-5: 2	Pre Rel-5: 00:00:02 Rel-5: 00:00:02
AFS 7.95	frames @-3dB	7950	50	Pre Rel-5: 0,034000 Rel-5: 0,020000	Pre Rel-5: 0,041956 Rel-5: 0,024680	Pre Rel-5: 8223 Rel-5: 13979	Pre Rel-5: 164 Rel-5: 280	Pre Rel-5: 00:02:44 Rel-5: 00:04:40
	Class1b @-3dB	7950	4200	Pre Rel-5: 0,007800 Rel-5: 0,006800	Pre Rel-5: 0,009625 Rel-5: 0,008391	Pre Rel-5: 35844 Rel-5: 41115	Pre Rel-5: 9 Rel-5: 10	Pre Rel-5: 00:00:09 Rel-5: 00:00:10
AFS 5.9	frames @-3dB	5900	50	Pre Rel-5: 0,010000 Rel-5:	Pre Rel-5: 0,012340 Rel-5:	Pre Rel-5: 27958 Rel-5:	Pre Rel-5: 559 Rel-5:	Pre Rel-5: 00:09:19 Rel-5:

				0,004100	0,005059	68190	1364	00:22:44
	Class1b @-3dB	5900	3150	Pre Rel-5: 0.001200 Rel-5: 0,000790	Pre Rel-5: 0,001481 Rel-5: 0,000975	Pre Rel-5: 232983 Rel-5: 353897	Pre Rel-5: 74 Rel-5: 112	Pre Rel-5: 00:01:14 Rel-5: 00:01:52
AFS 4.75	frames @-3dB	4750	50	Pre Rel-5: 0,003500 Rel-5: 0,001000	Pre Rel-5: 0,004319 Rel-5: 0,001234	Pre Rel-5: 79880 Rel-5: 279579	Pre Rel-5: 1598 Rel-5: 5592	Pre Rel-5: 00:26:38 Rel-5: 01:33:12
	Class1b @-3dB	4750	2800	Pre Rel-5: 0,000330 Rel-5: 0,000210	Pre Rel-5: 0,000407 Rel-5: 0,000259	Pre Rel-5: 847208 Rel-5: 1331327	Pre Rel-5: 303 Rel-5: 475	Pre Rel-5: 00:05:03 Rel-5: 00:07:55

14.5.1.2a Adjacent channel rejection - TCH/AFS in TIGHTER configuration

14.5.1.2a.1 Definition

The adjacent channel selectivity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted signal in the adjacent channel.

The adjacent channel can be adjacent in the RF spectrum or in time. There are therefore two types of adjacent channel selectivity:

1) Adjacent RF channel selectivity, which is specifically tested in this subclause.

2) Adjacent Time Slot selectivity, which is not tested in this subclause.

14.5.1.2a.2 Conformance requirement

3GPP TS 45.005 subclause 6.3.3

Table 6.3-1a: Reference interference ratio requirements in adjacent channels for Packet-switched (Normal symbol-rate), Enhanced circuit-switched data, Wideband AMR and 8-PSK modulated AMR channels, speech and associated control channels in *VAMOS mode, TIGHTER* – MS

		Modulation of wanted signal				
		GMSK	8-PSK	16-QAM	32-QAM	AQPSK
for adjacent (200 kHz) interference	C/Ia1 =	C/Ic - 18 dB, see table 2af for TIGHTER MS	See table 2l for speech, see tables 2g, 2i, 2n and 2w for other channels, see table 2af for TIGHTER MS	See table 2w, see table 2af for TIGHTER MS	See table 2w, see table 2af for TIGHTER MS	See table 2aa and 2ab
for adjacent (400 kHz) interference	C/Ia2 =	C/Ic - 50 dB	C/Ic - 50 dB	C/Ic - 48 dB	C/Ic - 48 dB	[Note 1]
for adjacent (600 kHz) interference	C/Ia3 =	C/Ic - 58 dB	C/Ic - 58 dB			
NOTE 1: The adjacent channel interference @ 400 kHz requirement (C/Ia2) does not apply to channels in VAMOS mode.						

NOTE: The C/Ia3 figure is given for information purposes and will not require testing. It was calculated for the case of an equipment with an antenna connector, operating at output power levels of +33 dBm and below. Rejection of signals at 600 kHz is specified in subclause 5.1.

3GPP TS 45.005 subclause 6.3.4

For all adjacent channel (200 kHz) requirements specified in table 2af for TIGHTER MS, the wanted signal level shall be: -75 dBm + Iar + Corr, where:

Iar = the adjacent channel (200 kHz) interference ratio according to table 2af
Corr = the correction factor for reference performance according to table 6.2-4.

14.5.1.2a.3 Test purpose

1. For TCH/AFS FER, MS shall meet the reference interference performance mentioned in 3GPP TS 45.005 sub clause 6.3.3, for adjacent-channel interference ratio mentioned in table 2af according to propagation conditions.
2. At reference adjacent-channel interference, the TCH/AFS class Ib BER shall meet the reference interference performance of table 2af in 3GPP TS 45.005.

14.5.1.2a.4 Method of test

14.5.1.2a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AFS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The multirate configuration indicates the use of a codec set limited to 12.2 kbit/s.

The SS commands the MS to create the traffic channel loop back signalling erased frames.

The SS transmits Standard Test Signal C1 on the TCH (wanted signal).

14.5.1.2a.4.2 Procedure

a) The fading characteristic of the wanted and the unwanted signal is set to TUHigh no FH.

b) In addition to the wanted signal, the SS transmits an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal.

   The unwanted signal is transmitted at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set according to the specified reference interference ratio as in table 2af.

c) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS tests the frame erasure compliance for the TCH/AFS by examining at least the minimum number of samples of consecutive frames. The number of frame erasure events is recorded.

e) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib, Bits are only taken from those frames for which no bad frame indication was given.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 7.95 kbit/s and steps c) to e) are repeated.

g) The unwanted signal is moved to a nominal frequency 400 kHz above the nominal frequency of the wanted signal. Its amplitude is set to 3 dB below the reference interference ratio ((-41 dB - 3 dB) for 400 kHz offset), meaning 44 dB above that of the wanted signal.

h) The SS uses a Channel Mode Modify procedure to change the active codec set to 5.9 kbit/s and steps c) to e) are repeated.

i) The unwanted signal is moved to a nominal frequency 400 kHz below the nominal frequency of the wanted signal. Its amplitude is set to 3 dB below the reference interference ratio ((-41 dB - 3 dB) for 400 kHz offset), meaning 44 dB above that of the wanted signal.

j) The SS uses a Channel Mode Modify procedure to change the active codec set to 4.75 kbit/s and steps c) to e) are repeated.

Maximum/Minimum Duration of Test

Maximum: 23 minutes (GSM850, GSM900), 125 minutes (DCS1800, PCS1900).

Minimum: 14 minutes (GSM850, GSM900), 17 minutes (DCS1800, PCS1900).

14.5.1.2a.5 Test requirements

Testing the adjacent channel interference performance is performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with BER/BLER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of the limit lines refer to Annex 6.2.

Wrong decision risk F for one single error ratio test:

F_{pass} = F_{fail} = F and F = 0.2%

Wrong decision probability D per test step:

D_{pass} = D_{fail} = D and D = 0.0085%

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.5.1.2a.5-1: Minimum test times due to TU high fading conditions

Full Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
990 Waves	743	424	349	330	165	156	m
min net test time	53	31	25	24	12	11	s @ 50km/h
min test time	428	244	201	190	95	90	s
	0:07:08	**0:04:04**	**0:03:21**	**0:03:10**	**0:01:35**	**0:01:30**	**hh:mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is done by comparing the result with the “derived test limit”. In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne $\geq$ 1 (inclusive artificial error)

For an early fail decision ne $\geq$ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rates measured for different channels and under the different propagation conditions shall be tested according to the values given in table 14.5.1.2a.5-2 and 14.5.1.2a.5-3.

Table 14.5.1.2a.5-2: Statistical test limits for GSM 850 and GSM 900 Adjacent Channel Rejection

TU high no FH								
0.4 to 0.9 GHz			**frames per s**	**Orig. BER**	**Derived**	**Target number**	**Target test**	**Target test time**
	Channel	**bits per sec**	**class1b per s**	**requirement**	**test limit**	**of samples**	**time (s)**	**(hh:mm:ss)**
AFS 12.2	Frames	12200	50	0,060000	0,074040	4660	93	00:01:33
	Class1b	12200	8150	0,017000	0,020978	16446	2	00:00:02
AFS 7.95	frames @-3dB	7950	50	0,053000	0,065402	5275	106	00:01:46
	Class1b @-3dB	7950	4200	0,010000	0,012340	27958	7	00:00:07
AFS 5.9	frames @-3dB	5900	50	0,020000	0,024680	13979	280	00:04:40
	Class1b @-3dB	5900	3150	0,002300	0,002838	121556	39	00:00:39
AFS 4.75	frames @-3dB	4750	50	0,008200	0,010119	34095	682	00:11:22
	Class1b @-3dB	4750	2800	0,001100	0,001357	254162	91	00:01:31

Table 14.5.1.2a.5-3: Statistical test limits for DCS 1800 and PCS 1900 Adjacent Channel Rejection

TU high no FH								
1.8 to 1.9 GHz			**frames per s**	**Orig. BER**	**Derived**	**Target number**	**Target test**	**Target test time**
	Channel	**bits per sec**	**class1b per s**	**requirement**	**test limit**	**of samples**	**time (s)**	**(hh:mm:ss)**
AFS 12.2	Frames	12200	50	0,027000	0,033318	10355	207	00:03:27
	Class1b	12200	8150	0,016000	0,019744	17474	2	00:00:02
AFS 7.95	frames @-3dB	7950	50	0,020000	0,024680	13979	280	00:04:40
	Class1b @-3dB	7950	4200	0,006800	0,008391	41115	10	00:00:10
AFS 5.9	frames @-3dB	5900	50	0,004100	0,005059	68190	1364	00:22:44
	Class1b @-3dB	5900	3150	0,000790	0,000975	353897	112	00:01:52
AFS 4.75	frames @-3dB	4750	50	0,001000	0,001234	279579	5592	01:33:12
	Class1b @-3dB	4750	2800	0,000210	0,000259	1331327	475	00:07:55

14.5.1.3 TCH/AHS

14.5.1.3.1 Definition

The adjacent channel selectivity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted signal in the adjacent channel.

The adjacent channel can be adjacent in the RF spectrum or in time. There are therefore two types of adjacent channel selectivity:

1) Adjacent RF channel selectivity which is specifically tested in this subclause.

2) Adjacent Time Slot selectivity, which is not tested in this subclause.

14.5.1.3.2 Conformance requirement

1. With adjacent channel interference at 200 kHz above and below the wanted signal and signal level 9 dB above the wanted signal level:

   1.1 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, the FER for TCH/AHS shall be within the requirements of table 2 in 3GPP TS 05.05; 3GPP TS 05.05, 6.3.

   1.2 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, the Class Ib and Class II RBER shall be within the requirements of table 2 in 3GPP TS 05.05; 3GPP TS 05.05, 6.3.

2. For adjacent channel interference at 400 kHz above and below the wanted signal frequency and signal level 41 dB above the wanted signal level:

   2.1 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, the FER for TCH/AHS shall be within the requirements of table 2 in 3GPP TS 05.05; 3GPP TS 05.05, 6.3.

   2.2 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, the Class Ib and Class II RBER shall be within the requirements of table 2 in 3GPP TS 05.05; 3GPP TS 05.05, 6.3.

14.5.1.3.3 Test purpose

1. To verify that with a TUhigh adjacent channel interferer at 200 kHz above and below the wanted TUhigh signal frequency and the interfering signal at a level resulting in the specified interference ratio:

   1.1 Conformance requirement 1.1 is met with an allowance for the statistical significance of the test.

   1.2 Conformance requirement 1.2 is met with an allowance for the statistical significance of the test.

2. To verify that with a TUhigh adjacent channel interferer at 400 kHz above and below a TUhigh wanted signal frequency and the interfering signal at a level resulting in the specified interference ratio:

   2.1 Conformance requirement 2.1 is met with an allowance for the statistical significance of the test.

   2.2 Conformance requirement 2.2 is met with an allowance for the statistical significance of the test.

14.5.1.3.4 Method of test

14.5.1.3.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AHS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The multirate configuration indicates the use of a codec set limited to 7,4 kbit/s.

The SS commands the MS to create the traffic channel loop back signalling erased frames.

The SS transmits Standard Test Signal C1 on the TCH (wanted signal).

14.5.1.3.4.2 Procedure

a) In addition to the wanted signal, the SS transmits an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal.

The fading characteristic of the wanted and the unwanted signal is set to TUHigh.

The unwanted signal is transmitted at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. The interference ratio is set to 3 dB above the reference interference ratio (-9 dB + 3 dB), meaning that the amplitude of the interferer is set to 6 dB above that of the wanted signal.

b) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

c) The SS tests the frame erasure compliance for the TCH/AHS by examining at least the minimum number of samples of consecutive frames. The number of frame erasure events is recorded.

d) The SS determines the number of residual bit error events for the bits of the class Ib and class II, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib and class II, Bits are only taken from those frames for which no bad frame indication was given.

e) The unwanted signal is moved to a nominal frequency 200 kHz below the nominal frequency of the wanted signal. The interference ratio is set to 3 dB above the reference interference ratio (-9 dB + 3 dB), meaning that the amplitude of the interferer is set to 6 dB above that of the wanted signal.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 6.7 kbit/s and steps b) to d) are repeated.

g) The unwanted signal is moved to a nominal frequency 400 kHz above the nominal frequency of the wanted signal. Its amplitude is set to the reference interference ratio (-41 dB for 400 kHz offset), meaning 41 dB above that of the wanted signal.

h) The SS uses a Channel Mode Modify procedure to change the active codec set to 5.15 kbit/s and steps b) to d) are repeated.

i) The unwanted signal is moved to a nominal frequency 400 kHz below the nominal frequency of the wanted signal. Its amplitude is set to the reference interference ratio (-41 dB for 400 kHz offset), meaning 41 dB above that of the wanted signal.

j) The SS uses a Channel Mode Modify procedure to change the active codec set to 4.75 kbit/s and steps b) to d) are repeated.

Maximum/Minimum Duration of Test

Pre Rel-5 MS

Maximum: 27 minutes (GSM850), 26 minutes (GSM900), 14 minutes (DCS1800, PCS1900).

Minimum: 27 minutes (GSM850), 26 minutes (GSM900), 13 minutes (DCS1800), 12 minutes (PCS1900).

Rel-5 onwards MS

Maximum: 27 minutes (GSM850), 26 minutes (GSM900), 15 minutes (DCS1800, PCS1900).

Minimum: 27 minutes (GSM850), 26 minutes (GSM900), 13 minutes (DCS1800), 12 minutes (PCS1900).

14.5.1.3.5 Test requirements

Testing the adjacent channel interference performance is performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with BER/BLER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of the limit lines refer to Annex 6.2

Wrong decision risk F for one single error ratio test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

D_{pass} = D_{fail} = D and D = 0.0085%

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14-59: Minimum test times due to TU high fading conditions

Half Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
990 Waves	743	424	349	330	165	156	m
min net test time	53	31	25	24	12	11	s @ 50km/h
min test time	855	489	403	380	190	180	s
	0:14:15	**0:08:09**	**0:06:43**	**0:06:20**	**0:03:10**	**0:03:00**	**hh.mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is done by comparing the result with the “derived test limit”. In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne $\geq$ 1 (inclusive artificial error)

For an early fail decision ne $\geq$ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rates measured for different channels and under the different propagation conditions shall be tested according to the values given in table 14-60 or 14-61. Adjacent channel rejection tests with a frequency condition noted as "@+ndB" are performed for an interference ratio n dB above the reference interference ratio (see 3GPP TS 05.05).

Table 14-60: Statistical test limits for GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 adjacent channel rejection

TU high no FH								
0.4 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
			clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
	Channel	bits per sec	class II per s					
AHS 7.4	frames @+3dB	7400	50	0,048000	0,059232	5825	116	00:01:56
	Class1b	7400	2950	0,005100	0,006293	54819	19	00:00:19

	@+3dB							
	Class II @+3dB	7400	1400	0,033000	0,040722	8472	6	00:00:06
AHS 6.7	frames @+3dB	6700	50	0,023000	0,028382	12156	243	00:04:03
	Class1b @+3dB	6700	2750	0,003900	0,004813	71687	26	00:00:26
	Class II @+3dB	6700	1200	0,036000	0,044424	7766	6	00:00:06
AHS 5.15	frames	5150	50	0,033000	0,040722	8472	169	00:02:49
	Class1b	5150	2100	0,006000	0,007404	46596	22	00:00:22
	Class II	5150	600	0,069000	0,085146	4052	7	00:00:07
AHS 4.75	frames	4750	50	Pre Rel-5: 0,025000 Rel-5: 0,018000	Pre Rel-5: 0,030850 Rel-5: 0,022212	Pre Rel-5: 11184 Rel-5: 15532	Pre Rel-5: 224 Rel-5: 311	Pre Rel-5: 00:03:44 Rel-5: 00:05:11
	Class1b	4750	2200	Pre Rel-5: 0,002900 Rel-5: 0,002200	Pre Rel-5: 0,003579 Rel-5: 0,002715	Pre Rel-5: 96407 Rel-5: 127081	Pre Rel-5: 44 Rel-5: 58	Pre Rel-5: 00:00:44 Rel-5: 00:00:58
	Class II	4750	600	Pre Rel-5: 0,075000 Rel-5: 0,070000	Pre Rel-5: 0,092550 Rel-5: 0,086380	Pre Rel-5: 3728 Rel-5: 3994	Pre Rel-5: 6 Rel-5: 7	Pre Rel-5: 00:00:06 Rel-5: 00:00:07

Table 14-61: Statistical test limits for DCS 1 800 and PCS 1 900 adjacent channel rejection

TU high no FH								
1.8 and 1.9 GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
			clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
	Channel	bits per sec	class II per s					
AHS 7.4	frames @+3dB	7400	50	Pre Rel-5: 0,054000 Rel-5: 0,049000	Pre Rel-5: 0,066636 Rel-5: 0,060466	Pre Rel-5: 5178 Rel-5: 5706	Pre Rel-5: 104 Rel-5: 114	Pre Rel-5: 00:01:44 Rel-5: 00:01:54
	Class1b @+3dB	7400	2950	Pre Rel-5: 0,006000 Rel-5: 0,005100	Pre Rel-5: 0,007404 Rel-5: 0,006293	Pre Rel-5: 46597 Rel-5: 54819	Pre Rel-5: 16 Rel-5: 19	Pre Rel-5: 00:00:16 Rel-5: 00:00:19
	Class II @+3dB	7400	1400	Pre Rel-5: 0,035000	Pre Rel-5: 0,043190	Pre Rel-5: 7988	Pre Rel-5: 6	Pre Rel-5: 00:00:06

				Rel-5: 0,033000	Rel-5: 0,040722	Rel-5: 8472	Rel-5: 6	Rel-5. 00:00:06
AHS 6.7	frames @+3dB	6700	50	0,025000	0,030850	11183	224	00:03:44
	Class1b @+3dB	6700	2750	0,003800	0,004689	73573	27	00:00:27
	Class II @+3dB	6700	1200	Pre Rel-5: 0,039000 Rel-5: 0,035000	Pre Rel-5: 0,048126 Rel-5: 0,043190	Pre Rel-5: 7169 Rel-5: 7988	Pre Rel-5: 6 Rel-5: 6	Pre Rel-5: 00:00:06 Rel-5: 00:00:06
AHS 5.15	frames	5150	50	0,038000	0,046892	7357	147	00:02:27
	Class1b	5150	2100	0,006600	0,008144	42360	20	00:00:20
	Class II	5150	600	0,068000	0,083912	4111	7	00:00:07
AHS 4.75	frames	4750	50	Pre Rel-5: 0,028000 Rel-5: 0,021000	Pre Rel-5: 0,034552 Rel-5: 0,025914	Pre Rel-5: 9985 Rel-5: 13313	Pre Rel-5: 200 Rel-5: 266	Pre Rel-5: 00:03:20 Rel-5: 00:04:26
	Class1b	4750	2200	0,002500	0,003085	111831	51	00:00:51
	Class II	4750	600	Pre Rel-5: 0,075000 Rel-5: 0,070000	Pre Rel-5: 0,09255 Rel-5: 0,086380	Pre Rel-5: 3728 Rel-5: 3994	Pre Rel-5: 6 Rel-5: 7	Pre Rel-5: 00:00:06 Rel-5: 00:00:07

14.5.1.3a Adjacent channel rejection - TCH/AHS in TIGHTER configuration

14.5.1.3a.1 Definition

The adjacent channel selectivity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted signal in the adjacent channel.

The adjacent channel can be adjacent in the RF spectrum or in time. There are therefore two types of adjacent channel selectivity:

1) Adjacent RF channel selectivity which is specifically tested in this subclause.

2) Adjacent Time Slot selectivity, which is not tested in this subclause.

14.5.1.3a.2 Conformance requirement

3GPP TS 45.005 subclause 6.3.3

Table 6.3-1a: Reference interference ratio requirements in adjacent channels for Packet-switched (Normal symbol-rate), Enhanced circuit-switched data, Wideband AMR and 8-PSK modulated AMR channels, speech and associated control channels in *VAMOS mode, TIGHTER* – MS

		Modulation of wanted signal				
		GMSK	8-PSK	16-QAM	32-QAM	AQPSK
for adjacent (200 kHz) interference	C/Ia1 =	C/Ic - 18 dB, see table 2af for TIGHTER MS	See table 2l for speech, see tables 2g, 2i, 2n and 2w for other channels, see table 2af for TIGHTER MS	See table 2w, see table 2af for TIGHTER MS	See table 2w, see table 2af for TIGHTER MS	See table 2aa and 2ab
for adjacent (400 kHz) interference	C/Ia2 =	C/Ic - 50 dB	C/Ic - 50 dB	C/Ic - 48 dB	C/Ic - 48 dB	[Note 1]
for adjacent (600 kHz) interference	C/Ia3 =	C/Ic - 58 dB	C/Ic - 58 dB			
NOTE 1: The adjacent channel interference @ 400 kHz requirement (C/Ia2) does not apply to channels in VAMOS mode.						

NOTE: The C/Ia3 figure is given for information purposes and will not require testing. It was calculated for the case of an equipment with an antenna connector, operating at output power levels of +33 dBm and below. Rejection of signals at 600 kHz is specified in subclause 5.1.

3GPP TS 45.005 subclause 6.3.4

For all adjacent channel (200 kHz) requirements specified in table 2af for TIGHTER MS, the wanted signal level shall be: -75 dBm + Iar + Corr, where:

Iar = the adjacent channel (200 kHz) interference ratio according to table 2af
Corr = the correction factor for reference performance according to table 6.2-4.

14.5.1.3a.3 Test purpose

1. For TCH/AHS FER, MS shall meet the reference interference performance mentioned in 3GPP TS 45.005 sub clause 6.3.3, for adjacent-channel interference ratio mentioned in table 2af according to propagation conditions.
2. At reference adjacent-channel interference, the TCH/AHS class Ib BER shall meet the reference interference performance of table 2af in 3GPP TS 45.005.
3. At reference adjacent-channel interference, the TCH/AHS class II BER shall meet the reference interference performance of table 2af in 3GPP TS 45.005.

14.5.1.3a.4 Method of test

14.5.1.3a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AHS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The multirate configuration indicates the use of a codec set limited to 7,4 kbit/s.

The SS commands the MS to create the traffic channel loop back signalling erased frames.

The SS transmits Standard Test Signal C1 on the TCH (wanted signal).

14.5.1.3a.4.2 Procedure

a) The fading characteristic of the wanted and the unwanted signal is set to TUHigh.
b) In addition to the wanted signal, the SS transmits an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal.

The unwanted signal is transmitted at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set according to the specified reference interference ratio as in table 2af.

c) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS tests the frame erasure compliance for the TCH/AHS by examining at least the minimum number of samples of consecutive frames. The number of frame erasure events is recorded.

e) The SS determines the number of residual bit error events for the bits of the class Ib and class II, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib and class II, Bits are only taken from those frames for which no bad frame indication was given.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 6.7 kbit/s and steps c) to e) are repeated

g) The unwanted signal is moved to a nominal frequency 400 kHz above the nominal frequency of the wanted signal. Its amplitude is set to the reference interference ratio (-41 dB for 400 kHz offset), meaning 41 dB above that of the wanted signal as defined in Table 2.

h) The SS uses a Channel Mode Modify procedure to change the active codec set to 5.15 kbit/s and steps c) to e) are repeated.

i) The unwanted signal is moved to a nominal frequency 400 kHz below the nominal frequency of the wanted signal. Its amplitude is set to the reference interference ratio (-41 dB for 400 kHz offset), meaning 41 dB above that of the wanted signal as defined in Table 2.

j) The SS uses a Channel Mode Modify procedure to change the active codec set to 4.75 kbit/s and steps c) to e) are repeated.

Maximum/Minimum Duration of Test

Maximum: 27 minutes (GSM850), 26 minutes (GSM900), 15 minutes (DCS1800, PCS1900).

Minimum: 27 minutes (GSM850), 26 minutes (GSM900), 13 minutes (DCS1800), 12 minutes (PCS1900).

14.5.1.3a.5 Test requirements

Testing the adjacent channel interference performance is performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with BER/BLER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of the limit lines refer to Annex 6.2

Wrong decision risk F for one single error ratio test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.5.1.3a.5-1: Minimum test times due to TU high fading conditions

Half Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
990 Waves	743	424	349	330	165	156	m
min net test time	53	31	25	24	12	11	s @ 50km/h
min test time	855	489	403	380	190	180	s
	0:14:15	**0:08:09**	**0:06:43**	**0:06:20**	**0:03:10**	**0:03:00**	**hh.mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is done by comparing the result with the “derived test limit”. In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne $\geq$ 1 (inclusive artificial error)

For an early fail decision ne $\geq$ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rates measured for different channels and under the different propagation conditions shall be tested according to the values given in table 14.5.1.3a.5-2 and 14.5.1.3a.5-3.

Table 14.5.1.3a.5-2: Statistical test limits for GSM 850 and GSM 900 Adjacent Channel Rejection

TU high no FH								
0.4 to 0.9 GHz			**frames per s**	**Orig. BER**	**Derived**	**Target number**	**Target test**	**Target test time**
			class 1b per s	**require-ment**	**test limit**	**of samples**	**time (s)**	**(hh:mm:ss)**
	Channel	**bits per sec**	**class II per s**					
AHS 7.4	frames @+3dB	7400	50	0,048000	0,059232	5825	116	00:01:56
	Class1b @+3dB	7400	2950	0,005100	0,006293	54819	19	00:00:19
	Class II @+3dB	7400	1400	0,033000	0,040722	8472	6	00:00:06
AHS 6.7	frames @+3dB	6700	50	0,023000	0,028382	12156	243	00:04:03
	Class1b @+3dB	6700	2750	0,003900	0,004813	71687	26	00:00:26
	Class II @+3dB	6700	1200	0,036000	0,044424	7766	6	00:00:06
AHS 5.15	Frames	5150	50	0,033000	0,040722	8472	169	00:02:49
	Class1b	5150	2100	0,006000	0,007404	46596	22	00:00:22
	Class II	5150	600	0,069000	0,085146	4052	7	00:00:07
AHS 4.75	Frames	4750	50	0,018000	0,022212	15532	311	00:05:11
	Class1b	4750	2200	0,002200	0,002715	127081	58	00:00:58
	Class II	4750	600	0,070000	0,086380	3994	7	00:00:07

Table 14.5.1.3a.5-3: Statistical test limits for DCS 1800 and PCS 1900 Adjacent Channel Rejection

TU high no FH								
1.8 and 1.9 GHz			**frames per s**	**Orig. BER**	**Derived**	**Target number**	**Target test**	**Target test time**
			class1b per s	**require-ment**	**test limit**	**of samples**	**time (s)**	**(hh:mm:ss)**
	Channel	**bits per sec**	**class II per s**					
AHS 7.4	frames @+3dB	7400	50	0,049000	0,060466	5706	114	00:01:54
	Class1b @+3dB	7400	2950	0,005100	0,006293	54819	19	00:00:19
	Class II @+3dB	7400	1400	0,033000	0,040722	8472	6	00:00:06
AHS 6.7	frames @+3dB	6700	50	0,025000	0,030850	11183	224	00:03:44
	Class1b @+3dB	6700	2750	0,003800	0,004689	73573	27	00:00:27
	Class II @+3dB	6700	1200	0,035000	0,043190	7988	6	00:00:06
AHS 5.15	Frames	5150	50	0,038000	0,046892	7357	147	00:02:27
	Class1b	5150	2100	0,006600	0,008144	42360	20	00:00:20
	Class II	5150	600	0,068000	0,083912	4111	7	00:00:07
AHS 4.75	Frames	4750	50	0,021000	0,025914	13313	266	00:04:26
	Class1b	4750	2200	0,002500	0,003085	111831	51	00:00:51
	Class II	4750	600	0,070000	0,086380	3994	7	00:00:07

14.5.1.4 O-TCH/AHS

14.5.1.4.1 Definition

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14.5.1.4.2 Conformance requirement

For 8-PSK modulated channels, speech channels (AMR and AMR-WB), the minimum interference ratio for which the reference performance for co channel interference (C/Ic) shall be met is specified in table 2k

The corresponding interference ratio for adjacent channel interference shall be:

Modulation of wanted signal				GMSK	8-PSK
-	for adjacent (200 kHz) interference	C/Ia1	=	C/Ic - 18 dB	See table 2l for speech, see tables 2f, 2g, 2h, 2i and 2n for other channels
-	for adjacent (400 kHz) interference	C/Ia2	=	C/Ic - 50 dB	C/Ic –50 dB
-	for adjacent (600 kHz) interference	C/Ia3	=	C/Ic - 58 dB	C/Ic –58 dB

For 8-PSK modulated speech channels (AMR and AMR-WB), ECSD channels and 8-PSK modulated packet-switched channels, the wanted input signal level shall be: - 93 dBm + Ir + Corr, where:

> Ir = the interference ratio according to tables 2b and 2c for packets switched channels, tables 2d and 2e for ECSD and table 2k for speech (AMR and AMR-WB) and associated control channels.
> Corr = the correction factor for reference performance according to subclause 6.2

For adjacent channel performance, the wanted input signal level shall be set to the value calculated using the formulas above for co channel performance.

> For all classes of MS supporting 8-PSK speech channels, an additional +2 dB adjustment applies for 8-PSK modulated speech channels.

The reference performance is the same as defined in subclause 6.2

The reference performance shall be:

For speech channels (O-TCH/AHSy) FER ≤ 1%

3GPP TS 45.005, subclauses 6.2, 6.3.

14.5.1.4.3 Test purpose

To verify that the MS does not exceed conformance requirement for FER and class 1b RBER under TU50 propagation conditions with an allowance for the statistical significance of the test, for channel combinations O-TCH/AHS7.4, O-TCH/AHS6.7.

14.5.1.4.4 Method of test

14.5.1.4.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a O-TCH/AHS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 7,4 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.5.1.4.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal) at a nominal frequency 400KHz above that of the wanted signal. The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal.

b) The fading characteristic of the wanted and the interfering signals are set to TU50.

c) The SS sets the level of the interfering signal to –27dBm.

d) The SS sets the level of the wanted signal to –77dBm.

e) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

f) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

g) The SS moves the interfering signal to a nominal frequency 200KHz below that of the wanted signal.

h) The SS sets the level of the interfering signal to –73dBm.

i) The SS uses a Channel Mode Modify procedure to change the active codec set to 6,7 kbit/s.

j) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14.5.1.4-2 or 14.5.1.4-3.

k) Steps e) to f) are repeated.

Maximum/Minimum Duration of Test

Maximum: 19 minutes (GSM850), 19 minutes (GSM900), 19 minutes (DCS1800), 19 minutes (PCS1900).

Minimum: 14 minutes (GSM850), 13 minutes (GSM900), 7 minutes (DCS1800), 6 minutes (PCS1900).

14.5.1.4.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7.

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure A7.1.3.1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.5.1.4-1: Minimum test times due to TU high fading conditions

Half Rate 50 km/h					
Frequency	0,85	0,9	1,8	1,9	GHz
Wavelength	0,35	0,33	0,17	0,16	m
min test time	403	380	190	180	s
	0:06:43	**0:06:20**	**0:03:10**	**0:03:00**	

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the “derived test limit”. In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision $ne \geq 1$ (inclusive artificial error)

For an early fail decision $ne \geq 7$

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14.5.1.4-2 and 14.5.1.4.3

Table 14.5.1.4-2: Statistical test limits for T-GSM 810, GSM 850 and GSM 900 O-TCH/AHS adj-chan interference

TU50 / No FH								
0.8 to 0.9 GHz		**C_{lev} (dBm)**	**Samples per second**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time (s)**	**Target test time (hh:mm:ss)**
O-TCH/ AHS 7.4	Frames	n/a	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		3950	0,001500	0.001851	186385	48	00:00:48
O-TCH/ AHS 6.7	Frames	-77.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		3950	0,001500	0.001851	186385	48	00:00:48

Table 14.5.1.4-3: Statistical test limits for DCS 1 800 and PCS 1 900 O-TCH/AHS adj-chan interference

TU50 / No FH								
1.8 to 1.9 GHz		**C_{lev} (dBm)**	**Samples per second**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time (s)**	**Target test time (hh:mm:ss)**
O-TCH/ AHS 7.4	Frames	n/a	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		3950	0,001700	0.002098	164442	42	00:00:42
O-TCH/ AHS 6.7	Frames	-78.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		3950	0,001500	0.001851	186385	48	00:00:48

14.5.1.5 O-TCH/WFS

14.5.1.5.1 Definition

The adjacent channel selectivity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted signal in the adjacent channel.

The adjacent channel can be adjacent in the RF spectrum or in time. There are therefore two types of adjacent channel selectivity:

1) Adjacent RF channel selectivity, which is specifically tested in this subclause.

2) Adjacent Time Slot selectivity, which is not tested in this subclause.

14.5.1.5.2 Conformance requirement

The reference interference performance (for co channel, C/Ic, or adjacent channel, C/Ia) in terms of frame erasure, bit error or residual bit error rates (whichever appropriate) is specified in table 2, according to the type of channel and the propagation condition. The actual interference ratio is defined as the interference ratio for which this performance is met. The actual interference ratio shall be less than a specified limit, called the reference interference ratio.

For equipment supporting 8-PSK, and for MS indicating support for Downlink Advanced Receiver Performance – phase I (see 3GPP TS 24.008), the applicable requirements in table 2a, 2b, 2c, 2d, 2e, 2f, 2g, 2h, 2i, 2j, 2k, 2l, 2m, 2n and 2p apply for both GMSK and 8-PSK modulated interfering signals. The corresponding interference ratio for adjacent channel interference shall be:

Modulation of wanted signal				GMSK	8-PSK
-	for adjacent (200 kHz) interference	C/Ia1	=	C/Ic - 18 dB	See table 2l for speech, see tables 2f, 2g, 2h, 2i and 2n for other channels
-	for adjacent (400 kHz) interference	C/Ia2	=	C/Ic - 50 dB	C/Ic –50 dB
-	for adjacent (600 kHz) interference	C/Ia3	=	C/Ic - 58 dB	C/Ic –58 dB

NOTE: The C/Ia3 figure is given for information purposes and will not require testing. It was calculated for the case of an equipment with an antenna connector, operating at output power levels of +33 dBm and below. Rejection of signals at 600 kHz is specified in subclause 5.1.

For 8-PSK modulated speech channels (AMR and AMR-WB), ECSD channels and 8-PSK modulated packet-switched channels, the wanted input signal level shall be: - 93 dBm + Ir + Corr, where:

Ir = the interference ratio according to tables 2b and 2c for packets switched channels, tables 2d and 2e for ECSD and table 2k for speech (AMR and AMR-WB) and associated control channels.
Corr = the correction factor for reference performance according to subclause 6.2

The levels shall be corrected by the following values:

MS, 8-PSK modulated signals	
for GSM 400, GSM 900, GSM 850 and GSM 700 small MS	0 dB
for other GSM 400, GSM 900, GSM 850 and GSM 700 MS	-2 dB
for DCS 1 800 and PCS 1900 class 1 or class 2 MS	0 dB
for other DCS 1 800 and PCS 1900 MS	-2 dB

For GMSK modulated speech channels for wideband AMR, and for 8-PSK modulated speech channels for AMR, associated control channels and in band signalling, the minimum input signal level for which the reference performance shall be met is specified in table 1f and 1g respectively for normal BTS, according to the type of channel and the propagation condition. The reference performance shall be:

-	for speech channels (O-TCH/AHSy, O-TCH/WFSy, O-TCH/WHSy)	FER	:	≤ 1%

For other equipment than normal BTS, the levels shall be corrected by the values in the table below, describing the reference performance level correction factors for packet switched channels. Furthermore, for all classes of MS supporting 8-PSK speech channels, an additional +2 dB adjustment applies for 8-PSK modulated speech channels. For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP 45.005 clauses 2, 6.2 and 6.3

NOTE: The tables 1 and 2 mentioned above can be found in 3GPP 45.005 clause 6.7

14.5.1.5.3 Test purpose

1 To verify that with a TUhigh adjacent channel interferer at 200 kHz above and below the wanted TUhigh signal frequency and the interfering signal at a level resulting in the specified interference ratio the MS does not exceed conformance requirements in tables 14.5.1.5-2/3 with an allowance for the statistical significance of the test.

2. To verify that with a TUhigh adjacent channel interferer at 400 kHz above and below a TUhigh wanted signal frequency and the interfering signal at a level resulting in the specified interference ratio the MS does not exceed conformance requirements in tables 14.5.1.5-2/3 with an allowance for the statistical significance of the test.

14.5.1.5.4 Method of test

14.5.1.5.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a O-TCH/WFS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The multirate configuration indicates the use of a codec set limited to 15.85 kbit/s.

The SS commands the MS to create the traffic channel loop back signalling erased frames.

The SS transmits Standard Test Signal C1 on the O-TCH (wanted signal) with an amplitude of -93 dBm + Ir + Corr +2 dB, where Ir equals C/Ic in table.14.5.1.5-2/3 and the values for Corr are as stated above.

14.5.1.5.4.2 Procedure

a) In addition to the wanted signal, the SS transmits an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal.

The fading characteristic of the wanted and the unwanted signal is set to TUHigh.

The unwanted signal is transmitted at a nominal frequency of 200 kHz above the nominal frequency of the wanted signal. The interference ratio is set to C/Ia1 from table 14.5.1.5-4.

b) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

c) The SS tests the frame erasure compliance for the O-TCH/WFS by examining at least the minimum number of samples of consecutive frames. The number of frame erasure events is recorded.

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib, Bits are only taken from those frames for which no bad frame indication was given.

e) The unwanted signal is moved to a nominal frequency 200 kHz below the nominal frequency of the wanted signal.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 12.65 kbit/s and the wanted signal level is set accordingly. The interference ratio is set to C/Ia1 from table 14.5.1.5-4 and steps b) to d) are repeated.

g) The unwanted signal is moved to a nominal frequency 400 kHz above the nominal frequency of the wanted signal.

h) The SS uses a Channel Mode Modify procedure to change the active codec set to 8.85 kbit/s and the wanted signal level is set accordingly. The interference ratio is set to (C/Ic - 50dB), i.e. the amplitude of the unwanted signal is set to (50 dB – C/Ic) above that of the wanted signal, (C/Ic is the co-channel interference ratio from table 14.5.1.5-2 and 14.5.1.5-3). Steps b) to d) are repeated.

i) The unwanted signal is moved to a nominal frequency 400 kHz below the nominal frequency of the wanted signal.

j) The SS uses a Channel Mode Modify procedure to change the active codec set to 6.60 kbit/s and the wanted signal level is set accordingly. The interference ratio is set to (C/Ic - 50dB), i.e. the amplitude of the unwanted signal is set to (50 dB – C/Ic) above that of the wanted signal, (C/Ic is the co-channel interference ratio from table 14.5.1.5-2 and 14.5.1.5-3). Steps b) to d) are repeated.

Maximum/Minimum Duration of Test

Maximum: 14 minutes (GSM700, T-GSM 810, GSM850 and GSM900), 7 minutes (DCS1800 and PCS1900).

Minimum: 14 minutes (GSM700, T-GSM 810, GSM850 and GSM900), 7 minutes (DCS1800 and PCS1900).

14.5.1.5.5 Test requirements

Testing the adjacent channel interference performance is performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with BER/BLER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of the limit lines refer to Annex 6.2

Wrong decision risk F for one single error ratio test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.5.1.5-1: Minimum test times due to TU high fading conditions

Full Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
990 Waves	743	424	349	330	165	156	m
min net test time	53	31	25	24	12	11	s @ 50km/h
min test time	428	244	201	190	95	90	s
	0:07:08	**0:04:04**	**0:03:21**	**0:03:10**	**0:01:35**	**0:01:30**	**hh:mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is done by comparing the result with the “derived test limit”. In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne $\geq$ 1 (inclusive artificial error)

For an early fail decision ne $\geq$ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rates measured for different channels and under the different propagation conditions, under any combination of normal and extreme test voltages and ambient temperatures, shall be tested according to the values given in table 14.5.1.5-2 or 14.5.1.5-3. Adjacent channel rejection tests with a frequency condition noted as "@-ndB" are performed for an interference ratio n dB below the reference interference ratio (see 3GPP TS 05.05). Where an entry in the table is ‘-‘, this combination should not be tested.

Table 14.5.1.5-2: Statistical test limits for GSM 710, T-GSM 810, GSM 850 and GSM 900 adjacent channel rejection

TU high no FH,								
0.4 to 0.9 GHz		**C/Ic (dB)**	**samples per s**	**Orig. BER/FER requirement**	**Derived test limit**	**Target number of samples**	**Target test time (s)**	**Target test time (hh:mm:ss)**
WFS15.85	frames	13.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		12250	0,004500	0,005553	62129	5	00:00:05
WFS12.65	frames	11.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		9050	0,003500	0,004319	79880	9	00:00:09
WFS 8.85	frames	10.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		5650	0,003500	0,004319	79880	15	00:00:15
WFS 6.60	frames	9.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		3900	0,001500	0,001851	186386	48	00:00:48

Table 14.5.1.5-3: Statistical test limits for DCS 1800 and PCS 1900 adjacent channel rejection

TU high no FH								
1.8 to 1.9 GHz		**C/Ic (dB)**	**samples per s**	**Orig. BER/FER requirement**	**Derived test limit**	**Target number of samples**	**Target test time (s)**	**Target test time (hh:mm:ss)**
WFS15.85	frames	12.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		12250	0,005000	0,006170	55916	5	00:00:05
WFS12.65	frames	10.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		9050	0,003600	0,004442	77668	9	00:00:09
WFS 8.85	frames	9.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		5650	0,004200	0,005183	66564	12	00:00:12
WFS 6.60	frames	8.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b		3900	0,002000	0,002468	139790	36	00:00:36

Table 14.5.1.5-4: Adjacent channel interference ratio C/Ia1 for 8PSK-modulated WB-AMR channels

Type of Channel		**GSM 850 and GSM 900**	**DCS 1 800 & PCS 1 900**
		Propagation condition	
		TU50(no FH)	**TU50(no FH)**
O-TCH/ WFS15.85	dB	-5	-5.5
O-TCH/ WFS12.65	dB	-7	-7.5

14.5.1.6 Adjacent channel interference O-TCH/WHS

14.5.1.6.1 Definition

-

14.5.1.6.2 Conformance requirement

For 8-PSK modulated channels, speech channels (AMR and AMR-WB), the minimum interference ratio for which the reference performance for co channel interference (C/Ic) shall be met is specified in table 2k

The corresponding interference ratio for adjacent channel interference shall be:

Modulation of wanted signal				GMSK	8-PSK
-	for adjacent (200 kHz) interference	C/Ia1	=	C/Ic - 18 dB	See table 2l for speech, see tables 2f, 2g, 2h, 2i and 2n for other channels
-	for adjacent (400 kHz) interference	C/Ia2	=	C/Ic - 50 dB	C/Ic –50 dB
-	for adjacent (600 kHz) interference	C/Ia3	=	C/Ic - 58 dB	C/Ic –58 dB

For 8-PSK modulated speech channels (AMR and AMR-WB), ECSD channels and 8-PSK modulated packet-switched channels, the wanted input signal level shall be: - 93 dBm + Ir + Corr, where:

Ir = the interference ratio according to tables 2b and 2c for packets switched channels, tables 2d and 2e for ECSD and table 2k for speech (AMR and AMR-WB) and associated control channels.
Corr = the correction factor for reference performance according to subclause 6.2

The levels shall be corrected by the following values:

MS, 8-PSK modulated signals	
for GSM 400, GSM 900, GSM 850 and GSM 700 small MS	0 dB
for other GSM 400, GSM 900, GSM 850 and GSM 700 MS	-2 dB
for DCS 1 800 and PCS 1900 class 1 or class 2 MS	0 dB
for other DCS 1 800 and PCS 1900 MS	-2 dB

For adjacent channel performance, the wanted input signal level shall be set to the value calculated using the formulas above for co channel performance.

For all classes of MS supporting 8-PSK speech channels, an additional +2 dB adjustment applies for 8-PSK modulated speech channels.

The reference performance is the same as defined in subclause 6.2

The reference performance shall be:

For speech channels (O-TCH/WHSy) FER ≤ 1%

3GPP TS 45.005, subclauses 6.2, 6.3.

14.5.1.6.3 Test purpose

To verify that the MS does not exceed conformance requirement for FER and class 1b RBER under TU50 propagation conditions with an allowance for the statistical significance of the test, for channel combinations O-TCH/WHS8.85, O-TCH/WHS6.6.

14.5.1.6.4 Method of test

14.5.1.6.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a O-TCH/WHS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 8,85 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal) with an amplitude of -93 dBm + Ir + Corr +2 dB, where Ir equals C/Ic in table. 14.5.1.6-2 and the values for Corr are as stated above.

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.5.1.6.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal) at a nominal frequency 400KHz above that of the wanted signal. The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal.

b) The fading characteristic of the wanted and the interfering signals are set to TU50.

c) The interference ratio is set to (C/Ic - 50dB), i.e. the amplitude of the unwanted signal is set to (50 dB – C/Ic) above that of the wanted signal, (C/Ic is the co-channel interference ratio from table 14.5.1.6-2).

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining sequences of at least the minimum number of samples of consecutive frames and assuming a frame is received successfully, if it is not signalled as erased.

f) The SS moves the interfering signal to a nominal frequency 200KHz below that of the wanted signal.

g) The SS uses a Channel Mode Modify procedure to change the active codec set to 6,6 kbit/s.

h) The SS sets the level of the wanted signal accordingly.

i) The interference ratio is set to C/Ia1 from table 14.5.1.6-2.

j) Steps d) to e) are repeated.

Maximum/Minimum Duration of Test

Maximum: 19 minutes (GSM850), 19 minutes (GSM900), 19 minutes (DCS1800), 19 minutes (PCS1900).

Minimum: 14 minutes (GSM850), 13 minutes (GSM900), 7 minutes (DCS1800), 6 minutes (PCS1900).

14.5.1.6.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7.

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure A7.1.3.1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.5.1.6-1: Minimum test times due to TU high fading conditions

Half Rate 50 km/h					
Frequency	0,85	0,9	1,8	1,9	GHz
Wavelength	0,35	0,33	0,17	0,16	M
min test time	403	380	190	180	S
	0:06:43	**0:06:20**	**0:03:10**	**0:03:00**	

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the "derived test limit". In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne $\geq$ 1 (inclusive artificial error)

For an early fail decision ne $\geq$ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14.5.1.6-2 and 14.5.1.6.3

Table 14.5.1.6-2: Statistical test limits for GSM 850 and GSM 900 O-TCH/WHS adj-chan interference

TU high no FH		C/Ia1 (dB)	C/Ic (dB)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
O-TCH/ WHS 8.85	Frames	-	15.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b			5650	0,001100	0,001357	254237	45	00:00:45
O-TCH/ WHS 6.60	Frames	-5.0	13.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b			3900	0,001500	0,001851	186386	48	00:00:48

Table 14.5.1.6-3: Statistical test limits for DCS 1 800 and PCS 1 900 O-TCH/WHS adj-chan interference

TU high no FH		C/Ia1 (dB)	C/Ic (dB)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
O-TCH/ WHS 8.85	Frames	-	14.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b			5650	0,001200	0, 001481	232951	42	00:00:42
O-TCH/ WHS 6.60	Frames	-5.0	13.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b			3900	0,001600	0,001974	174772	45	00:00:45

14.5.1.7 TCH/WFS Adjacent Channel Interference

14.5.1.7.1 Definition

The adjacent channel selectivity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted signal in the adjacent channel.

The adjacent channel can be adjacent in the RF spectrum or in time. There are therefore two types of adjacent channel selectivity:

1) Adjacent RF channel selectivity, which is specifically tested in this subclause.

2) Adjacent Time Slot selectivity, which is not tested in this subclause.

14.5.1.7.2 Conformance requirement

At reference adjacent channel interference the TCH/WFS class Ib BER shall meet the reference interference performance of table 2j in 3GPP TS 45.005 subclause 6.3.

At reference adjacent channel interference the TCH/WFS FER shall meet the reference performance stated in 3GPP TS 45.005 subclause 6.2.

The reference performance shall be:

For speech channels (TCH/WHSy) FER ≤ 1%

The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 2j, except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60.

For packet switched and AMR-WB speech, GMSK modulated channels the wanted input signal level shall be: -93 dBm + Ir + Corr, where:

Ir = the interference ratio according to table 2a and table 2j for the packet switched and AMR-WB speech channels respectively
Corr = the correction factor for reference performance according to subclause 3GPP TS 45.005 subclause 6.2.

The corresponding interference ratio for adjacent channel interference shall be:

Modulation of wanted signal				GMSK
-	for adjacent (200 kHz) interference	C/Ia1	=	C/Ic - 18 dB
-	for adjacent (400 kHz) interference	C/Ia2	=	C/Ic - 50 dB

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

Reference: 3GPP TS 45.005 Subclause 2, 6.3

The levels shall be corrected by the following values:

	MS, GMSK modulated signals	
-	for DCS 1 800 class 1 or class 2 MS	+2/+4 dB**
-	for DCS 1 800 class 3 MS	+2 dB
-	for GSM 400 small MS, GSM 900 small MS GSM 850 small MS and GSM 700 small MS	+2 dB
-	for other GSM 400, GSM 900 MS and GSM 850 MS and GSM 700 MS	0 dB
	for PCS 1900 class 1 or class 2 MS	+2 dB
	for other PCS 1900 MS	0 dB

**NOTE: For DCS 1 800 class 1 and class 2 MS, a correction offset of +2dB shall apply for the reference sensitivity performance as specified in table 1a for the normal conditions defined in Annex D and an offset of +4 dB shall be used to determine all other MS performances.

3GPP TS 45.005 Subclause 6.2

14.5.1.7.3 Test purpose

To verify that with an adjacent channel interferer at 200 kHz and at 400kHz above and below the wanted signal the MS does not exceed conformance requirements in tables 14.5.1.7-3/4 for three given codec rates under propagation condition TUhigh (for GSM 400, GSM 700, T-GSM 810, GSM 850, GSM 900, DCS 1800 and PCS 1900) with no frequency hopping, with an allowance for the statistical significance of the test.

14.5.1.7.4 Method of Test

14.5.1.7.4.1 Initial conditions

A call is set up according to the generic call set up procedure on TCH/WFS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The multirate configuration indicates the use of a codec set limited to 12.65 kbit/s.

The SS commands the MS to create the traffic channel loop back signalling erased frames.

The SS transmits Standard Test Signal C1 on the TCH (wanted signal) with an amplitude of -93 dBm + Ir + Corr, where Ir equals C/Ic in table.14.5.1.7-2 and the values for Corr are as stated above

14.5.1.7.4.2 Procedure

a) In addition to the wanted signal, the SS transmits an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal.

   The interference ratio shall be set to (C/Ic – 18 dB) for adjacent channel interference of 200 kHz and (C/Ic - 50 dB) for adjacent channel interference of 400 kHz respectively. The co-channel interference values C/Ic can be found in table 14.5.1.7-2.

The fading characteristic of the wanted and the unwanted signal is set to TUHigh.

The unwanted signal is transmitted at a nominal frequency of 200 kHz above the nominal frequency of the wanted signal. The interference ratio is set to (C/Ic – 18 dB), i.e. the amplitude of the unwanted signal is set to (18 dB – C/Ic) above that of the wanted signal.

b) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

c) The SS tests the frame erasure compliance for the TCH/WFS by examining at least the minimum number of samples of consecutive frames. The number of frame erasure events is recorded.

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib, Bits are only taken from those frames for which no bad frame indication was given.

e) The unwanted signal is moved to a nominal frequency of 200 kHz below the nominal frequency of the wanted signal. The interference ratio is set to (C/Ic – 18 dB), i.e. the amplitude of the unwanted signal is set to (18 dB – C/Ic) above that of the wanted signal.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 8.85 kbit/s. The wanted signal level is set accordingly and steps b) to d) are repeated.

g) The unwanted signal is moved to a nominal frequency of 400 kHz above the nominal frequency of the wanted signal. The interference ratio is set to (C/Ic – 50 dB), i.e. the amplitude of the unwanted signal is set to (50 dB – C/Ic) above that of the wanted signal.

h) The SS uses a Channel Mode Modify procedure to change the active codec set to 6.60 kbit/s. The wanted signal level is set accordingly and steps b) to d) are repeated.

i) The unwanted signal is moved to a nominal frequency of 400 kHz below the nominal frequency of the wanted signal. The interference ratio is set to (C/Ic – 50 dB), i.e. the amplitude of the unwanted signal is set to (50 dB – C/Ic) above that of the wanted signal. Steps b) to d) are repeated.

Maximum/Minimum Duration of Test

Maximum: 5 minutes (GSM850, GSM900), 23 minutes (DCS1800, PCS1900).

Minimum: 2 minutes (GSM850, GSM900), 4 minutes (DCS1800, PCS1900).

14.5.1.7.5 Test requirements

Testing the adjacent channel interference performance is performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with BER/BLER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of the limit lines refer to Annex 6.2

Wrong decision risk F for one single error ratio test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.5.1.7-1: Minimum test times due to TU high fading conditions

Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	428	244	201	190	95	90	s
	0:07:08	**0:04:04**	**0:03:21**	**0:03:10**	**0:01:35**	**0:01:30**	**hh:mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is done by comparing the result with the “derived test limit”. In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne $\geq$ 1 (inclusive artificial error)

For an early fail decision ne $\geq$ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

Table 14.5.1.7-2: Co-channel interference ratio C/Ic for GMSK-modulated WB-AMR channels

Type of Channel		GSM 850 and GSM 900	DCS 1 800 & PCS 1 900
		Propagation condition	
		TU50(no FH)	TU50(no FH)
TCH/ WFS12.65	dB	14.5	13.0
TCH/ WFS8.85	dB	11.5	10.0
TCH/ WFS6.60	dB	10.5	9.0

Table 14.5.1.7-3: Statistical test limits for GSM 700, T-GSM 810, GSM 850 and GSM 900 adjacent channel rejection

0.4 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
WFS 12.65	frames	12650	50	0.010000	0.012340	27958	560	00:09:20
	Class1b	12650	9050	0,004000	0,004936	69895	8	00:00:08
WFS 8.85	frames	8850	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	8850	5650	0,004200	0,005183	66566	12	00:00:12
WFS 6.60	frames	6600	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	6600	3900	0,001600	0,001974	174737	45	00:00:45

Table 14.5.1.7-3: Statistical test limits for DCS 1 800 and PCS 1 900 adjacent channel rejection

TU high no FH								
1.8 and 1.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
WFS 12.65	frames	12650	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	12650	9050	0,006300	0,007774	44378	5	00:00:05
WFS 8.85	frames	8850	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	8850	5650	0,006400	0,007898	43684	8	00:00:08
WFS 6.60	frames	6600	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	6600	3900	0,002700	0,003332	103548	27	00:00:27

14.5.1.7a Adjacent Channel Interference - TCH/WFS in TIGHTER configuration

14.5.1.7a.1 Definition

The adjacent channel selectivity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted signal in the adjacent channel.

The adjacent channel can be adjacent in the RF spectrum or in time. There are therefore two types of adjacent channel selectivity:

1) Adjacent RF channel selectivity, which is specifically tested in this subclause.

2) Adjacent Time Slot selectivity, which is not tested in this subclause.

14.5.1.7a.2 Conformance requirement

3GPP TS 45.005 subclause 6.3.3

Table 6.3-1a: Reference interference ratio requirements in adjacent channels for Packet-switched (Normal symbol-rate), Enhanced circuit-switched data, Wideband AMR and 8-PSK modulated AMR channels, speech and associated control channels in *VAMOS mode, TIGHTER* – MS

		Modulation of wanted signal				
		GMSK	8-PSK	16-QAM	32-QAM	AQPSK
for adjacent (200 kHz) interference	C/Ia1 =	C/Ic - 18 dB, see table 2af for TIGHTER MS	See table 2l for speech, see tables 2g, 2i, 2n and 2w for other channels, see table 2af for TIGHTER MS	See table 2w, see table 2af for TIGHTER MS	See table 2w, see table 2af for TIGHTER MS	See table 2aa and 2ab
for adjacent (400 kHz) interference	C/Ia2 =	C/Ic - 50 dB	C/Ic - 50 dB	C/Ic - 48 dB	C/Ic - 48 dB	[Note 1]
for adjacent (600 kHz) interference	C/Ia3 =	C/Ic - 58 dB	C/Ic - 58 dB			
NOTE 1: The adjacent channel interference @ 400 kHz requirement (C/Ia2) does not apply to channels in VAMOS mode.						

NOTE: The C/Ia3 figure is given for information purposes and will not require testing. It was calculated for the case of an equipment with an antenna connector, operating at output power levels of +33 dBm and below. Rejection of signals at 600 kHz is specified in subclause 5.1.

3GPP TS 45.005 subclause 6.3.4

For all adjacent channel (200 kHz) requirements specified in table 2af for TIGHTER MS, the wanted signal level shall be: -75 dBm + Iar + Corr, where:

Iar = the adjacent channel (200 kHz) interference ratio according to table 2af
Corr = the correction factor for reference performance according to table 6.2-4.

14.5.1.7a.3 Test purpose

To verify that with an adjacent channel interferer at 200 kHz above and below the wanted signal the MS does not exceed conformance requirements in tables 14.5.1.7a-3/4 for three given codec rates under propagation condition TUhigh (for GSM 850, GSM 900, DCS 1800 and PCS 1900) with no frequency hopping, with an allowance for the statistical significance of the test.

14.5.1.7a.4 Method of Test

14.5.1.7a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on TCH/WFS with an ARFCN in the mid ARFCN range, power control level set to maximum power.

The multirate configuration indicates the use of a codec set limited to 12.65 kbit/s.

The SS commands the MS to create the traffic channel loop back signalling erased frames.

The SS transmits Standard Test Signal C1 on the TCH (wanted signal) with an amplitude of -75 dBm + Iar + Corr, where Iar can be found in table.14.5.1.7a-2 and the values for Corr are as stated above.

14.5.1.7a.4.2 Procedure

a) The fading characteristic of the wanted and the unwanted signal is set to TUHigh.

   In addition to the wanted signal, the SS transmits an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal.

   The unwanted signal is transmitted at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set according to the specified reference interference ratio as in table 14.5.1. 7a-2.

b) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

c) The SS tests the frame erasure compliance for the TCH/WFS by examining at least the minimum number of samples of consecutive frames. The number of frame erasure events is recorded.

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining sequences of at least the minimum number of samples of consecutive bits of class Ib, Bits are only taken from those frames for which no bad frame indication was given.

e) The unwanted signal is moved to a nominal frequency of 200 kHz below the nominal frequency of the wanted signal. Its amplitude is set according to the specified reference interference ratio as in table 14.5.1.7a-2.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 8.85 kbit/s. The wanted signal level is set accordingly and steps b) to d) are repeated.

g) The unwanted signal is moved to a nominal frequency of 400 kHz above the nominal frequency of the wanted signal. The interference ratio is set to (C/Ic – 50 dB), i.e. the amplitude of the unwanted signal is set to (50 dB – C/Ic) above that of the wanted signal. The co-channel interference values C/Ic can be found in table 14.5.1.7a-3.

h) The SS uses a Channel Mode Modify procedure to change the active codec set to 6.60 kbit/s. The wanted signal level is set accordingly and steps b) to d) are repeated.

i) The unwanted signal is moved to a nominal frequency of 400 kHz below the nominal frequency of the wanted signal. The interference ratio is set to (C/Ic – 50 dB), i.e. the amplitude of the unwanted signal is set to (50 dB – C/Ic) above that of the wanted signal. Steps b) to d) are repeated. The co-channel interference values C/Ic can be found in table 14.5.1.7a-3.

Maximum/Minimum Duration of Test

Maximum: 5 minutes (GSM850, GSM900), 23 minutes (DCS1800, PCS1900).

Minimum: 2 minutes (GSM850, GSM900), 4 minutes (DCS1800, PCS1900).

14.5.1.7a.5 Test requirements

Testing the adjacent channel interference performance is performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with BER/BLER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of the limit lines refer to Annex 6.2

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.5.1.7a-1: Minimum test times due to TU high fading conditions

Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	0,43	0,35	0,33	0,17	0,16	m
min test time	428	244	201	190	95	90	s
	0:07:08	**0:04:04**	**0:03:21**	**0:03:10**	**0:01:35**	**0:01:30**	**hh:mm:ss**

The error rates measured for different channels shall be tested according to the values given in table 14.5.1.7a -4 or 14.5.1.7a-5.

Table 14.5.1.7a-2: Adjacent channel interference ratio Iar for GMSK-modulated WB-AMR channels and TIGHTER (acc. TS 45.005 table 2af)

Type of Channel		GSM 850 and GSM 900	DCS 1 800 & PCS 1 900
		Propagation condition	
		TU50(no FH)	TU50(no FH)
TCH/ WFS12.65	dB	-17.5	-19.0
TCH/ WFS8.85	dB	-20.5	-22.0
TCH/ WFS6.60	dB	-21.5	-23.0

Table 14.5.1.7a-3: Co-channel interference ratio C/Ic for GMSK-modulated WB-AMR channels (acc. TS 45.005 table 2j)

Type of Channel		GSM 850 and GSM 900	DCS 1 800 & PCS 1 900
		Propagation condition	
		TU50(no FH)	TU50(no FH)
TCH/ WFS12.65	dB	14.5	13.0
TCH/ WFS8.85	dB	11.5	10.0
TCH/ WFS6.60	dB	10.5	9.0

Table 14.5.1.7a-4: Statistical test limits for GSM 700, T-GSM 810, GSM 850 and GSM 900 adjacent channel rejection

TU high no FH								
0.4 to 0.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
WFS 12.65	Frames	12650	50	0.010000	0.012340	27958	560	00:09:20
	Class1b	12650	9050	0,004000	0,004936	69895	8	00:00:08
WFS 8.85	Frames	8850	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	8850	5650	0,004200	0,005183	66566	12	00:00:12
WFS 6.60	Frames	6600	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	6600	3900	0,001600	0,001974	174737	45	00:00:45

Table 14.5.1.7a-5: Statistical test limits for DCS 1800 and PCS 1900 adjacent channel rejection

TU high no FH								
1.8 and 1.9GHz			frames per s	Orig. BER	Derived	Target number	Target test	Target test time
	Channel	bits per sec	clas1b per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
WFS 12.65	Frames	12650	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	12650	9050	0,006300	0,007774	44378	5	00:00:05
WFS 8.85	Frames	8850	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	8850	5650	0,006400	0,007898	43684	8	00:00:08
WFS 6.60	Frames	6600	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	6600	3900	0,002700	0,003332	103548	27	00:00:27

14.5.2 Adjacent channel rejection - control channels

14.5.2.1 Definition

The adjacent channel selectivity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted signal in the adjacent channel.

The adjacent channel can be the adjacent in the RF spectrum or in time. There are therefore two types of adjacent channel selectivity:

1) Adjacent RF channel selectivity which is specifically tested in this subclause.

2) Adjacent Time Slot selectivity, which is implicitly tested in test 14.2.1.

14.5.2.2 Conformance requirement

1. For adjacent channel interference at 200 kHz above and below the wanted signal frequency and signal level 9 dB above the wanted signal level:

   1.1 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, the FER for the FACCH/F does not exceed the requirements of table 2 in 3GPP TS 05.05 subclause 6.3.

   1.2 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, the FER for the FACCH/F does not exceed the requirements of table 2 in 3GPP TS 05.05 under extreme test conditions; 3GPP TS 05.05 subclause 6.3, annex D subclauses D.2.1and D.2.2.

2 With adjacent channel interference at 400 kHz above and below the wanted signal frequency and signal level 41 dB above the wanted signal level:

   2.1 For a TUhigh faded wanted signal and a static adjacent channel interferer, the FER for the FACCH/F shall be better than:

   GSM 400, GSM 700, GSM 850 and GSM 900: 17,1 %; 3GPP TS 05.05, subclause 6.3;

   DCS 1 800 and PCS 1 900: 6,1 %; 3GPP TS 05.05, subclause 6.3.

   2.2 For a TUhigh faded wanted signal and a static adjacent channel interferer, the FACCH/F shall be better than:

   GSM 400, GSM 700, GSM 850 and GSM 900: 17,1 %;

   DCS 1 800 and PCS 1 900: 6,1 %.

   under extreme test conditions; 3GPP TS 05.05, subclause 6.3, annex D subclauses D.2.1 and D.2.2.

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.5.2.3 Test purpose

1 To verify that with TUhigh adjacent channel interference at 200 kHz above and below a TUhigh wanted signal frequency and signal level 9 dB above the wanted signal level:

   1.1 Conformance requirement 1.1 is met with an allowance for the statistical significance of the test.

   1.2 Conformance requirement 1.2 is met with an allowance for the statistical significance of the test.

2. To verify that with static adjacent channel interference at 400 kHz above and below a TUhigh wanted signal frequency and signal level 41 dB above the wanted signal level:

   2.1 Conformance requirement 2.1 is met with an allowance for the statistical significance of the test.

   2.2 Conformance requirement 2.2 is met with an allowance for the statistical significance of the test.

14.5.2.4 Method of test

14.5.2.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/F in the mid ARFCN range. Any one of the supported TCH/(F9,6, F4,8, or F2,4) or TCH (Signalling Only) shall be used.

The SS transmits the Standard Test Signal C1 on the TCH (wanted signal).

14.5.2.4.2 Procedure

a) In addition to the wanted signal, the SS transmits an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. The fading characteristic of the wanted and the unwanted signal is TUhigh.

The unwanted signal is transmitted at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to 9dB above that of the wanted signal.

b) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Due to the adjacent channel interference, the MS may not be able to acknowledge the Layer 2 frame. Each repeated L2 frame indicates a frame erasure event. The SS determines the number of frame erasure events during at least the minimum number of samples of FACCH/F frames.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.

c) The measurement of step b) is repeated with the unwanted signal on a frequency at the same displacement from, but below, the frequency of the wanted signal.

d) The measurement of steps a) to c) is repeated for a displacement of the unwanted signal of 400 kHz, and with the amplitude of the unwanted signal 41 dB above the level of the wanted input signal, and the unwanted signal static.

e) Steps a) to d) are repeated under extreme test conditions.

14.5.2.5 Test requirements

Table 14-23: Limits for adjacent channel selectivity

Interference at	Channel	Type of measurement	Test limit error rate %	Minimum No. of samples	Test limit error rate %	Minimum No. of samples
200 kHz	FACCH/F	FER	10,640	5 639	3,808	15 756
400 kHz	FACCH/F	FER	19,152	3 133	6,832	8 782

The error rates measured in this test shall not exceed the test limit error rates given in table 14-23. This shall apply for any combination of normal and extreme test voltages and ambient temperature, and with the interfering signals at either side of the wanted frequency.

NOTE: A static unwanted signal is used to avoid a potential problem with the noise floor of the fading simulator.

14.6 Intermodulation rejection

14.6.1 Intermodulation rejection - speech channels

14.6.1.1 Definition

The intermodulation rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of two or more unwanted signals with a specific frequency relationship to the wanted signal frequency.

For E-GSM 900 and R-GSM 900 MS this test is only performed in the P-GSM band.

14.6.1.2 Conformance requirement

In the presence of two unwanted signals with a specific frequency relationship to the wanted signal frequency the Class II RBER for TCH/FS shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 5.3.

14.6.1.3 Test purpose

To verify that the MS does not exceed the conformance requirement with an allowance for the statistical significance of the test.

14.6.1.4 Method of test

NOTE: The measurements address the third order intermodulation, which represents the most serious case.

14.6.1.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH with an ARFCN in the Mid ARFCN range, power control level set to maximum power.

The SS transmits Standard Test Signal C1 on the traffic channel.

14.6.1.4.2 Procedure

a) The amplitude of the wanted signal is set to 4 dB above the reference sensitivity level (see table 14-24).

b) The SS commands the MS to create the loop back facility signalling erased frames.

c) The SS produces a static wanted signal, and two static interfering (unwanted) signals at the same time. There is no correlation in the modulation between the signals.

The first interfering signal is on a frequency equal to the centre frequency of an ARFCN four above that of the receiver. This signal is static and unmodulated.

The second interfering signal is on an ARFCN eight above that of the receiver. This signal is static, continuous and modulated by random data.

The amplitude of both the interfering signals is set according to table 14-24.

d) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

The SS tests the RBER compliance of class II bits by examining at least the minimum number of samples of consecutive bits. Bits only taken from those frames which do not signal frame erasure. The number of error events is recorded.

e) The measurement of step d) is repeated with the two unwanted signals having frequencies corresponding to ARFCN four and eight below the ARFCN of the wanted signal.

f) Steps b) to e), are repeated but with the receiver operating on an ARFCN in the Low ARFCN range.

g) Steps b) to e), are repeated but with the receiver operating on an ARFCN in the High ARFCN range.

h) Steps a) to g) are repeated under extreme test conditions.

Table 14-24: Intermodulation test signal levels

	GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900		DCS 1 800		PCS 1 900
	Small MS	Other MS	Class 1 and 2	Class 3	
WANTED SIGNAL dBμVemf( )	15	13	17	15	15
FIRST INTERFERER dBμVemf( )	64	74	64	68	64
SECOND INTERFERER dBμVemf( )	63	63	64	68	64

NOTE: Some of the levels in table 14-24 are different to those specified in 3GPP TS 05.05 due to the consideration of the effect of modulation sideband noise from the second interferer.

14.6.1.5 Test requirements

The error rate measured in this test shall not exceed the test limit error rate values given in table 14-25.

This shall apply under normal condition and under any combination of normal and extreme test voltages and ambient temperature, and with the two interfering signals at either side of the wanted frequency.

Table 14-25: Limits for intermodulation rejection

Channel	Propagation conditions	Type of measurement	Test limit error rate %	Minimum No. of samples
TCH/FS Class II	Static	RBER	2,439	8 200

14.6.2 Intermodulation rejection - control channels

14.6.2.1 Definition

The intermodulation rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of two or more unwanted signals with a specific frequency relationship to the wanted signal frequency.

For E-GSM 900 and R-GSM 900 MS this test is only performed in the P-GSM band.

14.6.2.2 Conformance requirement

In the presence of two unwanted signals with a specific frequency relationship to the wanted signal frequency the FER for FACCH/F shall meet the reference sensitivity performance of table 1 in 3GPP TS 05.05 subclause 5.3.

14.6.2.3 Test purpose

To verify that the MS does not exceed the conformance requirement with an allowance for the statistical significance of the test.

14.6.2.4 Method of test

NOTE: The measurements address the third order intermodulation, which represents the most serious case.

14.6.2.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH with an ARFCN in the Mid ARFCN range, power control level set to maximum.

The SS transmits Standard Test Signal C1 on the traffic channel. The amplitude of the wanted signal is set to 4 dB above the reference sensitivity level (see table 14-25).

14.6.2.4.2 Procedure

a) The SS produces a TUhigh wanted signal, and two static interfering (unwanted) signals at the same time. There is no correlation in the modulation between the signals.

   The first interfering signal is on a frequency equal to the centre frequency of an ARFCN four above that of the receiver. This signal is static and unmodulated.

   The second interfering signal is on an ARFCN eight above that of the receiver. This signal is static, continuous and modulated by random data.

   The amplitude of both the interfering signals is set according to table 14-26.

b) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. The SS determines the number of frame erasure events during at least the minimum number of samples of FACCH/F frames.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.

c) The measurement of step b) is repeated with the two unwanted signals having frequencies corresponding to ARFCN four and eight below the ARFCN of the wanted signal.

d) Steps a) to c), are repeated but with the receiver operating on an ARFCN in the Low ARFCN range.

e) Steps a) to c), are repeated but with the receiver operating on an ARFCN in the High ARFCN range.

f) Steps a) to e) are repeated under extreme test conditions.

Table 14-26: Intermodulation test signal levels

	GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900		DCS 1 800		PCS 1 900
	Small MS	Other MS	Class 1 and 2	Class 3	
WANTED SIGNAL dBμVemf( )	15	13	17	15	15
FIRST INTERFERER dBμVemf( )	64	74	64	68	64
SECOND INTERFERER dBμVemf( )	63	63	64	68	64

NOTE: Some of the levels in table 14-26 are different to those specified in 3GPP TS 05.05 due to the consideration of the effect of modulation sideband noise from the second interferer.

14.6.2.5 Test requirements

The error rate measured in this test shall not exceed the test limit error rate values given in table 14-27.

This shall apply under normal condition and under any combination of normal and extreme test voltages and ambient temperature, and with the two interfering signals at either side of the wanted frequency.

Table 14-27: Limits for intermodulation rejection

			GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900		DCS 1 800 and PCS 1 900	
Channel	**Propagation conditions**	**Type of measurement**	**Test limit error rate %**	**Minimum No. of max-samples**	**Test limit error rate %**	**Min No. of max-samples**
FACCH/F	TUhigh/No FH	FER	8,961	6 696	4,368	13 736

14.7 Blocking and spurious response

14.7.1 Blocking and spurious response - speech channels

14.7.1.1 Definition

Blocking is a measure of the ability of the receiver to receive a modulated wanted input signal in the presence of an unwanted input signal, on frequencies other than those of the spurious responses or the adjacent channels, without exceeding a given degradation.

14.7.1.2 Conformance requirement

1. The blocking characteristics of the receiver are specified separately for in-band and out-of-band performance as identified in 3GPP TS 05.05 subclause 5.1.

   The reference sensitivity performance as specified in table 1 of 3GPP TS 05.05 shall be met when the following signals are simultaneously input to the receiver:

   - a useful signal at frequency f_0, 3 dB above the reference sensitivity level as specified in 3GPP TS 05.05 subclause 6.2;

   - a continuous, static sine wave signal at a level as in the table of 3GPP TS 05.05 subclause 5.1 and at a frequency (f) which is an integer multiple of 200 kHz;

   with the following exceptions, called spurious response frequencies:

   a) GSM 700, GSM 850 and GSM 900: in band, for a maximum of six occurrences (which if grouped shall not exceed three contiguous occurrences per group);

      DCS 1 800: in band, for a maximum of twelve occurrences (which if grouped shall not exceed three contiguous occurrences per group);

PCS 1 900: in band, for a maximum of twelve occurrences (which if grouped shall not exceed three contiguous occurrences per group);

GSM 400: in band, for a maximum of three occurrences;

b) out of band, for a maximum of 24 occurrences (which if below f_0 and grouped shall not exceed three contiguous occurrences per group).

where the above performance shall be met when the continuous sine wave signal (f) is set to a level of 70 dBµV (emf) (i.e. -43 dBm). 3GPP TS 05.05, subclause 5.1.

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.7.1.3 Test purpose

1. To verify that the in band blocking performance is met without exceeding the total number of allowed in band spurious responses. An allowance is made for the statistical significance of the test.

2. To verify that at selected out of band frequencies, the out of band blocking performance is met without exceeding the total number of allowed out of band spurious responses. An allowance is made for the statistical significance of the test.

NOTE: Not all of the possible out of band frequencies are tested as this results in excessive test time. However, the total number of out of band spurious responses, specified in 3GPP TS 05.05, are allowed to ensure a fair test of the MS.

14.7.1.4 Method of test

14.7.1.4.1 Initial conditions

A call is set up according to the generic call set up procedure, except the BCCH frequency list shall be empty, on a TCH with an arbitrary ARFCN in the range supported by the MS. The power control level is set to maximum power. The ARFCN of the BCCH shall be the same - or at an offset of +/- 2 channels, than that of the ARFCN for the TCH.

The SS transmits Standard Test Signal C1 on the traffic channel. (TCH frequency FR).

The SS commands the MS to create traffic channel loop back signalling erased frames.

14.7.1.4.2 Procedure

a) The SS produces a static wanted signal and a static interfering signal at the same time. The amplitude of the wanted signal is set to 4 dB above the reference sensitivity level.

b) The unwanted signal is a C.W. signal (Standard test signal IO) of frequency FB. It is applied in turn on the subset of frequencies calculated in step c) in the overall range 100 kHz to 12,75 GHz, where FB is an integer multiple of 200 kHz.

However, frequencies in the range FR ±600 kHz are excluded.

NOTE: Allowance must be made for possible spurious signals arising from the SS. These are particularly likely at sub harmonic frequencies nFB where n = 2, 3, 4, 5, etc.

c) The frequencies at which the test is performed (adjusted to an integer multiple of 200 kHz channels most closely approximating the absolute frequency of the calculated blocking signal frequency) are the combined frequencies from i), ii) and iii) below:-

i) The total frequency range formed by:

GSM 400 the frequencies between $F_{lo} + (IF_1 + IF_2 + ... + IF_n + 3,6\ MHz)$

and $F_{lo} - (IF_1 + IF_2 + ... + IF_n + 3,6\ MHz)$.

GSM 700 and T-GSM 810 the frequencies between $F_{lo} + (IF_1 + IF_2 + ... + IF_n + 7,5\ MHz)$

and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 7,5 MHz).

GSM 850 and P-GSM 900 the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n +1 2,5 MHz)

and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 12,5 MHz).

E-GSM 900 the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n + 17,5 MHz)

and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 17,5 MHz).

DCS 1 800 the frequencies between F_{lo} + (IF_1 + IF_2 + ... +IF_n + 37,5 MHz)

and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 37,5 MHz).

PCS 1 900 the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n + 30,0 MHz)

and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 30,0 MHz).

and

the frequencies +100 MHz and -100 MHz from the edge of the relevant receive band.

Measurements are made at 200 kHz intervals.

ii) The three frequencies IF_1, IF_1 + 200 kHz, IF_1 - 200 kHz.

iii) The frequencies:

$mF_{lo} + IF_1$;

$mF_{lo} - IF_1$;

mFR;

where m is all positive integers greater than or equal to 2 such that either sum lies in the range 100 kHz to 12,75 GHz.

The frequencies in step ii) and iii) lying in the range of frequencies defined by step i) above need not be repeated.

Where:

F_{lo}	- local oscillator applied to first receiver mixer
IF_1 ... IF_n	- are the n intermediate frequencies
F_{lo}, IF_1, IF_2 ... IF_n	- shall be declared by the manufacturer in the PIXIT statement 3GPP TS 51.010-1 annex 3.

d) The level of the unwanted signal is set according to table 14-28.

Table 14-28a: Level of unwanted signals

	GSM 900		DCS 1 800
	Small MS	Other MS	
FREQUENCY	LEVEL IN dBμVemf( )		
FR ±600 kHz to FR ±800 kHz	70	75	70
FR ±800 kHz to FR ±1,6 MHz	70	80	70
FR ±1,6 MHz to FR ±3 MHz	80	90	80
915 MHz to FR - 3 MHz	90	90	-
FR + 3 MHz to 980 MHz	90	90	-
1 785 MHz to FR - 3 MHz	-	-	87
FR + 3 MHz to 1 920 MHz	-	-	87
835 MHz to < 915 MHz	113	113	
> 980 MHz to 1 000 MHz	113	113	
100 kHz to < 835 MHz	90	90	
> 1 000 MHz to 12,75 GHz	90	90	
100 kHz to 1 705 MHz	-	-	113
> 1 705 MHz to < 1 785 MHz	-	-	101
> 1 920 MHz to 1 980 MHz	-	-	101
> 1 980 MHz to 12,75 GHz	-	-	90

Table 14-28b: Level of unwanted signals

	GSM 450		GSM 480	
	Small MS	Other MS	Small MS	Other MS
FREQUENCY	LEVEL IN dBμVemf( )			
FR ±600 kHz to FR ±800 kHz	70	75	70	75
FR ±800 kHz to FR ±1,6 MHz	70	80	70	80
FR ±1,6 MHz to FR ±3 MHz	80	90	80	90
457,6 MHz to FR - 3 MHz	90	90	-	-
FR + 3 MHz to 473,6 MHz	90	90	-	-
486 MHz to FR - 3 MHz	-	-	90	90
FR + 3 MHz to 502 MHz	-	-	90	90
100 kHz to < 457,6 MHz	113	113	-	-
> 473,6 MHz to 12,75 GHz	113	113	-	-
100 kHz to < 486 MHz	-	-	113	113
> 502 MHz to 12,75 GHz	-	-	113	113

Table 14-28c: Level of unwanted signals

	PCS 1 900
FREQUENCY	LEVEL IN dBμVemf( )
FR ±600 kHz to FR ±800 kHz	70
FR ±800 kHz to FR ±1,6 MHz	70
FR ±1,6 MHz to FR ±3 MHz	80
1 910 MHz to FR - 3 MHz	87
FR + 3 MHz to 2 010 MHz	87
100 kHz to 1 830 MHz	113
> 1 830 MHz to < 1 910 MHz	101
> 2 010 MHz to 2 070 MHz	101
> 2 070 MHz to 12,75 GHz	90

Table 14-28d: Level of unwanted signals

	GSM 710	GSM 750	T-GSM 810	GSM 850
FREQUENCY	**LEVEL IN dBμVemf( )**			
FR ±600 kHz to FR ±800 kHz	70	70	70	70
FR ±800 kHz to FR ±1,6 MHz	70	70	70	70
FR ±1,6 MHz to FR ±3 MHz	80	80	80	80
678 MHz to FR - 3 MHz	90	-	-	-
FR + 3 MHz to 728 MHz	90	-	-	-
727 MHz to FR - 3 MHz	-	90	-	-
FR + 3 MHz to 777 MHz	-	90	-	-
831 MHz to FR - 3 MHz	-	-	90	-
FR + 3 MHz to 886 MHz	-	-	90	-
849 MHz to FR - 3 MHz	-	-	-	90
FR + 3 MHz to 914 MHz	-	-	-	90
678 MHz to FR - 3 MHz	113	-	-	-
FR + 3 MHz to 728 MHz	113	-	-	-
100 kHz to < 727 MHz	-	113	-	-
> 777 MHz to 12,75 GHz	-	113	-	-
100 kHz to 831 MHz	-	-	113	-
> 886 MHz to 12,75 MHz	-	-	113	-
100 kHz to < 849 MHz	-	-	-	113
> 914 MHz to 12,75 GHz	-	-	-	113

NOTE 1: These values differ from 3GPP TS 05.05 because of practical generator limits in the SS.

NOTE 2: For an E-GSM 900 MS the level of the unwanted signal in the band 905 MHz to < 915 MHz is relaxed to 108 dBuVemf( ).

NOTE 3: For a GSM 450 small MS the level of the unwanted signal in the band 450,4 MHz to < 457,6 MHz is relaxed to 108 dBuVemf( ). For a GSM 480 small MS the level of the unwanted signal in the band 478,8 MHz to < 486 MHz is relaxed to 108 dBuVemf( ).

e) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

   The SS tests the RBER compliance for the bits of class II, by examining sequences of at least the minimum number of samples of consecutive bits of class II, where bits are taken only from those frames for which no bad frame indication was given. The number of error events is recorded.

   If a failure is indicated it is noted and counted towards the allowed exemption totals.

   In the case of failures discovered at the predicted frequencies at steps f ii), iii) or iv) the test is repeated on the adjacent channels ±200 kHz away. If either of these two frequencies fail then the next channel 200 kHz beyond is also tested. This process is repeated until all channels constituting the group of failures is known.

14.7.1.5 Test requirements

The error rate measured in this test shall not exceed the conformance requirement. Testing the conformance requirement can be done either in the classical way with a fixed minimum number of samples (refer to section 14.7.1.5.2) or using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with performance not on the limit (refer to section 14.7.1.5.1). Both methods are based on a bad DUT factor M = 1.5.

This shall apply under normal test voltage and ambient temperature, and with the interfering signal at any frequency in the range specified.

The following exceptions are allowed:

GSM 450: A maximum of three failures in the frequency band 457,6 MHz to 473,6 MHz.

A maximum of 24 failures in the combined bands 100 kHz to 457,6 MHz and 473,6 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

GSM 480: A maximum of three failures in the frequency band 486 MHz to 502 MHz.

A maximum of 24 failures in the combined bands 100 kHz to 486 MHz and 502 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

GSM 710: A maximum of six failures in the frequency band 678 MHz to 728 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 failures in the combined bands 100 kHz to 678 MHz and 728 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

GSM 750: A maximum of six failures in the frequency band 727 MHz to 782 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 failures in the combined bands 100 kHz to 727 MHz and 782 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

GSM 810: A maximum of six failures in the frequency band 831 MHz to 886 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 failures in the combined bands 100 kHz to 831 MHz and 886 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

GSM 850: A maximum of six failures in the frequency band 849 MHz to 914 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 failures in the combined bands 100 kHz to 849 MHz and 914 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

GSM 900: A maximum of six failures in the frequency band 915 MHz to 980 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 failures in the combined bands 100 kHz to 915 MHz and 980 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

DCS 1 800: A maximum of twelve failures in the band 1 785 MHz to 1 920 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 in the combined bands 100 kHz to 1 785 MHz and 1 920 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

PCS 1 900: A maximum of twelve failures in the band 1 910 MHz to 2 010 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 in the combined bands 100 kHz to 1 910 MHz and 2 010 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

If the number of failures do not exceed the maximum allowed figures stated above, the test of 14.7.1.4 is repeated at the frequencies at which the failures occurred. The level of the unwanted signal is set to 70 dBμVemf( ) and the performance requirement is once again that stated in the table above.

The number of Error Events recorded in this test shall not exceed the test limit error rate values given below, when using either the accelerated BER method or the maximum number of samples. No failures are allowed at this lower unwanted signal level.

14.7.1.5.1 Statistical testing of blocking and spurious response performance with early decision

For more information on statistical testing of blocking and spurious response performance, especially the definition of limit lines refer to Annex 7.

Wrong decision risk F for one single error rate test:

$F_{pass} \neq F_{fail}$ As the blocking test case comprises of many BER tests the wrong decision risk for a fail decision of one single error rate test must be smaller than the wrong decision risk for a pass decision to avoid an increased probability of an erroneous fail decision.

$F_{pass} = 0.2\%$

F_{fail} = 0.02%

Wrong decision probability D per test step:

$D_{pass} \neq D_{fail}$

D_{pass} = 0.008%

D_{fail} = 0.0008%

Parameters for limit lines:

1. D_{pass} = 0.008% wrong decision probability per test step for early pass decision.

   D_{fail} = 0.0008% wrong decision probability per test step for early fail decision.

2. M = 1.5 bad DUT factor
3. ne number of (error) events.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

For an early decision a minimum number of measured (error) events is necessary.

For an early pass decision ne $\geq$ 1

For an early fail decision ne $\geq$ 8

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The statistical test limits for blocking performance with early decision are given in Table 14-29a

Table 14-29a: Statistical test limits for blocking performance

Channel	bits per s	Orig. RBER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
TCH/FS Class II	3900	0,020000	0,025020	16107	4	00:00:04

14.7.1.5.2 Fixed testing of blocking and spurious response performance with minimum number of samples

The fixed testing of the conformance requirement is done using the minimum number of samples and the limit RBER given in table 14-29c

Table 14-29c: Limits for blocking

Channel	Type of measurement	Test limit error rate %	Minimum number of samples
TCH/FS Class II	RBER	2,439	8 200

14.7.2 Blocking and spurious response - control channels

14.7.2.1 Definition

Blocking is a measure of the ability of the receiver to receive a modulated wanted input signal in the presence of an unwanted input signal, on frequencies other than those of the spurious responses or the adjacent channels, without exceeding a given degradation.

14.7.2.2 Conformance requirement

1. The blocking characteristics of the receiver are specified separately for in-band and out-of-band performance as identified in 3GPP TS 05.05 subclause 5.1.

The reference sensitivity performance as specified in table 1 of 3GPP TS 05.05 shall be met when the following signals are simultaneously input to the receiver:

- a useful signal at frequency f_0, 3 dB above the reference sensitivity level as specified in 3GPP TS 05.05 subclause 6.2;
- a continuous, static sine wave signal at a level as in the table of 3GPP TS 05.05 subclause 5.1 and at a frequency (f) which is an integer multiple of 200 kHz.

  with the following exceptions, called spurious response frequencies:

  a) GSM 700, GSM 850 or GSM 900: in band, for a maximum of six occurrences (which if grouped shall not exceed three contiguous occurrences per group);

     DCS 1 800: in band, for a maximum of twelve occurrences (which if grouped shall not exceed three contiguous occurrences per group);

     PCS 1 900: in band, for a maximum of twelve occurrences (which if grouped shall not exceed three contiguous occurrences per group);

     GSM 400: in band, for a maximum of three occurrences;

  b) out of band, for a maximum of 24 occurrences (which if below f_0 and grouped shall not exceed three contiguous occurrences per group).

where the above performance shall be met when the continuous sine wave signal (f) is set to a level of 70 dBµV (emf) (i.e. -43 dBm). 3GPP TS 05.05, subclause 5.1.

14.7.2.3 Test purpose

1. To verify that the in band blocking performance is met without exceeding the total number of allowed in band spurious responses. An allowance is made for the statistical significance of the test.
2. To verify that at selected out of band frequencies, the out of band blocking performance is met without exceeding the total number of allowed out of band spurious responses. An allowance is made for the statistical significance of the test.

NOTE: Not all of the possible out of band frequencies are tested as this results in excessive test time. However, the total number of out of band spurious responses, specified in 3GPP TS 05.05, are allowed to ensure a fair test of the MS.

14.7.2.4 Method of test

14.7.2.4.1 Initial conditions

A call is set up according to the generic call set up procedure, except the BCCH frequency list shall be empty, on a TCH with an arbitrary ARFCN in the range supported by the MS. The power control level is set to maximum power. The ARFCN of the BCCH shall be the same - or at an offset of +/- 2 channels, than that of the ARFCN for the TCH.

The SS transmits Standard Test Signal C1 on the traffic channel. (TCH frequency FR).

14.7.2.4.2 Procedure

a) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Due to interfering signals, the MS may not be able to acknowledge the Layer 2 frame. Frame erasures are indicated by repeated L2 frames.

b) The SS is set to produce a TUhigh wanted signal and a static interfering signal at the same time. The SS sets the amplitude of the wanted signal to 4 dB above the reference sensitivity level.

c) The unwanted signal is a C.W. signal (Standard test signal IO) of frequency FB. It is applied in turn on the subset of frequencies calculated at step f) in the overall range 100 kHz to 12,75 GHz, where FB is an integer multiple of 200 kHz.

   However, frequencies in the range FR ±600 kHz are excluded.

NOTE: Allowance must be made for possible spurious signals arising from the SS. These are particularly likely at sub harmonic frequencies nFB where n = 2, 3, 4, 5, etc.

d) The frequencies at which the test is performed (adjusted to an integer multiple of 200 kHz channels most closely approximating the absolute frequency of the calculated blocking signal frequency) are the combined frequencies from i), ii) and iii) which follow:

i) The total frequency range formed by:-

GSM 400 the frequencies between $F_{lo} + (IF_1 + IF_2 + ... + IF_n + 3{,}6$ MHz)

and $F_{lo} - (IF_1 + IF_2 + ... + IF_n + 3{,}6$ MHz).

GSM 700 the frequencies between $F_{lo} + (IF_1 + IF_2 + ... + IF_n + 7{,}5$ MHz)

and $F_{lo} - (IF_1 + IF_2 + ... + IF_n + 7{,}5$ MHz).

GSM 850 the frequencies between $F_{lo} + (IF_1 + IF_2 + ... + IF_n + 12{,}5$ MHz)

and $F_{lo} - (IF_1 + IF_2 + ... + IF_n + 12{,}5$ MHz).

P-GSM 900 the frequencies between $F_{lo} + (IF_1 + IF_2 + ... + IF_n + 12{,}5$ MHz)

and $F_{lo} - (IF_1 + IF_2 + ... + IF_n + 12{,}5$ MHz).

E-GSM 900 the frequencies between $F_{lo} + (IF_1 + IF_2 + ... + IF_n +1\ 7{,}5$ MHz)

and $F_{lo} - (IF_1 + IF_2 + ... + IF_n + 17{,}5$ MHz).

DCS 1 800 the frequencies between $F_{lo} + (IF_1 + IF_2 + ... + IF_n + 37{,}5$ MHz)

and $F_{lo} - (IF_1 + IF_2 + ... + IF_n + 37{,}5$ MHz).

PCS 1 900 the frequencies between $F_{lo} + (IF_1 + IF_2 + ... + IF_n + 30{,}0$ MHz)

and $F_{lo} - (IF_1 + IF_2 + ... + IF_n + 30{,}0$ MHz).

and

the frequencies +100 MHz and -100 MHz from the edge of the relevant receive band.

Measurement are made at 200 kHz intervals.

ii) The three frequencies IF_1, IF_1 + 200 kHz, IF_1 - 200 kHz.

iii) The frequencies:

$mF_{lo} + IF_1$;

$mF_{lo} - IF_1$;

mFR;

where m is all positive integers greater than or equal to 2 such that either sum lies in the range 100 kHz to 12,75 GHz.

The frequencies in step ii) and iii) lying in the range of frequencies defined by step i) above need not be repeated.

Where:

F_{lo}	- local oscillator applied to first receiver mixer
$IF_1 ... IF_n$	- are the n intermediate frequencies
$F_{lo}, IF_1, IF_2 ... IF_n$	- shall be declared by the manufacturer in the PIXIT statement 3GPP TS 51.010-1 annex 3.

e) The level of the unwanted signal is set according to table 14-30.

Table 14-30a: Level of unwanted signals

	GSM 900		DCS 1 800
	Small MS	Other MS	
FREQUENCY	LEVEL IN dBμVemf( )		
FR ±600 kHz to FR ±800 kHz	70	75	70
FR ±800 kHz to FR ±1,6 MHz	70	80	70
FR ±1,6 MHz to FR ±3 MHz	80	90	80
915 MHz to FR - 3 MHz	90	90	-
FR + 3 MHz to 980 MHz	90	90	-
1785 MHz to FR - 3 MHz	-	-	87
FR + 3 MHz to 1 920 MHz	-	-	87
835 MHz to < 915 MHz	113	113	
> 980 MHz to 1 000 MHz	113	113	
100 kHz to < 835 MHz	90	90	
> 1 000 MHz to 12,75 GHz	90	90	
100 kHz to 1 705 MHz	-	-	113
> 1 705 MHz to < 1 785 MHz	-	-	101
> 1 920 MHz to 1 980 MHz	-	-	101
> 1 980 MHz to 12,75 GHz	-	-	90

Table 14-30b: Level of unwanted signals

	GSM 450		GSM 480	
	Small MS	Other MS	Small MS	Other MS
FREQUENCY	LEVEL IN dBμVemf( )			
FR ±600 kHz to FR ±800 kHz	70	75	70	75
FR ±800 kHz to FR ±1,6 MHz	70	80	70	80
FR ±1,6 MHz to FR ±3 MHz	80	90	80	90
457,6 MHz to FR - 3 MHz	90	90	-	-
FR + 3 MHz to 473,6 MHz	90	90	-	-
486 MHz to FR - 3 MHz	-	-	90	90
FR + 3 MHz to 502 MHz	-	-	90	90
100 kHz to < 457,6 MHz	113	113	-	-
> 473,6 MHz to 12,75 GHz	113	113	-	-
100 kHz to < 486 MHz	-	-	113	113
> 502 MHz to 12,75 GHz	-	-	113	113

Table 14-30c: Level of unwanted signals

	PCS 1 900
FREQUENCY	LEVEL IN dBμVemf( )
FR ±600 kHz to FR ±800 kHz	70
FR ±800 kHz to FR ±1,6 MHz	70
FR ±1,6 MHz to FR ±3 MHz	80
1 910 MHz to FR - 3 MHz	87
FR + 3 MHz to 2 010 MHz	87
100 kHz to 1 830 MHz	113
> 1 830 MHz to < 1 910 MHz	101
> 2 010 MHz to 2 070 MHz	101
> 2 070 MHz to 12,75 GHz	90

Table 14-30d: Level of unwanted signals

	GSM 710	GSM 750	T-GSM 810	GSM 850
FREQUENCY	LEVEL IN dBμVemf( )			
FR ±600 kHz to FR ±800 kHz	70	70	70	70
FR ±800 kHz to FR ±1,6 MHz	70	70	70	70
FR ±1,6 MHz to FR ±3 MHz	80	80	80	80
678 MHz to FR - 3 MHz	90	-	-	-
FR + 3 MHz to 728 MHz	90	-	-	-
727 MHz to FR - 3 MHz	-	90	-	-
FR + 3 MHz to 777 MHz	-	90	-	-
831 MHz to FR - 3 MHz	-	-	90	-
FR + 3 MHz to 886 MHz	-	-	90	-
849 MHz to FR - 3 MHz	-	-	-	90
FR + 3 MHz to 914 MHz	-	-	-	90
678 MHz to FR - 3 MHz	113	-	-	-
FR + 3 MHz to 728 MHz	113	-	-	-
100 kHz to < 727 MHz	-	113	-	-
> 782 MHz to 12,75 GHz	-	113	-	-
100 kHz to 831 MHz	-	-	113	-
> 886 MHz to 12,75 MHz	-	-	113	-
100 kHz to < 849 MHz	-	-	-	113
> 914 MHz to 12,75 GHz	-	-	-	113

NOTE 1: These values differ from 3GPP TS 05.05 because of practical generator limits in the SS.

NOTE 2: For an E-GSM 900 MS the level of the unwanted signal in the band 905 MHz to < 915 MHz is relaxed to 108 dBuVemf( ).

NOTE 3: For a GSM 450 small MS the level of the unwanted signal in the band 450,4 MHz to <457,6 MHz is relaxed to 108 dBuVemf( ). For a GSM 480 small MS the level of the unwanted signal in the band 478,8 MHz to <486 MHz is relaxed to 108 dBuVemf( ).

f) The SS determines the number of frame erasure events during at least the minimum number of samples. If a failure is indicated, it is noted and counted towards the allowed exemption total.

In the case of failures discovered at the predicted frequencies at steps f ii), iii) or iv) the test is repeated on the adjacent channels ±200 kHz away. If either of these two frequencies fail then the next channel 200 kHz beyond is also be tested. This process is repeated until all channels constituting the group of failures is known.

14.7.2.5 Test requirements

The error rate measured in this test shall not exceed the test limit error rate given in table 14-31.

This shall apply under normal test voltage and ambient temperature, and with the interfering signal at any frequency in the range specified.

Table 14-31: Limits for blocking

		GSM 400 and GSM 900		DCS 1 800 and PCS 1 900	
Channel	Type of measurement	Test limit error rate	Minimum No. of samples	Test limit error rate	Minimum No. of samples
FACCH/F	FER	8,961	6 696	4,368	13 736

The following exceptions are allowed:

GSM 450: A maximum of three failures in the frequency band 457,6 MHz to 473,6 MHz.

A maximum of 24 failures in the combined bands 100 kHz to 457,6 MHz and 473,6 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

GSM 480: A maximum of three failures in the frequency band 486 MHz to 502 MHz.

A maximum of 24 failures in the combined bands 100 kHz to 486 MHz and 502 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

GSM 710: A maximum of six failures in the frequency band 678 MHz to 728 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 failures in the combined bands 100 kHz to 678 MHz and 728 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

GSM 750: A maximum of six failures in the frequency band 727 MHz to 782 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 failures in the combined bands 100 kHz to 727 MHz and 782 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

T-GSM 810: A maximum of six failures in the frequency band 831 MHz to 886 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 failures in the combined bands 100 kHz to 831 MHz and 886 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

GSM 850: A maximum of six failures in the frequency band 849 MHz to 914 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 failures in the combined bands 100 kHz to 849 MHz and 914 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

GSM 900: A maximum of six failures in the band 915 MHz to 980 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 in the combined bands 100 kHz to 915 MHz and 980 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

DCS 1 800: A maximum of twelve failures in the band 1785 MHz to 1 920 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 in the combined bands 100 kHz to 1785 MHz and 1 920 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

PCS 1 900: A maximum of twelve failures in the band 1 910 MHz to 2 010 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 in the combined bands 100 kHz to 1 910 MHz and 2 010 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

If the number of failures do not exceed the maximum allowed figures stated above, the test of 14.7.2.4 is repeated at the frequencies at which the failures occurred. The level of the unwanted signal is set to 70 dBμVemf( ) and the performance requirement is once again that stated above.

The number of Error Events recorded in this test shall not exceed the test limit error rate values given above, when using the maximum number of samples.

No failures are allowed at this lower unwanted signal level.

14.7.3 Blocking and spurious response - speech channels for MS supporting the R-GSM band

14.7.3.1 Definition

Blocking is a measure of the ability of the receiver to receive a modulated wanted input signal in the presence of an unwanted input signal, on frequencies other than those of the spurious responses or the adjacent channels, without exceeding a given degradation.

14.7.3.2 Conformance requirement

1. The blocking characteristics of the receiver are specified separately for in-band and out-of-band performance as identified in 3GPP TS 05.05 subclause 5.1.

   The reference sensitivity performance as specified in table 1 of 3GPP TS 05.05 shall be met when the following signals are simultaneously input to the receiver:

   - a useful signal at frequency f_0, 3 dB above the reference sensitivity level as specified in 3GPP TS 05.05 subclause 6.2;

   - a continuous, static sine wave signal at a level as in the table of 3GPP TS 05.05 subclause 5.1 and at a frequency (f) which is an integer multiple of 200 kHz.

   With the following exceptions, called spurious response frequencies:

   a) R-GSM 900: in band, for a maximum of six occurrences (which if grouped shall not exceed three contiguous occurrences per group);

   b) out of band, for a maximum of 24 occurrences (which if below f_0 and grouped shall not exceed three contiguous occurrences per group).

   Where the above performance shall be met when the continuous sine wave signal (f) is set to a level of 70 dBµV (emf) (i.e. -43 dBm). 3GPP TS 05.05, subclause 5.1.

14.7.3.3 Test purpose

1. To verify that the in band blocking performance is met without exceeding the total number of allowed in band spurious responses. An allowance is made for the statistical significance of the test.

2. To verify that at selected out of band frequencies, the out of band blocking performance is met without exceeding the total number of allowed out of band spurious responses. An allowance is made for the statistical significance of the test.

NOTE: Not all of the possible out of band frequencies are tested as this results in excessive test time. However, the total number of out of band spurious responses, specified in 3GPP TS 05.05, are allowed to ensure a fair test of the MS.

14.7.3.4 Method of test

14.7.3.4.1 Initial conditions

A call is set up according to the generic call set up procedure, except the BCCH frequency list shall be empty, on a TCH with an arbitrary ARFCN in the range supported by the MS. The power control level is set to maximum power. The ARFCN of the BCCH shall be the same - or at an offset of +/- 2 channels, than that of the ARFCN for the TCH.

The SS transmits Standard Test Signal C1 on the traffic channel. (TCH frequency FR).

The SS commands the MS to create traffic channel loop back signalling erased frames.

14.7.3.4.2 Procedure

a) The SS produces a static wanted signal and a static interfering signal at the same time. The amplitude of the wanted signal is set to 4 dB above the reference sensitivity level.

b) The unwanted signal is a C.W. signal (Standard test signal IO) of frequency FB. It is applied in turn on the subset of frequencies calculated in step c) in the overall range 100 kHz to 12,75 GHz, where FB is an integer multiple of 200 kHz.

   However, frequencies in the range FR ±600 kHz are excluded.

NOTE: Allowance must be made for possible spurious signals arising from the SS. These are particularly likely at sub harmonic frequencies nFB where n = 2, 3, 4, 5, etc.

c) The frequencies at which the test is performed (adjusted to an integer multiple of 200 kHz channels most closely approximating the absolute frequency of the calculated blocking signal frequency) are the combined frequencies from i), ii) and iii) below:-

i) The total frequency range formed by:-

R-GSM 900 the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n + 19,5 MHz)

and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 19,5 MHz).

And the frequencies +100 MHz and -100 MHz from the edge of the relevant receive band.

Measurements are made at 200 kHz intervals.

ii) The three frequencies IF_1, IF_1 + 200 kHz, IF_1 - 200 kHz.

iii) The frequencies:

$mF_{lo} + IF_1$;

$mF_{lo} - IF_1$;

mFR;

where m is all positive integers greater than or equal to 2 such that either sum lies in the range 100 kHz to 12,75 GHz.

The frequencies in step ii) and iii) lying in the range of frequencies defined by step i) above need not be repeated.

Where:

F_{lo}	- local oscillator applied to first receiver mixer
IF_1 ... IF_n	- are the n intermediate frequencies
F_{lo}, IF_1, IF_2 ... IF_n	- shall be declared by the manufacturer in the PIXIT statement 3GPP TS 51.010-1 annex 3.

d) The level of the unwanted signal is set according to table 14-28b.

Table 14-28b: Level of unwanted signals for R-GSM MS

	R-GSM 900	
	Small MS	**Other MS**
FREQUENCY	**LEVEL IN dBμVemf( )**	
FR ±600 kHz to FR ±800 kHz	70	75
FR ±800 kHz to FR ±1,6 MHz	70	80
FR ±1,6 MHz to FR ±3 MHz	80	90
915 MHz to FR - 3 MHz	90	90
FR + 3 MHz to 980 MHz	90	90
1 785 MHz to FR - 3 MHz	-	-
FR + 3 MHz to 1 920 MHz	-	-
835 MHz to < 876 MHz	113	113
876 MHz to 880 MHz	106	113
880 MHz to 915 MHz	106	108
> 980 MHz to 1 000 MHz	113	113
100 kHz to < 835 MHz	90	90
> 1 000 MHz to 12,75 GHz	90	90

NOTE: These values differ from 3GPP TS 05.05 because of practical generator limits in the SS.

e) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

The SS tests the RBER compliance for the bits of class II, by examining sequences of at least the minimum number of samples of consecutive bits of class II, where bits are taken only from those frames for which no bad frame indication was given. The number of error events is recorded.

If a failure is indicated it is noted and counted towards the allowed exemption totals.

In the case of failures discovered at the predicted frequencies at steps f ii), iii) or iv) the test is repeated on the adjacent channels ±200 kHz away. If either of these two frequencies fail then the next channel 200 kHz beyond is also tested. This process is repeated until all channels constituting the group of failures is known.

14.7.3.5 Test requirements

The error rate measured in this test shall not exceed the test limit error rate values given in table 14-29b.

This shall apply under normal test voltage and ambient temperature, and with the interfering signal at any frequency in the range specified.

Table 14-29b: Limits for blocking

Channel	Type of measurement	Test limit error rate %	Minimum number of samples
TCH/FS Class II	RBER	2,439	8 200

The following exceptions are allowed:

R-GSM 900: A maximum of six failures in the frequency band 915 MHz to 980 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 failures in the combined bands 100 kHz to 915 MHz and 980 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

If the number of failures do not exceed the maximum allowed figures stated above, the test of 14.7.3.4 is repeated at the frequencies at which the failures occurred. The level of the unwanted signal is set to 70 dBµVemf( ) and the performance requirement is once again that that stated in the table above.

The number Error rate measured in this test shall not exceed the test limit error rate values given in table 14-29b.

No failures are allowed at this lower unwanted signal level.

14.7.4 Blocking and spurious response - control channels for MS supporting the R-GSM band

14.7.4.1 Definition

Blocking is a measure of the ability of the receiver to receive a modulated wanted input signal in the presence of an unwanted input signal, on frequencies other than those of the spurious responses or the adjacent channels, without exceeding a given degradation.

14.7.4.2 Conformance requirement

1. The blocking characteristics of the receiver are specified separately for in-band and out-of-band performance as identified in 3GPP TS 05.05 subclause 5.1.

   The reference sensitivity performance as specified in table 1 of 3GPP TS 05.05 shall be met when the following signals are simultaneously input to the receiver:

   - a useful signal at frequency f_0, 3 dB above the reference sensitivity level as specified in 3GPP TS 05.05 subclause 6.2;

   - a continuous, static sine wave signal at a level as in the table of 3GPP TS 05.05 subclause 5.1 and at a frequency (f) which is an integer multiple of 200 kHz.

     With the following exceptions, called spurious response frequencies:-

     a) R-GSM 900: in band, for a maximum of six occurrences (which if grouped shall not exceed three contiguous occurrences per group);

     b) out of band, for a maximum of 24 occurrences (which if below f_0 and grouped shall not exceed three contiguous occurrences per group).

Where the above performance shall be met when the continuous sine wave signal (f) is set to a level of 70 dB µV (emf) (i.e. -43 dBm). 3GPP TS 05.05, subclause 5.1.

14.7.4.3 Test purpose

1. To verify that the in band blocking performance is met without exceeding the total number of allowed in band spurious responses. An allowance is made for the statistical significance of the test.
2. To verify that at selected out of band frequencies, the out of band blocking performance is met without exceeding the total number of allowed out of band spurious responses. An allowance is made for the statistical significance of the test.

NOTE: Not all of the possible out of band frequencies are tested as this results in excessive test time. However, the total number of out of band spurious responses, specified in 3GPP TS 05.05, are allowed to ensure a fair test of the MS.

14.7.4.4 Method of test

14.7.4.4.1 Initial conditions

A call is set up according to the generic call set up procedure, except the BCCH frequency list shall be empty, on a TCH with an arbitrary ARFCN in the range supported by the MS. The power control level is set to maximum power. The ARFCN of the BCCH shall be the same - or at an offset of +/- 2 channels, than that of the ARFCN for the TCH.

The SS transmits Standard Test Signal C1 on the traffic channel. (TCH frequency FR).

14.7.4.4.2 Procedure

a) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Due to interfering signals, the MS may not be able to acknowledge the Layer 2 frame. Frame erasures are indicated by repeated L2 frames.

b) The SS is set to produce a TUhigh wanted signal and a static interfering signal at the same time. The SS sets the amplitude of the wanted signal to 4 dB above the reference sensitivity level.

c) The unwanted signal is a C.W. signal (Standard test signal IO) of frequency FB. It is applied in turn on the subset of frequencies calculated at step f) in the overall range 100 kHz to 12,75 GHz, where FB is an integer multiple of 200 kHz.

   However, frequencies in the range FR ±600 kHz are excluded.

NOTE: Allowance must be made for possible spurious signals arising from the SS. These are particularly likely at sub harmonic frequencies nFB where n = 2, 3, 4, 5, etc.

d) The frequencies at which the test is performed (adjusted to an integer multiple of 200 kHz channels most closely approximating the absolute frequency of the calculated blocking signal frequency) are the combined frequencies from i), ii) and iii) which follow:

   i) The total frequency range formed by:-

   R-GSM 900 the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n + 19,5 MHz)

   and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 19,5 MHz).

   and

   the frequencies +100 MHz and -100 MHz from the edge of the relevant receive band.

   Measurement are made at 200 kHz intervals.

   ii) The three frequencies IF_1, IF_1 + 200 kHz, IF_1 - 200 kHz.

   iii) The frequencies:

   $mF_{lo} + IF_1$;

   $mF_{lo} - IF_1$;

mFR;

where m is all positive integers greater than or equal to 2 such that either sum lies in the range 100 kHz to 12,75 GHz.

The frequencies in step ii) and iii) lying in the range of frequencies defined by step i) above need not be repeated.

Where:

F_{lo} - local oscillator applied to first receiver mixer

IF_1 ... IF_n - are the n intermediate frequencies

F_{lo}, IF_1, IF_2 ... IF_n - shall be declared by the manufacturer in the PIXIT statement 3GPP TS 51.010-1 annex 3.

e) The level of the unwanted signal is set according to table 14-30b.

Table 14-30b: Level of unwanted signals

	GSM 900	
	Small MS	Other MS
FREQUENCY	LEVEL IN dBµVemf( )	
FR ±600 kHz to FR ±800 kHz	70	75
FR ±800 kHz to FR ±1,6 MHz	70	80
FR ±1,6 MHz to FR ±3 MHz	80	90
915 MHz to FR - 3 MHz	90	90
FR + 3 MHz to 980 MHz	90	90
835 MHz to < 876 MHz	113	113
876 MHz to 880 MHz	106	113
880 MHz to 915 MHz	106	108
> 980 MHz to 1 000 MHz	113	113
100 kHz to < 835 MHz	90	90
>1000 MHz to 12,75 GHz	90	90

NOTE: These values differ from 3GPP TS 05.05 because of practical generator limits in the SS.

f) The SS determines the number of frame erasure events during at least the minimum number of samples. If a failure is indicated, it is noted and counted towards the allowed exemption total.

In the case of failures discovered at the predicted frequencies at steps f ii), iii) or iv) the test is repeated on the adjacent channels ±200 kHz away. If either of these two frequencies fail then the next channel 200 kHz beyond is also be tested. This process is repeated until all channels constituting the group of failures is known.

14.7.4.5 Test requirements

The error rate measured in this test shall not exceed the test limit error rate given in table 14-31b.

This shall apply under normal test voltage and ambient temperature, and with the interfering signal at any frequency in the range specified.

Table 14-31b: Limits for blocking

		GSM 900		DCS 1 800	
Channel	Type of measurement	Test limit error rate	Minimum No. of samples	Test limit error rate	Minimum No. of samples
FACCH/F	FER	8,961	6 696	4,368	13 736

The following exceptions are allowed:

R-GSM 900: A maximum of six failures in the band 915 MHz to 980 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 in the combined bands 100 kHz to 915 MHz and 980 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

If the number of failures do not exceed the maximum allowed figures stated above, the test of 14.7.4.4 is repeated at the frequencies at which the failures occurred. The level of the unwanted signal is set to 70 dBμVemf( ) and the performance requirement is once again that stated above.

The number of Error Events recorded in this test shall not exceed the test limit error rate values given above, when using the maximum number of samples.

No failures are allowed at this lower unwanted signal level.

14.8 AM suppression

14.8.1 AM suppression - speech channels

14.8.1.1 Definition

AM suppression is a measure of the ability of the receiver to receive a modulated wanted input signal in the presence of an unwanted TDMA modulated interferer.

14.8.1.2 Conformance requirement

The reference sensitivity performance as specified in table 1 shall be met when the following signals are simultaneously input to the receiver:

- a useful signal at frequency f_0, 3 dB above the reference sensitivity level as specified in 3GPP TS 05.05 subclause 5.2.
- a single frequency (f), in the relevant receive band, $|f - f_0| \geq$ 6MHz, which is an integer multiple of 200 kHz, a GSM TDMA signal modulated by any 148-bits subsequence of the 511-bits pseudo random bit sequence, defined in ITU-T Recommendation O.153 fascicle IV.4, at a level as defined in the table below. The interferer shall have one timeslot active and the frequency shall be at least 2 channels separated from any identified spurious responses. The transmitted bursts shall be synchronized to but, delayed in time between 61 and 86 bit periods relative to the bursts of the wanted signal. 3GPP TS 05.05, subclause 5.2.

MS type	Signal level
GSM 400	-31 dBm
GSM 700	-31 dBm
GSM 850	-31 dBm
GSM 900	-31 dBm
DCS 1 800	-29 / -31 dBm (note)
PCS 1 900	-31 dBm
NOTE: The –31 dBm level shall apply to DCS 1 800 class 1 and class 2 MS meeting the –102 dBm reference sensitivity level requirement according to 3GPP TS 05.05, subclause 6.2.	

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.8.1.3 Test purpose

To verify that the AM suppression performance of the MS meets the conformance requirement with an allowance for the statistical significance of the test.

14.8.1.4 Method of test

14.8.1.4.1 Initial conditions

A call is set up according to the generic call set up procedure, on a TCH/FS with an ARFCN in the mid ARFCN range. The power control level is set to maximum power.

The SS transmits standard Test Signal C1 on the traffic channel (TCH frequency FR).

The SS commands the MS to create traffic channel loop back signalling erased frames.

This test is performed after test 14.7.

14.8.1.4.2 Procedure

a) The SS produces a static wanted signal with an amplitude 4 dB above reference sensitivity level.

b) The SS produces an interfering signal as described below:

- static fading profile;
- at an in band frequency greater than 6 MHz separated from FR and separated by at least two ARFCNs from any spurious responses.

NOTE: Spurious responses are identified by test cases 14.7.1 and 14.7.2.

- at a level as described in table 14-32.
- GSM TDMA modulated by random data with one timeslot active.
- synchronized to, but delayed between 61 and 86 bit periods to the bursts of the wanted signal.

Table 14-32: Interferer signal level

MS type	Signal level (dBμVemf)
GSM 400	82
GSM 700	82
T-GSM 810	82
GSM 850	82
GSM 900	82
DCS 1 800	82/84
PCS 1 900	82
NOTE: The 82 dBμVemf (i.e. -31 dBm) level shall apply to DCS 1 800 class 1 and class 2 MS meeting the -102 dBm reference sensitivity level requirement according to 3GPP TS 05.05, subclause 6.2.	

c) The SS compares the data of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS tests the RBER compliance of class II bits by examining at least the minimum number of samples of consecutive bits. Bits only taken from those frames which do not signal frame erasure. The number of error events is recorded.

14.8.1.5 Test requirements

The error rates measured in this test shall not exceed the test limit error rate values given in table 14.27.

Table 14-33: Limits for AM suppression

Channel	Propagation conditions	Type of measurement	Test limit error rate %	Minimum No. of samples
TCH/FS Class II	Static	RBER	2,439	8 200

14.8.2 AM suppression - control channels

14.8.2.1 Definition

AM suppression is a measure of the ability of the receiver to receive a modulated wanted input signal in the presence of an unwanted TDMA modulated interferer.

14.8.2.2 Conformance requirement

The reference sensitivity performance as specified in table 1 shall be met when the following signals are simultaneously input to the receiver:

- a useful signal at frequency f_0, 3 dB above the reference sensitivity level as specified in 3GPP TS 05.05 subclause 5.2.
- a single frequency (f), in the relevant receive band, $|f - f_0| \geq$ 6MHz, which is an integer multiple of 200 kHz, a GSM TDMA signal modulated by any 148-bits subsequence of the 511-bits pseudo random bit sequence, defined in ITU-T Recommendation O.153 fascicle IV.4, at a level as defined in the table below. The interferer shall have one timeslot active and the frequency shall be at least 2 channels separated from any identified spurious responses. The transmitted bursts shall be synchronized to but, delayed in time between 61 and 86 bit periods relative to the bursts of the wanted signal. 3GPP TS 05.05, subclause 5.2.

MS type	Signal level
GSM 400	-31 dBm
GSM 700	-31 dBm
GSM 850	-31 dBm
GSM 900	-31 dBm
DCS 1 800	-29 / -31 dBm (note)
PCS 1 900	-31 dBm
NOTE: The –31 dBm level shall apply to DCS 1 800 class 1 and class 2 MS meeting the –102 dBm reference sensitivity level requirement according to 3GPP TS 05.05, subclause 6.2.	

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.8.2.3 Test purpose

To verify that the AM suppression performance of the MS meets the conformance requirement with an allowance for the statistical significance of the test.

14.8.2.4 Method of test

14.8.2.4.1 Initial conditions

A call is set up according to the generic call set up procedure, on a TCH with an ARFCN in the mid ARFCN range. The power control level is set to maximum power.

The SS transmits standard Test Signal C1 on the traffic channel (TCH frequency FR).

This test is performed after test 14.7.

14.8.2.4.2 Procedure

a) The SS produces a TUhigh wanted signal with an amplitude 4 dB above reference sensitivity level.

b) The SS produces an interfering signal as described below:

  - static fading profile;
  - t an in band frequency greater than 6 MHz separated from FR and separated by at least two ARFCNs from any spurious responses.

NOTE: Spurious responses are identified by test cases 14.7.1 and 14.7.2.

- at a level as described in table 14-34.
- GSM TDMA modulated by random data with one timeslot active.
- synchronized to, but delayed between 61 and 86 bit periods to the bursts of the wanted signal.

Table 14-34: Interferer signal level

MS type	Signal level (dBμVemf)
GSM 400	82
GSM 700	82
T-GSM 810	82
GSM 850	82
GSM 900	82
DCS 1 800	82/84
PCS 1 900	82
NOTE: The 82 dBμVemf (i.e. –31 dBm) level shall apply to DCS 1 800 class 1 and class 2 MS meeting the –102 dBm reference sensitivity level requirement according to 3GPP TS 05.05, subclause 6.2.	

c) The SS sends the status message. Due to interfering signals, the MS may not be able acknowledge the Layer 2 frame. Frame erasures are indicated by repeated L2 frames.

d) The SS determines the number of frame erasure events during at least the minimum number of samples. If a failure is indicated, it is noted and counted towards the allowed exemption total.

14.8.2.5 Test requirements

The error rates measured in this test shall not exceed the test limit error rate values given in table 14.35.

Table 14-35: Limits for AM suppression

			GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900		DCS 1 800 and PCS 1 900	
Channel	**Propagation conditions**	**Type of measurement**	**Test limit error rate %**	**Minimum No. of max-samples**	**Test limit error rate %**	**Min No. of max-samples**
FACCH/F	TUhigh/No FH	FER	8,961	6 696	4,368	13 736

14.8.3 AM suppression - packet channels

14.8.3.1 Definition

AM suppression is a measure of the ability of the receiver to receive a modulated wanted input signal in the presence of an unwanted TDMA modulated interferer.

14.8.3.2 Conformance requirement

The reference sensitivity performance as specified in tables 1, 1a, 1c and 1e, adjusted by the correction factors of table 6.2-4, shall be met when the following signals are simultaneously input to the receiver.

- A useful signal, modulated with the relevant supported modulation (GMSK or 8-PSK) and symbol rate, at frequency f_0, 3 dB above the reference sensitivity level or input level for reference performance, whichever applicable, as specified in sub clause 6.2
- A single frequency (f), in the relevant receive band, $|f - f_0| \geq 6$MHz, which is an integer multiple of 200 kHz, a GSM TDMA signal modulated by any 148-bits subsequence of the 511-bits pseudo random bit sequence, defined in ITU-T Recommendation O.153 fascicle IV.4, at a level as defined in the table below. The interferer shall have one timeslot active and the frequency shall be at least 2 channels separated from any identified spurious responses. The transmitted bursts shall be synchronized to but, delayed in time between 61 and 86 bit periods relative to the bursts of the wanted signal.

MS type	Signal level
GSM 400	-31 dBm
GSM 700	-31 dBm
GSM 850	-31 dBm
GSM 900	-31 dBm
DCS 1 800	-29 / -31 dBm (note)
PCS 1 900	-31 dBm
NOTE: The –31 dBm level shall apply to DCS 1 800 class 1 and class 2 MS meeting the –102 dBm reference sensitivity level requirement according to 3GPP TS 45.005, subclause 6.2.	

3GPP TS 45.005, subclause 5.2

The block error rate (BLER) performance for PDTCH/MCS5 to 9 shall not exceed 10 % or 30 % depending on Coding Schemes.

The block error rate (BLER) performance for USF/MCS5 shall not exceed 1 %.

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP TS 45.005 subclause 6.2

14.8.3.3 Test purpose

To verify that the AM suppression performance of the MS meets the conformance requirements with an allowance for the statistical significance of the test.

14.8.3.4 Method of test

14.8.3.4.1 Initial conditions

For 8-PSK modulation a downlink TBF is set up according to the generic procedure specified in clause 50 for packet switched with an ARFCN in the Mid ARFCN range, power control level set to maximum. The power control parameter ALPHA (α) is set to 0. The MCS is set to MCS-5 and the SS shall transmit on the maximum number of receive timeslots.

For the USF BLER parts of the test case the test mode defined in GSM Rec. 4.14 (para 5.4) will be used for uplink TBF. If the MS is capable of both:

Mode (a) transmitting pseudo-random data sequence in RLC data blocks

Mode (b) transmitting looped-back RLC data blocks

then Mode (a) will be used.

If Mode (b) is used then the SS sends the pseudo-random data sequence specified for Mode (a) on the downlink for loopback on the uplink.

The SS transmits EGPRS RLC data blocks containing random data.

This test is performed after test 14.18.5.

14.8.3.4.2 Procedure

a) The SS produces a static wanted signal with an amplitude 4 dB above reference sensitivity level according 3GPP 45.005 table 1c.

b) The SS produces an interfering signal as described below:

   - static fading profile;

   - at an in band frequency greater than 6 MHz separated from FR and separated by at least two ARFCNs from any spurious responses.

NOTE: Spurious responses are identified by test case 14.18.5.

- at a level as described in table 14.8.3-1.
- GSM TDMA modulated by random data with one timeslot active.
- synchronized to, but delayed between 61 and 86 bit periods to the bursts of the wanted signal.

Table 14.8.3-1: Interferer signal level

MS type	Signal level (dBμVemf)
GSM 400	82
GSM 700	82
T-GSM 810	82
GSM 850	82
GSM 900	82
DCS 1 800	82/84
PCS 1 900	82
NOTE: The 82 dBμVemf (i.e. -31 dBm) level shall apply to DCS 1 800 class 1 and class 2 MS meeting the -102 dBm reference sensitivity level requirement according to 3GPP TS 05.05, subclause 6.2.	

c) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 04.60, 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

d) The SS sets the value of the USF/MCS-5 according 3GPP 45.005 table 1c.

e) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

NOTE: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can sent this message.

14.8.3.5 Test requirements

The error rates measured in this test shall not exceed the test limit error rate values given in table 14.8.3-2.

Table 14.8.3-2: Limits for AM suppression

Channel	Propagation conditions	Type of measurement	Test limit error rate %	Minimum No. of samples
MCS-5	Static	BLER	10	2000
USF/MCS-5	Static	BLER	1	20 000

14.9 Paging performance at high input levels

14.9.1 Definition

The paging performance at high input levels is the signal level at the MS receiver input at which a certain FER for the PCH must be achieved.

14.9.2 Conformance requirement

The paging performance at high input levels requirements of 3GPP TS 05.05 subclause 6.5 a) for PCH under static propagation conditions shall be met from 20 dB above reference sensitivity level up to -15 dBm for GSM 400, GSM 700, GSM 850 and GSM 900 and -23 dBm for DCS 1 800 and PCS 1 900.

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.9.3 Test purpose

To verify that the MS does not exceed the conformance requirement with an allowance for the statistical significance of the test.

14.9.4 Method of test

14.9.4.1 Initial conditions

System Simulator:
1 cell, Tx-Integer = 3, MAX RETRANS is set to minimum. The CCCH is combined with SDCCH.
BS_PA_MFRMS = 9 to achieve worst case sleep mode (DRX). The signal level at the receiver input is set to:

GSM 400: -15 dBm;

GSM 700: -15 dBm;

GSM 850: -15 dBm;

T-GSM 810: -15 dBm;

GSM 900: -15 dBm;

DCS 1800: -23 dBm;

PCS 1 900: -23 dBm.

Mobile Station:
The MS has a valid TMSI. It is "idle updated". The MS should have been powered up immediately before running the test, i.e. if a Location update is necessary the MS must be switched off and on again.

14.9.4.2 Procedure

The MS is paged and the SS starts timer T3113. If a CHANNEL REQUEST is received before expiry of T3113 the SS sends an IMMEDIATE ASSIGNMENT REJECT. The sequence is performed 4 times.

Between two consecutive executions the SS must wait for an amount of time which is enough to guarantee that the MS is in service (listening to its paging subchannel).

14.9.5 Test requirements

If the MS answers all pagings with a CHANNEL REQUEST the requirements are met.

NOTE: The probability for a good MS to fail this test is less than 1 %.

14.10 Performance of the Codec Mode Request Generation for Adaptive Multi-Rate Codecs

14.10.1 Performance of the Codec Mode Request Generation – TCH/AFS

14.10.1.1 Definition

When a traffic channel supporting an Adaptive Multi-Rate speech codec is activated, the Codec Mode Request is sent by MS in band every other speech frame to indicate to the Network the recommended codec mode of the ACS to use on the downlink.

14.10.1.2 Conformance Requirement

For TULow channel conditions with ideal frequency hopping without DTX activated, the MS shall produce Codec Mode Requests with the following accuracy:

Requirement 1: When a carrier to interferer ratio 4 dB higher than a defined upper threshold is applied to the antenna connector, the MS shall request a higher mode with a probability exceeding 90%. This shall be measured immediately after a settling-time of 200 ms.

Requirement 2: When a carrier to interferer ratio 4 dB lower than a defined lower threshold is applied to the antenna connector, the MS shall request a lower mode with a probability exceeding 90%. This shall be measured immediately after a settling-time of 200 ms.

If required, the above test levels shall be reduced by the fixed normalization factor defined in sub-clause 3.3.1 of TS 45.009 to account for potential improved receiver performances.

NOTE: Ideal frequency hopping assumes perfect decorrelation between bursts. For the propagation profile TU3, this is not easily achievable due to the high number of hopping frequencies required. Therefore, performance tests should be performed under ideal frequency hopping conditions for the following propagation profiles: TU50 for GSM900 and GSM850, TU25 for DCS1800 and PCS1900, TU100 for GSM400, and TU60 for GSM700.

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.10.1.3 Test Purpose

1. To verify that the MS does not exceed conformance requirement 1 under TUHigh and frequency hopping propagation conditions without DTX with an allowance for the statistical significance of the test.

2. To verify that the MS does not exceed conformance requirement 2 under TUHigh and frequency hopping propagation conditions without DTX with an allowance for the statistical significance of the test.

3. To implicitly verify the correct implementation of the AMR Thresholds and Hysteresis parameters received in either an ASSIGNMENT COMMAND or MODE MODIFY procedure, or through an AMR_CONFIG_REQ or THRESH_REQ message carried in a RATSCCH.

NOTE: This would normally be performed as a signalling test, however due to the complex layer 1 requirements it is verified here. Any future modification or Change Request on this section should take into account this additional test objective.

14.10.1.4 Method of Test

14.10.1.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AFS with a hopping pattern in the Mid ARFCN range and covering at least 10 frequencies not exceeding 5 MHz. DTX shall not be activated. Power control level shall be set to maximum power.

The initial configuration indicates the use of the 12.2 mode of AMR only.

The SS transmits Standard Test Signal C1 on the traffic channel.

In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

- The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Initially, the unwanted signal is switched off.
- The fading characteristic of the wanted and the interfering signal is TUHigh.

NOTE 1: The fading characteristics shall be TU50 for GSM900, T-GSM 810 and GSM850, TU25 for DCS1800 and PCS1900, TU100 for GSM400, and TU60 for GSM700.

Specific PICS Statements:

-

PIXIT Statements:

- AMR C/I normalization factor.

14.10.1.4.2 Procedure

INITIAL CONFIG:

1a) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	TCH/AFS in kbit/s
CODEC_MODE_4	10,2
CODEC_MODE_3	7.4
CODEC_MODE_2	6,7
CODEC_MODE_1	5,15

With Initial Codec Mode unspecified, thus the default ICM rule being used and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_4	Thr1d = 17.5 dB	+ ∞
CODEC_MODE_3	Thr2d = 14.5 dB	Thr1u = 19.5 dB
CODEC_MODE_2	Thr3d = 12.5 dB	Thr2u = 16.5 dB
CODEC_MODE_1	– ∞	Thr3u = 14.5 dB

The SS uses the expected Initial Codec Mode (default rule) after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode (default rule).

1b) The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	TCH/AFS in kbit/s
CODEC_MODE_3	12,2
CODEC_MODE_2	7.95
CODEC_MODE_1	4,75

With the Initial Codec Mode set to the 12.2 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 12.5 dB	+ ∞
CODEC_MODE_2	Thr2d = 6.5 dB	Thr1u = 14.5 dB
CODEC_MODE_1	– ∞	Thr2u = 8.5 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

The SS waits until the MS indicates in the CMR that the 12.2 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr1u. The SS waits 500ms.

1c) The downlink radio environment is altered so that the carrier to interference ratio is reduced to 4 dB below the highest of the downwards thresholds Thr1d. The SS increments the counter for ‘C/I decreases below thresholds’.

1d) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 7.95 kbit/s or a lower codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

1e) The SS switches the downlink codec mode to 7.95 kbit/s and waits for 0.5s.

1f) The downlink radio environment is altered so that the carrier to interference ratio is reduced to 4 dB below the lowest of the downwards thresholds Thr2d. The SS increments the counter for ‘C/I decreases below thresholds’.

1g) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 4.75 kbits/s codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

1h) The SS switches the downlink codec mode to 4.75 kbit/s and waits for 0.5s.

1i) The downlink radio environment is altered so that the carrier to interference ratio is increased to 4 dB above the lowest of the upwards thresholds Thr2u. The SS increments the counter for ‘C/I increases above thresholds’.

1j) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 7.95 kbit/s or a higher codec mode in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

1k) The SS switches the downlink codec mode to 7.95 kbit/s and waits for 0.5s.

1l) The downlink radio environment is altered so that the carrier to interference ratio is increased to 4 dB above the highest of the upwards thresholds Thr1u. The SS increments the counter for ‘C/I increases above thresholds’.

1m) The SS checks the CMR received by the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use 12.2 kbit/s in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

1n) The SS switches the downlink codec mode to 12.2 kbit/s and waits for 0.5s.

1o) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 2:

2a) The unwanted signal is removed.

The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	TCH/AFS in kbit/s
CODEC_MODE_4	10,2
CODEC_MODE_3	7.4
CODEC_MODE_2	6,7
CODEC_MODE_1	5,15

With the Initial Codec Mode set to any mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_4	Thr1d = 17.5 dB	$+\infty$
CODEC_MODE_3	Thr2d = 14.5 dB	Thr1u = 19.5 dB
CODEC_MODE_2	Thr3d = 12.5 dB	Thr2u = 16.5 dB
CODEC_MODE_1	$-\infty$	Thr3u = 14.5 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

2b) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	TCH/AFS in kbit/s
CODEC_MODE_3	12,2
CODEC_MODE_2	7.95
CODEC_MODE_1	4,75

With the Initial Codec Mode set to the 12.2 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 11.5 dB	+ ∞
CODEC_MODE_2	Thr2d = 5.5 dB	Thr1u = 13.5 dB
CODEC_MODE_1	– ∞	Thr2u = 7.5 dB

The SS switches the downlink codec to the Initial Codec Mode after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode.

The SS waits until the MS indicates in the CMR that the 12.2 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr1u. The SS waits 500ms

2c) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 3:

3a) The unwanted signal is removed.

The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the AMR 7.95 kbit/s mode only:

The SS switches the downlink codec to the 7.95 mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested codec. The SS waits for the MS to change the uplink codec to the expected codec, 12 frames after receiving the ACK_OK message.

3b) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	TCH/AFS in kbit/s
CODEC_MODE_3	12,2
CODEC_MODE_2	7.95
CODEC_MODE_1	4,75

With the Initial Codec Mode set to the 12.2 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 18.5 dB	+ ∞
CODEC_MODE_2	Thr2d = 10.5 dB	Thr1u = 20.5 dB
CODEC_MODE_1	– ∞	Thr2u = 12.5 dB

The SS switches the downlink codec to the Initial Codec Mode after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode

The SS waits until the MS indicates in the CMR that the 12.2 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

3c) The SS then sends a THRESH_REQ through a RATSCCH message commanding the MS to modify the Thresholds and Hysteresis to the following values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 13.5 dB	+ ∞
CODEC_MODE_2	Thr2d = 7.5 dB	Thr1u = 15.5 dB
CODEC_MODE_1	– ∞	Thr2u = 9.5 dB

The SS waits 12 frames after receiving the ACK_OK message.

3d) The SS waits until the MS indicates in the CMR that the 12.2 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr1u. The SS waits 500ms

3e) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 4:

4a) The unwanted signal is removed.

The SS uses a Channel Mode Modify procedure commanding the MS to use the AMR 10.2 kbit/s mode only:

The SS waits for the MS to change the uplink codec to the 10.2 kbit/s mode.

4b) The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	TCH/AFS in kbit/s
CODEC_MODE_3	12,2
CODEC_MODE_2	7.95
CODEC_MODE_1	4,75

With the Initial Codec Mode set to the 12.2 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 12.5 dB	+ ∞
CODEC_MODE_2	Thr2d = 6.5 dB	Thr1u = 14.5 dB
CODEC_MODE_1	– ∞	Thr2u = 8.5 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

The SS waits until the MS indicates in the CMR that the 12.2 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr1u. The SS waits 500ms

4c) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

NOTE: The core specifications state that an MS shall respond to a change of C/I within 200ms. The core specifications place no bounds on magnitude or rate of change of C/I. For this test the magnitude of change is bounded by THRESH and HYST selection, and the rate of change is bounded by the 500ms wait periods. These bounds are selected to ensure an MS implementation is not adversely biased by this test.

Maximum/Minimum Duration of Test

Maximum/minimum: 54 minutes (GSM850, GSM900, DCS1800, PCS1900).

14.10.1.5 Test requirements

The requirement and minimum set of samples shall not exceed the values given in the following table for each set of thresholds.

Event	Maximum allowed error rate	Minimum No. of samples
C/I increases over Thresholds	11%	2000
C/I decreases below Thresholds	11%	2000

NOTE: The maximum allowed error rates for the C/I thresholds are derived from the average of the C/I event counters in Step 1 to Step 4 of the method of test.

14.10.2 Performance of the Codec Mode Request Generation – TCH/AHS

14.10.2.1 Definition

When a traffic channel supporting an Adaptive Multi-Rate speech codec is activated, the Codec Mode Request is sent by MS in band every other speech frame to indicate to the Network the recommended codec mode of the ACS to use on the downlink.

14.10.2.2 Conformance Requirement

For TULow channel conditions with ideal frequency hopping without DTX activated, the MS shall produce Codec Mode Requests with the following accuracy:

Requirement 1: When a carrier to interferer ratio 4 dB higher than a defined upper threshold is applied to the antenna connector, the MS shall request a higher mode with a probability exceeding 90%. This shall be measured immediately after a settling-time of 200 ms.

Requirement 2: When a carrier to interferer ratio 4 dB lower than a defined lower threshold is applied to the antenna connector, the MS shall request a lower mode with a probability exceeding 90%. This shall be measured immediately after a settling-time of 200 ms.

If required, the above test levels shall be reduced by the fixed normalization factor defined in sub-clause 3.3.1 of TS 45.009 to account for potential improved receiver performances.

NOTE: Ideal frequency hopping assumes perfect decorrelation between bursts. For the propagation profile TU3, this is not easily achievable due to the high number of hopping frequencies required. Therefore, performance tests should be performed under ideal frequency hopping conditions for the following propagation profiles: TU50 for GSM900 and GSM850, TU25 for DCS1800 and PCS1900, TU100 for GSM400, and TU60 for GSM700.

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.10.2.3 Test Purpose

1. To verify that the MS does not exceed conformance requirement 1 under TUHigh and frequency hopping propagation conditions without DTX with an allowance for the statistical significance of the test.
2. To verify that the MS does not exceed conformance requirement 2 under TUHigh and frequency hopping propagation conditions without DTX with an allowance for the statistical significance of the test.
3. To implicitly verify the correct implementation of the AMR Thresholds and Hysteresis parameters received in ether an ASSIGNMENT COMMAND or MODE MODIFY procedure, or through an AMR_CONFIG_REQ or and in a AMR_CONFIG_REQ message carried in a RATSCCH.

NOTE: This would normally be performed as a signalling test, however due to the complex layer 1 requirements it is verified here. Any future modification or Change Request on this section should take into account this additional test objective.

14.10.2.4 Method of Test

14.10.2.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AHS with a hopping pattern in the Mid ARFCN range and covering at least 10 frequencies not exceeding 5 MHz. DTX shall not be activated. Power control level shall be set to maximum power.

The initial configuration indicates the use of the 7.95 mode of AMR only.

The SS transmits Standard Test Signal C1 on the traffic channel.

In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

- The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Initially, the unwanted signal is switched off.
- The fading characteristic of the wanted and the interfering signal is TUHigh.

NOTE 1: The fading characteristics shall be TU50 for GSM900, T-GSM 810 and GSM850, TU25 for DCS1800 and PCS1900, TU100 for GSM400, and TU60 for GSM700.

Specific PICS Statements:

-

PIXIT Statements:

- AMR C/I normalization factor.

14.10.2.4.2 Procedure

<u>INITIAL CONFIG:</u>

1a) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	TCH/AHS in kbit/s
CODEC_MODE_4	7.4
CODEC_MODE_3	6.7
CODEC_MODE_2	5.15
CODEC_MODE_1	4.75

With Initial Codec Mode unspecified, thus the default ICM rule being used and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_4	Thr1d = 17.5 dB	+ ∞
CODEC_MODE_3	Thr2d = 14.5 dB	Thr1u = 19.5 dB
CODEC_MODE_2	Thr3d = 12.5 dB	Thr2u = 16.5 dB
CODEC_MODE_1	– ∞	Thr3u = 14.5 dB

The SS uses the expected Initial Codec Mode (default rule) after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode (default rule).

1b) The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	TCH/AHS in kbit/s
CODEC_MODE_3	7.95
CODEC_MODE_2	6.7
CODEC_MODE_1	4,75

With the Initial Codec Mode set to the 7.95 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 14.0 dB	+ ∞
CODEC_MODE_2	Thr2d = 10.0 dB	Thr1u = 16.0 dB
CODEC_MODE_1	– ∞	Thr2u = 12.0 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

The SS waits until the MS indicates in the CMR that the 7.95 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr1u. The SS waits 1 second.

1c) The downlink radio environment is altered so that the carrier to interference ratio is reduced to 4 dB below the highest of the downwards thresholds Thr1d. The SS increments the counter for 'C/I decreases below thresholds'.

1d) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 6.7 kbit/s or a lower codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

1e) The SS switches the downlink codec mode to 6.7 kbit/s and waits for 0.5s.

1f) The downlink radio environment is altered so that the carrier to interference ratio is reduced to 4 dB below the lowest of the downwards thresholds Thr2d. The SS increments the counter for 'C/I decreases below thresholds'.

1g) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 4.75 kbits/s codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

1h) The SS switches the downlink codec mode to 4.75 kbit/s and waits for 0.5s.

1i) The downlink radio environment is altered so that the carrier to interference ratio is increased to 4 dB above the lowest of the upwards thresholds Thr2u. The SS increments the counter for 'C/I increases above thresholds'.

1j) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 6.7 kbit/s or a higher codec mode in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

1k) The SS switches the downlink codec mode to 6.7 kbit/s and waits for 0.5s.

1l) The downlink radio environment is altered so that the carrier to interference ratio is increased to 4 dB above the highest of the upwards thresholds Thr1u. The SS increments the counter for 'C/I increases above thresholds'.

1m) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use 7.95 kbit/s in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

1n) The SS switches the downlink codec mode to 7.95 kbit/s and waits for 0.5s.

1o) The SS repeat steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases samples have been recorded.

STEP 2:

2a) The unwanted signal is removed.

The SS then send an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	TCH/AHS in kbit/s
CODEC_MODE_4	7.4
CODEC_MODE_3	6.7
CODEC_MODE_2	5.15
CODEC_MODE_1	4.75

With the Initial Codec Mode set to any mode.

and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_4	Thr1d = 17.5 dB	$+\infty$
CODEC_MODE_3	Thr2d = 14.5 dB	Thr1u = 19.5 dB
CODEC_MODE_2	Thr3d = 12.5 dB	Thr2u = 16.5 dB
CODEC_MODE_1	$-\infty$	Thr3u = 14.5 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

2b) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	TCH/AHS in kbit/s
CODEC_MODE_3	7.95
CODEC_MODE_2	6.7
CODEC_MODE_1	4,75

With the Initial Codec Mode set to the 7.95 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 13.0 dB	+ ∞
CODEC_MODE_2	Thr2d = 9 dB	Thr1u = 15.0 dB
CODEC_MODE_1	– ∞	Thr2u = 11.0 dB

The SS switches the downlink codec to the Initial Codec Mode after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode.

The SS waits until the MS indicates in the CMR that the 7.95 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr1u. The SS waits 500ms

2c) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 3:

3a) The unwanted signal is removed.

The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the AMR 6.7 kbit/s mode only:

The SS switches the downlink codec to the 6.7 mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested codec. The SS waits for the MS to change the uplink codec to the expected codec, 12 frames after receiving the ACK_OK message.

3b) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	TCH/AHS in kbit/s
CODEC_MODE_3	7.95
CODEC_MODE_2	6.7
CODEC_MODE_1	4,75

With the Initial Codec Mode set to the 7.95 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 18.5 dB	+ ∞
CODEC_MODE_2	Thr2d = 10.5 dB	Thr1u = 20.5 dB
CODEC_MODE_1	– ∞	Thr2u = 12.5 dB

The SS switches the downlink codec to the Initial Codec Mode after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode

The SS waits until the MS indicates in the CMR that the 7.95 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

3c) The SS then sends a THRESH_REQ through a RATSCCH message commanding the MS to modify the Thresholds and Hysteresis to the following values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 15.0 dB	+ ∞
CODEC_MODE_2	Thr2d = 11.0 dB	Thr1u = 17.0 dB
CODEC_MODE_1	– ∞	Thr2u = 13.0 dB

The SS waits 12 frames after receiving the ACK_OK message.

3d) The SS waits until the MS indicates in the CMR that the 7.95 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr1u. The SS waits 500ms

3e) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 4:

4a) The unwanted signal is removed.

The SS uses a Channel Mode Modify procedure commanding the MS to use the AMR 5.15 kbit/s mode only:

The SS waits for the MS to change the uplink codec to the 5.15 kbit/s mode.

4b) The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	TCH/AHS in kbit/s
CODEC_MODE_3	7.95
CODEC_MODE_2	6.7
CODEC_MODE_1	4,75

With the Initial Codec Mode set to the 7.95 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 14.0 dB	+ ∞
CODEC_MODE_2	Thr2d = 10.0 dB	Thr1u = 16.0 dB
CODEC_MODE_1	– ∞	Thr2u = 12.0 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

The SS waits until the MS indicates in the CMR that the 7.95 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr1u. The SS waits 500ms

4c) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

NOTE: The core specifications state that an MS shall respond to a change of C/I within 200ms. The core specifications place no bounds on magnitude or rate of change of C/I. For this test the magnitude of change is bounded by THRESH and HYST selection, and the rate of change is bounded by the 500ms wait periods. These bounds are selected to ensure an MS implementation is not adversely biased by this test.

Maximum/Minimum Duration of Test

Maximum/minimum: 54 minutes (GSM850, GSM900, DCS1800, PCS1900).

14.10.2.5 Test requirements

The requirement and minimum set of samples shall not exceed the values given in the following table for each set of thresholds.

Event	Maximum allowed error rate	Minimum No. of samples
C/I increases over Thresholds	11%	2000
C/I decreases below Thresholds	11%	2000

NOTE: The maximum allowed error rates for the C/I thresholds are derived from the average of the C/I event counters in Step 1 to Step 4 of the method of test.

14.10.3 Performance of the Codec Mode Request Generation – TCH/AFS - improved RX

14.10.3.1 Definition

When a traffic channel supporting an Adaptive Multi-Rate speech codec is activated, the Codec Mode Request is sent by MS in band every other speech frame to indicate to the Network the recommended codec mode of the ACS to use on the downlink.

14.10.3.2 Conformance Requirement

For TULow channel conditions with ideal frequency hopping without DTX activated, the MS shall produce Codec Mode Requests with the following accuracy:

Requirement 1: When a carrier to interferer ratio 4 dB higher than a defined upper threshold is applied to the antenna connector, the MS shall request a higher mode with a probability exceeding 90%. This shall be measured immediately after a settling-time of 200 ms.

Requirement 2: When a carrier to interferer ratio 4 dB lower than a defined lower threshold is applied to the antenna connector, the MS shall request a lower mode with a probability exceeding 90%. This shall be measured immediately after a settling-time of 200 ms.

The above test levels shall be reduced by the normalization factor defined in sub-clause 3.3.1 of TS 45.009 to account for improved receiver performances, specified in 14.10.3.4.1 below.

NOTE: Ideal frequency hopping assumes perfect decorrelation between bursts. For the propagation profile TU3, this is not easily achievable due to the high number of hopping frequencies required. Therefore, performance tests should be performed under ideal frequency hopping conditions for the following propagation profiles: TU50 for GSM900 and GSM850, TU25 for DCS1800 and PCS1900, TU100 for GSM400, and TU60 for GSM700.

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.10.3.3 Test Purpose

1. To verify that the MS does not exceed conformance requirement 1 under TUHigh and frequency hopping propagation conditions without DTX with an allowance for the statistical significance of the test.

2. To verify that the MS does not exceed conformance requirement 2 under TUHigh and frequency hopping propagation conditions without DTX with an allowance for the statistical significance of the test.

3. To implicitly verify the correct implementation of the AMR Thresholds and Hysteresis parameters received in either an ASSIGNMENT COMMAND or MODE MODIFY procedure, or through an AMR_CONFIG_REQ or THRESH_REQ message carried in a RATSCCH.

NOTE: This would normally be performed as a signalling test, however due to the complex layer 1 requirements it is verified here. Any future modification or Change Request on this section should take into account this additional test objective.

NOTE: The C/I values used throughout this test have been carefully selected to ensure no values above 16dB are signalled, low C/I values will not conflict with the synchronisation requirements in TS 45.010, and also to ensure the C/I values are shared between upward and downward applications. Any future modification or Change Request on this section should take into account these aspects.

14.10.3.4 Method of Test

14.10.3.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AFS with a hopping pattern in the Mid ARFCN range and covering at least 10 frequencies not exceeding 5 MHz. DTX shall not be activated. Power control level shall be set to maximum power.

The initial configuration indicates the use of the 12.2 mode of AMR only.

The SS transmits Standard Test Signal C1 on the traffic channel.

In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

- The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Initially, the unwanted signal is switched off.

- The fading characteristic of the wanted and the interfering signal is TUHigh.

NOTE 1: The fading characteristics shall be TU50 for GSM900, T-GSM 810 and GSM850, TU25 for DCS1800 and PCS1900, TU100 for GSM400, and TU60 for GSM700.

Specific PICS Statements:

-

PIXIT Statements:

- AMR C/I normalization factors (AFS DARP) as follows:

Required additional information PIXIT
CI_NORM_AFS_DARP_2dB
CI_NORM_AFS_DARP_3dB
CI_NORM_AFS_DARP_4dB
CI_NORM_AFS_DARP_6dB
CI_NORM_AFS_DARP_8dB
CI_NORM_AFS_DARP_10dB
CI_NORM_AFS_DARP_11dB
CI_NORM_AFS_DARP_12dB
CI_NORM_AFS_DARP_14dB
CI_NORM_AFS_DARP_17dB
CI_NORM_AFS_DARP_19dB
CI_NORM_AFS_DARP_20dB

14.10.3.4.2 Procedure

INITIAL CONFIG:

1a) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	TCH/AFS in kbit/s
CODEC_MODE_4	10,2
CODEC_MODE_3	7.4
CODEC_MODE_2	6,7
CODEC_MODE_1	5,15

With Initial Codec Mode unspecified, thus the default ICM rule being used and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_4	Thr1d = 17.5 dB	+ ∞
CODEC_MODE_3	Thr2d = 14.5 dB	Thr1u = 19.5 dB
CODEC_MODE_2	Thr3d = 12.5 dB	Thr2u = 16.5 dB
CODEC_MODE_1	– ∞	Thr3u = 14.5 dB

The SS uses the expected Initial Codec Mode (default rule) after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode (default rule).

1b) The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	TCH/AFS in kbit/s
CODEC_MODE_3	12,2
CODEC_MODE_2	7.95
CODEC_MODE_1	4,75

With the Initial Codec Mode set to the 12.2 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 15.0 dB	+ ∞
CODEC_MODE_2	Thr2d = 6.0 dB	Thr1u = 15.0 dB
CODEC_MODE_1	– ∞	Thr2u = 6.0 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

The SS waits until the MS indicates in the CMR that the 12.2 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set Thr1u + 4dB - CI_NORM_AFS_DARP_19dB. The SS waits 500ms.

1c) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr1d – 4dB - CI_NORM_AFS_DARP_11dB. The SS increments the counter for 'C/I decreases below thresholds'.

1d) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 7.95 kbit/s or a lower codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

1e) The SS switches the downlink codec mode to 7.95 kbit/s and waits for 0.5s.

1f) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr2d – 4dB - CI_NORM_AFS_DARP_2dB. The SS increments the counter for 'C/I decreases below thresholds'.

1g) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 4.75 kbits/s codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

1h) The SS switches the downlink codec mode to 4.75 kbit/s and waits for 0.5s.

1i) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr2u + 4dB - CI_NORM_AFS_DARP_10dB. The SS increments the counter for 'C/I increases above thresholds'.

1j) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 7.95 kbit/s or a higher codec mode in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

1k) The SS switches the downlink codec mode to 7.95 kbit/s and waits for 0.5s.

1l) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr1u + 4dB - CI_NORM_AFS_DARP_19dB. The SS increments the counter for 'C/I increases above thresholds'.

1m) The SS checks the CMR received by the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use 12.2 kbit/s in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

1n) The SS switches the downlink codec mode to 12.2 kbit/s and waits for 0.5s.

1o) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 2:

2a) The unwanted signal is removed.

The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	TCH/AFS in kbit/s
CODEC_MODE_4	10,2
CODEC_MODE_3	7.4
CODEC_MODE_2	6,7
CODEC_MODE_1	5,15

With the Initial Codec Mode set to any mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_4	Thr1d = 17.5 dB	+ ∞
CODEC_MODE_3	Thr2d = 14.5 dB	Thr1u = 19.5 dB
CODEC_MODE_2	Thr3d = 12.5 dB	Thr2u = 16.5 dB
CODEC_MODE_1	– ∞	Thr3u = 14.5 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

2b) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	TCH/AFS in kbit/s
CODEC_MODE_3	12,2
CODEC_MODE_2	7.95
CODEC_MODE_1	4,75

With the Initial Codec Mode set to the 12.2 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 12.0 dB	+ ∞
CODEC_MODE_2	Thr2d = 8.0 dB	Thr1u = 13.0 dB
CODEC_MODE_1	– ∞	Thr2u = 8.0 dB

The SS switches the downlink codec to the Initial Codec Mode after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode.

The SS waits until the MS indicates in the CMR that the 12.2 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to Thr1u + 4dB - CI_NORM_AFS_DARP_17dB. The SS waits 500ms

2c) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr1d – 4dB - CI_NORM_AFS_DARP_8dB. The SS increments the counter for 'C/I decreases below thresholds'.

2d) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 7.95 kbit/s or a lower codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

2e) The SS switches the downlink codec mode to 7.95 kbit/s and waits for 0.5s.

2f) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr2d – 4dB - CI_NORM_AFS_DARP_4dB. The SS increments the counter for 'C/I decreases below thresholds'.

2g) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 4.75 kbits/s codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

2h) The SS switches the downlink codec mode to 4.75 kbit/s and waits for 0.5s.

2i) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr2u + 4dB - CI_NORM_AFS_DARP_12dB. The SS increments the counter for 'C/I increases above thresholds'.

2j) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 7.95 kbit/s or a higher codec mode in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

2k) The SS switches the downlink codec mode to 7.95 kbit/s and waits for 0.5s.

2l) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr1u + 4dB - CI_NORM_AFS_DARP_17dB. The SS increments the counter for 'C/I increases above thresholds'.

2m) The SS checks the CMR received by the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use 12.2 kbit/s in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

2n) The SS switches the downlink codec mode to 12.2 kbit/s and waits for 0.5s.

2o) The SS repeats steps 2c) to 2n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 3:

3a) The unwanted signal is removed.

The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the AMR 7.95 kbit/s mode only:

The SS switches the downlink codec to the 7.95 mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested codec. The SS waits for the MS to change the uplink codec to the expected codec, 12 frames after receiving the ACK_OK message.

3b) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	TCH/AFS in kbit/s
CODEC_MODE_3	12,2
CODEC_MODE_2	7.95
CODEC_MODE_1	4,75

With the Initial Codec Mode set to the 12.2 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 18.5 dB	+ ∞
CODEC_MODE_2	Thr2d = 10.5 dB	Thr1u = 20.5 dB
CODEC_MODE_1	– ∞	Thr2u = 12.5 dB

The SS switches the downlink codec to the Initial Codec Mode after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode

The SS waits until the MS indicates in the CMR that the 12.2 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

3c) The SS then sends a THRESH_REQ through a RATSCCH message commanding the MS to modify the Thresholds and Hysteresis to the following values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 14.0 dB	+ ∞
CODEC_MODE_2	Thr2d = 10.0 dB	Thr1u = 16.0 dB
CODEC_MODE_1	– ∞	Thr2u = 10.0 dB

The SS waits 12 frames after receiving the ACK_OK message.

3d) The SS waits until the MS indicates in the CMR that the 12.2 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to Thr1u + 4dB - CI_NORM_AFS_DARP_20dB. The SS waits 500ms

3e) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr1d – 4dB - CI_NORM_AFS_DARP_10dB. The SS increments the counter for 'C/I decreases below thresholds'.

3f) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 7.95 kbit/s or a lower codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

3g) The SS switches the downlink codec mode to 7.95 kbit/s and waits for 0.5s.

3h) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr2d – 4dB - CI_NORM_AFS_DARP_6dB. The SS increments the counter for 'C/I decreases below thresholds'.

3i) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 4.75 kbits/s codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

3j) The SS switches the downlink codec mode to 4.75 kbit/s and waits for 0.5s.

3k) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr2u + 4dB - CI_NORM_AFS_DARP_14dB. The SS increments the counter for 'C/I increases above thresholds'.

3l) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 7.95 kbit/s or a higher codec mode in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

3m) The SS switches the downlink codec mode to 7.95 kbit/s and waits for 0.5s.

3n) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr1u + 4dB - CI_NORM_AFS_DARP_20dB. The SS increments the counter for 'C/I increases above thresholds'.

3o) The SS checks the CMR received by the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use 12.2 kbit/s in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

3p) The SS switches the downlink codec mode to 12.2 kbit/s and waits for 0.5s.

3q) The SS repeats steps 3e) to 3p) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 4:

4a) The unwanted signal is removed.

The SS uses a Channel Mode Modify procedure commanding the MS to use the AMR 10.2 kbit/s mode only:

The SS waits for the MS to change the uplink codec to the 10.2 kbit/s mode.

4b) The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	TCH/AFS in kbit/s
CODEC_MODE_3	12,2
CODEC_MODE_2	7.95
CODEC_MODE_1	4,75

With the Initial Codec Mode set to the 12.2 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 16.0 dB	+ ∞
CODEC_MODE_2	Thr2d = 7.0 dB	Thr1u = 16.0 dB
CODEC_MODE_1	– ∞	Thr2u = 7.0 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

The SS waits until the MS indicates in the CMR that the 12.2 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to Thr1u + 4dB - CI_NORM_AFS_DARP_20dB. The SS waits 500ms

4c) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr1d – 4dB - CI_NORM_AFS_DARP_12dB. The SS increments the counter for 'C/I decreases below thresholds'.

4d) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 7.95 kbit/s or a lower codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

4e) The SS switches the downlink codec mode to 7.95 kbit/s and waits for 0.5s.

4f) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr2d – 4dB - CI_NORM_AFS_DARP_3dB. The SS increments the counter for 'C/I decreases below thresholds'.

4g) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 4.75 kbits/s codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

4h) The SS switches the downlink codec mode to 4.75 kbit/s and waits for 0.5s.

4i) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr2u + 4dB - CI_NORM_AFS_DARP_11dB. The SS increments the counter for 'C/I increases above thresholds'.

4j) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 7.95 kbit/s or a higher codec mode in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

4k) The SS switches the downlink codec mode to 7.95 kbit/s and waits for 0.5s.

4l) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr1u + 4dB - CI_NORM_AFS_DARP_20dB. The SS increments the counter for 'C/I increases above thresholds'.

4m) The SS checks the CMR received by the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use 12.2 kbit/s in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

4n) The SS switches the downlink codec mode to 12.2 kbit/s and waits for 0.5s.

4o) The SS repeats steps 4c) to 4n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

NOTE: The core specifications state that an MS shall respond to a change of C/I within 200ms. The core specifications place no bounds on magnitude or rate of change of C/I. For this test the magnitude of change is bounded by THRESH and HYST selection, and the rate of change is bounded by the 500ms wait periods. These bounds are selected to ensure an MS implementation is not adversely biased by this test.

Maximum/Minimum Duration of Test

Maximum/minimum: 54 minutes (GSM850, GSM900, DCS1800, PCS1900).

14.10.3.5 Test requirements

The requirement and minimum set of samples shall not exceed the values given in the following table for each set of thresholds.

Event	Maximum allowed error rate	Minimum No. of samples
C/I increases over Thresholds	11%	2000
C/I decreases below Thresholds	11%	2000

NOTE: The maximum allowed error rates for the C/I thresholds are derived from the average of the C/I event counters in Step 1 to Step 4 of the method of test.

14.10.4 Performance of the Codec Mode Request Generation – TCH/AHS – improved RX

14.10.4.1 Definition

When a traffic channel supporting an Adaptive Multi-Rate speech codec is activated, the Codec Mode Request is sent by MS in band every other speech frame to indicate to the Network the recommended codec mode of the ACS to use on the downlink.

14.10.4.2 Conformance Requirement

For TULow channel conditions with ideal frequency hopping without DTX activated, the MS shall produce Codec Mode Requests with the following accuracy:

Requirement 1: When a carrier to interferer ratio 4 dB higher than a defined upper threshold is applied to the antenna connector, the MS shall request a higher mode with a probability exceeding 90%. This shall be measured immediately after a settling-time of 200 ms.

Requirement 2: When a carrier to interferer ratio 4 dB lower than a defined lower threshold is applied to the antenna connector, the MS shall request a lower mode with a probability exceeding 90%. This shall be measured immediately after a settling-time of 200 ms.

The above test levels shall be reduced by the normalization factor defined in sub-clause 3.3.1 of TS 45.009 to account for improved receiver performances, specified in 14.10.3.4.1 below.

NOTE: Ideal frequency hopping assumes perfect decorrelation between bursts. For the propagation profile TU3, this is not easily achievable due to the high number of hopping frequencies required. Therefore, performance tests should be performed under ideal frequency hopping conditions for the following propagation profiles: TU50 for GSM900 and GSM850, TU25 for DCS1800 and PCS1900, TU100 for GSM400, and TU60 for GSM700.

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.10.4.3 Test Purpose

1. To verify that the MS does not exceed conformance requirement 1 under TUHigh and frequency hopping propagation conditions without DTX with an allowance for the statistical significance of the test.

2. To verify that the MS does not exceed conformance requirement 2 under TUHigh and frequency hopping propagation conditions without DTX with an allowance for the statistical significance of the test.

3. To implicitly verify the correct implementation of the AMR Thresholds and Hysteresis parameters received in ether an ASSIGNMENT COMMAND or MODE MODIFY procedure, or through an AMR_CONFIG_REQ or and in a AMR_CONFIG_REQ message carried in a RATSCCH.

NOTE: This would normally be performed as a signalling test, however due to the complex layer 1 requirements it is verified here. Any future modification or Change Request on this section should take into account this additional test objective.

NOTE: The C/I values used throughout this test have been carefully selected to ensure no values above 16dB are signalled, low C/I values will not conflict with the synchronisation requirements in TS 45.010, and also to ensure the C/I values are shared between upward and downward applications. Any future modification or Change Request on this section should take into account these aspects.

14.10.4.4 Method of Test

14.10.4.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AHS with a hopping pattern in the Mid ARFCN range and covering at least 10 frequencies not exceeding 5 MHz. DTX shall not be activated. Power control level shall be set to maximum power.

The initial configuration indicates the use of the 7.95 mode of AMR only.

The SS transmits Standard Test Signal C1 on the traffic channel.

In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

- The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Initially, the unwanted signal is switched off.

- The fading characteristic of the wanted and the interfering signal is TUHigh.

NOTE 1: The fading characteristics shall be TU50 for GSM900, T-GSM 810 and GSM850, TU25 for DCS1800 and PCS1900, TU100 for GSM400, and TU60 for GSM700.

Specific PICS Statements:

-

PIXIT Statements:

- AMR C/I normalization factors (AHS DARP) as follows:

Required additional information PIXIT
CI_NORM_AHS_DARP_4dB
CI_NORM_AHS_DARP_6dB
CI_NORM_AHS_DARP_7dB
CI_NORM_AHS_DARP_10dB
CI_NORM_AHS_DARP_12dB
CI_NORM_AHS_DARP_13dB
CI_NORM_AHS_DARP_16dB
CI_NORM_AHS_DARP_17dB
CI_NORM_AHS_DARP_20dB
CI_NORM_AHS_DARP_21dB

14.10.4.4.2 Procedure

INITIAL CONFIG:

1a) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	TCH/AHS in kbit/s
CODEC_MODE_4	7.4
CODEC_MODE_3	6.7
CODEC_MODE_2	5.15
CODEC_MODE_1	4.75

With Initial Codec Mode unspecified, thus the default ICM rule being used and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_4	Thr1d = 17.5 dB	+ ∞
CODEC_MODE_3	Thr2d = 14.5 dB	Thr1u = 19.5 dB
CODEC_MODE_2	Thr3d = 12.5 dB	Thr2u = 16.5 dB
CODEC_MODE_1	– ∞	Thr3u = 14.5 dB

The SS uses the expected Initial Codec Mode (default rule) after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode (default rule).

1b) The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	TCH/AHS in kbit/s
CODEC_MODE_3	7.95
CODEC_MODE_2	6.7
CODEC_MODE_1	4,75

With the Initial Codec Mode set to the 7.95 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 14.0 dB	+ ∞
CODEC_MODE_2	Thr2d = 8.0 dB	Thr1u = 16.0 dB
CODEC_MODE_1	– ∞	Thr2u = 9.0 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

The SS waits until the MS indicates in the CMR that the 7.95 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to Thr1u + 4dB - CI_NORM_AHS_DARP_20dB. The SS waits 1 second.

1c) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr1d – 4dB - CI_NORM_AHS_DARP_10dB. The SS increments the counter for 'C/I decreases below thresholds'.

1d) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 6.7 kbit/s or a lower codec mode in the downlink, then the

SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

1e) The SS switches the downlink codec mode to 6.7 kbit/s and waits for 0.5s.

1f) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr2d - 4dB - CI_NORM_AHS_DARP_4dB. The SS increments the counter for 'C/I decreases below thresholds'.

1g) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 4.75 kbits/s codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

1h) The SS switches the downlink codec mode to 4.75 kbit/s and waits for 0.5s.

1i) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr2u + 4dB - CI_NORM_AHS_DARP_13dB. The SS increments the counter for 'C/I increases above thresholds'.

1j) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 6.7 kbit/s or a higher codec mode in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

1k) The SS switches the downlink codec mode to 6.7 kbit/s and waits for 0.5s.

1l) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr1u + 4dB - CI_NORM_AHS_DARP_20dB. The SS increments the counter for 'C/I increases above thresholds'.

1m) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use 7.95 kbit/s in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

1n) The SS switches the downlink codec mode to 7.95 kbit/s and waits for 0.5s.

1o) The SS repeat steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases samples have been recorded.

STEP 2:

2a) The unwanted signal is removed.

The SS then send an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	TCH/AHS in kbit/s
CODEC_MODE_4	7.4
CODEC_MODE_3	6.7
CODEC_MODE_2	5.15
CODEC_MODE_1	4.75

With the Initial Codec Mode set to any mode.

and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_4	Thr1d = 17.5 dB	$+\infty$
CODEC_MODE_3	Thr2d = 14.5 dB	Thr1u = 19.5 dB
CODEC_MODE_2	Thr3d = 12.5 dB	Thr2u = 16.5 dB
CODEC_MODE_1	$-\infty$	Thr3u = 14.5 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial

Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

2b) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	TCH/AHS in kbit/s
CODEC_MODE_3	7.95
CODEC_MODE_2	6.7
CODEC_MODE_1	4,75

With the Initial Codec Mode set to the 7.95 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 14.0 dB	$+\infty$
CODEC_MODE_2	Thr2d = 8 dB	Thr1u = 16.0 dB
CODEC_MODE_1	$-\infty$	Thr2u = 8.0 dB

The SS switches the downlink codec to the Initial Codec Mode after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode.

The SS waits until the MS indicates in the CMR that the 7.95 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to Thr1u + 4dB - CI_NORM_AHS_DARP_20dB. The SS waits 500ms

2c) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr1d – 4dB - CI_NORM_AHS_DARP_10dB. The SS increments the counter for 'C/I decreases below thresholds'.

2d) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 6.7 kbit/s or a lower codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

2e) The SS switches the downlink codec mode to 6.7 kbit/s and waits for 0.5s.

2f) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr2d - 4dB - CI_NORM_AHS_DARP_4dB. The SS increments the counter for 'C/I decreases below thresholds'.

2g) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 4.75 kbits/s codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

2h) The SS switches the downlink codec mode to 4.75 kbit/s and waits for 0.5s.

2i) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr2u + 4dB - CI_NORM_AHS_DARP_12dB. The SS increments the counter for 'C/I increases above thresholds'.

2j) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 6.7 kbit/s or a higher codec mode in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

2k) The SS switches the downlink codec mode to 6.7 kbit/s and waits for 0.5s.

2l) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr1u + 4dB - CI_NORM_AHS_DARP_20dB. The SS increments the counter for 'C/I increases above thresholds'.

2m) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use 7.95 kbit/s in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

2n) The SS switches the downlink codec mode to 7.95 kbit/s and waits for 0.5s.

2o) The SS repeats steps 2c) to 2n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 3:

3a) The unwanted signal is removed.

The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the AMR 6.7 kbit/s mode only:

The SS switches the downlink codec to the 6.7 mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested codec. The SS waits for the MS to change the uplink codec to the expected codec, 12 frames after receiving the ACK_OK message.

3b) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	TCH/AHS in kbit/s
CODEC_MODE_3	7.95
CODEC_MODE_2	6.7
CODEC_MODE_1	4,75

With the Initial Codec Mode set to the 7.95 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 18.5 dB	+ ∞
CODEC_MODE_2	Thr2d = 10.5 dB	Thr1u = 20.5 dB
CODEC_MODE_1	– ∞	Thr2u = 12.5 dB

The SS switches the downlink codec to the Initial Codec Mode after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode

The SS waits until the MS indicates in the CMR that the 7.95 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

3c) The SS then sends a THRESH_REQ through a RATSCCH message commanding the MS to modify the Thresholds and Hysteresis to the following values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 16.0 dB	+ ∞
CODEC_MODE_2	Thr2d = 11.0 dB	Thr1u = 17.0 dB
CODEC_MODE_1	– ∞	Thr2u = 13.0 dB

The SS waits 12 frames after receiving the ACK_OK message.

3d) The SS waits until the MS indicates in the CMR that the 7.95 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to Thr1u + 4dB - CI_NORM_AHS_DARP_21dB. The SS waits 500ms

3e) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr1d – 4dB - CI_NORM_AHS_DARP_12dB. The SS increments the counter for ‘C/I decreases below thresholds’.

3f) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 6.7 kbit/s or a lower codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

3g) The SS switches the downlink codec mode to 6.7 kbit/s and waits for 0.5s.

3h) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr2d - 4dB - CI_NORM_AHS_DARP_7dB. The SS increments the counter for ‘C/I decreases below thresholds’.

3i) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 4.75 kbits/s codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

3j) The SS switches the downlink codec mode to 4.75 kbit/s and waits for 0.5s.

3k) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr2u + 4dB - CI_NORM_AHS_DARP_17dB. The SS increments the counter for ‘C/I increases above thresholds’.

3l) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 6.7 kbit/s or a higher codec mode in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

3m) The SS switches the downlink codec mode to 6.7 kbit/s and waits for 0.5s.

3n) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr1u + 4dB - CI_NORM_AHS_DARP_21dB. The SS increments the counter for ‘C/I increases above thresholds’.

3o) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use 7.95 kbit/s in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

3p) The SS switches the downlink codec mode to 7.95 kbit/s and waits for 0.5s.

3q) The SS repeats steps 3e) to 3p) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 4:

4a) The unwanted signal is removed.

The SS uses a Channel Mode Modify procedure commanding the MS to use the AMR 5.15 kbit/s mode only:

The SS waits for the MS to change the uplink codec to the 5.15 kbit/s mode.

4b) The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	TCH/AHS in kbit/s
CODEC_MODE_3	7.95
CODEC_MODE_2	6.7
CODEC_MODE_1	4,75

With the Initial Codec Mode set to the 7.95 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 17.0 dB	+ ∞
CODEC_MODE_2	Thr2d = 10.0 dB	Thr1u = 17.0 dB
CODEC_MODE_1	– ∞	Thr2u = 12.0 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

The SS waits until the MS indicates in the CMR that the 7.95 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to Thr1u + 4dB - CI_NORM_AHS_DARP_21dB. The SS waits 500ms

4c) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr1d – 4dB - CI_NORM_AHS_DARP_13dB. The SS increments the counter for 'C/I decreases below thresholds'.

4d) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 6.7 kbit/s or a lower codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

4e) The SS switches the downlink codec mode to 6.7 kbit/s and waits for 0.5s.

4f) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr2d - 4dB - CI_NORM_AHS_DARP_6dB. The SS increments the counter for 'C/I decreases below thresholds'.

4g) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 4.75 kbits/s codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

4h) The SS switches the downlink codec mode to 4.75 kbit/s and waits for 0.5s.

4i) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr2u + 4dB - CI_NORM_AHS_DARP_16dB. The SS increments the counter for 'C/I increases above thresholds'.

4j) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 6.7 kbit/s or a higher codec mode in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

4k) The SS switches the downlink codec mode to 6.7 kbit/s and waits for 0.5s.

4l) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr1u + 4dB - CI_NORM_AHS_DARP_21dB. The SS increments the counter for 'C/I increases above thresholds'.

4m) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use 7.95 kbit/s in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

4n) The SS switches the downlink codec mode to 7.95 kbit/s and waits for 0.5s.

4o) The SS repeats steps 4c) to 4n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

NOTE: The core specifications state that an MS shall respond to a change of C/I within 200ms. The core specifications place no bounds on magnitude or rate of change of C/I. For this test the magnitude of change is bounded by THRESH and HYST selection, and the rate of change is bounded by the 500ms wait periods. These bounds are selected to ensure an MS implementation is not adversely biased by this test.

Maximum/Minimum Duration of Test

Maximum/minimum: 54 minutes (GSM850, GSM900, DCS1800, PCS1900).

14.10.4.5 Test requirements

The requirement and minimum set of samples shall not exceed the values given in the following table for each set of thresholds.

Event	Maximum allowed error rate	Minimum No. of samples
C/I increases over Thresholds	11%	2000
C/I decreases below Thresholds	11%	2000

NOTE: The maximum allowed error rates for the C/I thresholds are derived from the average of the C/I event counters in Step 1 to Step 4 of the method of test.

14.10.5 Performance of the Codec Mode Request Generation – O-TCH/AHS

14.10.5.1 Definition

When a traffic channel supporting an Adaptive Multi-Rate speech codec is activated, the Codec Mode Request is sent by MS in band every other speech frame to indicate to the Network the recommended codec mode of the ACS to use on the downlink.

14.10.5.2 Conformance Requirement

For TULow channel conditions with ideal frequency hopping without DTX activated, the MS shall produce Codec Mode Requests with the following accuracy:

Requirement 1: When a carrier to interferer ratio 4 dB higher than a defined upper threshold is applied to the antenna connector, the MS shall request a higher mode with a probability exceeding 90%. This shall be measured immediately after a settling-time of 200 ms.

Requirement 2: When a carrier to interferer ratio 4 dB lower than a defined lower threshold is applied to the antenna connector, the MS shall request a lower mode with a probability exceeding 90%. This shall be measured immediately after a settling-time of 200 ms.

If required, the above test levels shall be reduced by the fixed normalization factor defined in sub-clause 3.3.1 of TS 45.009 to account for potential improved receiver performances.

NOTE: Ideal frequency hopping assumes perfect decorrelation between bursts. For the propagation profile TU3, this is not easily achievable due to the high number of hopping frequencies required. Therefore, performance tests should be performed under ideal frequency hopping conditions for the following propagation profiles: TU50 for GSM900 and GSM850, TU25 for DCS1800 and PCS1900, TU100 for GSM400, and TU60 for GSM700.

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.10.5.3 Test Purpose

1. To verify that the MS does not exceed conformance requirement 1 under TUHigh and frequency hopping propagation conditions without DTX with an allowance for the statistical significance of the test.

2. To verify that the MS does not exceed conformance requirement 2 under TUHigh and frequency hopping propagation conditions without DTX with an allowance for the statistical significance of the test.

3. To implicitly verify the correct implementation of the AMR Thresholds and Hysteresis parameters received in either an ASSIGNMENT COMMAND or MODE MODIFY procedure, or through an AMR_CONFIG_REQ or THRESH_REQ message carried in a RATSCCH.

NOTE: This would normally be performed as a signalling test, however due to the complex layer 1 requirements it is verified here. Any future modification or Change Request on this section should take into account this additional test objective.

14.10.5.4 Method of Test

14.10.5.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a O-TCH/AHS with a hopping pattern in the Mid ARFCN range and covering at least 10 frequencies not exceeding 5 MHz. DTX shall not be activated. Power control level shall be set to maximum power.

The initial configuration indicates the use of the 12.2 mode of AMR only.

The SS transmits Standard Test Signal C1 on the traffic channel.

In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

- The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Initially, the unwanted signal is switched off.

- The fading characteristic of the wanted and the interfering signal is TUHigh.

NOTE 1: The fading characteristics shall be TU50 for GSM900, T-GSM 810 and GSM850, TU25 for DCS1800 and PCS1900, TU100 for GSM400, and TU60 for GSM700.

Specific PICS Statements:

-

PIXIT Statements:

- AMR C/I normalization factor.

14.10.5.4.2 Procedure

INITIAL CONFIG:

1a) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	O-TCH/AHS in kbit/s
CODEC_MODE_4	10,2
CODEC_MODE_3	7.4
CODEC_MODE_2	6,7
CODEC_MODE_1	5,15

With Initial Codec Mode unspecified, thus the default ICM rule being used and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_4	Thr1d = 17.5 dB	$+\infty$
CODEC_MODE_3	Thr2d = 14.5 dB	Thr1u = 19.5 dB
CODEC_MODE_2	Thr3d = 12.5 dB	Thr2u = 16.5 dB
CODEC_MODE_1	$-\infty$	Thr3u = 14.5 dB

The SS uses the expected Initial Codec Mode (default rule) after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode (default rule).

1b) The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	O-TCH/AHS in kbit/s
CODEC_MODE_3	12,2
CODEC_MODE_2	7.95
CODEC_MODE_1	4,75

With the Initial Codec Mode set to the 12.2 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 12.5 dB	$+\infty$
CODEC_MODE_2	Thr2d = 6.5 dB	Thr1u = 14.5 dB
CODEC_MODE_1	$-\infty$	Thr2u = 8.5 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

The SS waits until the MS indicates in the CMR that the 12.2 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr1u. The SS waits 500ms.

1c) The downlink radio environment is altered so that the carrier to interference ratio is reduced to 4 dB below the highest of the downwards thresholds Thr1d. The SS increments the counter for 'C/I decreases below thresholds'.

1d) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 7.95 kbit/s or a lower codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

1e) The SS switches the downlink codec mode to 7.95 kbit/s and waits for 0.5s.

1f) The downlink radio environment is altered so that the carrier to interference ratio is reduced to 4 dB below the lowest of the downwards thresholds Thr2d. The SS increments the counter for 'C/I decreases below thresholds'.

1g) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 4.75 kbits/s codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

1h) The SS switches the downlink codec mode to 4.75 kbit/s and waits for 0.5s.

1i) The downlink radio environment is altered so that the carrier to interference ratio is increased to 4 dB above the lowest of the upwards thresholds Thr2u. The SS increments the counter for 'C/I increases above thresholds'.

1j) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 7.95 kbit/s or a higher codec mode in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

1k) The SS switches the downlink codec mode to 7.95 kbit/s and waits for 0.5s.

1l) The downlink radio environment is altered so that the carrier to interference ratio is increased to 4 dB above the highest of the upwards thresholds Thr1u. The SS increments the counter for ‘C/I increases above thresholds’.

1m) The SS checks the CMR received by the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use 12.2 kbit/s in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

1n) The SS switches the downlink codec mode to 12.2 kbit/s and waits for 0.5s.

1o) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 2:

2a) The unwanted signal is removed.

The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	O-TCH/AHS in kbit/s
CODEC_MODE_4	10,2
CODEC_MODE_3	7.4
CODEC_MODE_2	6,7
CODEC_MODE_1	5,15

With the Initial Codec Mode set to any mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_4	Thr1d = 17.5 dB	+ ∞
CODEC_MODE_3	Thr2d = 14.5 dB	Thr1u = 19.5 dB
CODEC_MODE_2	Thr3d = 12.5 dB	Thr2u = 16.5 dB
CODEC_MODE_1	– ∞	Thr3u = 14.5 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

2b) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	O-TCH/AHS in kbit/s
CODEC_MODE_3	12,2
CODEC_MODE_2	7.95
CODEC_MODE_1	4,75

With the Initial Codec Mode set to the 12.2 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 11.5 dB	+ ∞
CODEC_MODE_2	Thr2d = 5.5 dB	Thr1u = 13.5 dB
CODEC_MODE_1	– ∞	Thr2u = 7.5 dB

The SS switches the downlink codec to the Initial Codec Mode after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode.

The SS waits until the MS indicates in the CMR that the 12.2 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr1u. The SS waits 500ms

2c) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 3:

3a) The unwanted signal is removed.

The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the AMR 7.95 kbit/s mode only:

The SS switches the downlink codec to the 7.95 mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested codec. The SS waits for the MS to change the uplink codec to the expected codec, 12 frames after receiving the ACK_OK message.

3b) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	O-TCH/AHS in kbit/s
CODEC_MODE_3	12,2
CODEC_MODE_2	7.95
CODEC_MODE_1	4,75

With the Initial Codec Mode set to the 12.2 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 18.5 dB	+ ∞
CODEC_MODE_2	Thr2d = 10.5 dB	Thr1u = 20.5 dB
CODEC_MODE_1	– ∞	Thr2u = 12.5 dB

The SS switches the downlink codec to the Initial Codec Mode after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode

The SS waits until the MS indicates in the CMR that the 12.2 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

3c) The SS then sends a THRESH_REQ through a RATSCCH message commanding the MS to modify the Thresholds and Hysteresis to the following values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 13.5 dB	+ ∞
CODEC_MODE_2	Thr2d = 7.5 dB	Thr1u = 15.5 dB
CODEC_MODE_1	– ∞	Thr2u = 9.5 dB

The SS waits 12 frames after receiving the ACK_OK message.

3d) The SS waits until the MS indicates in the CMR that the 12.2 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr1u. The SS waits 500ms

3e) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 4:

4a) The unwanted signal is removed.

The SS uses a Channel Mode Modify procedure commanding the MS to use the AMR 10.2 kbit/s mode only:

The SS waits for the MS to change the uplink codec to the 10.2 kbit/s mode.

4b) The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	O-TCH/AHS in kbit/s
CODEC_MODE_3	12,2
CODEC_MODE_2	7.95
CODEC_MODE_1	4,75

With the Initial Codec Mode set to the 12.2 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 12.5 dB	+ ∞
CODEC_MODE_2	Thr2d = 6.5 dB	Thr1u = 14.5 dB
CODEC_MODE_1	– ∞	Thr2u = 8.5 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

The SS waits until the MS indicates in the CMR that the 12.2 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr1u. The SS waits 500ms

4c) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

NOTE: The core specifications state that an MS shall respond to a change of C/I within 200ms. The core specifications place no bounds on magnitude or rate of change of C/I. For this test the magnitude of change is bounded by THRESH and HYST selection, and the rate of change is bounded by the 500ms wait periods. These bounds are selected to ensure an MS implementation is not adversely biased by this test.

Maximum/Minimum Duration of Test

Maximum/minimum: 54 minutes (GSM850, GSM900, DCS1800, PCS1900).

14.10.5.5 Test requirements

The requirement and minimum set of samples shall not exceed the values given in the following table for each set of thresholds.

Event	Maximum allowed error rate	Minimum No. of samples
C/I increases over Thresholds	11%	2000
C/I decreases below Thresholds	11%	2000

NOTE: The maximum allowed error rates for the C/I thresholds are derived from the average of the C/I event counters in Step 1 to Step 4 of the method of test.

14.10.6 Performance of the Codec Mode Request Generation – O-TCH/WFS

14.10.6.1 Definition

When a traffic channel supporting an Adaptive Multi-Rate speech codec is activated, the Codec Mode Request is sent by MS in band every other speech frame to indicate to the Network the recommended codec mode of the ACS to use on the downlink.

14.10.6.2 Conformance Requirement

For TU3 channel conditions with ideal frequency hopping without DTX activated in GSM900 and GSM850, the MS shall produce Codec Mode Requests with the following accuracy:

- When a carrier to interferer ratio 4 dB higher than a defined upper threshold is applied to the antenna connector, the MS shall request a higher mode with a probability exceeding 90%. This shall be measured immediately after a settling-time of 200 ms.

- When a carrier to interferer ratio 4 dB lower than a defined lower threshold is applied to the antenna connector, the MS shall request a lower mode with a probability exceeding 90%. This shall be measured immediately after a settling-time of 200 ms.

If required, the above test levels shall be reduced by the normalization factor defined in sub-clause 3.3.1 to account for potential improved receiver performances.

For other frequency bands, the propagation profile should be adjusted to: TU1.5 for DCS1800 and PCS1900, TU6 for GSM400 and TU3.6 for GSM700.

NOTE 1: Ideal frequency hopping assumes perfect decorrelation between bursts. For the propagation profile TU3, this is not easily achievable due to the high number of hopping frequencies required. Therefore, performance tests should be performed under ideal frequency hopping conditions for the following propagation profiles: TU50 for GSM900 and GSM850, TU25 for DCS1800 and PCS1900, TU100 for GSM400, and TU60 for GSM700.

3GPP TS 45.009, subclause 3.3.3.3

14.10.6.3 Test Purpose

1. To verify that the MS does not exceed the conformance requirements (for producing codec request) under TU High and frequency hopping propagation conditions without DTX with an allowance for the statistical significance of the test.
2. To implicitly verify the correct implementation of the AMR Thresholds and Hysteresis parameters received in either an ASSIGNMENT COMMAND or MODE MODIFY procedure, or through an AMR_CONFIG_REQ or THRESH_REQ message carried in a RATSCCH.

NOTE: This would normally be performed as a signalling test, however due to the complex layer 1 requirements it is verified here. Any future modification or Change Request on this section should take into account this additional test objective.

14.10.6.4 Method of Test

14.10.6.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a O-TCH/WFS with a hopping pattern in the Mid ARFCN range and covering at least 10 frequencies not exceeding 5 MHz. DTX shall not be activated. Power control level shall be set to maximum power.

The initial configuration indicates the use of the 12.65 mode of AMR only.

The SS transmits Standard Test Signal C1 on the traffic channel.

In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

- The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Initially, the unwanted signal is switched off.
- The fading characteristic of the wanted and the interfering signal is TU High.

NOTE 1: The fading characteristics shall be TU50 for GSM900 and GSM850, TU25 for DCS1800 and PCS1900, TU100 for GSM400, and TU60 for GSM700..

Specific PICS Statements:

-

PIXIT Statements:

- O-TCH/F C/I normalisation factor

14.10.6.4.2 Procedure

INITIAL CONFIG:

1a) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	O-TCH/WFS in kbit/s
CODEC_MODE_4	23,85
CODEC_MODE_3	12,65
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With Initial Codec Mode unspecified, thus the default ICM rule being used and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_4	Thr1d = 17.5 dB	+ ∞
CODEC_MODE_3	Thr2d = 14.5 dB	Thr1u = 19.5 dB
CODEC_MODE_2	Thr3d = 12.5 dB	Thr2u = 16.5 dB
CODEC_MODE_1	– ∞	Thr3u = 14.5 dB

The SS uses the expected Initial Codec Mode (default rule) after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode (default rule).

1b) The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	O-TCH/WFS in kbit/s
CODEC_MODE_3	12,65
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With the Initial Codec Mode set to the 12.65 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 12.5 dB	+ ∞
CODEC_MODE_2	Thr2d = 6.5 dB	Thr1u = 14.5 dB
CODEC_MODE_1	– ∞	Thr2u = 8.5 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

The SS waits until the MS indicates in the CMR that the 12.65 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr1u. The SS waits 500ms.

1c) The downlink radio environment is altered so that the carrier to interference ratio is reduced to 4 dB below the highest of the downwards thresholds Thr1d. The SS increments the counter for ‘C/I decreases below thresholds’.

1d) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 8.85 kbit/s or a lower codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

1e) The SS switches the downlink codec mode to 8.85 kbit/s and waits for 0.5s.

1f) The downlink radio environment is altered so that the carrier to interference ratio is reduced to 4 dB below the lowest of the downwards thresholds Thr2d. The SS increments the counter for ‘C/I decreases below thresholds’.

1g) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 6.6 kbits/s codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

1h) The SS switches the downlink codec mode to 6.6 kbit/s and waits for 0.5s.

1i) The downlink radio environment is altered so that the carrier to interference ratio is increased to 4 dB above the lowest of the upwards thresholds Thr2u. The SS increments the counter for 'C/I increases above thresholds'.

1j) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 8.85 kbit/s or a higher codec mode in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

1k) The SS switches the downlink codec mode to 8.85 kbit/s and waits for 0.5s.

1l) The downlink radio environment is altered so that the carrier to interference ratio is increased to 4 dB above the highest of the upwards thresholds Thr1u. The SS increments the counter for 'C/I increases above thresholds'.

1m) The SS checks the CMR received by the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use 12.65 kbit/s in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

1n) The SS switches the downlink codec mode to 12.65 kbit/s and waits for 0.5s.

1o) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 2:

2a) The unwanted signal is removed.

The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	O-TCH/WFS in kbit/s
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With the Initial Codec Mode set to any mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_2	Thr3d = 12.5 dB	$+\infty$
CODEC_MODE_1	$-\infty$	Thr3u = 14.5 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

2b) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	O-TCH/WFS in kbit/s
CODEC_MODE_3	12,65
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With the Initial Codec Mode set to the 12.65 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 11.5 dB	$+\infty$
CODEC_MODE_2	Thr2d = 5.5 dB	Thr1u = 13.5 dB
CODEC_MODE_1	$-\infty$	Thr2u = 7.5 dB

The SS switches the downlink codec to the Initial Codec Mode after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode.

The SS waits until the MS indicates in the CMR that the 12.65 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr1u. The SS waits 500ms

2c) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 3:

3a) The unwanted signal is removed.

The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the AMR 8.85 kbit/s mode only:

The SS switches the downlink codec to the 8.85 mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested codec. The SS waits for the MS to change the uplink codec to the expected codec, 12 frames after receiving the ACK_OK message.

3b) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	O-TCH/WFS in kbit/s
CODEC_MODE_3	12,65
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With the Initial Codec Mode set to the 12.65 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 18.5 dB	$+\infty$
CODEC_MODE_2	Thr2d = 10.5 dB	Thr1u = 20.5 dB
CODEC_MODE_1	$-\infty$	Thr2u = 12.5 dB

The SS switches the downlink codec to the Initial Codec Mode after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode

The SS waits until the MS indicates in the CMR that the 12.65 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

3c) The SS then sends a THRESH_REQ through a RATSCCH message commanding the MS to modify the Thresholds and Hysteresis to the following values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 13.5 dB	$+\infty$
CODEC_MODE_2	Thr2d = 7.5 dB	Thr1u = 15.5 dB
CODEC_MODE_1	$-\infty$	Thr2u = 9.5 dB

The SS waits 12 frames after receiving the ACK_OK message.

3d) The SS waits until the MS indicates in the CMR that the 12.65 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr1u. The SS waits 500ms

3e) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 4:

4a) The unwanted signal is removed.

- The SS uses a Channel Mode Modify procedure commanding the MS to use the AMR 8.85 kbit/s mode only:
- The SS waits for the MS to change the uplink codec to the 8.85 kbit/s mode.

4b) The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	O-TCH/WFS in kbit/s
CODEC_MODE_3	12,65
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With the Initial Codec Mode set to the 12.65 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 12.5 dB	$+\infty$
CODEC_MODE_2	Thr2d = 6.5 dB	Thr1u = 14.5 dB
CODEC_MODE_1	$-\infty$	Thr2u = 8.5 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

The SS waits until the MS indicates in the CMR that the 12.65 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr1u. The SS waits 500ms

4c) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

NOTE: The core specifications state that an MS shall respond to a change of C/I within 200ms. The core specifications place no bounds on magnitude or rate of change of C/I. For this test the magnitude of change is bounded by THRESH and HYST selection, and the rate of change is bounded by the 500ms wait periods. These bounds are selected to ensure an MS implementation is not adversely biased by this test.

Maximum/Minimum Duration of Test

Maximum/minimum: 54 minutes.

14.10.6.5 Test requirements

The requirement and minimum set of samples shall not exceed the values given in the following table for each set of thresholds.

Event	Maximum allowed error rate	Minimum No. of samples
C/I increases over Thresholds	11%	2000
C/I decreases below Thresholds	11%	2000

NOTE: The maximum allowed error rates for the C/I thresholds are derived from the average of the C/I event counters in Step 1 to Step 4 of the method of test.

14.10.7 Performance of the Codec Mode Request Generation – O-TCH/WHS

14.10.7.1 Definition

When a traffic channel supporting an Adaptive Multi-Rate speech codec is activated, the Codec Mode Request is sent by MS in band every other speech frame to indicate to the Network the recommended codec mode of the ACS to use on the downlink.

14.10.7.2 Conformance Requirement

For TULow channel conditions with ideal frequency hopping without DTX activated, the MS shall produce Codec Mode Requests with the following accuracy:

Requirement 1: When a carrier to interferer ratio 4 dB higher than a defined upper threshold is applied to the antenna connector, the MS shall request a higher mode with a probability exceeding 90%. This shall be measured immediately after a settling-time of 200 ms.

Requirement 2: When a carrier to interferer ratio 4 dB lower than a defined lower threshold is applied to the antenna connector, the MS shall request a lower mode with a probability exceeding 90%. This shall be measured immediately after a settling-time of 200 ms.

If required, the above test levels shall be reduced by the fixed normalization factor defined in sub-clause 3.3.1 of TS 45.009 to account for potential improved receiver performances.

NOTE: Ideal frequency hopping assumes perfect decorrelation between bursts. For the propagation profile TU3, this is not easily achievable due to the high number of hopping frequencies required. Therefore, performance tests should be performed under ideal frequency hopping conditions for the following propagation profiles: TU50 for GSM900 and GSM850, TU25 for DCS1800 and PCS1900, TU100 for GSM400, and TU60 for GSM700.

14.10.7.3 Test Purpose

1. To verify that the MS does not exceed conformance requirement 1 under TUHigh and frequency hopping propagation conditions without DTX with an allowance for the statistical significance of the test.

2. To verify that the MS does not exceed conformance requirement 2 under TUHigh and frequency hopping propagation conditions without DTX with an allowance for the statistical significance of the test.

3. To implicitly verify the correct implementation of the AMR Thresholds and Hysteresis parameters received in either an ASSIGNMENT COMMAND or MODE MODIFY procedure, or through an AMR_CONFIG_REQ or THRESH_REQ message carried in a RATSCCH.

NOTE: This would normally be performed as a signalling test, however due to the complex layer 1 requirements it is verified here. Any future modification or Change Request on this section should take into account this additional test objective.

14.10.7.4 Method of Test

14.10.7.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a O-TCH/WHS with a hopping pattern in the Mid ARFCN range and covering at least 10 frequencies not exceeding 5 MHz. DTX shall not be activated. Power control level shall be set to maximum power.

The initial configuration indicates the use of the 12.65 mode of AMR only.

The SS transmits Standard Test Signal C1 on the traffic channel.

In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

- The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Initially, the unwanted signal is switched off.
- The fading characteristic of the wanted and the interfering signal is TUHigh.

NOTE 1: The fading characteristics shall be TU50 for GSM900 and GSM850, TU25 for DCS1800 and PCS1900, TU100 for GSM400, and TU60 for GSM700..

Specific PICS Statements:

-

PIXIT Statements:

- AMR C/I normalization factor.

14.10.7.4.2 Procedure

INITIAL CONFIG:

1a) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	O-TCH/WHS in kbit/s
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With Initial Codec Mode unspecified, thus the default ICM rule being used and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_2	Thr3d = 12.5 dB	$+\infty$
CODEC_MODE_1	$-\infty$	Thr3u = 14.5 dB

The SS uses the expected Initial Codec Mode (default rule) after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode (default rule).

1b) The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	O-TCH/WHS in kbit/s
CODEC_MODE_3	12,65
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With the Initial Codec Mode set to the 12.65 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 12.5 dB	+ ∞
CODEC_MODE_2	Thr2d = 6.5 dB	Thr1u = 14.5 dB
CODEC_MODE_1	– ∞	Thr2u = 8.5 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

The SS waits until the MS indicates in the CMR that the 12.65 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr1u. The SS waits 500ms.

1c) The downlink radio environment is altered so that the carrier to interference ratio is reduced to 4 dB below the highest of the downwards thresholds Thr1d. The SS increments the counter for 'C/I decreases below thresholds'.

1d) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 8.85 kbit/s or a lower codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

1e) The SS switches the downlink codec mode to 8.85 kbit/s and waits for 0.5s.

1f) The downlink radio environment is altered so that the carrier to interference ratio is reduced to 4 dB below the lowest of the downwards thresholds Thr2d. The SS increments the counter for 'C/I decreases below thresholds'.

1g) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 6.6 kbits/s codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

1h) The SS switches the downlink codec mode to 6.6 kbit/s and waits for 0.5s.

1i) The downlink radio environment is altered so that the carrier to interference ratio is increased to 4 dB above the lowest of the upwards thresholds Thr2u. The SS increments the counter for 'C/I increases above thresholds'.

1j) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 8.85 kbit/s or a higher codec mode in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

1k) The SS switches the downlink codec mode to 8.85 kbit/s and waits for 0.5s.

1l) The downlink radio environment is altered so that the carrier to interference ratio is increased to 4 dB above the highest of the upwards thresholds Thr1u. The SS increments the counter for 'C/I increases above thresholds'.

1m) The SS checks the CMR received by the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use 12.65 kbit/s in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

1n) The SS switches the downlink codec mode to 12.65 kbit/s and waits for 0.5s.

1o) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 2:

2a) The unwanted signal is removed.

The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	O-TCH/WHS in kbit/s
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With the Initial Codec Mode set to any mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_2	Thr3d = 12.5 dB	+ ∞
CODEC_MODE_1	– ∞	Thr3u = 14.5 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

2b) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	O-TCH/WHS in kbit/s
CODEC_MODE_3	12,65
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With the Initial Codec Mode set to the 12.2 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 11.5 dB	+ ∞
CODEC_MODE_2	Thr2d = 5.5 dB	Thr1u = 13.5 dB
CODEC_MODE_1	– ∞	Thr2u = 7.5 dB

The SS switches the downlink codec to the Initial Codec Mode after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode.

The SS waits until the MS indicates in the CMR that the 12.65 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr1u. The SS waits 500ms

2c) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 3:

3a) The unwanted signal is removed.

The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the AMR 8.85 kbit/s mode only:

The SS switches the downlink codec to the 8.85 mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested codec. The SS waits for the MS to change the uplink codec to the expected codec, 12 frames after receiving the ACK_OK message.

3b) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	O-TCH/WHS in kbit/s
CODEC_MODE_3	12,65
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With the Initial Codec Mode set to the 12.65 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 18.5 dB	$+\infty$
CODEC_MODE_2	Thr2d = 10.5 dB	Thr1u = 20.5 dB
CODEC_MODE_1	$-\infty$	Thr2u = 12.5 dB

The SS switches the downlink codec to the Initial Codec Mode after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode

The SS waits until the MS indicates in the CMR that the 12.65 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

3c) The SS then sends a THRESH_REQ through a RATSCCH message commanding the MS to modify the Thresholds and Hysteresis to the following values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 13.5 dB	$+\infty$
CODEC_MODE_2	Thr2d = 7.5 dB	Thr1u = 15.5 dB
CODEC_MODE_1	$-\infty$	Thr2u = 9.5 dB

The SS waits 12 frames after receiving the ACK_OK message.

3d) The SS waits until the MS indicates in the CMR that the 12.65 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr1u. The SS waits 500ms

3e) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 4:

4a) The unwanted signal is removed.

- The SS uses a Channel Mode Modify procedure commanding the MS to use the AMR 8.85 kbit/s mode only:
- The SS waits for the MS to change the uplink codec to the 8.85 kbit/s mode.

4b) The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	O-TCH/WHS in kbit/s
CODEC_MODE_3	12,65
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With the Initial Codec Mode set to the 12.65 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr1d = 12.5 dB	+ ∞
CODEC_MODE_2	Thr2d = 6.5 dB	Thr1u = 14.5 dB
CODEC_MODE_1	– ∞	Thr2u = 8.5 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

The SS waits until the MS indicates in the CMR that the 12.65 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr1u. The SS waits 500ms

4c) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

NOTE: The core specifications state that an MS shall respond to a change of C/I within 200ms. The core specifications place no bounds on magnitude or rate of change of C/I. For this test the magnitude of change is bounded by THRESH and HYST selection, and the rate of change is bounded by the 500ms wait periods. These bounds are selected to ensure an MS implementation is not adversely biased by this test.

Maximum/Minimum Duration of Test

Maximum/minimum: 54 minutes (GSM850, GSM900, DCS1800, PCS1900).

14.10.7.5 Test requirements

The requirement and minimum set of samples shall not exceed the values given in the following table for each set of thresholds.

Event	Maximum allowed error rate	Minimum No. of samples
C/I increases over Thresholds	11%	2000
C/I decreases below Thresholds	11%	2000

NOTE: The maximum allowed error rates for the C/I thresholds are derived from the average of the C/I event counters in Step 1 to Step 4 of the method of test.

14.10.8 Performance of the Codec Mode Request Generation – TCH/WFS

14.10.8.1 Definition

When a traffic channel supporting a WB-AMR speech codec is activated, the Codec Mode Request is sent by MS in band every other speech frame to indicate to the Network the recommended codec mode of the ACS to use on the downlink.

14.10.8.2 Conformance Requirement

For TU3 channel conditions with ideal frequency hopping without DTX activated in GSM900 and GSM850, the MS shall produce Codec Mode Requests with the following accuracy:

- When a carrier to interferer ratio 4 dB higher than a defined upper threshold is applied to the antenna connector, the MS shall request a higher mode with a probability exceeding 90%. This shall be measured immediately after a settling-time of 200 ms.

- When a carrier to interferer ratio 4 dB lower than a defined lower threshold is applied to the antenna connector, the MS shall request a lower mode with a probability exceeding 90%. This shall be measured immediately after a settling-time of 200 ms.

If required, the above test levels shall be reduced by the normalization factor defined in sub-clause 3.3.1 to account for potential improved receiver performances.

For other frequency bands, the propagation profile should be adjusted to: TU1.5 for DCS1800 and PCS1900, TU6 for GSM400 and TU3.6 for GSM700.

NOTE 1: Ideal frequency hopping assumes perfect decorrelation between bursts. For the propagation profile TU3, this is not easily achievable due to the high number of hopping frequencies required. Therefore, performance tests should be performed under ideal frequency hopping conditions for the following propagation profiles: TU50 for GSM900 and GSM850, TU25 for DCS1800 and PCS1900, TU100 for GSM400, and TU60 for GSM700.

3GPP TS 45.009 subclause 3.3.3.3

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP TS 45.005 subclause 2

14.10.8.3 Test Purpose

1. To verify that the MS does not exceed conformance requirement (for producing codec request) under TUHigh and frequency hopping propagation conditions without DTX with an allowance for the statistical significance of the test.

2. To implicitly verify the correct implementation of the WB-AMR Thresholds and Hysteresis parameters received in either an ASSIGNMENT COMMAND or MODE MODIFY procedure, or through an AMR_CONFIG_REQ or THRESH_REQ message carried in a RATSCCH.

NOTE: This would normally be performed as a signalling test, however due to the complex layer 1 requirements it is verified here. Any future modification or Change Request on this section should take into account this additional test objective.

14.10.8.4 Method of Test

14.10.8.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/WFS with a hopping pattern in the Mid ARFCN range and covering at least 10 frequencies not exceeding 5 MHz. DTX shall not be activated. Power control level shall be set to maximum power.

The initial configuration indicates the use of the 12.65 mode of AMR only.

The SS transmits Standard Test Signal C1 on the traffic channel.

In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

- The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Initially, the unwanted signal is switched off.

- The fading characteristic of the wanted and the interfering signal is TUHigh.

NOTE 1: The fading characteristics shall be TU50 for GSM900, T-GSM 810 and GSM850, TU25 for DCS1800 and PCS1900, TU100 for GSM400, and TU60 for GSM700.

Specific PICS Statements:

-

PIXIT Statements:

TCH/WFS C/I normalization factor

14.10.8.4.2 Procedure

STEP 1

1a) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	TCH/WFS in kbit/s
CODEC_MODE_3	12,65
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With Initial Codec Mode unspecified, thus the default ICM rule being used and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	18.5 dB	$+\infty$
CODEC_MODE_2	12.5 dB	20.5 dB
CODEC_MODE_1	$-\infty$	14.5 dB

The SS uses the expected Initial Codec Mode (default rule) after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode (default rule).

1b) The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	TCH/WFS in kbit/s
CODEC_MODE_3	12,65
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With the Initial Codec Mode set to the 12.65 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr3d = 12.5 dB	$+\infty$
CODEC_MODE_2	Thr2d = 6.5 dB	Thr2u = 14.5 dB
CODEC_MODE_1	$-\infty$	Thr1u = 8.5 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

The SS waits until the MS indicates in the CMR that the 12.65 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr2u. The SS waits 500ms.

1c) The downlink radio environment is altered so that the carrier to interference ratio is reduced to 4 dB below the highest of the downwards thresholds Thr1d. The SS increments the counter for ‘C/I decreases below thresholds’.

1d) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 8.85 kbit/s or a lower codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

1e) The SS switches the downlink codec mode to 8.85 kbit/s and waits for 0.5s.

1f) The downlink radio environment is altered so that the carrier to interference ratio is reduced to 4 dB below the lowest of the downwards thresholds Thr2d. The SS increments the counter for ‘C/I decreases below thresholds’.

1g) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 6.6 kbits/s codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

1h) The SS switches the downlink codec mode to 6.6 kbit/s and waits for 0.5s.

1i) The downlink radio environment is altered so that the carrier to interference ratio is increased to 4dB above the lowest of the upwards thresholds Thr1u. The SS increments the counter for ‘C/I increases above thresholds’.

1j) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 8.85 kbit/s or a higher codec mode in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

1k) The SS switches the downlink codec mode to 8.85 kbit/s and waits for 0.5s.

1l) The downlink radio environment is altered so that the carrier to interference ratio is increased to 4 dB above the highest of the upwards thresholds Thr2u. The SS increments the counter for ‘C/I increases above thresholds’.

1m) The SS checks the CMR received by the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use 12.65 kbit/s in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

1n) The SS switches the downlink codec mode to 12.65 kbit/s and waits for 0.5s.

1o) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 2:

2a) The unwanted signal is removed.

The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	TCH/WFS in kbit/s
CODEC_MODE_3	12,65
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With the Initial Codec Mode set to any mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	18.5 dB	+ ∞
CODEC_MODE_2	12.5 dB	20.5 dB
CODEC_MODE_1	– ∞	14.5 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

2b) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	TCH/WFS in kbit/s
CODEC_MODE_3	12,65
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With the Initial Codec Mode set to the 12.65 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr3d = 11.5 dB	+ ∞
CODEC_MODE_2	Thr2d = 5.5 dB	Thr2u = 13.5 dB
CODEC_MODE_1	– ∞	Thr1u = 7.5 dB

The SS switches the downlink codec to the Initial Codec Mode after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode.

The SS waits until the MS indicates in the CMR that the 12.65 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr2u. The SS waits 500ms

2c) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 3:

3a) The unwanted signal is removed.

The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the AMR 8.85 kbit/s mode only:

The SS switches the downlink codec to the 8.85 kbit/s mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested codec. The SS waits for the MS to change the uplink codec to the expected codec, 12 frames after receiving the ACK_OK message.

3b) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	TCH/WFS in kbit/s
CODEC_MODE_3	12,65
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With the Initial Codec Mode set to the 12.65 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr3d = 18.5 dB	+ ∞
CODEC_MODE_2	Thr2d = 10.5 dB	Thr2u = 20.5 dB
CODEC_MODE_1	– ∞	Thr1u = 12.5 dB

The SS switches the downlink codec to the Initial Codec Mode after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode

The SS waits until the MS indicates in the CMR that the 12.65 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

3c) The SS then sends a THRESH_REQ through a RATSCCH message commanding the MS to modify the Thresholds and Hysteresis to the following values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr3d = 13.5 dB	+ ∞
CODEC_MODE_2	Thr2d = 7.5 dB	Thr2u = 15.5 dB
CODEC_MODE_1	– ∞	Thr1u = 9.5 dB

The SS waits 12 frames after receiving the ACK_OK message.

3d) The SS waits until the MS indicates in the CMR that the 12.65 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr1u. The SS waits 500ms

3e) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 4:

4a) The unwanted signal is removed.

The SS uses a Channel Mode Modify procedure commanding the MS to use the AMR 8.85 kbit/s mode only:

The SS waits for the MS to change the uplink codec to the 8.85 kbit/s mode.

4b) The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	TCH/WFS in kbit/s
CODEC_MODE_3	12,65
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With the Initial Codec Mode set to the 12.65 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr3d = 12.5 dB	+ ∞
CODEC_MODE_2	Thr2d = 6.5 dB	Thr2u = 14.5 dB
CODEC_MODE_1	– ∞	Thr1u = 8.5 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

The SS waits until the MS indicates in the CMR that the 12.65 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to 4 dB above the highest of the upwards thresholds Thr2u. The SS waits 500ms

4c) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

Maximum/Minimum Duration of Test

Maximum/minimum: 54 minutes.

14.10.8.5 Test requirements

The requirement and minimum set of samples shall not exceed the values given in the following table for each set of thresholds.

Event	Maximum allowed error rate	Minimum No. of samples
C/I increases over Thresholds	11%	2000
C/I decreases below Thresholds	11%	2000

NOTE: The maximum allowed error rates for the C/I thresholds are derived from the average of the C/I event counters in Step 1 to Step 4 of the method of test.

14.10.9 Performance of the Codec Mode Request Generation – TCH/WFS - improved RX

14.10.9.1 Definition

When a traffic channel supporting an Adaptive Multi-Rate speech codec version 5 is activated, the Codec Mode Request is sent by MS in band every other speech frame to indicate to the Network the recommended codec mode of the ACS to use on the downlink.

14.10.9.2 Conformance Requirement

3GPP TS 45.009 subclause 3.3.3.3:

For TU3 channel conditions with ideal frequency hopping without DTX activated in GSM900 and GSM850, the MS shall produce Codec Mode Requests with the following accuracy:

- When a carrier to interferer ratio 4 dB higher than a defined upper threshold is applied to the antenna connector, the MS shall request a higher mode with a probability exceeding 90%. This shall be measured immediately after a settling-time of 200 ms.

- When a carrier to interferer ratio 4 dB lower than a defined lower threshold is applied to the antenna connector, the MS shall request a lower mode with a probability exceeding 90%. This shall be measured immediately after a settling-time of 200 ms.

If required, the above test levels shall be reduced by the normalization factor defined in sub-clause 3.3.1 to account for potential improved receiver performances.

For other frequency bands, the propagation profile should be adjusted to: TU1.5 for DCS1800 and PCS1900, TU6 for GSM400 and TU3.6 for GSM700.

NOTE 1: Ideal frequency hopping assumes perfect decorrelation between bursts. For the propagation profile TU3, this is not easily achievable due to the high number of hopping frequencies required. Therefore, performance tests should be performed under ideal frequency hopping conditions for the following propagation profiles: TU50 for GSM900 and GSM850, TU25 for DCS1800 and PCS1900, TU100 for GSM400, and TU60 for GSM700.

NOTE 2: Receivers with improved performance may exceed the minimum requirements reflected by the normalisation factor defined in sub-clause 3.3.1. The normalisation factor, reflecting the improved performance, may depend on the carrier to interference ratio (C/I). Therefore, the conformance test of these receivers may require normalisation factors to be provided for each nominal C/I of the test.

3GPP TS 45.005 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.10.9.3 Test Purpose

1. To verify that the MS does not exceed conformance requirements for producing codec mode request under TUHigh and frequency hopping propagation conditions without DTX with an allowance for the statistical significance of the test.

2. To implicitly verify the correct implementation of the AMR Thresholds and Hysteresis parameters received in either an ASSIGNMENT COMMAND or MODE MODIFY procedure, or through an AMR_CONFIG_REQ or THRESH_REQ message carried in a RATSCCH.

NOTE: This would normally be performed as a signalling test, however due to the complex layer 1 requirements it is verified here. Any future modification or Change Request on this section should take into account this additional test objective.

NOTE: The C/I values used throughout this test have been carefully selected to ensure no values above 16dB are signalled, low C/I values will not conflict with the synchronisation requirements in TS 45.010, and also to ensure the C/I values are shared between upward and downward applications. Any future modification or Change Request on this section should take into account these aspects.

14.10.9.4 Method of Test

14.10.9.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/WFS with a hopping pattern in the Mid ARFCN range and covering at least 10 frequencies not exceeding 5 MHz. DTX shall not be activated. Power control level shall be set to maximum power.

The initial configuration indicates the use of the 12.65 mode of AMR only.

The SS transmits Standard Test Signal C1 on the traffic channel.

In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

- The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. Initially, the unwanted signal is switched off.

- The fading characteristic of the wanted and the interfering signal is TUHigh.

NOTE 1: The fading characteristics shall be TU50 for GSM900, T-GSM 810 and GSM850, TU25 for DCS1800 and PCS1900, TU100 for GSM400, and TU60 for GSM700.

Specific PICS Statements

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PIXIT Statements

TCH/WFS C/I normalization factors (TCH/WFS DARP) as follows:

Required additional information (PIXIT)
CI_NORM_WFS_DARP_2dB
CI_NORM_WFS_DARP_3dB
CI_NORM_WFS_DARP_4dB
CI_NORM_WFS_DARP_6dB
CI_NORM_WFS_DARP_8dB
CI_NORM_WFS_DARP_10dB
CI_NORM_WFS_DARP_11dB
CI_NORM_WFS_DARP_12dB
CI_NORM_WFS_DARP_14dB
CI_NORM_WFS_DARP_17dB
CI_NORM_WFS_DARP_19dB
CI_NORM_WFS_DARP_20dB

14.10.9.4.2 Procedure

STEP 1:

1a) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	TCH/WFS in kbit/s
CODEC_MODE_3	12,65
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With Initial Codec Mode unspecified, thus the default ICM rule being used and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr3d = 17.5 dB	$+\infty$
CODEC_MODE_2	Thr2d = 12.5 dB	Thr2u = 19.5 dB
CODEC_MODE_1	$-\infty$	Thr1u = 14.5 dB

The SS uses the expected Initial Codec Mode (default rule) after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode (default rule).

1b) The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	TCH/WFS in kbit/s
CODEC_MODE_3	12,65
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With the Initial Codec Mode set to the 12.65 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr3d = 15.0 dB	+ ∞
CODEC_MODE_2	Thr2d = 6.0 dB	Thr2u = 15.0 dB
CODEC_MODE_1	– ∞	Thr1u = 6.0 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

The SS waits until the MS indicates in the CMR that the 12.65 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set Thr2u + 4dB - CI_NORM_AFS_DARP_19dB. The SS waits 500ms.

1c) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr3d – 4dB - CI_NORM_AFS_DARP_11dB. The SS increments the counter for ‘C/I decreases below thresholds’.

1d) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 8.85 kbit/s or a lower codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

1e) The SS switches the downlink codec mode to 8.85 kbit/s and waits for 0.5s.

1f) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr2d – 4dB - CI_NORM_AFS_DARP_2dB. The SS increments the counter for ‘C/I decreases below thresholds’.

1g) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 6.6 kbits/s codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

1h) The SS switches the downlink codec mode to 6.6 kbit/s and waits for 0.5s.

1i) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr1u + 4dB - CI_NORM_AFS_DARP_10dB. The SS increments the counter for ‘C/I increases above thresholds’.

1j) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 8.85 kbit/s or a higher codec mode in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

1k) The SS switches the downlink codec mode to 8.85 kbit/s and waits for 0.5s.

1l) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr2u + 4dB - CI_NORM_AFS_DARP_19dB. The SS increments the counter for ‘C/I increases above thresholds’.

1m) The SS checks the CMR received by the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use 12.65 kbit/s in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

1n) The SS switches the downlink codec mode to 12.65 kbit/s and waits for 0.5s.

1o) The SS repeats steps 1c) to 1n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 2:

2a) The unwanted signal is removed.

The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	TCH/WFS in kbit/s
CODEC_MODE_3	12,65
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With the Initial Codec Mode set to any mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr3d = 17.5 dB	+ ∞
CODEC_MODE_2	Thr2d = 12.5 dB	Thr2u = 19.5 dB
CODEC_MODE_1	– ∞	Thr1u = 14.5 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

2b) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	TCH/WFS in kbit/s
CODEC_MODE_3	12,65
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With the Initial Codec Mode set to the 12.65 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr3d = 12.0 dB	+ ∞
CODEC_MODE_2	Thr2d = 8.0 dB	Thr2u = 13.0 dB
CODEC_MODE_1	– ∞	Thr1u = 8.0 dB

The SS switches the downlink codec to the Initial Codec Mode after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode.

The SS waits until the MS indicates in the CMR that the 12.65 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to Thr2u + 4dB - CI_NORM_AFS_DARP_17dB. The SS waits 500ms

2c) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr3d – 4dB - CI_NORM_AFS_DARP_8dB. The SS increments the counter for 'C/I decreases below thresholds'.

2d) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 8.85 kbit/s or a lower codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

2e) The SS switches the downlink codec mode to 8.85 kbit/s and waits for 0.5s.

2f) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr2d – 4dB - CI_NORM_AFS_DARP_4dB. The SS increments the counter for 'C/I decreases below thresholds'.

2g) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 6.6 kbits/s codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

2h) The SS switches the downlink codec mode to 6.6 kbit/s and waits for 0.5s.

2i) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr1u + 4dB - CI_NORM_AFS_DARP_12dB. The SS increments the counter for 'C/I increases above thresholds'.

2j) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 8.85 kbit/s or a higher codec mode in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

2k) The SS switches the downlink codec mode to 8.85 kbit/s and waits for 0.5s.

2l) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr2u + 4dB - CI_NORM_AFS_DARP_17dB. The SS increments the counter for 'C/I increases above thresholds'.

2m) The SS checks the CMR received by the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use 12.65 kbit/s in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

2n) The SS switches the downlink codec mode to 12.65 kbit/s and waits for 0.5s.

2o) The SS repeats steps 2c) to 2n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 3:

3a) The unwanted signal is removed.

The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the AMR 8.85 kbit/s mode only:

The SS switches the downlink codec to the 8.85 mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested codec. The SS waits for the MS to change the uplink codec to the expected codec, 12 frames after receiving the ACK_OK message.

3b) The SS uses a Channel Mode Modify procedure to change the active codec set to the following set:

Codec Mode	TCH/WFS in kbit/s
CODEC_MODE_3	12,65
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With the Initial Codec Mode set to the 12.65 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr3d = 18.5 dB	$+\infty$
CODEC_MODE_2	Thr2d = 10.5 dB	Thr2u = 20.5 dB
CODEC_MODE_1	$-\infty$	Thr1u = 12.5 dB

The SS switches the downlink codec to the Initial Codec Mode after sending the mode modify message and commands the MS through the CMC field to use the Initial Codec Mode as well. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode

The SS waits until the MS indicates in the CMR that the 12.65 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

3c) The SS then sends a THRESH_REQ through a RATSCCH message commanding the MS to modify the Thresholds and Hysteresis to the following values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr3d = 14.0 dB	+ ∞
CODEC_MODE_2	Thr2d = 10.0 dB	Thr2u = 16.0 dB
CODEC_MODE_1	– ∞	Thr1u = 10.0 dB

The SS waits 12 frames after receiving the ACK_OK message.

3d) The SS waits until the MS indicates in the CMR that the 12.65 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to Thr2u + 4dB - CI_NORM_AFS_DARP_20dB. The SS waits 500ms

3e) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr3d – 4dB - CI_NORM_AFS_DARP_10dB. The SS increments the counter for 'C/I decreases below thresholds'.

3f) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 8.85 kbit/s or a lower codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

3g) The SS switches the downlink codec mode to 8.85 kbit/s and waits for 0.5s.

3h) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr2d – 4dB - CI_NORM_AFS_DARP_6dB. The SS increments the counter for 'C/I decreases below thresholds'.

3i) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 6.6 kbits/s codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

3j) The SS switches the downlink codec mode to 6.6 kbit/s and waits for 0.5s.

3k) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr1u + 4dB - CI_NORM_AFS_DARP_14dB. The SS increments the counter for 'C/I increases above thresholds'.

3l) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 8.85 kbit/s or a higher codec mode in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

3m) The SS switches the downlink codec mode to 8.85 kbit/s and waits for 0.5s.

3n) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr2u + 4dB - CI_NORM_AFS_DARP_20dB. The SS increments the counter for 'C/I increases above thresholds'.

3o) The SS checks the CMR received by the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use 12.65 kbit/s in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

3p) The SS switches the downlink codec mode to 12.65 kbit/s and waits for 0.5s.

3q) The SS repeats steps 3e) to 3p) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

STEP 4:

4a) The unwanted signal is removed.

The SS uses a Channel Mode Modify procedure commanding the MS to use the WFS 8.85 kbit/s mode only:

The SS waits for the MS to change the uplink codec to the 8.85 kbit/s mode.

4b) The SS then sends an AMR_CONF_REQ through a RATSCCH message commanding the MS to use the following ACS:

Codec Mode	TCH/WFS in kbit/s
CODEC_MODE_3	12,65
CODEC_MODE_2	8,85
CODEC_MODE_1	6,6

With the Initial Codec Mode set to the 12.65 kbit/s mode and the following decision thresholds and hysteresis values:

MC'/MR'	THR_MC_Dn(MC)/ THR_MR_Dn(MR)	THR_MC_Up(MC)/ THR_MR_Up(MR)
CODEC_MODE_3	Thr3d = 16.0 dB	$+\infty$
CODEC_MODE_2	Thr2d = 7.0 dB	Thr2u = 16.0 dB
CODEC_MODE_1	$-\infty$	Thr1u = 7.0 dB

The SS switches the downlink codec to the Initial Codec Mode 12 frames after sending the AMR_CONF_REQ message and commands the MS through the CMC field to use the requested Initial Codec Mode. The SS waits for the MS to change the uplink codec to the expected Initial Codec Mode, 12 frames after receiving the ACK_OK message.

The SS waits until the MS indicates in the CMR that the 12.65 kbit/s is the recommended downlink codec mode.

If the MS never reaches that point then the test is failed.

The downlink radio environment is altered so that the carrier to interference ratio is set to Thr2u + 4dB - CI_NORM_AFS_DARP_20dB. The SS waits 500ms

4c) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr3d – 4dB - CI_NORM_AFS_DARP_12dB. The SS increments the counter for 'C/I decreases below thresholds'.

4d) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 8.85 kbit/s or a lower codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

4e) The SS switches the downlink codec mode to 8.85 kbit/s and waits for 0.5s.

4f) The downlink radio environment is altered so that the carrier to interference ratio is reduced to Thr2d – 4dB - CI_NORM_AFS_DARP_3dB. The SS increments the counter for 'C/I decreases below thresholds'.

4g) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 6.6 kbits/s codec mode in the downlink, then the SS should increment the successful C/I decrease event counter. Otherwise, the SS should increment the unsuccessful C/I decrease event counter.

4h) The SS switches the downlink codec mode to 6.6 kbit/s and waits for 0.5s.

4i) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr1u + 4dB - CI_NORM_AFS_DARP_11dB. The SS increments the counter for 'C/I increases above thresholds'.

4j) The SS checks the CMR received from the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use the 8.85 kbit/s or a higher codec mode in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

4k) The SS switches the downlink codec mode to 8.85 kbit/s and waits for 0.5s.

4l) The downlink radio environment is altered so that the carrier to interference ratio is increased to Thr2u + 4dB - CI_NORM_AFS_DARP_20dB. The SS increments the counter for 'C/I increases above thresholds'.

4m) The SS checks the CMR received by the MS 200ms after the carrier to interference has been altered. If the CMR indicates that the MS recommends to use 12.65 kbit/s in the downlink, then the SS should increment the successful C/I increase event counter. Otherwise, the SS should increment the unsuccessful C/I increase event counter.

4n) The SS switches the downlink codec mode to 12.65 kbit/s and waits for 0.5s.

4o) The SS repeats steps 4c) to 4n) until 500 samples of C/I increases and 500 samples of C/I decreases have been recorded.

NOTE: The core specifications state that an MS shall respond to a change of C/I within 200ms. The core specifications place no bounds on magnitude or rate of change of C/I. For this test the magnitude of change is bounded by THRESH and HYST selection, and the rate of change is bounded by the 500ms wait periods. These bounds are selected to ensure an MS implementation is not adversely biased by this test.

Maximum/Minimum Duration of Test

Maximum/minimum: 54 minutes.

14.10.9.5 Test requirements

The requirement and minimum set of samples shall not exceed the values given in the following table for each set of thresholds.

Event	Maximum allowed error rate	Minimum No. of samples
C/I increases over Thresholds	11%	2000
C/I decreases below Thresholds	11%	2000

NOTE: The maximum allowed error rates for the C/I thresholds are derived from the average of the C/I event counters in Step 1 to Step 4 of the method of test.

14.11 DARP Phase 1 Speech bearer tests

14.11.1 TCH/FS

14.11.1.1 DTS-1

14.11.1.1.1 Definition

The DARP reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the DARP receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.11.1.1.2 Conformance requirement

1. MS indicating support for Downlink Advanced Receiver Performance – phase I (see 3GPP TS 24.008) shall fulfil the requirements in table 2o for wanted signals on GMSK modulated channels under TU50 no FH propagation conditions and GMSK modulated interferers for the test scenarios defined in annex L. The reference performance shall be:

   - For speech channels (TCH/FS) FER: ≤ 1 %

2. The values in table 2o are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex L).

In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 2o at the corresponding C/I1.

3GPP TS 45.005, subclause 6.3

14.11.1.1.3 Test purpose

To verify that the MS does not exceed the first conformance requirement for TCH/FS under propagation condition TUhigh with an allowance for the statistical significance of the test.

To verify that the MS does not exceed the second conformance requirement for TCH/FS under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.11.1.1.4 Method of test

14.11.1.1.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/FS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.11.1.1.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. The interfering signal level is set to -80 dBm.

   The fading characteristic of the wanted and the interfering signal is TUHigh.

b) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14.11.1-2 or 14.11.1-3.

c) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the number of residual bit error events for the bits of the class II, by examining at least the minimum number of samples of consecutive bits of class II. Bits are only taken from those frames not signalled as erased.

f) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased.

Maximum/Minimum Duration of Test

Maximum: 10 minutes (GSM850), 10 minutes (GSM900), 10 minutes (DCS1800), 10 minutes (PCS1900).

Minimum: 4 minutes (GSM850), 4 minutes (GSM900), 2 minutes (DCS1800), 2 minutes (PCS1900).

14.11.1.1.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7 (A7.1.3.2)

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure Annex 7 figure A7.1.3.1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.11.1-1: Minimum test times due to TU high fading conditions

Full Rate 50 km/h					
Frequency	0,85	0,9	1,8	1,9	GHz
Wavelength	0,35	0,33	0,17	0,16	m
Min test time	201	190	95	90	s
	0:03:21	**0:03:10**	**0:01:35**	**0:01:30**	**hh:mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the "derived test limit". In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne $\geq$ 1 (inclusive artificial error)

For an early fail decision ne $\geq$ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14.11.1-2 or 14.11.1-3.

Table 14.11.1-2: Statistical test limits for GSM 850 and GSM 900 TCH/FS DARP DTS-1

DTS-1								
0.8 to 0.9 GHz		**C_{lev} (dBm)**	**Samples per second**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time (s)**	**Target test time (hh:mm:ss)**
FS	Frames	-75.5	50	0,010000	0,012340	27958	560	00:09:20
	Class Ib	(as frames)	6600	0,001000	0,001234	279580	43	00:00:43
	Class II	(as frames)	3900	0,046000	0,056764	6078	2	00:00:02

Table 14.11.1-3: Statistical test limits for DCS 1 800 and PCS 1 900 TCH/AFS DARP DTS-1

DTS-1									
1.8 to 1.9GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
FS	Frames	-76.5	50	0,010000	0,012340	27958	560	00:09:20
	Class Ib	(as frames)	6600	0,001000	0,001234	279580	43	00:00:43
	Class II	(as frames)	3900	0,053000	0,065402	5276	2	00:00:02

14.11.1.1a DARP Phase 1 Speech bearer test TCH/FS DTS-1 in TIGHTER configuration

14.11.1.1a.1 Definition

The DARP reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the DARP receiver with additional TIGHTER requirements to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.11.1.1a.2 Conformance requirement

1. A MS indicating support for TIGHTER capability (see 3GPP TS 24.008) shall fulfil the additional requirements in table 2ad for co channel interference (C/Ic), table 2af for adjacent channel (200 kHz) interference (C/Ia1), and the additional requirements in table 2ae for wanted signals on GMSK modulated channels for the test scenarios defined in annex L. The reference performance shall be:

   - For speech channels (TCH/FS, TCH/HS, TCH/EFS, TCH/AFSx, TCH/AHSx, TCH/WFSx) FER: ≤ 1 %

2. The values in table 2ae are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex L).
   In addition to table 6.3-6, for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 2ad, 2ae, and 2af at the corresponding interference ratio C/Ic, C/I1, and C/Ia1, respectively.

3GPP TS 45.005, subclause 6.3

14.11.1.1a.3 Test purpose

To verify that the MS does not exceed the first conformance requirement for TCH/FS under propagation condition TUhigh with an allowance for the statistical significance of the test.

To verify that the MS does not exceed the second conformance requirement for TCH/FS under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.11.1.1a.4 Method of test

14.11.1.1a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/FS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.11.1.1a.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. The interfering signal level is set to -80 dBm.

The fading characteristic of the wanted and the interfering signal is TUHigh.

b) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14.11.1.1a-2 or 14.11.1.1a-3.

c) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the number of residual bit error events for the bits of the class II, by examining at least the minimum number of samples of consecutive bits of class II. Bits are only taken from those frames not signalled as erased.

f) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased.

Maximum/Minimum Duration of Test

Maximum: 10 minutes (GSM850), 10 minutes (GSM900), 10 minutes (DCS1800), 10 minutes (PCS1900).

Minimum: 4 minutes (GSM850), 4 minutes (GSM900), 2 minutes (DCS1800), 2 minutes (PCS1900)

14.11.1.1a.5 Test requirement

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7 (A7.1.3.2)

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.11.1.1a-1: Minimum test times due to TU high fading conditions

Full Rate 50 km/h					
Frequency	0,85	0,9	1,8	1,9	GHz
Wavelength	0,35	0,33	0,17	0,16	m
Min test time	201	190	95	90	s
	0:03:21	**0:03:10**	**0:01:35**	**0:01:30**	**hh:mm:ss**

The error rate measured in this test shall be tested according to the values given in tables 14.11.1.1a-2 or 14.11.1.1a-3.

Table 14.11.1.1a-2: Statistical test limits for GSM 850 and GSM 900 TCH/FS DARP DTS-1

DTS-1									
0.8 to 0.9GHz		**C_{lev} (dBm)**	**Samples per second**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time (s)**	**Target test time (hh:mm:ss)**
FS	Frames	-84	50	0,010000	0,012340	27958	560	00:09:20
	Class Ib	(as frames)	6600	0,001000	0,001234	279579	43	00:00:43
	Class II	(as frames)	3900	0,046000	0,056764	6078	2	00:00:02

Table 14.11.1.1a-3: Statistical test limits for DCS 1800 and PCS 1900 TCH/FS DARP DTS-1

DTS-1								
1.8 to 1.9GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
FS	Frames	-84	50	0,010000	0,012340	27958	560	00:09:20
	Class Ib	(as frames)	6600	0,001000	0,001234	279579	43	00:00:43
	Class II	(as frames)	3900	0,053000	0,065402	5276	2	00:00:02

14.11.2 TCH/AFS

14.11.2.1 DTS-1

14.11.2.1.1 Definition

The DARP reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the DARP receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.11.2.1.2 Conformance requirement

1. MS indicating support for Downlink Advanced Receiver Performance – phase I (see 3GPP TS 24.008) shall fulfil the requirements in table 2o for wanted signals on GMSK modulated channels under TU50 no FH propagation conditions and GMSK modulated interferers for the test scenarios defined in annex L. The reference performance shall be:

   - For speech channels (TCH/FS, TCH/AFSx, TCH/AHSx) FER: ≤ 1 %

2. The values in table 2o are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex L).
   In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 2o at the corresponding C/I1.

3GPP TS 45.005, subclause 6.3

14.11.2.1.3 Test purpose

To verify that the MS does not exceed the first conformance requirement for TCH/AFS under propagation condition TUhigh with an allowance for the statistical significance of the test.

To verify that the MS does not exceed the second conformance requirement for TCH/AFS under propagation condition TUhigh with an allowance for the statistical significance of the test for class Ib BER.

14.11.2.1.4 Method of test

14.11.2.1.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AFS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 12,2 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal), with training sequence code (TSC) = 0.

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.11.2.1.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. The interfering signal level is set to -80 dBm.

The fading characteristic of the wanted and the interfering signal is TUHigh.

b) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14-63 or 14-64.

c) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 10,2 kbit/s and steps b) to e) are repeated.

g) The SS uses a Channel Mode Modify procedure to change the active codec set to 7,95 kbit/s and steps b) to e) are repeated.

h) The SS uses a Channel Mode Modify procedure to change the active codec set to 7,4 kbit/s and steps b) to e) are repeated.

i) The SS uses a Channel Mode Modify procedure to change the active codec set to 6,7 kbit/s and steps b) to e) are repeated.

j) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,9 kbit/s and steps b) to e) are repeated.

k) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,15 kbit/s and steps b) to e) are repeated.

l) The SS uses a Channel Mode Modify procedure to change the active codec set to 4,75 kbit/s and steps b) to e) are repeated.

Maximum/Minimum Duration of Test

Maximum: 75 minutes (GSM850), 75 minutes (GSM900), 75 minutes (DCS1800), 75 minutes (PCS1900).

Minimum: 27 minutes (GSM850), 26 minutes (GSM900), 13 minutes (DCS1800), 12 minutes (PCS1900).

14.11.2.1.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7.

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure A7.1.3.2.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14-62: Minimum test times due to TU high fading conditions

Full Rate 50 km/h					
Frequency	0,85	0,9	1,8	1,9	GHz
Wavelength	0,35	0,33	0,17	0,16	m
min test time	201	190	95	90	s
	0:03:21	**0:03:10**	**0:01:35**	**0:01:30**	**hh:mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the “derived test limit”. In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne ≥ 1 (inclusive artificial error)

For an early fail decision ne ≥ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14-63 or 14-64.

Table 14-63: Statistical test limits for GSM 850 and GSM 900 TCH/AFS DARP DTS-1

DTS-1								
0.8 to 0.9GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AFS 12.2	Frames	-75.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	8150	0,006000	0,007404	46596	6	00:00:06
AFS 10.2	Frames	-76.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	6950	0,002000	0,002468	139789	20	00:00:20
AFS 7.95	Frames	-78.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	4200	0,003500	0,004319	79879	19	00:00:19
AFS 7.4	Frames	-78.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	4350	0,002000	0,002468	139789	32	00:00:32
AFS 6.7	Frames	-80.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	3950	0,005000	0,006170	55915	14	00:00:14
AFS 5.9	Frames	-80.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	3150	0,002000	0,002468	139789	44	00:00:44
AFS 5.15	Frames	-81.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	2700	0,002100	0.002591	133153	49	00:00:49
AFS 4.75	Frames	-81.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	2800	0,001500	0.001851	186385	66	00:01:06

Table 14-64: Statistical test limits for DCS 1 800 and PCS 1 900 TCH/AFS DARP DTS-1

DTS-1								
1.8 to 1.9GHz		**C_{lev} (dBm)**	**Samples per second**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time (s)**	**Target test time (hh:mm:ss)**
AFS 12.2	Frames	-76.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	8150	0,008700	0,010736	32134	4	00:00:04
AFS 10.2	Frames	-77.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	6950	0,002000	0,002468	139789	20	00:00:20
AFS 7.95	Frames	-79.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	4200	0,003600	0,004442	77667	18	00:00:18
AFS 7.4	Frames	-79.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	4350	0,002000	0,002468	139789	32	00:00:32
AFS 6.7	Frames	-80.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	3950	0,007000	0,008638	39939	10	00:00:10
AFS 5.9	Frames	-81.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	3150	0,002000	0,002468	139789	44	00:00:44
AFS 5.15	Frames	-81.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	2700	0,002500	0.003085	111831	41	00:00:41
AFS 4.75	Frames	-82.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	2800	0,001500	0.001851	186385	66	00:01:06

14.11.2.1a DARP Phase 1 Speech bearer test TCH/AFS DTS-1 in TIGHTER configuration

14.11.2.1a.1 Definition

The DARP reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the DARP receiver with additional TIGHTER requirements to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.11.2.1a.2 Conformance requirement

1. A MS indicating support for TIGHTER capability (see 3GPP TS 24.008) shall fulfil the additional requirements in table 2ad for co channel interference (C/Ic), table 2af for adjacent channel (200 kHz) interference (C/Ia1), and the additional requirements in table 2ae for wanted signals on GMSK modulated channels for the test scenarios defined in annex L. The reference performance shall be:

   - For speech channels (TCH/FS, TCH/HS, TCH/EFS, TCH/AFSx, TCH/AHSx, TCH/WFSx) FER: ≤ 1 %

2. The values in table 2ae are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex L).
   In addition to table 6.3-6, for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 2ad, 2ae, and 2af at the corresponding interference ratio C/Ic, C/I1, and C/Ia1, respectively.

3GPP TS 45.005, subclause 6.3

14.11.2.1a.3 Test purpose

To verify that the MS does not exceed the first conformance requirement for TCH/AFS under propagation condition TUhigh with an allowance for the statistical significance of the test.

To verify that the MS does not exceed the second conformance requirement for TCH/AFS under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.11.2.1a.4 Method of test

14.11.2.1a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AFS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 12,2 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal), with training sequence code (TSC) = 0.

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.11.2.1a.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. The interfering signal level is set to -80 dBm.

   The fading characteristic of the wanted and the interfering signal is TUHigh.

b) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14.11.2.1a-2 or 14.11.2.1a-3.

c) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 10,2 kbit/s and steps b) to e) are repeated.

g) The SS uses a Channel Mode Modify procedure to change the active codec set to 7,95 kbit/s and steps b) to e) are repeated.

h) The SS uses a Channel Mode Modify procedure to change the active codec set to 7,4 kbit/s and steps b) to e) are repeated.

i) The SS uses a Channel Mode Modify procedure to change the active codec set to 6,7 kbit/s and steps b) to e) are repeated.

j) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,9 kbit/s and steps b) to e) are repeated.

k) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,15 kbit/s and steps b) to e) are repeated.

l) The SS uses a Channel Mode Modify procedure to change the active codec set to 4,75 kbit/s and steps b) to e) are repeated

Maximum/Minimum Duration of Test

Maximum: 75 minutes (GSM850), 75 minutes (GSM900), 75 minutes (DCS1800), 75 minutes (PCS1900).

Minimum: 27 minutes (GSM850), 26 minutes (GSM900), 13 minutes (DCS1800), 12 minutes (PCS1900).

14.11.2.1a.5 Test requirement

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7.

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.11.2.1a-1: Minimum test times due to TU high fading conditions

Full Rate 50 km/h					
Frequency	0,85	0,9	1,8	1,9	GHz
Wavelength	0,35	0,33	0,17	0,16	m
Min test time	201	190	95	90	s
	0:03:21	**0:03:10**	**0:01:35**	**0:01:30**	**hh:mm:ss**

The error rate measured in this test shall be tested according to the values given in tables 14.11.2.1a-2 or 14.11.2.1a-3.

Table 14.11.2.1a-2: Statistical test limits for GSM 850 and GSM 900 TCH/AFS DARP DTS-1

DTS-1								
0.8 to 0.9GHz		**C_{lev} (dBm)**	**Samples per second**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time (s)**	**Target test time (hh:mm:ss)**
AFS 12.2	Frames	-82.5	50	0,010000	0,012340	27958	559	00:09:19
	Class1b	(as frames)	8150	0,006000	0,007404	46596	6	00:00:06
AFS 10.2	Frames	-84	50	0,010000	0,012340	27958	559	00:09:19
	Class1b	(as frames)	6950	0,002000	0,002468	139789	20	00:00:20
AFS 7.95	Frames	-86	50	0,010000	0,012340	27958	559	00:09:19
	Class1b	(as frames)	4200	0,003500	0,004319	79880	19	00:00:19
AFS 7.4	Frames	-86	50	0,010000	0,012340	27958	559	00:09:19
	Class1b	(as frames)	4350	0,002000	0,002468	139789	32	00:00:32
AFS 6.7	Frames	-87.5	50	0,010000	0,012340	27958	559	00:09:19
	Class1b	(as frames)	3950	0,005000	0,006170	55916	14	00:00:14
AFS 5.9	Frames	-87.5	50	0,010000	0,012340	27958	559	00:09:19
	Class1b	(as frames)	3150	0,002000	0,002468	139789	44	00:00:44
AFS 5.15	Frames	-88.5	50	0,010000	0,012340	27958	559	00:09:19
	Class1b	(as frames)	2700	0,002100	0,002591	133133	49	00:00:49
AFS 4.75	Frames	-89	50	0,010000	0,012340	27958	559	00:09:19
	Class1b	(as frames)	2800	0,001500	0.001851	186386	67	00:01:07

Table 14.11.2.1a-3: Statistical test limits for DCS 1800 and PCS 1900 TCH/AFS DARP DTS-1

DTS-1									
1.8 to 1.9GHz		**C_{lev} (dBm)**	**Samples per second**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time (s)**	**Target test time (hh:mm:ss)**
AFS 12.2	Frames	-83.5	50	0,010000	0,012340	27958	559	00:09:19
	Class1b	(as frames)	8150	0,008700	0,010736	32135	4	00:00:04
AFS 10.2	Frames	-84.5	50	0,010000	0,012340	27958	559	00:09:19
	Class1b	(as frames)	6950	0,002000	0,002468	139789	20	00:00:20
AFS 7.95	Frames	-87	50	0,010000	0,012340	27958	559	00:09:19
	Class1b	(as frames)	4200	0,003600	0,004442	77661	18	00:00:18
AFS 7.4	Frames	-87	50	0,010000	0,012340	27958	559	00:09:19
	Class1b	(as frames)	4350	0,002000	0,002468	139789	32	00:00:32
AFS 6.7	Frames	-88	50	0,010000	0,012340	27958	559	00:09:19
	Class1b	(as frames)	3950	0,007000	0,008638	39940	10	00:00:10
AFS 5.9	Frames	-88.5	50	0,010000	0,012340	27958	559	00:09:19
	Class1b	(as frames)	3150	0,002000	0,002468	139789	44	00:00:44
AFS 5.15	Frames	-89	50	0,010000	0,012340	27958	559	00:09:19
	Class1b	(as frames)	2700	0,002500	0,003085	111831	41	00:00:41
AFS 4.75	Frames	-89.5	50	0,010000	0,012340	27958	559	00:09:19
	Class1b	(as frames)	2800	0,001500	0.001851	186386	67	00:01:07

14.11.2.2 DTS-4

14.11.2.2.1 Definition

The DARP reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the DARP receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.11.2.2.2 Conformance requirement

1. MS indicating support for Downlink Advanced Receiver Performance – phase I (see 3GPP TS 24.008) shall fulfil the requirements in table 2o for wanted signals on GMSK modulated channels under TU50 no FH propagation conditions and GMSK modulated interferers for the test scenarios defined in annex L. The reference performance shall be:

   – For speech channels (TCH/FS, TCH/AFSx, TCH/AHSx) FER: ≤ 1 %

2. The values in table 2o are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex L).
   In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 2o at the corresponding C/I1.

3GPP TS 45.005, subclause 6.3

14.11.2.2.3 Test purpose

To verify that the MS does not exceed the first conformance requirement for TCH/AFS under propagation condition TUhigh with an allowance for the statistical significance of the test.

To verify that the MS does not exceed the second conformance requirement for TCH/AFS under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.11.2.2.4 Method of test

14.11.2.2.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AFS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 12,2 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal), with training sequence code (TSC) = 0.

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.11.2.2.4.2 Procedure

a) In addition to the wanted signal, the SS produces one further interfering signal to produce scenario DTS-4.

   A signal of type I5 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -77 dBm.

b) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14.11.2.2-2 or 14-11.2.2-3.

c) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,9 kbit/s and steps b) to e) are repeated.

Maximum/Minimum Duration of Test

Maximum: 19 minutes (GSM850), 19 minutes (GSM900), 19 minutes (DCS1800), 19 minutes (PCS1900).

Minimum: 7 minutes (GSM850), 6 minutes (GSM900), 3 minutes (DCS1800), 3 minutes (PCS1900).

14.11.2.2.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7.

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure A7.1.3.1.

4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.11.2.2-1: Minimum test times due to TU 50 fading conditions

Full Rate 50 km/h					
Frequency	0,85	0,9	1,8	1,9	GHz
Wavelength	0,35	0,33	0,17	0,16	m
min test time	201	190	95	90	s
	0:03:21	**0:03:10**	**0:01:35**	**0:01:30**	**hh:mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the “derived test limit”. In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne $\geq$ 1 (inclusive artificial error)

For an early fail decision ne $\geq$ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14.11.2.2-2 or 14.11.2.2-3.

Table 14.11.2.2-2: Statistical test limits for GSM 850 and GSM 900 TCH/AFS DARP DTS-4

DTS-4								
0.8 to 0.9GHz		**C_{lev} (dBm)**	**Samples per second**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time (s)**	**Target test time (hh:mm:ss)**
AFS 12.2	Frames	-73.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	8150	0,008000	0,009872	34947	5	00:00:05
AFS 5.9	Frames	-79.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	3150	0,001600	0,001974	174772	56	00:00:56

Table 14.11.2.2-3: Statistical test limits for DCS 1 800 and PCS 1 900 TCH/AFS DARP DTS-4

DTS-4								
1.8 to 1.9GHz		**C_{lev} (dBm)**	**Samples per second**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time (s)**	**Target test time (hh:mm:ss)**
AFS 12.2	Frames	-74.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	8150	0,009500	0,011723	29429	4	00:00:04
AFS 5.9	Frames	-80.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	3150	0,002100	0,002591	138498	44	00:00:44

14.11.2.2a DARP Phase 1 Speech bearer test TCH-AFS DTS-4 in TIGHTER configuration

14.11.2.2a.1 Definition

The DARP reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the DARP receiver with additional TIGHTER requirements to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.11.2.2a.2 Conformance requirement

1. A MS indicating support for TIGHTER Capability (see 3GPP TS 24.008) shall fulfil the requirements in table 2ad for co channel interference (C/Ic), table 2af for adjacent channel (200 kHz) interference (C/Ia1), and the additional requirements in table 2ae for wanted signals on GMSK modulated channels for the test scenarios defined in annex L. The reference performance shall be:

- For speech channels (TCH/FS, TCH/HS, TCH/EFS, TCH/AFSx, TCH/AHSx, TCH/WFSx) FER: ≤ 1 %

2. The values in table 2ae are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex L).
   In addition to table 6.3-6, for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 2ad, 2ae and 2af at the corresponding interference ratio C/Ic, C/I1, and C/Ia1, respectively.

3GPP TS 45.005, subclause 6.3

14.11.2.2a.3 Test purpose

To verify that the MS does not exceed the first conformance requirement for TCH/AFS under propagation condition TUhigh with an allowance for the statistical significance of the test.

To verify that the MS does not exceed the second conformance requirement for TCH/AFS under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.11.2.2a.4 Method of test

14.11.2.2a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AFS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 12,2 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal), with training sequence code (TSC) = 0.

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.11.2.2a.4.2 Procedure

a) In addition to the wanted signal, the SS produces one further interfering signal to produce scenario DTS-4.

   A signal of type I5 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -77 dBm.

b) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14.11.2.2a-2 or 14-11.2.2a-3.

c) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,9 kbit/s and steps b) to e) are repeated.

Maximum/Minimum Duration of Test

Maximum: 19 minutes (GSM850), 19 minutes (GSM900), 19 minutes (DCS1800), 19 minutes (PCS1900).

Minimum: 7 minutes (GSM850), 6 minutes (GSM900), 3 minutes (DCS1800), 3 minutes (PCS1900).

14.11.2.2a.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7.

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure A7.1.3.1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.11.2.2a-1: Minimum test times due to TU 50 fading conditions

Full Rate 50 km/h					
Frequency	0,85	0,9	1,8	1,9	GHz
Wavelength	0,35	0,33	0,17	0,16	m
min test time	201	190	95	90	s
	0:03:21	**0:03:10**	**0:01:35**	**0:01:30**	**hh:mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the "derived test limit". In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision $ne \geq 1$ (inclusive artificial error)

For an early fail decision ne $\geq$ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14.11.2.2-2 or 14.11.2.2-3.

Table 14.11.2.2a-2: Statistical test limits for GSM 850 and GSM 900 TCH/AFS DARP DTS-4

DTS-4								
0.8 to 0.9 GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AFS 12.2	Frames	-82.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	8150	0,008000	0,009872	34947	5	00:00:05
AFS 5.9	Frames	-88.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	3150	0,001600	0,001974	174772	56	00:00:56

Table 14.11.2.2a-3: Statistical test limits for DCS 1 800 and PCS 1 900 TCH/AFS DARP DTS-4

DTS-4								
1.8 to 1.9 GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AFS 12.2	Frames	-82.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	8150	0,009500	0,011723	29429	4	00:00:04
AFS 5.9	Frames	-88.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	3150	0,002100	0,002591	133133	44	00:00:44

14.11.2.3 DTS-2/3/5

14.11.2.3.1 Definition

The DARP reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the DARP receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.11.2.3.2 Conformance requirement

1. MS indicating support for Downlink Advanced Receiver Performance – phase I (see 3GPP TS 24.008) shall fulfil the requirements in table 2o for wanted signals on GMSK modulated channels under TU50 no FH propagation conditions and GMSK modulated interferers for the test scenarios defined in annex L. The reference performance shall be:

   - For speech channels (TCH/FS, TCH/AFSx, TCH/AHSx) FER: ≤ 1 %

2. The values in table 2o are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex L).
   In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 2o at the corresponding C/I1.

3GPP TS 45.005, subclause 6.3

14.11.2.3.3 Test purpose

To verify that the MS does not exceed the first conformance requirement for TCH/AFS under propagation condition TUhigh with an allowance for the statistical significance of the test.

To verify that the MS does not exceed the second conformance requirement for TCH/AFS under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.11.2.3.4 Method of test

14.11.2.3.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AFS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 10,2 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal), with training sequence code (TSC) = 0.

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.11.2.3.4.2 Procedure

a) In addition to the wanted signal, the SS produces a further four interfering signals to produce scenario DTS-2.

A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -80 dBm.

A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -90 dBm.

A signal of type I1 using an ARFCN one higher than C1, with fading characteristics of TUHigh, and signal level of -77 dBm.

A signal of type I3 using the same ARFCN as C1, and signal level of -97 dBm.

b) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14.11.2.3-2 or 14.11.2.3-3, and sets the fading characteristic of the signal to TUHigh..

c) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 4,75 kbit/s and steps b) to e) are repeated.

g) The SS discontinues all interfering signals.

h) In addition to the wanted signal, the SS produces a further four interfering signals to produce scenario DTS-3.

A signal of type I4 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -80 dBm.

A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -90 dBm.

A signal of type I1 using an ARFCN one lower than C1, with fading characteristics of TUHigh, and signal level of -77 dBm.

A signal of type I3 using the same ARFCN as C1, and signal level of -97 dBm.

i) The SS uses a Channel Mode Modify procedure to change the active codec set to 7,95 kbit/s and steps b) to e) are repeated.

j) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,15 kbit/s and steps b) to e) are repeated.

k) The SS discontinues all interfering signals.

l) In addition to the wanted signal, the SS produces a further four interfering signals to produce scenario DTS-5.

A signal of type I5 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -77 dBm.

A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -90 dBm.

A signal of type I1 using an ARFCN one higher than C1, with fading characteristics of TUHigh, and signal level of -77 dBm.

A signal of type I3 using the same ARFCN as C1, and signal level of -97 dBm.

m) The SS uses a Channel Mode Modify procedure to change the active codec set to 12,2 kbit/s and steps b) to e) are repeated.

n) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,9 kbit/s and steps b) to e) are repeated.

Maximum/Minimum Duration of Test

Maximum: 56 minutes (GSM850), 56 minutes (GSM900), 56 minutes (DCS1800), 56 minutes (PCS1900).

Minimum: 20 minutes (GSM850), 19 minutes (GSM900), 10 minutes (DCS1800), 9 minutes (PCS1900).

14.11.2.3.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7.

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure A7.1.3.1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.11.2.3-1: Minimum test times due to TU 50 fading conditions

Full Rate 50 km/h					
Frequency	0,85	0,9	1,8	1,9	GHz
Wavelength	0,35	0,33	0,17	0,16	m
min test time	201	190	95	90	s
	0:03:21	**0:03:10**	**0:01:35**	**0:01:30**	**hh:mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the "derived test limit". In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne $\geq$ 1 (inclusive artificial error)

For an early fail decision ne $\geq$ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14.11.2.3-2 or 14.11.2.3-3.

Table 14.11.2.3-2: Statistical test limits for GSM 850 and GSM 900 TCH/AFS DARP DTS-2/3/5

DTS-2/3/5								
0.8 to 0.9GHz		C_{Iev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AFS 10.2	Frames	-71.5	50	0,010000	0,012340	27958	560	00:09:20
DTS-2	Class1b	(as frames)	6950	0,001500	0,001851	186385	27	00:00:27
AFS 4.75	Frames	-75.5	50	0,010000	0,012340	27958	560	00:09:20
DTS-2	Class1b	(as frames)	2800	0,001500	0,001851	186385	67	00:01:07
AFS 7.95	Frames	-72.5	50	0,010000	0,012340	27958	560	00:09:20
DTS-3	Class1b	(as frames)	4200	0,002800	0,003455	99855	24	00:00:24
AFS 5.15	Frames	-74.5	50	0,010000	0,012340	27958	560	00:09:20
DTS-3	Class1b	(as frames)	2700	0,002500	0,003085	111831	42	00:00:42
AFS 12.2	Frames	-70.0	50	0,010000	0,012340	27958	560	00:09:20
DTS-5	Class1b	(as frames)	8150	0,007000	0,008638	39939	5	00:00:05
AFS 5.9	Frames	-74.5	50	0,010000	0,012340	27958	560	00:09:20
DTS-5	Class1b	(as frames)	3150	0,002000	0,002468	139789	45	00:00:45

Table 14.11.2.3-3: Statistical test limits for DCS 1 800 and PCS 1 900 TCH/AFS DARP DTS-2/3/5

DTS-2/3/5								
1.8 to 1.9GHz		C_{Iev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)

AFS 10.2	Frames	-72.5	50	0,010000	0,012340	27958	560	00:09:20
DTS-2	Class1b	(as frames)	6950	0,002000	0,002468	139789	21	00:00:21
AFS 4.75	Frames	-77.0	50	0,010000	0,012340	27958	560	00:09:20
DTS-2	Class1b	(as frames)	2800	0,002000	0,002468	139789	50	00:00:50
AFS 7.95	Frames	-73.5	50	0,010000	0,012340	27958	560	00:09:20
DTS-3	Class1b	(as frames)	4200	0,004000	0,004936	69894	17	00:00:17
AFS 5.15	Frames	-75.5	50	0,010000	0,012340	27958	560	00:09:20
DTS-3	Class1b	(as frames)	2700	0,002500	0,003085	111831	42	00:00:42
AFS 12.2	Frames	-71.0	50	0,010000	0,012340	27958	560	00:09:20
DTS-5	Class1b	(as frames)	8150	0,011000	0,013574	25416	4	00:00:04
AFS 5.9	Frames	-76.0	50	0,010000	0,012340	27958	560	00:09:20
DTS-5	Class1b	(as frames)	3150	0,002200	0,002715	127071	41	00:00:41

14.11.2.3a DARP Phase 1 Speech bearer test TCH/AFS DTS-2/3/5 in TIGHTER configuration

14.11.2.3a.1 Definition

The DARP reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the DARP receiver with additional TIGHTER requirements to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.11.2.3a.2 Conformance requirement

1. A MS indicating support for TIGHTER capability (see 3GPP TS 24.008) shall fulfil the additional requirements in table 2ad for co channel interference (C/Ic), table 2af for adjacent channel (200 kHz) interference (C/Ia1), and the additional requirements in table 2ae for wanted signals on GMSK modulated channels for the test scenarios defined in annex L. The reference performance shall be:

   - For speech channels (TCH/FS, TCH/HS, TCH/EFS, TCH/AFSx, TCH/AHSx, TCH/WFSx) FER: ≤ 1 %

2. The values in table 2ae are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex L).
   In addition to table 6.3-6, for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 2ad, 2ae, and 2af at the corresponding interference ratio C/Ic, C/I1, and C/Ia1, respectively.

3GPP TS 45.005, subclause 6.3

14.11.2.3a.3 Test purpose

To verify that the MS does not exceed the first conformance requirement for TCH/AFS under propagation condition TUhigh with an allowance for the statistical significance of the test.

To verify that the MS does not exceed the second conformance requirement for TCH/ AFS under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.11.2.3a.4 Method of test

14.11.2.3a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AFS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 10,2 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal), with training sequence code (TSC) = 0.

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.11.2.3a.4.2 Procedure

a) In addition to the wanted signal, the SS produces a further four interfering signals to produce scenario DTS-2.

A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -80 dBm.

A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -90 dBm.

A signal of type I1 using an ARFCN one higher than C1, with fading characteristics of TUHigh, and signal level of -77 dBm.

A signal of type I3 using the same ARFCN as C1, and signal level of -97 dBm.

b) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14.11.2.3a-2 or 14.11.2.3a-3, and sets the fading characteristic of the signal to TUHigh.

c) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 4,75 kbit/s and steps b) to e) are repeated.

g) The SS discontinues all interfering signals.

h) In addition to the wanted signal, the SS produces a further four interfering signals to produce scenario DTS-3.

A signal of type I4 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -80 dBm.

A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -90 dBm.

A signal of type I1 using an ARFCN one lower than C1, with fading characteristics of TUHigh, and signal level of -77 dBm.

A signal of type I3 using the same ARFCN as C1, and signal level of -97 dBm.

i) The SS uses a Channel Mode Modify procedure to change the active codec set to 7,95 kbit/s and steps b) to e) are repeated.

j) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,15 kbit/s and steps b) to e) are repeated.

k) The SS discontinues all interfering signals.

l) In addition to the wanted signal, the SS produces a further four interfering signals to produce scenario DTS-5.

A signal of type I5 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -77 dBm.

A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -90 dBm.

A signal of type I1 using an ARFCN one higher than C1, with fading characteristics of TUHigh, and signal level of -77 dBm.

A signal of type I3 using the same ARFCN as C1, and signal level of -97 dBm.

m) The SS uses a Channel Mode Modify procedure to change the active codec set to 12,2 kbit/s and steps b) to e) are repeated.

n) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,9 kbit/s and steps b) to e) are repeated.

Maximum/Minimum Duration of Test

Maximum: 56 minutes (GSM850), 56 minutes (GSM900), 56 minutes (DCS1800), 56 minutes (PCS1900).

Minimum: 20 minutes (GSM850), 19 minutes (GSM900), 10 minutes (DCS1800), 9 minutes (PCS1900).

14.11.2.3a.5 Test requirement

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7.

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.11.2.3a-1: Minimum test times due to TU 50 fading conditions

Full Rate 50 km/h					
Frequency	0,85	0,9	1,8	1,9	GHz
Wavelength	0,35	0,33	0,17	0,16	m
min test time	201	190	95	90	s
	0:03:21	**0:03:10**	**0:01:35**	**0:01:30**	**hh:mm:ss**

The error rate measured in this test shall be tested according to the values given in tables 14.11.2.3a-2 or 14.11.2.3a-3.

Table 14.11.2.3a-2: Statistical test limits for GSM 850 and GSM 900 TCH/AFS DARP DTS-2/3/5

DTS-2/3/5								
0.8 to 0.9GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AFS 10.2 DTS-2	Frames	-73.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	6950	0,001500	0,001851	186386	27	00:00:27
AFS 4.75 DTS-2	Frames	-77.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	2800	0,001500	0,001851	186386	67	00:01:07
AFS 7.95 DTS-3	Frames	-74.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	4200	0,002800	0,003455	99850	24	00:00:24
AFS 5.15 DTS-3	Frames	-76.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	2700	0,002500	0,003085	111832	42	00:00:42
AFS 12.2 DTS-5	Frames	-72.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	8150	0,007000	0,008638	39939	5	00:00:05
AFS 5.9 DTS-5	Frames	-77.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	3150	0,002000	0,002468	139789	45	00:00:45

Table 14.11.2.3a-3: Statistical test limits for DCS 1800 and PCS 1900 TCH/AFS DARP DTS-2/3/5

DTS-2/3/5								
1.8 to 1.9GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AFS 10.2 DTS-2	Frames	-74.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	6950	0,002000	0,002468	139790	21	00:00:21
AFS 4.75 DTS-2	Frames	-79.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	2800	0,002000	0,002468	139790	50	00:00:50
AFS 7.95 DTS-3	Frames	-75.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	4200	0,004000	0,004936	69895	17	00:00:17
AFS 5.15 DTS-3	Frames	-77.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	2700	0,002500	0,003085	111832	42	00:00:42
AFS 12.2 DTS-5	Frames	-73.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	8150	0,011000	0,013574	25416	4	00:00:04
AFS 5.9 DTS-5	Frames	-78.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	3150	0,002200	0,002715	127071	41	00:00:41

14.11.3 TCH/AHS

14.11.3.1 DTS-1

14.11.3.1.1 Definition

The DARP reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the DARP receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.11.3.1.2 Conformance requirement

1. MS indicating support for Downlink Advanced Receiver Performance – phase I (see 3GPP TS 24.008) shall fulfil the requirements in table 2o for wanted signals on GMSK modulated channels under TU50 no FH propagation conditions and GMSK modulated interferers for the test scenarios defined in annex L. The reference performance shall be:

   - For speech channels (TCH/FS, TCH/AFSx, TCH/AHSx) FER: ≤ 1 %

2. The values in table 2o are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex L).
   In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 2o at the corresponding C/I1.

3GPP TS 45.005, subclause 6.3

14.11.3.1.3 Test purpose

To verify that the MS does not exceed the first conformance requirement for TCH/AHS under propagation condition TUhigh with an allowance for the statistical significance of the test.

To verify that the MS does not exceed the second conformance requirement for TCH/AHS under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.11.3.1.4 Method of test

14.11.3.1.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AHS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 7,95 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal), with training sequence code (TSC) = 0.

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.11.3.1.4.2 Procedure

a) In addition to the wanted signal, the SS produces one further interfering signal to produce scenario DTS-1.

   A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -80 dBm.

b) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14.11.3.1-2 or 14.11.3.1-3.

c) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of the class Ib and II, by examining at least the minimum number of samples of consecutive bits of class Ib and II. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully if it is not signalled as erased.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 7,4 kbit/s and steps b) to e) are repeated.

g) The SS uses a Channel Mode Modify procedure to change the active codec set to 6,7 kbit/s and steps b) to e) are repeated.

h) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,9 kbit/s and steps b) to e) are repeated.

l) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,15 kbit/s and steps b) to e) are repeated.

m) The SS uses a Channel Mode Modify procedure to change the active codec set to 4,75 kbit/s and steps b) to e) are repeated.

Maximum/Minimum Duration of Test

Maximum: 56 minutes (GSM850), 56 minutes (GSM900), 56 minutes (DCS1800), 56 minutes (PCS1900).

Minimum: 41 minutes (GSM850), 38 minutes (GSM900), 19 minutes (DCS1800), 18 minutes (PCS1900).

14.11.3.1.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7.

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure A7.1.3.2.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.11.3.1-1: Minimum test times due to TU high fading conditions

Half Rate 50 km/h					
Frequency	0,85	0,9	1,8	1,9	GHz
Wavelenth	0,35	0,33	0,17	0,16	m
min test time	403	380	190	180	s
	0:06:43	**0:06:20**	**0:03:10**	**0:03:00**	**hh:mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the “derived test limit”. In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne ≥ 1 (inclusive artificial error)

For an early fail decision ne ≥ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14.11.3.1-2 or 14.11.3.1-3.

Table 14-11.3.1-2: Statistical test limits for GSM 850 and GSM 900 TCH/AHS DARP DTS-1

DTS-1								
0.8 to 0.9GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AHS 7.95	Frames	-71.0	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2800	0.003500	0.004319	79881	29	0:00:29
	Class II	(as frames)	1800	0.018000	0.022212	15533	9	0:00:09
AHS 7.4	Frames	-71.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2950	0.002500	0.003085	111832	38	0:00:38
	Class II	(as frames)	1400	0.022000	0.027148	12709	10	0:00:10
AHS 6.7	Frames	-73.0	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2750	0.002500	0.003085	111832	41	0:00:41
	Class II	(as frames)	1200	0.029000	0.035786	9642	9	0:00:09
AHS 5.9	Frames	-74.0	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2350	0.001500	0.001851	186387	80	0:01:20
	Class II	(as frames)	800	0.037000	0.045658	7557	10	0:00:10
AHS 5.15	Frames	-75.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2100	0.002500	0.003085	111832	54	0:00:54
	Class II	(as frames)	600	0.049000	0.060466	5707	10	0:00:10
AHS 4.75	Frames	-77.0	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2200	0.002000	0.002468	139790	64	0:01:04
	Class II	(as frames)	600	0.065000	0.080210	4302	8	0:00:08

Table 14-11.3.1-3: Statistical test limits for DCS 1 800 and PCS 1 900 TCH/AHS DARP DTS-1

DTS-1								
1.8 to 1.9GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AHS 7.95	Frames	-70.0	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2800	0.003500	0.004319	79881	29	0:00:29
	Class II	(as frames)	1800	0.017000	0.020978	16447	10	0:00:10
AHS 7.4	Frames	-71.0	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2950	0.002000	0.002468	139790	48	0:00:48
	Class II	(as frames)	1400	0.021000	0.025914	13314	10	0:00:10
AHS 6.7	Frames	-72.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2750	0.002500	0.003085	111832	41	0:00:41
	Class II	(as frames)	1200	0.032000	0.039488	8738	8	0:00:08
AHS 5.9	Frames	-74.0	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2350	0.001500	0.001851	186387	80	0:01:20
	Class II	(as frames)	800	0.038000	0.046892	7358	10	0:00:10
AHS 5.15	Frames	-75.0	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2100	0.003100	0.003825	90188	43	0:00:43
	Class II	(as frames)	600	0.050000	0.061700	5593	10	0:00:10
AHS 4.75	Frames	-76.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2200	0.002000	0.002468	139790	64	0:01:04
	Class II	(as frames)	600	0.067000	0.082678	4174	7	0:00:07

14.11.3.1a DARP Phase 1 Speech bearer test TCH/AHS DTS-1 in TIGHTER configuration

14.11.3.1a.1 Definition

The DARP reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the DARP receiver with additional TIGHTER requirements to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.11.3.1a.2 Conformance requirement

1. A MS indicating support for TIGHTER capability (see 3GPP TS 24.008) shall fulfil the additional requirements in table 2ad for co channel interference (C/Ic), table 2af for adjacent channel (200 kHz) interference (C/Ia1), and the additional requirements in table 2ae for wanted signals on GMSK modulated channels for the test scenarios defined in annex L. The reference performance shall be:

   - For speech channels (TCH/FS, TCH/HS, TCH/EFS, TCH/AFSx, TCH/AHSx, TCH/WFSx) FER: ≤ 1 %

2. The values in table 2ae are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex L).
   In addition to table 6.3-6, for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 2ad, 2ae, and 2af at the corresponding interference ratio C/Ic, C/I1, and C/Ia1, respectively.

3GPP TS 45.005, subclause 6.3

14.11.3.1a.3 Test purpose

To verify that the MS does not exceed the first conformance requirement for TCH/AHS under propagation condition TUhigh with an allowance for the statistical significance of the test.

To verify that the MS does not exceed the second conformance requirement for TCH/AHS under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.11.3.1a.4 Method of test

14.11.3.1a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AHS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 7,95 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal), with training sequence code (TSC) = 0.

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.11.3.1a.4.2 Procedure

a) In addition to the wanted signal, the SS produces one further interfering signal to produce scenario DTS-1.

   A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -80 dBm.

b) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14.11.3.1a-2 or 14.11.3.1a-3.

c) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of the class Ib and II, by examining at least the minimum number of samples of consecutive bits of class Ib and II. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully if it is not signalled as erased.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 7,4 kbit/s and steps b) to e) are repeated.

g) The SS uses a Channel Mode Modify procedure to change the active codec set to 6,7 kbit/s and steps b) to e) are repeated.

h) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,9 kbit/s and steps b) to e) are repeated.

i) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,15 kbit/s and steps b) to e) are repeated.

j) The SS uses a Channel Mode Modify procedure to change the active codec set to 4,75 kbit/s and steps b) to e) are repeated.

Maximum/Minimum Duration of Test

Maximum: 56 minutes (GSM850), 56 minutes (GSM900), 56 minutes (DCS1800), 56 minutes (PCS1900).

Minimum: 41 minutes (GSM850), 38 minutes (GSM900), 19 minutes (DCS1800), 18 minutes (PCS1900).

14.11.3.1a.5 Test requirement

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7.

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.11.3.1a-1: Minimum test times due to TU high fading conditions

Half Rate 50 km/h					
Frequency	0,85	0,9	1,8	1,9	GHz
Wavelenth	0,35	0,33	0,17	0,16	m
min test time	403	380	190	180	s
	0:06:43	**0:06:20**	**0:03:10**	**0:03:00**	**hh:mm:ss**

The error rate measured in this test shall be tested according to the values given in tables 14.11.3.1a-2 or 14.11.3.1a-3.

Table 14-11.3.1a-2: Statistical test limits for GSM 850 and GSM 900 TCH/AHS DARP DTS-1

DTS-1								
0.8 to 0.9GHz		**C_{lev} (dBm)**	**Samples per second**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time (s)**	**Target test time (hh:mm:ss)**
AHS 7.95	Frames	-78.5	50	0.010000	0.012340	27958	560	0:09:20
	Class1b	(as frames)	2800	0.003500	0.004319	79880	29	0:00:29
	Class II	(as frames)	1800	0.018000	0.022212	15533	9	0:00:09
AHS 7.4	Frames	-79	50	0.010000	0.012340	27958	560	0:09:20
	Class1b	(as frames)	2950	0.002500	0.003085	111832	38	0:00:38
	Class II	(as frames)	1400	0.022000	0.027148	12709	10	0:00:10
AHS 6.7	Frames	-80.5	50	0.010000	0.012340	27958	560	0:09:20
	Class1b	(as frames)	2750	0.002500	0.003085	111832	41	0:00:41
	Class II	(as frames)	1200	0.029000	0.035786	9641	9	0:00:09
AHS 5.9	Frames	-81.5	50	0.010000	0.012340	27958	560	0:09:20
	Class1b	(as frames)	2350	0.001500	0.001851	186386	80	0:01:20
	Class II	(as frames)	800	0.037000	0.045658	7557	10	0:00:10
AHS 5.15	Frames	-83	50	0.010000	0.012340	27958	560	0:09:20
	Class1b	(as frames)	2100	0.002500	0.003085	111832	54	0:00:54
	Class II	(as frames)	600	0.049000	0.060466	5706	10	0:00:10
AHS 4.75	Frames	-84.5	50	0.010000	0.012340	27958	560	0:09:20
	Class1b	(as frames)	2200	0.002000	0.002468	139790	64	0:01:04
	Class II	(as frames)	600	0.065000	0.080210	4302	8	0:00:08

Table 14.11.3.1a-3: Statistical test limits for DCS 1800 and PCS 1900 TCH/AHS DARP DTS-1

DTS-1									
1.8 to 1.9GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AHS 7.95	Frames	-77.5	50	0.010000	0.012340	27958	560	0:09:20
	Class1b	(as frames)	2800	0.003500	0.004319	79880	29	0:00:29
	Class II	(as frames)	1800	0.017000	0.020978	16446	10	0:00:10
AHS 7.4	Frames	-78.5	50	0.010000	0.012340	27958	560	0:09:20
	Class1b	(as frames)	2950	0.002000	0.002468	139790	48	0:00:48
	Class II	(as frames)	1400	0.021000	0.025914	13314	10	0:00:10
AHS 6.7	Frames	-80	50	0.010000	0.012340	27958	560	0:09:20
	Class1b	(as frames)	2750	0.002500	0.003085	111832	41	0:00:41
	Class II	(as frames)	1200	0.032000	0.039488	8737	8	0:00:08
AHS 5.9	Frames	-81.5	50	0.010000	0.012340	27958	560	0:09:20
	Class1b	(as frames)	2350	0.001500	0.001851	186386	80	0:01:20
	Class II	(as frames)	800	0.038000	0.046892	7358	10	0:00:10
AHS 5.15	Frames	-82.5	50	0.010000	0.012340	27958	560	0:09:20
	Class1b	(as frames)	2100	0.003100	0.003825	90187	43	0:00:43
	Class II	(as frames)	600	0.050000	0.061700	5592	10	0:00:10
AHS 4.75	Frames	-84	50	0.010000	0.012340	27958	560	0:09:20
	Class1b	(as frames)	2200	0.002000	0.002468	139790	64	0:01:04
	Class II	(as frames)	600	0.067000	0.082678	4173	7	0:00:07

14.11.3.2 Void

14.11.3.3 DTS-2/3

14.11.3.3.1 Definition

The DARP reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the DARP receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.11.3.3.2 Conformance requirement

3. MS indicating support for Downlink Advanced Receiver Performance – phase I (see 3GPP TS 24.008) shall fulfil the requirements in table 2o for wanted signals on GMSK modulated channels under TU50 no FH propagation conditions and GMSK modulated interferers for the test scenarios defined in annex L. The reference performance shall be:

- For speech channels (TCH/FS, TCH/AFSx, TCH/AHSx) FER: $\leq$ 1 %

4. The values in table 2o are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex L).
   In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 2o at the corresponding C/I1.

3GPP TS 45.005, subclause 6.3

14.11.3.3.3 Test purpose

To verify that the MS does not exceed the first conformance requirement for TCH/AHS under propagation condition TUhigh with an allowance for the statistical significance of the test.

To verify that the MS does not exceed the second conformance requirement for TCH/AHS under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.11.3.3.4 Method of test

14.11.3.3.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AHS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 7,4 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal), with training sequence code (TSC) = 0.

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.11.3.3.4.2 Procedure

a) In addition to the wanted signal, the SS produces a further four interfering signals to produce scenario DTS-2.

A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -80 dBm.

A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -90 dBm.

A signal of type I1 using an ARFCN one higher than C1, with fading characteristics of TUHigh, and signal level of -77 dBm.

A signal of type I3 using the same ARFCN as C1, and signal level of -97 dBm.

b) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14.11.3.3-2 or 14.11.3.3-3, and sets the fading characteristic of the signal to TUHigh..

c) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of the class Ib and II, by examining at least the minimum number of samples of consecutive bits of class Ib and II. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully if it is not signalled as erased.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 4,75 kbit/s and steps b) to e) are repeated.

g) The SS discontinues all interfering signals.

h) In addition to the wanted signal, the SS produces a further four interfering signals to produce scenario DTS-3.

A signal of type I4 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -80 dBm.

A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -90 dBm.

A signal of type I1 using an ARFCN one lower than C1, with fading characteristics of TUHigh, and signal level of -77 dBm.

A signal of type I3 using the same ARFCN as C1, and signal level of -97 dBm.

i) The SS uses a Channel Mode Modify procedure to change the active codec set to 6,7 kbit/s and steps b) to e) are repeated.

j) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,15 kbit/s and steps b) to e) are repeated.

Maximum/Minimum Duration of Test

Maximum: 38 minutes (GSM850), 38 minutes (GSM900), 38 minutes (DCS1800), 38 minutes (PCS1900).

Minimum: 27 minutes (GSM850), 26 minutes (GSM900), 13 minutes (DCS1800), 12 minutes (PCS1900).

14.11.3.3.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7.

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure A7.1.3.1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.11.3.3-1: Minimum test times due to TU 50 fading conditions

Half Rate 50 km/h					
Frequency	0,85	0,9	1,8	1,9	GHz
Wavelength	0,35	0,33	0,17	0,16	m
min test time	403	380	190	180	s
	0:06:43	**0:06:20**	**0:03:10**	**0:03:00**	**hh:mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the "derived test limit". In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne ≥ 1 (inclusive artificial error)

For an early fail decision ne ≥ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14.11.3.3-2 or 14.11.3.3-3.

Table 14.11.3.3-2: Statistical test limits for GSM 850 and GSM 900 TCH/AHS DARP DTS-2/3

DTS-2/3								
0.8 to 0.9GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AHS 7.4	Frames	-67.5	50	0.010000	0.012340	27959	560	0:09:20
DTS-2	Class1b	(as frames)	2950	0.002000	0.002468	139790	48	0:00:48
	Class II	(as frames)	1400	0.019000	0.023446	14716	11	0:00:11
AHS 4.75	Frames	-72.5	50	0.010000	0.012340	27959	560	0:09:20
DTS-2	Class1b	(as frames)	2200	0.002500	0.003085	111832	51	0:00:51
	Class II	(as frames)	600	0.058000	0.071572	4821	9	0:00:09
AHS 6.7	Frames	-68.0	50	0.010000	0.012340	27959	560	0:09:20
DTS-3	Class1b	(as frames)	2750	0.002500	0.003085	111832	41	0:00:41
	Class II	(as frames)	1200	0.025000	0.030850	11184	10	0:00:10
AHS 5.15	Frames	-70.0	50	0.010000	0.012340	27959	560	0:09:20
DTS-3	Class1b	(as frames)	2100	0.003000	0.003702	93194	45	0:00:45
	Class II	(as frames)	600	0.048000	0.059232	5826	10	0:00:10

Table 14.11.3.3-3: Statistical test limits for DCS 1 800 and PCS 1 900 TCH/AHS DARP DTS-2/3

DTS-2/3								
1.8 to 1.9GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AHS 7.4	Frames	-67.0	50	0.010000	0.012340	27959	560	0:09:20
DTS-2	Class1b	(as frames)	2950	0.002000	0.002468	139790	48	0:00:48
	Class II	(as frames)	1400	0.019000	0.023446	14716	11	0:00:11
AHS 4.75	Frames	-72.0	50	0.010000	0.012340	27959	560	0:09:20
DTS-2	Class1b	(as frames)	2200	0.002500	0.003085	111832	51	0:00:51
	Class II	(as frames)	600	0.059000	0.072806	4740	8	0:00:08
AHS 6.7	Frames	-67.5	50	0.010000	0.012340	27959	560	0:09:20
DTS-3	Class1b	(as frames)	2750	0.002500	0.003085	111832	41	0:00:41
	Class II	(as frames)	1200	0.025000	0.030850	11184	10	0:00:10
AHS 5.15	Frames	-70.0	50	0.010000	0.012340	27959	560	0:09:20
DTS-3	Class1b	(as frames)	2100	0.003000	0.003702	93194	45	0:00:45
	Class II	(as frames)	600	0.044000	0.054296	6355	11	0:00:11

14.11.3.3a DARP Phase 1 Speech bearer test - TCH-AHS / DTS-2/3 in TIGHTER configuration

14.11.3.3a.1 Definition

The DARP reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the DARP receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.11.3.3a.2 Conformance requirement

3GPP TS 45.005 subclause 6.3.5

1. A MS indicating support for TIGHTER Capability shall fulfil the additional requirements in table 2ae for wanted signals on GMSK modulated channels for the DTS2/3 test conditions defined in annex L. The reference performance shall be:

   - For speech channels (TCH/AHSx) FER: ≤ 1 %

2. The values in table 2ae are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex L).In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 2ae corresponding interference ratio C/I1.

14.11.3.3a.3 Test purpose

To verify that the MS does not exceed the first conformance requirement for TCH/AHS under propagation condition TUhigh with an allowance for the statistical significance of the test.

To verify that the MS does not exceed the second conformance requirement for TCH/AHS under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.11.3.3a.4 Method of test

14.11.3.3a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AHS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 7,4 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal), with training sequence code (TSC) = 0.

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.11.3.3a.4.2 Procedure

a) In addition to the wanted signal, the SS produces a further four interfering signals to produce scenario DTS-2.

   A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -80 dBm.

   A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -90 dBm.

   A signal of type I1 using an ARFCN one higher than C1, with fading characteristics of TUHigh, and signal level of -77 dBm.

   A signal of type I3 using the same ARFCN as C1, and signal level of -97 dBm.

b) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14.11.3.3a-2 or 14.11.3.3a-3, and sets the fading characteristic of the signal to TUHigh..

c) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of the class Ib and II, by examining at least the minimum number of samples of consecutive bits of class Ib and II. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully if it is not signalled as erased.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 4,75 kbit/s and steps b) to e) are repeated.

g) The SS discontinues all interfering signals.

h) In addition to the wanted signal, the SS produces a further four interfering signals to produce scenario DTS-3.

A signal of type I4 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -80 dBm.

A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -90 dBm.

A signal of type I1 using an ARFCN one lower than C1, with fading characteristics of TUHigh, and signal level of -77 dBm.

A signal of type I3 using the same ARFCN as C1, and signal level of -97 dBm.

i) The SS uses a Channel Mode Modify procedure to change the active codec set to 6,7 kbit/s and steps b) to e) are repeated.

j) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,15 kbit/s and steps b) to e) are repeated.

Maximum/Minimum Duration of Test

Maximum: 38 minutes (GSM850), 38 minutes (GSM900), 38 minutes (DCS1800), 38 minutes (PCS1900).

Minimum: 27 minutes (GSM850), 26 minutes (GSM900), 13 minutes (DCS1800), 12 minutes (PCS1900).

14.11.3.3a.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definitions of limit lines refer to Annex 7.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.11.3.3a-1: Minimum test times due to TU 50 fading conditions

Half Rate 50 km/h					
Frequency	0,85	0,9	1,8	1,9	GHz
Wavelength	0,35	0,33	0,17	0,16	m
min test time	403	380	190	180	s
	0:06:43	**0:06:20**	**0:03:10**	**0:03:00**	**hh:mm:ss**

The error rate measured in this test shall be tested according to the values given in table's 14.11.3.3a-2 or 14.11.3.3a-3.

Table 14.11.3.3a-2: Statistical test limits for GSM 850 and GSM 900 TCH/AHS DARP DTS-2/3

DTS-2/3								
0.8 to 0.9GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AHS 7.4 DTS-2	Frames	-69.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2950	0.002000	0.002468	139790	48	0:00:48
	Class II	(as frames)	1400	0.019000	0.023446	14716	11	0:00:11
AHS 4.75 DTS-2	Frames	-74.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2200	0.002500	0.003085	111832	51	0:00:51
	Class II	(as frames)	600	0.058000	0.071572	4821	9	0:00:09
AHS 6.7 DTS-3	Frames	-70.0	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2750	0.002500	0.003085	111832	41	0:00:41
	Class II	(as frames)	1200	0.025000	0.030850	11184	10	0:00:10
AHS 5.15 DTS-3	Frames	-72.0	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2100	0.003000	0.003702	93194	45	0:00:45
	Class II	(as frames)	600	0.048000	0.059232	5826	10	0:00:10

Table 14.11.3.3a-3: Statistical test limits for DCS 1 800 and PCS 1 900 TCH/AHS DARP DTS-2/3

DTS-2/3								
1.8 to 1.9GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AHS 7.4 DTS-2	Frames	-69.0	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2950	0.002000	0.002468	139790	48	0:00:48
	Class II	(as frames)	1400	0.019000	0.023446	14716	11	0:00:11
AHS 4.75 DTS-2	Frames	-74.0	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2200	0.002500	0.003085	111832	51	0:00:51
	Class II	(as frames)	600	0.059000	0.072806	4740	8	0:00:08
AHS 6.7 DTS-3	Frames	-69.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2750	0.002500	0.003085	111832	41	0:00:41
	Class II	(as frames)	1200	0.025000	0.030850	11184	10	0:00:10
AHS 5.15 DTS-3	Frames	-72.0	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2100	0.003000	0.003702	93194	45	0:00:45
	Class II	(as frames)	600	0.044000	0.054296	6355	11	0:00:11

14.12 DARP Phase 1 Signalling bearer tests

14.12.1 FACCH/F

14.12.1.1 FACCH – DTS-1

14.12.1.1.1 Definition

The DARP reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the DARP receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.12.1.1.2 Conformance requirement

1. MS indicating support for Downlink Advanced Receiver Performance – phase I (see 3GPP TS 24.008) shall fulfil the requirements in table 2o for wanted signals on GMSK modulated channels under TU50 no FH propagation conditions and GMSK modulated interferers for the test scenarios defined in annex L. The reference performance shall be:
   - For signalling channels (FACCH/F, SDCCH) FER: ≤ 5 %
2. The values in table 2o are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex L).

3GPP TS 45.005, subclause 6.3

14.12.1.1.3 Test purpose

To verify that the MS does not exceed the first conformance requirement for FACCH/F under propagation condition TUhigh with an allowance for the statistical significance of the test.

To verify that the MS does not exceed the second conformance requirement for FACCH/F under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.12.1.1.4 Method of test

14.12.1.1.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/F with an ARFCN in the mid ARFCN range. The power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

14.12.1.1.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. The interfering signal level is set to -80 dBm.

   The fading characteristic of the wanted and the interfering signal is TUHigh.

b) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14-12.1.1.4.2 (GSM 900 / 850) and table 14-12.1.1.4.3 (DCS 1800 / 1900).

c) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Each repeated L2 frame indicates a frame erasure event.

d) The SS determines the number of frame erasure events during at least the minimum number of samples of FACCH/F frames.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.

14.12.1.1.4.3 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7 (A 7.1.3.2)

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure 14-1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14-12.1.1.4.1: Minimum test times due to TU high fading conditions

Full Rate 50 km/h					
Frequency	0,85	0,9	1,8	1,9	GHz
Wavelength	0,35	0,33	0,17	0,16	M
min test time	403	380	190	180	S
	0:06:43	**0:06:20**	**0:03:10**	**0:03:00**	**hh:mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the “derived test limit”. In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision $ne \geq 1$ (inclusive artificial error).

For an early fail decision $ne \geq 7$.

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in table 14-12.1.1.4.2

Table 14-12.1.1.4.2: Statistical test limits for FACCH/F DARP DTS-1 (GSM 900 / 850)

DTS-1									
		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
FACCH/F	Frames	-77.0	5	0,050000	0,061700	5592	1119	00:18:39

Table 14-12.1.1.4.3: Statistical test limits for FACCH/F DARP DTS-1 (DCS 1800 / 1900)

DTS-1								
		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
FACCH/F	Frames	-77.0	5	0,050000	0,061700	5592	1119	00:18:39

14.12.1.1a DARP Phase 1 Signalling bearer test - FACCH/F -DTS-1 in TIGHTER configuration

14.12.1.1a.1 Definition

The DARP reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the DARP receiver with additional TIGHTER requirements to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.12.1.1a.2 Conformance requirement

1. A MS indicating support for TIGHTER Capability (see 3GPP TS 24.008) shall fulfil the requirements in table 2ad for co channel interference (C/Ic), table 2af for adjacent channel (200 kHz) interference (C/Ia1), and the additional requirements in table 2ae for wanted signals on GMSK modulated channels for the test scenarios defined in annex L. The reference performance shall be:
   - For signalling channels (FACCH/F, FACCH/H, SDCCH) FER: ≤ 5 %
2. The values in table 2ae are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex L).

3GPP TS 45.005, subclause 6.3

14.12.1.1a.3 Test purpose

To verify that the MS does not exceed the first conformance requirement for FACCH/F under propagation condition TUhigh with an allowance for the statistical significance of the test.

To verify that the MS does not exceed the second conformance requirement for FACCH/F under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.12.1.1a.4 Method of test

14.12.1.1.4a.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/F with an ARFCN in the mid ARFCN range. The power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

14.12.1.1.4a.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. The interfering signal level is set to -80 dBm.

   The fading characteristic of the wanted and the interfering signal is TUHigh.

b) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14-12.1.1a.4.2 (GSM 900 / 850) and table 14-12.1.1a.4.3 (DCS 1800 / 1900).

c) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Each repeated L2 frame indicates a frame erasure event.

d) The SS determines the number of frame erasure events during at least the minimum number of samples of FACCH/F frames.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.

14.12.1.1.4a.3 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7 (A 7.1.3.2)

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure 14-1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

- Before limit checking is valid the minimum test time due to fading needs to be considered:
- Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14-12.1.1a.4.1: Minimum test times due to TU high fading conditions

Full Rate 50 km/h					
Frequency	0,85	0,9	1,8	1,9	GHz
Wavelength	0,35	0,33	0,17	0,16	M
min test time	403	380	190	180	S
	0:06:43	**0:06:20**	**0:03:10**	**0:03:00**	**hh:mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the “derived test limit”. In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne $\geq$ 1 (inclusive artificial error).

For an early fail decision ne $\geq$ 7.

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in table 14-12.1.1.4.2

Table 14-12.1.1a.4.2: Statistical test limits for FACCH/F DARP DTS-1 (GSM 900 / 850)

DTS-1								
		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
FACCH/F	Frames	-85.5	5	0,050000	0,061700	5592	1119	00:18:39

Table 14-12.1.1.4.3: Statistical test limits for FACCH/F DARP DTS-1 (DCS 1800 / 1900)

DTS-1								
		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
FACCH/F	Frames	-85.5	5	0,050000	0,061700	5592	1119	00:18:39

14.12.1.2 FACCH – DTS-2-3

14.12.1.2.1 Definition

The DARP reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the DARP receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.12.1.2.2 Conformance requirement

1. MS indicating support for Downlink Advanced Receiver Performance – phase I (see 3GPP TS 24.008) shall fulfil the requirements in table 2o for wanted signals on GMSK modulated channels under TU50 no FH propagation conditions and GMSK modulated interferers for the test scenarios defined in annex L. The reference performance shall be:

   - For signalling channels (FACCH/F, SDCCH) FER: $\leq$ 5 %

2. The values in table 2o are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex L).

3GPP TS 45.005, subclause 6.3

14.12.1.2.3 Test purpose

To verify that the MS does not exceed the first conformance requirement for FACCH/F under propagation condition TUhigh with an allowance for the statistical significance of the test.

To verify that the MS does not exceed the second conformance requirement for FACCH/F under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.12.1.2.4 Method of test

14.12.1.2.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/F with an ARFCN in the mid ARFCN range. The power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

14.12.1.2.4.2 Procedure

a) In addition to the wanted signal, the SS produces a further four interfering signals to produce scenario DTS-2.

A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -80 dBm.

A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -90 dBm.

A signal of type I1 using an ARFCN one higher than C1, with fading characteristics of TUHigh, and signal level of -77 dBm.

A signal of type I3 using the same ARFCN as C1, and signal level of -97 dBm.

b) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14-12.1.2.4.2 (GSM 900 / 850) and table 14-12.1.2.4.4 (DCS 1800 / 1900).

c) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Each repeated L2 frame indicates a frame erasure event.

d) The SS determines the number of frame erasure events during at least the minimum number of samples of FACCH/F frames.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.

e) The SS discontinues all interfering signals.

f) In addition to the wanted signal, the SS produces a further four interfering signals to produce scenario DTS-3.

A signal of type I4 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -80 dBm.

A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -90 dBm.

A signal of type I1 using an ARFCN one lower than C1, with fading characteristics of TUHigh, and signal level of -77 dBm.

A signal of type I3 using the same ARFCN as C1, and signal level of -97 dBm.

g) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14-12.1.2.4.3 (GSM 900 / 850) and table 14-12.1.2.4.5 (DCS 1800 / 1900).

h) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Each repeated L2 frame indicates a frame erasure event.

i) The SS determines the number of frame erasure events during at least the minimum number of samples of FACCH/F frames.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.

14.12.1.2.4.3 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 6.2.

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure 14-1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14-12.1.2.4.1: Minimum test times due to TU high fading conditions

Full Rate 50 km/h					
Frequency	0,85	0,9	1,8	1,9	GHz
Wavelength	0,35	0,33	0,17	0,16	M
min test time	403	380	190	180	S
	0:06:43	**0:06:20**	**0:03:10**	**0:03:00**	**hh:mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the “derived test limit”. In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne $\geq$ 1 (inclusive artificial error)

For an early fail decision ne $\geq$ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14-12.1.2.4.2 and 14-12.1.2.4.3.

Table 14-12.1.2.4.2: Statistical test limits for FACCH/F DARP DTS-2 (GSM 900 / 850)

DTS-2								
		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
FACCH/F	Frames	-72.0	5	0,050000	0,061700	5592	1119	00:18:39

Table 14-12.1.2.4.3: Statistical test limits for FACCH/F DARP DTS-3 (GSM 900 / 850)

DTS-3								
		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
FACCH/F	Frames	-71.0	5	0,050000	0,061700	5592	1119	00:18:39

Table 14-12.1.2.4.4: Statistical test limits for FACCH/F DARP DTS-2 (DCS 1800 / 1900)

DTS-2								
		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
FACCH/F	Frames	-72,5-	5	0,050000	0,061700	5592	1119	00:18:39

Table 14-12.1.2.4.5: Statistical test limits for FACCH/F DARP DTS-3 (DCS 1800 / 1900)

DTS-3								
		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
FACCH/F	Frames	-72,0	5	0,050000	0,061700	5592	1119	00:18:39

14.12.1.2a DARP Phase 1 Signalling bearer test - FACCH – DTS-2-3 in TIGHTER configuration

14.12.1.2a.1 Definition

The DARP reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the DARP receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.12.1.2a.2 Conformance requirement

3GPP TS 45.005 subclause 6.3.5

1. For FACCH/F, a MS indicating support for TIGHTER Capability shall fulfil the additional requirements in table 2ae for wanted signals on GMSK modulated channels for the DTS-2/3 test conditions defined in annex L. The reference performance shall be:

   - For signalling channels (FACCH/F, FACCH/H, SDCCH) FER: ≤ 5 %

2. The values in table 2ae are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex L).In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 2ae corresponding interference ratio C/I1.

14.12.1.2a.3 Test purpose

To verify that the MS does not exceed the first conformance requirement for FACCH/F under propagation condition TUhigh with an allowance for the statistical significance of the test.

To verify that the MS does not exceed the second conformance requirement for FACCH/F under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.12.1.2a.4 Method of test

14.12.1.2a.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/F with an ARFCN in the mid ARFCN range. The power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

14.12.1.2a.4.2 Procedure

a) In addition to the wanted signal, the SS produces a further four interfering signals to produce scenario DTS-2.

   A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -80 dBm.

   A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -90 dBm.

   A signal of type I1 using an ARFCN one higher than C1, with fading characteristics of TUHigh, and signal level of -77 dBm.

   A signal of type I3 using the same ARFCN as C1, and signal level of -97 dBm.

b) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14.12.1.2a.4.3-2 (GSM 900 / 850) and table 14.12.1.2a.4.3-4 (DCS 1800 / 1900).

c) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Each repeated L2 frame indicates a frame erasure event.

d) The SS determines the number of frame erasure events during at least the minimum number of samples of FACCH/F frames.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.

e) The SS discontinues all interfering signals.

f) In addition to the wanted signal, the SS produces a further four interfering signals to produce scenario DTS-3.

   A signal of type I4 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -80 dBm.

   A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -90 dBm.

   A signal of type I1 using an ARFCN one lower than C1, with fading characteristics of TUHigh, and signal level of -77 dBm.

   A signal of type I3 using the same ARFCN as C1, and signal level of -97 dBm.

g) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14.12.1.2a.4.3-3 (GSM 900 / 850) and table 14.12.1.2a.4.3-5 (DCS 1800 / 1900).

h) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Each repeated L2 frame indicates a frame erasure event.

i) The SS determines the number of frame erasure events during at least the minimum number of samples of FACCH/F frames.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.

14.12.1.2a.4.3 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definitions of limit lines refer to Annex 6.2.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.12.1.2a.4.3-1: Minimum test times due to TU high fading conditions

Full Rate 50 km/h					
Frequency	0,85	0,9	1,8	1,9	GHz
Wavelength	0,35	0,33	0,17	0,16	M
min test time	403	380	190	180	S
	0:06:43	**0:06:20**	**0:03:10**	**0:03:00**	**hh:mm:ss**

The error rate measured in this test shall be tested according to the values given in tables 14.12.1.2a.4.3-2 to 14.12.1.2a.4.3-5.

Table 14.12.1.2a.4.3-2: Statistical test limits for FACCH/F DARP DTS-2 (GSM 900 / 850)

DTS-2								
		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
FACCH/F	Frames	-74.5	5	0,050000	0,061700	5592	1119	00:18:39

Table 14.12.1.2a.4.3-3: Statistical test limits for FACCH/F DARP DTS-3 (GSM 900 / 850)

DTS-3								
		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
FACCH/F	Frames	-73.0	5	0,050000	0,061700	5592	1119	00:18:39

Table 14.12.1.2a.4.3-4: Statistical test limits for FACCH/F DARP DTS-2 (DCS 1800 / 1900)

DTS-2								
		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
FACCH/F	Frames	-75.0	5	0,050000	0,061700	5592	1119	00:18:39

Table 14.12.1.2a.4.3-5: Statistical test limits for FACCH/F DARP DTS-3 (DCS 1800 / 1900)

DTS-3								
		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	**Target test time (hh:mm:ss)**
FACCH/F	Frames	-74.0	5	0,050000	0,061700	5592	1119	00:18:39

14.13 Void

14.14 Void

14.15 Void

14.16 GPRS receiver tests

Statistical testing of receiver BLER performance

Error Definition

Block Error Ratio (BLER):

The Block Error Ratio is the ratio of blocks received in error to the total number of received blocks, where a block is defined as received in error if the error detection functions in the receiver, operating in accordance with 3GPP TS 05.03, indicate an error as a the result of the Block Check Sequence (BCS).

For USF the Block Error Ratio is the ratio of incorrectly interpreted USF to the total number of received USF.

Test criteria

In the receiver tests for circuit switched channels, test error rates have been defined in order not to pass MS with a performance worse than the specification by 1 dB, with tests to be performed at the sensitivity and interference levels defined in 3GPP TS 05.05. For circuit switched channels 3GPP TS 05.05 defines the error rates at a fixed sensitivity or interference level.

For packet switched channels 3GPP TS 05.05 defines the receive or interference level at which a fixed Block Error Ratio is met. Therefore, for GPRS the receiver is tested with a 1 dB offset in the receive level and the interference level.

If the error events can be assumed to be random independent variables, outputs of stationary random processes with identical Gaussian distributions, the previous figures suggest a number of events not lower than 200 in AWGN channel and not lower than 600 in a multipath environment.

For multipath propagation conditions the hypothesis of stationary random processes does not generally hold. In case of non frequency hopping operation mode, the radio channel may be assumed to change 10 times per wavelength of travelled distance and to be short term stationary in between. So, in this case, the required observation time for having good statistical properties should not be lower (with some rounding) than that reported in table 14.16-1.

Table 14.16-1: Minimum test time according to propagation profile

	GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900				**DCS 1 800 and PCS 1 900**			
Propagation Conditions	**TUlow**	**TUhigh**	**HT**	**RA**	**TUlow**	**TUhigh**	**HT**	**RA**
Min. test time (s)	500	30	15	6	500	15	7,5	6

Table 14.16-2 details, for the different test conditions, the minimum number of blocks required in order to meet points 1) to 3): the corresponding test time (point 4) can be consequently computed.

Table 14.16-2: Test conditions

Type of test	Type of sub-test	Propagation/ frequency conditions	Specified BLER %	Minimum No of blocks
Sensitivity	PDTCH/CS-1	static	10	2000
"	PDTCH/CS-1	TUhigh/no FH	10	6000
"	PDTCH/CS-1	TUhigh/FH	10	6000
"	PDTCH/CS-1	RA/no FH	10	6000
"	PDTCH/CS-1	HT/no FH	10	6000
"	PDTCH/CS-2	static	10	2000
"	PDTCH/CS-2	TUhigh/no FH	10	6000
"	PDTCH/CS-2	TUhigh/FH	10	6000
"	PDTCH/CS-2	RA/no FH	10	6000
"	PDTCH/CS-2	HT/no FH	10	6000
"	PDTCH/CS-3	static	10	2000
"	PDTCH/CS-3	TUhigh/no FH	10	6000
"	PDTCH/CS-3	TUhigh/FH	10	6000
"	PDTCH/CS-3	RA/no FH	10	6000
"	PDTCH/CS-3	HT/no FH	10	6000
"	PDTCH/CS-4	static	10	2000
"	PDTCH/CS-4	TUhigh/no FH	10	6000
"	PDTCH/CS-4	TUhigh/FH	10	6000
"	USF/CS-1	static	1	20000
"	USF/CS-1	TUhigh/no FH	1	60000
"	USF/CS-1	TUhigh/FH	1	60000
"	USF/CS-1	RA/no FH	1	60000
"	USF/CS-1	HT/no FH	1	60000
"	USF/CS-2/CS-3/CS-4	static	1	20000
"	USF/CS-2/CS-3/CS-4	TUhigh/noFH	1	60000
"	USF/CS-2/CS-3/CS-4	TUhigh/FH	1	60000
"	USF/CS-2/CS-3/CS-4	RA/no FH	1	60000
"	USF/CS-2/CS-3/CS-4	HT/no FH	1	60000
Co-channel	PDTCH/CS-1	TUlow/no FH	10	6000, but minimum of 500s
,,	PDTCH/CS-1	TUhigh/no FH	10	6000
,,	PDTCH/CS-1	TUhigh/FH	10	6000
,,	PDTCH/CS-1	RA/no FH	10	6000
,,	PDTCH/CS-2	TUlow/no FH	10	6000, but minimum of 500s
,,	PDTCH/CS-2	TUhigh/no FH	10	6000
,,	PDTCH/CS-2	TUhigh/FH	10	6000
,,	PDTCH/CS-2	RA/no FH	10	6000
,,	PDTCH/CS-3	TUlow/no FH	10	6000, but minimum of 500s
,,	PDTCH/CS-3	TUhigh/no FH	10	6000
,,	PDTCH/CS-3	TUhigh/FH	10	6000
,,	PDTCH/CS-3	RA/no FH	10	6000
,,	PDTCH/CS-4	TUlow/no FH	10	6000, but minimum of 500s
,,	PDTCH/CS-4	TUhigh/no FH	10	6000
"	PDTCH/CS-4	TUhigh/FH	10	6000
"	USF/CS-1	TUlow/no FH	1	60000
"	USF/CS-1	TUhigh/no FH	1	60000
"	USF/CS-1	TUhigh/FH	1	60000
"	USF/CS-1	RA/no FH	1	60000
"	USF/CS-2/CS-3/CS-4	TUlow/no FH	1	60000
"	USF/CS-2/CS-3/CS-4	TUhigh/no FH	1	60000
"	USF/CS-2/CS-3/CS-4	TUhigh/FH	1	60000
"	USF/CS-2/CS-3/CS-4	RA/no FH	1	60000
NOTE 1: For PDTCH sub-tests under fading conditions, the number of RLC blocks indicated above shall be transmitted on each downlink timeslot of the multislot configuration. NOTE 2: For USF sub-tests under fading conditions, the number of RLC blocks indicated above shall be per uplink timeslot of the multislot configuration.				

14.16.1 Minimum Input level for Reference Performance

14.16.1.1 Definition

The minimum input level is the signal level at the MS receiver input at which a certain BLER is met.

14.16.1.2 Conformance requirement

1. The block error rate (BLER) performance shall not exceed 10 % at input levels according to the table below.

Type of channel		Propagation conditions				
		static	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)	HT (no FH)
GSM 400, GSM 700, GSM 850 and GSM 900						
PDTCH/CS-1	dBm	-104	-104	-104	-104	-103
PDTCH/CS-2	dBm	-104	-100	-101	-101	-99
PDTCH/CS-3	dBm	-104	-98	-99	-98	-96
PDTCH/CS-4	dBm	-101	-90	-90	*	*
DCS 1 800 and PCS 1 900						
PDTCH/CS-1	dBm	-104	-104	-104	-104	-103
PDTCH/CS-2	dBm	-104	-100	-100	-101	-99
PDTCH/CS-3	dBm	-104	-98	-98	-98	-94
PDTCH/CS-4	dBm	-101	-88	-88	*	*

The input levels given in the above Table are referenced to normal GSM 900 MS, and have to be corrected by the following values for other MS:

GSM 400, GSM 700, GSM 850 and GSM 900 small MS +2 dB

DCS 1800 class 1 or 2 MS +2/+4 dB**

DCS 1800 class 3 and PCS 1 900 class 1 or 2 MS +2 dB

PCS 1 900 class 3 MS 0 dB

** For all DCS 1 800 class 1 and class 2 MS, a correction offset of +2dB shall apply for the reference sensitivity performance as specified in table 1a for the normal conditions defined in Annex D and an offset of +4 dB shall be used to determine all other MS performances.

3GPP TS 05.05, table 1a; 3GPP TS 05.05, subclause 6.2.

2 The block error rate (BLER) performance shall not exceed 1 % at input levels according to the table below.

Type of channel		Propagation conditions				
		static	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)	HT (no FH)
GSM 400, GSM 700, GSM 850 and GSM 900						
USF/CS-1	dBm	< -104	-101	-103	-103	-101
USF/CS-2 to 4	dBm	< -104	-103	-104	-104	-104
DCS 1 800 and PCS 1 900						
USF/CS-1	dBm	< -104	-103	-103	-103	-101
USF/CS-2 to 4	dBm	< -104	-104	-104	-104	-103

The input levels given in the above Table are referenced to normal GSM 900 MS, and have to be corrected by the following values for other MS:

GSM 400, GSM 700, GSM 850 and GSM 900 small MS +2 dB

DCS 1800 class 1 or 2 MS +2/+4 dB**

DCS 1800 class 3 and PCS 1 900 class 1 or 2 MS +2 dB

PCS 1 900 class 3 MS 0 dB

** For all DCS 1 800 class 1 and class 2 MS, a correction offset of +2dB shall apply for the reference sensitivity performance as specified in table 1a for the normal conditions defined in Annex D and an offset of +4 dB shall be used to determine all other MS performances.

3GPP TS 05.05, table 1a; 3GPP TS 05.05, subclause 6.2.

3. The BLER shall not exceed the conformance requirements given in 1. - 2. under extreme conditions; 3GPP TS 05.05, subclause 6.2 and annex D subclauses D.2.1 and D.2.2.

4. The reference sensitivity performance specified above need not be met in the following cases:

   for MS at the static channel, if the received level on either of the two adjacent timeslots to the wanted exceed the wanted timeslot by more than 20 dB;

   for MS on a multislot configuration, if the received level on any of the timeslots belonging to the same multislot configuration as the wanted time slot, exceed the wanted time slot by more than 6 dB;

   The interfering adjacent time slots shall be static with valid GSM signals in all cases;

   3GPP TS 05.05, subclause 6.2.

5) For an MS allocated a USF on a PDCH with a random RF input or a valid PDCH signal with a random USF not equal to the allocated USF, the overall reception shall be such that the MS shall detect the allocated USF in less than 1% of the radio blocks. This requirement shall be met for all input levels up to -40 dBm.

   3GPP TS 05.05, subclause 6.4

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.16.1.3 Test purpose

NOTE: This test is performed under STATIC propagation conditions to allow implicit testing of the ability of the MS to hop over the full band. The tests under dynamic propagation conditions are better suited to test the minimum input level for reference BLER performance conformance but cannot test hopping over the full band due to limited bandwidth of available fading simulators.

1. To verify that that the MS sends a Packet Not Acknowledge in the Packet Downlink Ack/Nack in case of a the Block Check Sequence indicating a Block Error.

2. To verify that the MS does not exceed conformance requirement 1 for CS-3 and CS-4 under STATIC, TUhigh, HT and RA propagation conditions with an allowance for the statistical significance of the test.

3. To verify that the MS does not exceed conformance requirement 2 under HT propagation conditions with an allowance for the statistical significance of the test.

4. To verify that the MS does not exceed conformance requirement 3 under STATIC, TUhigh, HT and RA propagation conditions for the PDTCH, and HT propagation conditions for the USF, with an allowance for the statistical significance of the test.

5. To verify that the MS meets the conformance requirements also 1 and 2 for the conditions allowed by conformance requirement 4, with an allowance for the statistical significance of the test.

6. To verify that the MS meets conformance requirement 5, with an allowance for the statistical significance of the test.

14.16.1.4 Method of test

14.16.1.4.1 Initial conditions

NOTE 1: The BA list sent on the BCCH and SACCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range 15 dBμVemf( ) to 35 dBμVemf( ). Surrounding cell signal levels and cell reselection parameters are set so that the MS will not try a cell reselection.

NOTE 2: The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

NOTE 3: When frequency hopping is used, the traffic channel may fall on any of the ARFCNs defined in clause 6.

NOTE 4: The PSI1 message is included in the PACCH when the MS is in packet transfer mode. The PBCCH_CHANGE_MARK value in PSI1 is not changed. This, together with preventing cell reselection as per Note 1, ensures that the MS is highly unlikely to suspend the TBF (3GPP TS 04.60 subclause 5.5.1.4.2 Suspension of operation to receive system operation), and thus making the effect of TBF suspension statistically insignificant for the test result.

A call is set up according to the generic call set up procedure for packet switched on an ARFCN in the Mid range, on the maximum number of receive timeslots, with the MS transmitting at maximum power. The power control parameter ALPHA (α) is set to 0.

For the ACK/NACK BLER and the BCS BLER parts of the test case, a downlink TBF will be established.

For the USF BLER parts of the test case the Test Mode defined in 3GPP TS 04.14 (subclause 5.4) will be used for uplink TBF. If the MS is capable of both:

Mode (a) transmitting pseudo-random data sequence in RLC data blocks;

Mode (b) transmitting looped-back RLC data blocks;

then Mode (a) will be used.

If Mode (b) is used then the SS sends the pseudo-random data sequence specified for Mode (a) on the downlink for loopback on the uplink.

14.16.1.4.2 Procedure

a) The SS transmits packets under Static propagation conditions, using CS-3 coding at a level of 1 dB above the level given in conformance reference 1. Out of the 400 blocks transmitted by the SS, 20 blocks are sent with incorrect BCS, at (pseudo) random positions. The SS checks, for the blocks it transmitted with incorrect BCS, whether or not the MS Packet Downlink Ack/Nack as sent by the MS indicates these blocks as not acknowledged.

b) The SS transmits packets under static conditions, with the MS commanded to hopping mode using the hopping sequence used in clause 6, and using CS-3 coding to the MS on all allocated timeslots, at a level of 1 dB above the level given in the table in conformance requirement 1. On the time slots not allocated to the MS, the SS transmits at a level of 20 dB above the level given in the table in conformance requirement 1. This implicitly tests adjacent time slot rejection.

c) The SS counts the number of blocks transmitted with CS-3 and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can sent this message.

d) Once the number of blocks transmitted with CS-3 as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14.16-2, the SS calculates the Block error ratio. The SS resets both counters.

e) The SS repeats step b) to d) with the following four fading conditions and hopping modes: TUhigh/noFH, TUhigh/FH, HT/noFH and RA/noFH. For these tests with fading channels , the SS does not transmit on the timeslots not allocated to the MS.

f) The SS repeats steps b) to d) using CS-4 coding with the following three fading conditions: Static/FH, TUhigh/noFH and TUhigh/FH. For these tests with fading channels , the SS does not transmit on the timeslots not allocated to the MS.

g) The SS repeats steps b) to f) under extreme test conditions.

h) This step is only performed for a multislot MS. The SS establishes the normal test conditions with the exceptions in the parameter settings of Packet Downlink Assignment message:

- P0 = 14 dBm;
- BTS_PWR_CTRL_MODE = Mode A;
- PR_MODE = B.

Furthermore, the SS has to set the PR fields in the MAC headers of each downlink RLC data block to correspond the applied downlink power level, as defined below. The SS repeats steps b) to d) with only one of the active timeslots at 1 dB above the level at which the reference sensitivity performance shall be met, and all other timeslots belonging to the same multislot configuration at a level of 6 dB above this timeslot.

i) The SS establishes the normal test conditions, and sets the fading function to HT/noFH.

j) The SS sets the value of the USF/CS-1 such as to allocate the uplink to the MS, transmitting at a level of 1 dB above the level given in the table in conformance requirement 2.

k) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

l) Once the number of USF/CS-1 allocating the uplink for the MS as counted in step k) reaches or exceeds the minimum number of blocks as given in table 14.16-2, the SS calculates the Block error ratio. The SS resets both counters.

m) The SS repeats steps j) to l) using USF/CS2 to 4 coding.

NOTE: Since coding for USF-bits is identical for CS2 and CS3, it’s not required to perform the step for both of those CS.

n) The SS repeats steps i) to m) under extreme test conditions.

o) The SS establishes normal test condition and a static channel. The SS sets the value of the USF/CS-1 to all values randomly, with the exception of the one allocated to the MS, transmitting at 3 dB below the level at which reference performance shall be met, and counts the number of times the MS transmits on the uplink. This is done for 2 000 blocks.

14.16.1.5 Test requirements

In step a) the Packet Downlink Ack/Nack as sent by the MS shall indicate every block transmitted by the SS with incorrect BCS as not acknowledged.

The block error ratio, as calculated by the SS for different channels and under the different propagation conditions, under any combination of normal and extreme test voltages and ambient temperatures, shall not exceed the conformance requirement.

In step o) the MS shall transmit no more than 25 times.

In the case when downlink power control is not used and the output power used on the transmitted blocks is not equal to (BCCH level – Pb) then the MS is not required to fulfil 3GPP TS 05.05 requirements for the first 25 blocks addressed to this MS (3GPP TS 05.08, subclause 10.2.2).

NOTE: This is stated in the Rel 99 version of 3GPP TS 05.08.

14.16.1a Minimum Input level for Reference Performance in TIGHTER configuration

14.16.1a.1 Definition

The minimum input level is the signal level at the MS receiver input at which a certain BLER is met.

14.16.1a.2 Conformance requirement

For a MS indicating support for TIGHTER Capability (see 3GPP TS 24.008), the minimum input signal levels for which the reference performance shall be met are specified in table 1w, according to the propagation condition. The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 1w, except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60.

1. The block error rate (BLER) performance shall not exceed 10 % at input levels according to the table below.

Type of channel		Propagation conditions				
		static	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)	HT (no FH)
GSM 400, GSM 700, GSM 850 and GSM 900						
PDTCH/CS-1	dBm	-105	-106	-106	-105,5	-104,5
PDTCH/CS-2	dBm	-105	-102	-103	-102,5	-100,5
PDTCH/CS-3	dBm	-105	-100	-101	-99,5	-97,5
PDTCH/CS-4	dBm	-102	-92	-92	(note 2)	(note 2)
DCS 1 800 and PCS 1 900						
PDTCH/CS-1	dBm	(note 3)	-106	-106	-105,5	-104,5
PDTCH/CS-2	dBm	(note 3)	-102	-102	-102,5	-100,5
PDTCH/CS-3	dBm	(note 3)	-100	-100	-99,5	-95,5
PDTCH/CS-4	dBm	(note 3)	-90	-90	(note 2)	(note 2)
NOTE 2: PDTCH for MCS-x cannot meet the reference performance for some propagation conditions.						
NOTE 3: The requirements for the DCS 1800 & PCS 1900 Static propagation condition are the same as for the GSM 850 & GSM 900 Static propagation condition, the requirements for the GSM 850 & GSM 900 TU50 (ideal FH) and DCS 1800 & PCS 1900 TU50 (ideal FH) propagation conditions are the same as for the DCS 1800 & PCS 1900 TU50 (no FH) propagation condition, and the requirements for the DCS 1800 & PCS 1900 RA130 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 RA250 (no FH) propagation condition.						

The input levels given in the above Table are referenced to normal GSM 900 MS, and have to be corrected by the following values for other MS:

GSM 400, GSM 700, GSM 850 and GSM 900 small MS	+2 dB
DCS 1800 class 1 or 2 MS	+2/+4 dB**
DCS 1800 class 3 and PCS 1 900 class 1 or 2 MS	+2 dB
PCS 1 900 class 3 MS	0 dB

** For all DCS 1 800 class 1 and class 2 MS, a correction offset of +2dB shall apply for the reference sensitivity performance as specified in table 1a for the normal conditions defined in Annex D and an offset of +4 dB shall be used to determine all other MS performances.

3GPP TS 05.05, table 1a; 3GPP TS 05.05, subclause 6.2.

2. The block error rate (BLER) performance shall not exceed 1 % at input levels according to the table below.

Type of channel		Propagation conditions				
		static	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)	HT (no FH)
GSM 400, GSM 700, GSM 850 and GSM 900						
USF/CS-1	dBm	< -104	-101	-103	-103	-101
USF/CS-2 to 4	dBm	< -104	-103	-104	-104	-104
DCS 1 800 and PCS 1 900						
USF/CS-1	dBm	< -104	-103	-103	-103	-101
USF/CS-2 to 4	dBm	< -104	-104	-104	-104	-103

The input levels given in the above Table are referenced to normal GSM 900 MS, and have to be corrected by the following values for other MS:

GSM 400, GSM 700, GSM 850 and GSM 900 small MS	+2 dB
DCS 1800 class 1 or 2 MS	+2/+4 dB**
DCS 1800 class 3 and PCS 1 900 class 1 or 2 MS	+2 dB
PCS 1 900 class 3 MS	0 dB

** For all DCS 1 800 class 1 and class 2 MS, a correction offset of +2dB shall apply for the reference sensitivity performance as specified in table 1a for the normal conditions defined in Annex D and an offset of +4 dB shall be used to determine all other MS performances.

3GPP TS 05.05, table 1a; 3GPP TS 05.05, subclause 6.2.

3. The BLER shall not exceed the conformance requirements given in 1. - 2. under extreme conditions; 3GPP TS 05.05, subclause 6.2 and annex D subclauses D.2.1 and D.2.2.

4. The reference sensitivity performance specified above need not be met in the following cases:

   for MS at the static channel, if the received level on either of the two adjacent timeslots to the wanted exceed the wanted timeslot by more than 20 dB;

   for MS on a multislot configuration, if the received level on any of the timeslots belonging to the same multislot configuration as the wanted time slot, exceed the wanted time slot by more than 6 dB;

   The interfering adjacent time slots shall be static with valid GSM signals in all cases;

   3GPP TS 05.05, subclause 6.2.

5. For an MS allocated a USF on a PDCH with a random RF input or a valid PDCH signal with a random USF not equal to the allocated USF, the overall reception shall be such that the MS shall detect the allocated USF in less than 1% of the radio blocks. This requirement shall be met for all input levels up to -40 dBm.

   3GPP TS 05.05, subclause 6.4

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.16.1a.3 Test purpose

NOTE: This test is performed under STATIC propagation conditions to allow implicit testing of the ability of the MS to hop over the full band. The tests under dynamic propagation conditions are better suited to test the minimum input level for reference BLER performance conformance but cannot test hopping over the full band due to limited bandwidth of available fading simulators.

1. To verify that that the MS sends a Packet Not Acknowledge in the Packet Downlink Ack/Nack in case of a the Block Check Sequence indicating a Block Error.

2. To verify that the MS does not exceed conformance requirement 1 for CS-3 and CS-4 under STATIC, TUhigh, HT and RA propagation conditions with an allowance for the statistical significance of the test.

3. To verify that the MS does not exceed conformance requirement 2 under HT propagation conditions with an allowance for the statistical significance of the test.

4. To verify that the MS does not exceed conformance requirement 3 under STATIC, TUhigh, HT and RA propagation conditions for the PDTCH, and HT propagation conditions for the USF, with an allowance for the statistical significance of the test.

5. To verify that the MS meets the conformance requirements also 1 and 2 for the conditions allowed by conformance requirement 4, with an allowance for the statistical significance of the test.

6. To verify that the MS meets conformance requirement 5, with an allowance for the statistical significance of the test.

14.16.1a.4 Method of test

14.16.1a.4.1 Initial conditions

NOTE 1: The BA list sent on the BCCH and SACCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range 15 dBμVemf( ) to 35 dBμVemf( ). Surrounding cell signal levels and cell reselection parameters are set so that the MS will not try a cell reselection.

NOTE 2: The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

NOTE 3: When frequency hopping is used, the traffic channel may fall on any of the ARFCNs defined in clause 6.

NOTE 4: The PSI1 message is included in the PACCH when the MS is in packet transfer mode. The PBCCH_CHANGE_MARK value in PSI1 is not changed. This, together with preventing cell reselection as per Note 1, ensures that the MS is highly unlikely to suspend the TBF (3GPP TS 04.60 subclause 5.5.1.4.2 Suspension of operation to receive system operation), and thus making the effect of TBF suspension statistically insignificant for the test result.

A call is set up according to the generic call set up procedure for packet switched on an ARFCN in the Mid range, on the maximum number of receive timeslots, with the MS transmitting at maximum power. The power control parameter ALPHA (α) is set to 0.

For the ACK/NACK BLER and the BCS BLER parts of the test case, a downlink TBF will be established.

For the USF BLER parts of the test case the Test Mode defined in 3GPP TS 04.14 (subclause 5.4) will be used for uplink TBF. If the MS is capable of both:

Mode (a) transmitting pseudo-random data sequence in RLC data blocks;

Mode (b) transmitting looped-back RLC data blocks;

then Mode (a) will be used.

If Mode (b) is used then the SS sends the pseudo-random data sequence specified for Mode (a) on the downlink for loopback on the uplink.

14.16.1a.4.2 Procedure

a) The SS transmits packets under Static propagation conditions, using CS-3 coding at a level of 1 dB above the level given in conformance reference 1. Out of the 400 blocks transmitted by the SS, 20 blocks are sent with incorrect BCS, at (pseudo) random positions. The SS checks, for the blocks it transmitted with incorrect BCS, whether or not the MS Packet Downlink Ack/Nack as sent by the MS indicates these blocks as not acknowledged.

b) The SS transmits packets under static conditions, with the MS commanded to hopping mode using the hopping sequence used in clause 6, and using CS-3 coding to the MS on all allocated timeslots, at a level of 1 dB above the level given in the table in conformance requirement 1. On the time slots not allocated to the MS, the SS transmits at a level of 20 dB above the level given in the table in conformance requirement 1. This implicitly tests adjacent time slot rejection.

c) The SS counts the number of blocks transmitted with CS-3 and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can sent this message.

d) Once the number of blocks transmitted with CS-3 as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14.16-2, the SS calculates the Block error ratio. The SS resets both counters.

e) The SS repeats step b) to d) with the following four fading conditions and hopping modes: TUhigh/noFH, TUhigh/FH, HT/noFH and RA/noFH. For these tests with fading channels , the SS does not transmit on the timeslots not allocated to the MS.

f) The SS repeats steps b) to d) using CS-4 coding with the following three fading conditions: Static/FH, TUhigh/noFH and TUhigh/FH. For these tests with fading channels , the SS does not transmit on the timeslots not allocated to the MS.

g) The SS repeats steps b) to f) under extreme test conditions.

h) This step is only performed for a multislot MS. The SS establishes the normal test conditions with the exceptions in the parameter settings of Packet Downlink Assignment message:

  - P0 = 14 dBm;
  - BTS_PWR_CTRL_MODE = Mode A;
  - PR_MODE = B.

  Furthermore, the SS has to set the PR fields in the MAC headers of each downlink RLC data block to correspond the applied downlink power level, as defined below. The SS repeats steps b) to d) with only one of the active timeslots at 1 dB above the level at which the reference sensitivity performance shall be met, and all other timeslots belonging to the same multislot configuration at a level of 6 dB above this timeslot.

i) The SS establishes the normal test conditions, and sets the fading function to HT/noFH.

j) The SS sets the value of the USF/CS-1 such as to allocate the uplink to the MS, transmitting at a level of 1 dB above the level given in the table in conformance requirement 2.

k) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

l) Once the number of USF/CS-1 allocating the uplink for the MS as counted in step k) reaches or exceeds the minimum number of blocks as given in table 14.16-2, the SS calculates the Block error ratio. The SS resets both counters.

m) The SS repeats steps j) to l) using USF/CS2 to 4 coding.

NOTE: Since coding for USF-bits is identical for CS2 and CS3, it's not required to perform the step for both of those CS.

n) The SS repeats steps i) to m) under extreme test conditions.

o) The SS establishes normal test condition and a static channel. The SS sets the value of the USF/CS-1 to all values randomly, with the exception of the one allocated to the MS, transmitting at 3 dB below the level at which reference performance shall be met, and counts the number of times the MS transmits on the uplink. This is done for 2 000 blocks.

14.16.1a.5 Test requirements

In step a) the Packet Downlink Ack/Nack as sent by the MS shall indicate every block transmitted by the SS with incorrect BCS as not acknowledged.

The block error ratio, as calculated by the SS for different channels and under the different propagation conditions, under any combination of normal and extreme test voltages and ambient temperatures, shall not exceed the conformance requirement.

In step o) the MS shall transmit no more than 25 times.

In the case when downlink power control is not used and the output power used on the transmitted blocks is not equal to (BCCH level – Pb) then the MS is not required to fulfil 3GPP TS 05.05 requirements for the first 25 blocks addressed to this MS (3GPP TS 05.08, subclause 10.2.2).

NOTE: This is stated in the Rel 99 version of 3GPP TS 05.08.

14.16.2 Co-channel rejection

14.16.2.1 Co-channel rejection for packet channels

14.16.2.1.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.16.2.1.2 Conformance requirement

1. The block error rate (BLER) performance shall not exceed 10 % at co-channel interference ratios (C/I_c) exceeding those according to the table below.

Type of channel		Propagation conditions			
		TUlow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
GSM 400, GSM 700, GSM 850 and GSM 900					
PDTCH/CS-1	dB	13	10	9	9
PDTCH/CS-2	dB	15	14	13	13
PDTCH/CS-3	dB	16	16	15	16
PDTCH/CS-4	dB	21	24	24	-
DCS 1 800 and PCS 1 900					
PDTCH/CS-1	dB	13	9	9	9
PDTCH/CS-2	dB	15	13	13	13
PDTCH/CS-3	dB	16	16	16	16
PDTCH/CS-4	dB	21	27	27	-

3GPP TS 05.05, table 2a; 3GPP TS 05.05, subclause 6.2.

2 The block error rate (BLER) performance shall not exceed 1 % at co-channel interference ratios (C/I_c) exceeding those according to the table below.

Type of channel		Propagation conditions			
		TUlow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
GSM 400, GSM 700, GSM 850 and GSM 900					
USF/CS-1	dB	19	12	10	10
USF/CS-2 to 4	dB	18	10	9	8
DCS 1 800 and PCS 1 900					
USF/CS-1	dB	19	10	10	10
USF/CS-2 to 4	dB	18	9	9	7

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.16.2.1.3 Test purpose

1. To verify that the MS does not exceed conformance requirement 1 under propagation condition TUlow/no FH, TUhigh/noFH, TUhigh/FH and RA/no FH with an allowance for the statistical significance of the test.

2. To verify that the MS does not exceed conformance requirement 2 under propagation condition TUhigh/noFH, with an allowance for the statistical significance of the test.

14.16.2.1.4 Method of test

14.16.2.1.4.1 Initial conditions

A call is set up according to the generic call set up procedure with an ARFCN in the mid ARFCN range, power control level set to maximum power. The power control parameter ALPHA (α) is set to 0.

The SS transmits Standard Test Signal C1.

In addition to this wanted signal (C), the SS produces an independent, uncorrelated interfering signal (I).

This unwanted signal is random, continuous and GSM-modulated, and has no fixed relationship with the bit transitions of the wanted signal.

For the ACK/NACK BLER and the BCS BLER parts of the test case, a downlink TBF will be established.

For the USF BLER parts of the test case the Test Mode defined in GSM Rec. 4.14 (para 5.4) will be used for uplink TBF. If the MS is capable of both:

Mode (a) transmitting pseudo-random data sequence in RLC data blocks;

Mode (b) transmitting looped-back RLC data blocks;

then Mode (a) will be used.

If Mode (b) is used then the SS sends the pseudo-random data sequence specified for Mode (a) on the downlink for loopback on the uplink.

Specific PICS statements:

- Support of DARP Phase 1 (TSPC_DARP_Phase1)

PIXIT Statements:

-

14.16.2.1.4.2 Procedure

a) The SS transmits packets using CS-1 coding to the MS on all allocated timeslots.

b) The fading characteristic of the wanted and the interfering signal is TUlow, no FH applies.

c) The co-channel interference ratio is set to 1 dB above the ratio given in the table in conformance requirement 1. The interferer shall have the same frequency hopping sequence as the wanted signal, as well as be subject to the same fading profile.

d) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can sent this message.

e) Once the number of blocks transmitted with the current coding scheme as counted in step d) reaches or exceeds the minimum number of blocks as given in table 14.16-2, the SS calculates the Block error ratio. The SS resets both counters.

f) In the case of CS-1 the SS repeats step c) to e) with the fading conditions and hopping modes: TUhigh/FH, and RA/noFH and, if the MS does not support DARP phase 1 also with TUhigh/noFH fading condition.
In the case of CS-2 the SS repeats step c) to e) with the fading condition and hopping mode RA/no FH only.
In the case of CS-3 the SS repeats step c) to e) with the fading condition and hopping mode TUhigh/FH only.
In the case of CS-4 and the MS does not support DARP phase 1 the SS repeats step c) to e) with the fading condition and hopping modes: TUhigh/noFH.

g) The SS repeats the steps b) to f) for each of the coding schemes CS-2, CS-3 and CS-4.

h) The SS sets the fading function to TUhigh/noFH.

i) The SS sets the value of the USF/CS-1 such as to allocate the uplink to the MS, using a co-channel interference level of 1 dB above the level given in the table in conformance requirement 2.

j) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

k) Once the number of USF/CS-1 allocating the uplink for the MS as counted in step j) reaches or exceeds the minimum number of blocks as given in table 14.16-2, the SS calculates the Block error ratio. The SS resets both counters.

l) The SS repeats steps i) to k) using USF/CS2 coding.

14.16.2.1.5 Test requirements

The block error ratio, as calculated by the SS for different channels and under the different propagation conditions, shall not exceed the conformance requirement.

NOTE: The wanted signal levels derived from calculations using 3GPP TS 45.005 subclause 6.3 together with subclause 14.16.2.1.4.2 c) shall be set according to the table below.

Type of channel		Propagation conditions			
		TUlow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 Small Ms (see note (1))					
PDTCH/CS-1	dBm	-77	-80	-81	-81
PDTCH/CS-2	dBm	-75	-76	-77	-77
PDTCH/CS-3	dBm	-74	-74	-75	-74
PDTCH/CS-4	dBm	-69	-66	-66	-
DCS 1 800 and PCS 1 900 (class 1 and 2) (see note (2))					
PDTCH/CS-1	dBm	-77	-81	-81	-81
PDTCH/CS-2	dBm	-75	-77	-77	-77
PDTCH/CS-3	dBm	-74	-74	-74	-74
PDTCH/CS-4	dBm	-69	-63	-63	-
NOTE 1: For other GSM 400, GSM 900, T-GSM 810, GSM 850 and GSM 700 MS the values in the table above should be decreased by 2 dBm.					
NOTE 2: For other classes of PCS 1 900 MS the values in the above table should be decreased by 2 dBm. For DCS 1 800 MS under extreme conditions the values in the above table should be increased by 2 dBm.					

14.16.2.1a Co-channel rejection for packet channels – TIGHTER configuration

14.16.2.1a.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

14.16.2.1a.2 Conformance requirement

For a MS indicating support for TIGHTER Capability (see 3GPP TS 24.008), the minimum input signal levels for which the reference performance shall be met are specified in table 1w, according to the propagation condition. The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 1w, except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60.

1. The block error rate (BLER) performance shall not exceed 10 % at co-channel interference ratios (C/I_c) exceeding those according to the table14.16.2.1a-1 as below.

Table 14.16.2.1a-1

Type of channel		Propagation conditions			
		TUlow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
GSM 400, GSM 700, GSM 850 and GSM 900					
PDTCH/CS-1	dB	9	6,5	5,5	6,5
PDTCH/CS-2	dB	11	10,5	9,5	10,5
PDTCH/CS-3	dB	12	12,5	11,5	13,5
PDTCH/CS-4	dB	17	20,5	20,5	-
DCS 1 800 and PCS 1 900					
PDTCH/CS-1	dB	9	5,5	5,5	6,5
PDTCH/CS-2	dB	11	9,5	9,5	10,5
PDTCH/CS-3	dB	12	12,5	12,5	13,5
PDTCH/CS-4	dB	17	23,5	23,5	-

3GPP TS 45.005, table 2ad; 3GPP TS 45.005, subclause 6.2.

2. The block error rate (BLER) performance shall not exceed 1 % at co-channel interference ratios (C/I_c) exceeding those according to the table 14.16.2.1a-2 below.

Table 14.16.2.1a-2

Type of channel		Propagation conditions			
		TUlow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
GSM 400, GSM 700, GSM 850 and GSM 900					
USF/CS-1	dB	19	12	10	10
USF/CS-2 to 4	dB	18	10	9	8
DCS 1 800 and PCS 1 900					
USF/CS-1	dB	19	10	10	10
USF/CS-2 to 4	dB	18	9	9	7

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.16.2.1a.3 Test purpose

1. To verify that the MS does not exceed conformance requirement 1 under propagation condition TUlow/no FH, TUhigh/noFH, TUhigh/FH and RA/no FH with an allowance for the statistical significance of the test.

2. To verify that the MS does not exceed conformance requirement 2 under propagation condition TUhigh/noFH, with an allowance for the statistical significance of the test.

14.16.2.1a.4 Method of test

14.16.2.1a.4.1 Initial conditions

A call is set up according to the generic call set up procedure with an ARFCN in the mid ARFCN range, power control level set to maximum power. The power control parameter ALPHA (α) is set to 0.

The SS transmits Standard Test Signal C1.

In addition to this wanted signal (C), the SS produces an independent, uncorrelated interfering signal (I).

This unwanted signal is random, continuous and GSM-modulated, and has no fixed relationship with the bit transitions of the wanted signal.

For the ACK/NACK BLER and the BCS BLER parts of the test case, a downlink TBF will be established.

For the USF BLER parts of the test case the Test Mode defined in GSM Rec. 4.14 (para 5.4) will be used for uplink TBF. If the MS is capable of both:

Mode (a) transmitting pseudo-random data sequence in RLC data blocks;

Mode (b) transmitting looped-back RLC data blocks;

then Mode (a) will be used.

If Mode (b) is used then the SS sends the pseudo-random data sequence specified for Mode (a) on the downlink for loopback on the uplink.

Specific PICS statements:

PIXIT Statements:

-

14.16.2.1a.4.2 Procedure

a) The SS transmits packets using CS-1 coding to the MS on all allocated timeslots.

b) The fading characteristic of the wanted and the interfering signal is TUlow, no FH applies.

c) The co-channel interference ratio is set to 1 dB above the ratio given in the table in conformance requirement 1. The interferer shall have the same frequency hopping sequence as the wanted signal, as well as be subject to the same fading profile.

d) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can sent this message.

e) Once the number of blocks transmitted with the current coding scheme as counted in step d) reaches or exceeds the minimum number of blocks as given in table 14.16-2, the SS calculates the Block error ratio. The SS resets both counters.

f) In the case of CS-1 the SS repeats step c) to e) with the fading conditions and hopping modes: TUhigh/FH and RA/noFH.
In the case of CS-2 the SS repeats step c) to e) with the fading condition and hopping mode RA/no FH only.
In the case of CS-3 the SS repeats step c) to e) with the fading condition and hopping mode TUhigh/FH only.

g) The SS repeats the steps b) to f) for each of the coding schemes CS-2, CS-3 and CS-4.

h) The SS sets the fading function to TUhigh/noFH.

i) The SS sets the value of the USF/CS-1 such as to allocate the uplink to the MS, using a co-channel interference level of 1 dB above the level given in the table in conformance requirement 2.

j) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

k) Once the number of USF/CS-1 allocating the uplink for the MS as counted in step j) reaches or exceeds the minimum number of blocks as given in table 14.16-2, the SS calculates the Block error ratio. The SS resets both counters.

l) The SS repeats steps i) to k) using USF/CS2 coding.

14.16.2.1a.5 Test requirements

The block error ratio, as calculated by the SS for different channels and under the different propagation conditions, shall not exceed the conformance requirement.

NOTE: The wanted signal levels derived from calculations using 3GPP TS 45.005 subclause 6.3 together with subclause 14.16.2.1a.4.2 c) shall be set according to the table 14.16.2.1a-3 as below.

Table 14.16.2.1a-3

Type of channel		Propagation conditions			
		TUlow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900 Small Ms (see note (1))					
PDTCH/CS-1	dBm	-81	-83,5	-84,5	-83,5
PDTCH/CS-2	dBm	-79	-79,5	-80,5	-79,5
PDTCH/CS-3	dBm	-78	-77,5	-78,5	-76,5
PDTCH/CS-4	dBm	-73	-69,5	-69,5	-
DCS 1 800 and PCS 1 900 (class 1 and 2) (see note (2))					
PDTCH/CS-1	dBm	-81	-84,5	-84,5	-83,5
PDTCH/CS-2	dBm	-79	-80,5	-80,5	-79,5
PDTCH/CS-3	dBm	-78	-77,5	-77,5	-76,5
PDTCH/CS-4	dBm	-73	-66,5	-66,5	-
NOTE 1: For other GSM 400, GSM 900, T-GSM 810, GSM 850 and GSM 700 MS the values in the table above should be decreased by 2 dBm. NOTE 2: For other classes of PCS 1 900 MS the values in the above table should be decreased by 2 dBm. For DCS 1 800 MS under extreme conditions the values in the above table should be increased by 2 dBm.					

14.16.3 Acknowledged mode / Downlink TBF / I_LEVEL measurement report

14.16.3.1 Conformance requirements

The PACKET DOWNLINK ACK/NACK message contains a Channel Quality Report (see 3GPP TS 05.08). The optional I_LEVEL measurement results shall be included in at least every other PACKET DOWNLINK ACK/NACK message.

The accuracy of the received signal level and interference measurements shall be as defined in subclause 8.1.2. The measured signal strength values shall be mapped to the reported C values as defined for RXLEV in subclause 8.1.4. If included in a PACKET MEASUREMENT REPORT message, the measured interference level, γ_{CH}, shall be mapped to a reported I_LEVEL as defined for RXLEV in subclause 8.1.4. If included in a PACKET DOWNLINK ACK/NACK or a PACKET RESOURCE REQUEST message, the measured interference level, γ_{CH}, shall be mapped to a reported I_LEVEL value between 0 and 15, relative to reported C value as follows:

I_LEVEL 0 = interference level is greater than C
I_LEVEL 1 = interference level is less than or equal to C and greater than C - 2 dB
I_LEVEL 2 = interference level is less than or equal to C - 2 dB and greater than C - 4 dB
:
:
I_LEVEL 14 = interference level is less than or equal to C - 26 dB and greater than C - 28 dB
I_LEVEL 15 = interference level is less than or equal to C - 28 dB

14.16.3.2 References

3GPP TS 04.60, 3GPP TS 44.060, subclause 8.1.2.2.

3GPP TS 05.08, 3GPP TS 45.008, subclauses 10.3

14.16.3.3 Test purpose

To verify that correct I_LEVEL measurement results are included in at least every other PACKET DOWNLINK ACK/NACK message.

14.16.3.4 Method of test

14.16.3.5 Initial Conditions

System Simulator:

1) cell, default setting, PBCCH not present. The power control parameter ALPHA (α) is set to 0.
2) The level of the serving cell BCCH and of the PDTCH is set to 30 dB above the reference sensitivity level which is specified in 3GPP TS 05.05. For instance for class 2 or 3 MS, in GSM 900 MS, the level of the serving cell BCCH and of the PDTCH shall be set to –104 dBm + 30dB = -74dBm.
3) PC_MEAS_CHAN indicates that the MS shall measure the received signal level of each radio block on one of the PDCH monitored by the MS for PACCH.
4) The interference filter parameter N_AVG_I is set to 3 (coded value 0011)
5) The C value filter parameter T_{AVG_T} is set to 15 (coded 01111).
6) Normal conditions as defined in Annex D of 3GPP TS 05.05 are applied.

Mobile Station:

The MS is GPRS updated with a P-TMSI allocated, SPLIT PG CYCLE negotiated and the test PDP Context2 activated.

14.16.3.6 Void

14.16.3.7 Test Procedure

In addition to the wanted signal on PDTCH, the SS produces an uncorrelated co-channel interfering signal, GMSK modulated: the unwanted signal is sent during idle frames of PDTCH of the wanted signal, and has no fixed relationship with the bit transitions of the wanted signal.

This interfering signal is sent on the same nominal carrier frequency as the PACCH and PDTCH and at a level x dB above the level of the PDTCH and modulated with random data.

x is a random value in [1 dB; -29 dB] in steps of 2 dB, negative values of x meaning that the resulting interference level is below the level of the PDTCH.

For instance, for GSM 900 MS, the resulting interference level depends on the x random value as follows:

x	Interference level
1 dB	-73 dBm
-1 dB	-75 dBm
-3 dB	-77 dBm
-5 dB	-79 dBm
-7 dB	-81 dBm
-9 dB	-83 dBm
-11 dB	-85 dBm
-13 dB	-87 dBm
-15 dB	-89 dBm
-17 dB	-91 dBm
-19 dB	-93 dBm
-21 dB	-95 dBm
-23 dB	-97 dBm
-25 dB	-99 dBm
-27 dB	-101 dBm
-29 dB	-103 dBm

NOTE: Values of the reference sensitivity level for every frequencies are defined in “3GPP TS 05.05.

a) The SS establishes a downlink TBF and sends RLC data blocks.
b) The MS is polled every 12 RLC data block by setting the S/P bit.

c) The SS verifies that a correct I_level parameter is included in the Channel Quality report of at least every other two Packet Downlink Ack/Nack messages.

d) The SS verifies that the reported value of I_level is correct: the measured interference level is mapped to a reported I_LEVEL value between 0 and 15, relative to reported C value as follows (as stated in 3GPP TS 05.08, subclauses 10.3), level resulting from the value of x:

x	I_LEVEL
1 dB	0
-1 dB	1
-3 dB	2
-5 dB	3
-7 dB	4
-9 dB	5
-11 dB	6
-13 dB	7
-15 dB	8
-17 dB	9
-19 dB	10
-21 dB	11
-23 dB	12
-25 dB	13
-27 dB	14
-29 dB	15

The accuracy of the interference measurement shall fulfil the requirement as defined in 3GPP TS 05.08, subclauses 8.1.2:

the R.M.S received signal level at the receiver input shall be measured by the MS and the BSS over the full range of -110 dBm to -48 dBm with an absolute accuracy of ± 4 dB from -110 dBm to -70 dBm under normal conditions and ± 6 dB over the full range under both normal and extreme conditions.

Thus, for GSM 900 MS, the resulting tolerance is ± 4 dB for every value of the x random variable.

14.16.4 DARP Phase 1 GPRS tests

14.16.4.1 Synchronous single co-channel interferer (DTS-1)

14.16.4.1.1 Definition

The DARP reference test scenario DTS-1 for a single synchronous co-channel interferer defines an interfering signal and corresponding performance limits. This test is a measure of the capability of the DARP receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of this specific unwanted signals.

14.16.4.1.2 Conformance requirement

MS indicating support for Downlink Advanced Receiver Performance – phase I (see 3GPP TS 24.008) shall fulfil the requirements in table 2o for wanted signals on GMSK modulated channels under TU50 no FH propagation conditions and GMSK modulated interferers for the test scenarios defined in annex L. The reference performance shall be:

- For packet switched channels (PDTCH) BLER: ≤ 10 %

The values in table 2o are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex L).

3GPP TS 45.005; clause 6.3.

Reference Test Scenarios for Synchronous single co-channel interferer

Reference Test Scenario	Interfering Signal	Interferer relative power level	TSC	Interferer Delay range
DTS-1	Co-channel 1	0 dB	none	no delay

3GPP TS 45.005; Annex L.

GSM 900 and GSM 850	
Propagation condition	**DTS-1, TU50 no FH**
Type of channel	**C/I**
PDTCH CS-1	3 dB
PDTCH CS-2	6 dB
PDTCH CS-3	8,5 dB
PDTCH CS-4	19,5 dB

DCS 1 800 & PCS 1900	
Propagation condition	**DTS-1, TU50 no FH**
Type of channel	**C/I**
PDTCH CS-1	2,5 dB
PDTCH CS-2	6 dB
PDTCH CS-3	9 dB
PDTCH CS-4	22 dB

3GPP TS 45.005; table 2o (extracts).

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP TS 45.005; subclause 2

14.16.4.1.3 Test purpose

To verify that the MS does not exceed conformance requirement for different coding schemes and under the propagation condition TU50/noFH with an allowance for the statistical significance of the test.

14.16.4.1.4 Test method

14.16.4.1.4.1 Initial condition

A call is set up according to the generic call set up procedure with an ARFCN in the mid ARFCN range, power control level set to maximum power. The power control parameter ALPHA (α) is set to 0.

The SS establish a downlink TBF.

The SS transmits Standard Test Signal C1 with TSC 0.

In addition to this wanted signal (C1), the SS produces an independent, uncorrelated interfering signal (I1). This unwanted signal is random, continuous and GSM-modulated and has no fixed relationship with the bit transitions of the wanted signal.

14.16.4.1.4.2 Procedure

a) The co-channel interferer signal I1 (unwanted signal) is set to -80 dBm.

b) The fading characteristic of the wanted signal C1 and the interferer signal I1 is set to TU High. No FH applies.

c) The SS transmits packets using CS-1 coding to the MS on all allocated timeslots.

d) The SS sets the level of the wanted signal 1dB above the value according the Table 14.16.4.1.5-1 and Table 14.16.4.1.5-2..

e) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, sub clause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

f) Once the number of blocks transmitted with the current coding scheme as counted in step (e) reaches or exceeds the minimum number of blocks as given in table 14.16-2 the SS calculates the Block error ratio. The SS resets both counters.

f) The SS repeats the steps c) to f) for each of the coding schemes CS-2, CS-3 and CS-4.

14.16.4.1.5 Test requirement

The block error ratio, as calculated by the SS for different channels under the TU High propagation conditions, shall not exceed the conformance requirement.

NOTE: The wanted signal levels derived from calculations using 3GPP TS 45.005 table 2o.

Table 14.16.4.1.5-1

GSM 900 and GSM 850		
PDTCH CS-1	C/dBm	- 77.0
PDTCH CS-2	C/dBm	- 74.0
PDTCH CS-3	C/dBm	- 71.5
PDTCH CS-4	C/dBm	- 60.5

Table 14.16.4.1.5-2

DCS 1 800 & PCS 1900		
PDTCH CS-1	C/dBm	- 77.5
PDTCH CS-2	C/dBm	- 74.0
PDTCH CS-3	C/dBm	- 71.0
PDTCH CS-4	C/dBm	- 58.0

14.16.4.1a Synchronous single co-channel interferer (DTS-1) in TIGHTER configuration

14.16.4.1a.1 Definition

The DARP reference test scenario DTS-1 for a single synchronous co-channel interferer defines an interfering signal and corresponding performance limits. This test is a measure of the capability of the DARP receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of this specific unwanted signal.

14.16.4.1a.2 Conformance requirement

A MS indicating support for TIGHTER Capability (see 3GPP TS 24.008) shall fulfil the requirements in table 2ad for co channel interference (C/Ic), table 2af for adjacent channel (200 kHz) interference (C/Ia1), and the additional requirements in table 2ae for wanted signals on GMSK modulated channels for the test scenarios defined in annex L.

The reference performance shall be:

- For packet switched channels (PDTCH) BLER:≤ 10 %

The values in table 2ae are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex L).

3GPP TS 45.005 sub clause 6.3.5

Reference Test Scenarios for Synchronous single co-channel interferer

Reference Test Scenario	Interfering Signal	Interferer relative power level	TSC	Interferer Delay range
DTS-1	Co-channel 1	0 dB	none	no delay

3GPP TS 45.005; Annex L.

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP TS 45.005; sub clause 2

14.16.4.1a.3 Test purpose

To verify that the MS does not exceed conformance requirement for different coding schemes and under the propagation condition TU50/noFH with an allowance for the statistical significance of the test.

GSM 900 and GSM 850	
Propagation condition	**DTS-1, TU50 no FH**
Type of channel	**C/I**
PDTCH CS-1	-7 dB
PDTCH CS-2	-4 dB
PDTCH CS-3	-1,5 dB
PDTCH CS-4	9,5 dB

DCS 1 800 & PCS 1900	
Propagation condition	**DTS-1, TU50 no FH**
Type of channel	**C/I**
PDTCH CS-1	-6,5 dB
PDTCH CS-2	-3 dB
PDTCH CS-3	0 dB
PDTCH CS-4	13 dB

3GPP TS 45.005; table 2ae (excerpt)

14.16.4.1a.4 Test method

14.16.4.1a.4.1 Initial condition

A call is set up according to the generic call set up procedure for packet switched on an ARFCN in the Mid-range, on the maximum number of receive timeslots, with the MS transmitting at maximum power. The power control parameter ALPHA (α) is set to 0.

The SS establish a downlink TBF.

The SS transmits Standard Test Signal C1 with TSC 0.

In addition to this wanted signal (C1), the SS produces an independent, uncorrelated interfering signal (I1). This unwanted signal is random, continuous and GSM-modulated and has no fixed relationship with the bit transitions of the wanted signal.

14.16.4.1a.4.2 Procedure

a) The co-channel interferer signal I1 (unwanted signal) is set to -80 dBm.

b) The fading characteristic of the wanted signal C1 and the interferer signal I1 is set to TU High. No FH applies.

c) The SS transmits packets using CS-1 coding to the MS on all allocated timeslots.

d) The SS sets the level of the wanted signal 1dB above the value according the Table 14.16.4.1a.5-1 and Table 14.16.4.1a.5-2..

e) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the ACK/NACK Description information element (see 3GPP TS 04.60, sub clause 12.3) in the Packet Downlink ACK/NACK as sent from the MS to the SS on the PACCH.

f) Once the number of blocks transmitted with the current coding scheme as counted in step (e) reaches or exceeds the minimum number of blocks as given in table 14.16-2 the SS calculates the Block error ratio. The SS resets both counters.

g) The SS repeats the steps c) to f) for each of the coding schemes CS-2, CS-3 and CS-4.

14.16.4.1a.5 Test requirement

The block error ratio, as calculated by the SS for different channels under the TU High propagation conditions, shall not exceed the conformance requirement.

NOTE: The wanted signal levels derived from calculations using 3GPP TS 45.005 table 2ae.

Table 14.16.4.1a.5-1

GSM 900 and GSM 850		
PDTCH CS-1	C/dBm	- 87.0
PDTCH CS-2	C/dBm	- 84.0
PDTCH CS-3	C/dBm	- 81.5
PDTCH CS-4	C/dBm	- 71.5

Table 14.16.4.1a.5-2

DCS 1 800 & PCS 1900		
PDTCH CS-1	C/dBm	- 86.5
PDTCH CS-2	C/dBm	- 83.0
PDTCH CS-3	C/dBm	- 80.0
PDTCH CS-4	C/dBm	- 67.0

14.16.4.2 Synchronous multiple interferers (DTS-2 / DTS-3)

14.16.4.2.1 Definition

The DARP reference test scenarios DTS-2 and DTS-3 for multiple synchronous interferers define a set of interfering signals and the corresponding performance limits. These tests are a measure of the capability of the DARP receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted signals.

14.16.4.2.2 Conformance requirement

The block error rate (BLER) performance for PDTCH / CS-1 to CS-4 shall not exceed 10 % at the multiple interference ratios (C/I_c) according to table 14.16.4.2.2-1.

Table 14.16.4.2.2-1: Reference Test Scenarios for synchronous multiple interferers

Reference Test Scenario	Interfering Signal	Interferer relative power level	TSC	Interferer Delay range
DTS-2	Co-channel 1 Co-channel 2 Adjacent 1 AWGN	0 dB -10 dB 3 dB -17 dB	none none none -	no delay no delay no delay -
DTS-3	Co-channel 1 Co-channel 2 Adjacent 1 AWGN	0 dB -10 dB 3 dB -17 dB	random none none -	-1 to +4 symbols no delay no delay -

The values in Table 14.16.4.2.2-2 and Table 14.16.4.2.2-3 are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (3GPP TS 45.005, annex L).

Table 14.16.4.2.2-2

GSM 900 and GSM 850		
Propagation condition	**TU50 no FH**	
Type of channel	**C/I**	
	DTS-2	**DTS-3**
PDTCH CS-1	8 dB	8,5 dB
PDTCH CS-2	10,5 dB	11 dB
PDTCH CS-3	13 dB	13,5 dB
PDTCH CS-4	22 dB	22,5 dB

Table 14.16.4.2.2-3

DCS 1 800 & PCS 1900		
Propagation condition	**TU50 no FH**	
Type of channel	**C/I**	
	DTS-2	**DTS-3**
PDTCH CS-1	7 dB	8 dB
PDTCH CS-2	10,5 dB	11 dB
PDTCH CS-3	12,5 dB	13 dB
PDTCH CS-4	23,5 dB	24 dB

Reference 3GPP TS 45.005, annex L, table 2o

14.16.4.2.3 Test purpose

To verify that the MS does not exceed the conformance requirement for different coding schemes under the propagation condition TU50/noFH with an allowance for the statistical significance of the test.

14.16.4.2.4 Test method

14.16.4.2.4.1 Initial condition

A call is set up according to the generic call set up procedure for packet switched on an ARFCN in the Mid range, on the maximum number of receive timeslots which the MS is capable to support, The MS is transmitting at maximum power. The power control parameter ALPHA (α) is set to 0.

The SS establish a downlink TBF.

The SS transmits Standard Test Signal C1 with TSC 0.

In addition to this wanted signal (C1), the SS produces multiple interfering signals for DTS-2 or DTS-3 scenarios as appropriate for the test procedure.

These interferers are:

Identical interferer for DTS-2 and DTS-3:

- Co-channel 2 (I_{CoCh2}): Synchronous co-channel interferer of type I1 as specified in TS 51.010 annex 5.2
- Adjacent 1 (I_{AdjCh1}): Adjacent channel interferer of type I1 as specified in TS 51.010 annex 5.2
- AWGN (I_{AWGN}): AWGN interferer of type I3 as specified in TS51.010 annex 5.2

DTS-2 specific interferer:

- Co-channel 1 (I_{CoCh1}): Synchronous co-channel interferer of type I1 as specified in TS 51.010 annex 5.2

DTS-3 specific interferer:

- Co-channel 1 (I_{CoCh1}): Delayed co-channel interferer of type I4 as specified in TS 51.010 annex 5.2.

14.16.4.2.4.2 Test Procedure

14.16.4.2.4.3 DTS-2 Procedure

a) The DTS-2 co-channel interferer signal I_{CoCh1} is configured according to DTS-2 configuration.

b) The co-channel interferer signal I_{CoCh1} set to -80 dBm.

c) The power levels of the interferers I_{CoCh2} , I_{AdjCh1}, and I_{AWGN} are set according to table 14.16.4.2.2-1. The power levels are defined relative to I_{CoCh1}.

d) The fading characteristics of the wanted signal C1 and the interferer signals I_{CoCh1}, I_{CoCh2}, and I_{AdjCh1} are set to TU High. No FH applies.

e) The SS transmits packets using CS-1 coding on all allocated timeslots.

f) The SS sets the level of the wanted signal C1 1 dB above the value according to Table 14.16.4.2.5-1 and Table 14.16.4.2.5-2.

g) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, sub clause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

h) Once the number of blocks transmitted with the current coding scheme as counted in step (e) reaches or exceeds the minimum number of blocks as given in table 14.16-2 the SS calculates the Block error ratio. The SS resets both counters.

i) SS repeats the steps (e) to (h) for each of the coding schemes CS-2, CS-3 and CS-4.

14.16.4.2.4.4 DTS-3 Procedure

a) The DTS-3 co-channel interferer signal I_{CoCh1} is configured according to DTS-3 configuration.

b) The SS repeats the steps (b) to (i) identical to the DTS-2 procedure

14.16.4.2.5 Test requirement

The block error ratio, as calculated by the SS for different channels and under the TU High propagation conditions, shall not exceed the conformance requirement.

NOTE: The wanted signal levels derived from calculations using 3GPP TS 45.005 (table 2o, annex L) , shall be set according to the table below.

Table 14.16.4.2.5-1

GSM 900 and GSM 850			
Type of channel		**DARP Test Scenario**	
		DTS-2	**DTS-3**
PDTCH CS-1	C/dBm	- 72,0	-71,5
PDTCH CS-2	C/dBm	- 69,5	-69,0
PDTCH CS-3	C/dBm	-67,0	-66,5
PDTCH CS-4	C/dBm	-58,0	-57,5

Table 14.16.4.2.5-2

DCS 1 800 & PCS 1900			
Type of channel		**DARP Test Scenario**	
		DTS-2	**DTS-3**
PDTCH CS-1	C/dBm	- 73,0	- 72,0
PDTCH CS-2	C /dBm	- 69,5	- 69,0
PDTCH CS-3	C /dBm	- 67,5	- 67,0
PDTCH CS-4	C /dBm	- 56,5	- 56,0

14.16.4.2a Synchronous multiple interferers (DTS-2 / DTS-3) in TIGHTER configuration

14.16.4.2a.1 Definition

The DARP reference test scenarios DTS-2 and DTS-3 for multiple synchronous interferers define a set of interfering signals and the corresponding performance limits. These tests are a measure of the capability of the DARP receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted signals.

14.16.4.2a.2 Conformance requirement

A MS indicating support for TIGHTER Capability (see 3GPP TS 24.008) shall fulfil the requirements in table 2ad for co channel interference (C/Ic), table 2af for adjacent channel (200 kHz) interference (C/Ia1), and the additional requirements in table 2ae for wanted signals on GMSK modulated channels for the test scenarios defined in annex L.

The reference performance shall be:

- For packet switched channel (PDTCH) BLER: ≤ 10 %

The values in Table 2ae are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (3GPP TS 45.005, annex L).

Table 14.16.4.2a.2-1: Reference Test Scenarios for synchronous multiple interferers

Reference Test Scenario	Interfering Signal	Interferer relative power level	TSC	Interferer Delay range
DTS-2	Co-channel 1 Co-channel 2 Adjacent 1 AWGN	0 dB -10 dB 3 dB -17 dB	none none none -	no delay no delay no delay -
DTS-3	Co-channel 1 Co-channel 2 Adjacent 1 AWGN	0 dB -10 dB 3 dB -17 dB	random none none -	-1 to +4 symbols no delay no delay -

3GPP TS 45.005; Annex L

Reference 3GPP TS 45.005, annex L, table 2ae (excerpt)

14.16.4.2a.3 Test purpose

To verify that the MS does not exceed the conformance requirement for different coding schemes under the propagation condition TU50/noFH with an allowance for the statistical significance of the test.

GSM 900 and GSM 850		
Propagation condition	**TU50 no FH**	
Type of channel	**C/I**	
	DTS-2	**DTS-3**
PDTCH CS-1	6 dB	6,5 dB
PDTCH CS-2	8,5 dB	9 dB
PDTCH CS-3	11 dB	11,5 dB
PDTCH CS-4	20 dB	20,5 dB

DCS 1 800 & PCS 1900		
Propagation condition	**TU50 no FH**	
Type of channel	**C/I**	
	DTS-2	**DTS-3**
PDTCH CS-1	5 dB	6 dB
PDTCH CS-2	8,5 dB	9 dB
PDTCH CS-3	10,5 dB	11 dB
PDTCH CS-4	21,5 dB	22 dB

14.16.4.2a.4 Test method

14.16.4.2a.4.1 Initial condition

A call is set up according to the generic call set up procedure for packet switched on an ARFCN in the Mid range, on the maximum number of receive timeslots which the MS is capable to support, The MS is transmitting at maximum power. The power control parameter ALPHA (α) is set to 0.

The SS establish a downlink TBF.

The SS transmits Standard Test Signal C1 with TSC 0.

In addition to this wanted signal (C1), the SS produces multiple interfering signals for DTS-2 or DTS-3 scenarios as appropriate for the test procedure.

These interferers are:

Identical interferer for DTS-2 and DTS-3:

- Co-channel 2 (I_{CoCh2}): Synchronous co-channel interferer of type I1 as specified in TS 51.010 annex 5.2
- Adjacent 1 (I_{AdjCh1}): Adjacent channel interferer of type I1 as specified in TS 51.010 annex 5.2
- AWGN (I_{AWGN}): AWGN interferer of type I3 as specified in TS51.010 annex 5.2

DTS-2 specific interferer:

- Co-channel 1 (I_{CoCh1}): Synchronous co-channel interferer of type I1 as specified in TS 51.010 annex 5.2

DTS-3 specific interferer:

- Co-channel 1 (I_{CoCh1}): Delayed co-channel interferer of type I4 as specified in TS 51.010 annex 5.2.

14.16.4.2a.4.2 Test Procedure

14.16.4.2a.4.3 DTS-2 Procedure

a) The DTS-2 co-channel interferer signal I_{CoCh1} is configured according to DTS-2 configuration.

b) The co-channel interferer signal I_{CoCh1} set to -80 dBm.

c) The power levels of the interferers I_{CoCh2} , I_{AdjCh1}, and I_{AWGN} are set according to table 14.16.4.2a.2-1. The power levels are defined relative to I_{CoCh1}.

d) The fading characteristics of the wanted signal C1 and the interferer signals I_{CoCh1}, I_{CoCh2}, and I_{AdjCh1} are set to TU High. No FH applies.

e) The SS transmits packets using CS-1 coding on all allocated timeslots.

f) The SS sets the level of the wanted signal C1 1 dB above the value according to Table 14.16.4.2a.5-1 and Table 14.16.4.2a.5-2.

g) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the ACK/NACK Description information element (see 3GPP TS 04.60, sub clause 12.3) in the Packet Downlink ACK/NACK as sent from the MS to the SS on the PACCH.

h) Once the number of blocks transmitted with the current coding scheme as counted in step (e) reaches or exceeds the minimum number of blocks as given in table 14.16-2 the SS calculates the Block error ratio. The SS resets both counters.

i) SS repeats the steps (e) to (h) for each of the coding schemes CS-2, CS-3 and CS-4.

14.16.4.2a.4.4 DTS-3 Procedure

a) The DTS-3 co-channel interferer signal I_{CoCh1} is configured according to DTS-3 configuration.

b) The SS repeats the steps (b) to (i) identical to the DTS-2 procedure

14.16.4.2a.5 Test requirement

The block error ratio, as calculated by the SS for different channels and under the TU High propagation conditions, shall not exceed the conformance requirement.

NOTE: The wanted signal levels derived from calculations using 3GPP TS 45.005 table 2ae, , shall be set according to the table below.

Table 14.16.4.2a.5-1

GSM 900 and GSM 850			
Type of channel		**DARP Test Scenario**	
		DTS-2	**DTS-3**
PDTCH CS-1	C/dBm	- 74,0	-73,5
PDTCH CS-2	C/dBm	- 71,5	-71,0
PDTCH CS-3	C/dBm	-69,0	-68,5
PDTCH CS-4	C/dBm	-60,0	-59,5

Table 14.16.4a.2.5-2

DCS 1 800 & PCS 1900			
Type of channel		**DARP Test Scenario**	
		DTS-2	**DTS-3**
PDTCH CS-1	C/dBm	- 75,0	- 74,0
PDTCH CS-2	C /dBm	- 71,5	- 71,0
PDTCH CS-3	C /dBm	- 69,5	- 69,0
PDTCH CS-4	C /dBm	- 58,5	- 58,0

14.16.5 DARP Phase II GPRS tests

14.16.5.1 Synchronous single co-channel interferer (DTS-1)

14.16.5.1.1 Definition

The DARP phase II reference test scenario DTS-1 for a single synchronous co-channel interferer defines an interfering signal and corresponding performance limits. This test is a measure of the capability of the DARP phase II receivers to receive a wanted modulated signal without exceeding a given degradation due to the presence of this specific unwanted signal.

14.16.5.1.2 Conformance requirement

MS indicating support for Downlink Advanced Receiver Performance – phase II (see 3GPP TS 24.008) shall fulfil the requirements in table 2q for the test scenarios defined in annex N

The reference performance shall be:

- For packet switched channels (PDTCH) BLER:≤ 10 %

The values in table 2q are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex N).

3GPP TS 45.005; clause 6.3.

Reference Test Scenario for synchronous single co-channel interferer

Reference Test Scenario	Interfering Signal	Interferer relative power level	TSC	Interferer Delay range
DTS-1	Co-channel 1	0 dB	none	no delay

3GPP TS 45.005; Annex N.

GSM 900 and GSM 850	
Propagation condition: TU50 (no FH)	
Correlation=0; AGI=0 dB	
PDTCH CS-1	-12,5 dB
PDTCH CS-2	-9,5 dB
PDTCH CS-3	-8,0 dB
PDTCH CS-4	0,0 dB

GSM 1800 and GSM 1900	
Propagation condition: TU50 (no FH)	
Correlation=0; AGI=0 dB	
PDTCH CS-1	-12,0 dB
PDTCH CS-2	-9,0 dB
PDTCH CS-3	-7,0 dB
PDTCH CS-4	4,5 dB

3GPP TS 45.005; table 2q (excerpt for DTS-1).

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP TS 45.005; sub clause 2

14.16.5.1.3 Test purpose

To verify that the MS does not exceed conformance requirement for differen t coding schemes and under the propagation condition TU50/noFH with an allowance for the statistical significance of the test.

14.16.5.1.4 Test method

14.16.5.1.4.1 Initial condition

The SS is configured as defined in annex N.2 picture N.2.2 of 3GPP 45.005

The diversity parameter for the antenna correlation is set to 0 and the antenna gain imbalance (AGI) is set to 0 dB

A call is set up according to the generic call set up procedure with an ARFCN in the mid ARFCN range on the maximum number of receive timeslots which the MS is capable to support. The power control level set to maximum power.

The power control parameter ALPHA (α) is set to 0.

The SS establish a downlink TBF.

The SS transmits Standard Test Signal C1 with TSC 0.

In addition to this wanted signal (C1), the SS produces an independent, uncorrelated interfering signal (I1). This unwanted signal is random, continuous and GSM-modulated and has no fixed relationship with the bit transitions of the wanted signal.

14.16.5.1.4.2 Procedure

a) The co-channel interferer signal I1 (unwanted signal) is set to -70 dBm.

b) The fading characteristic of the wanted signal C1 and the interferer signal I1 is set to TU High. No FH applies.

c) The SS transmits packets using CS-1 coding to the MS on all allocated timeslots.

d) The SS sets the level of the wanted signal 1dB above the value according the Table 14.16.5.1.5-1 and Table 14.16.5.1.5-2.

e) The SS transmits the number of blocks with current coding scheme accordingly with table 14.16-2 and counts the BLER based on the content of the ACK/NACK Description information element (see 3GPP TS 04.60, sub clause 12.3) in the Packet Downlink ACK/NACK as sent from the MS to the SS on the PACCH. The SS resets both counters.

f) The SS repeats the steps (c) to (e) for each of the coding schemes CS-2, CS-3 andCS-4.

14.16.5.1.5 Test requirement

The block error ratio, as calculated by the SS for different channels under the TU High propagation conditions, shall not exceed the conformance requirement.

NOTE: The wanted signal levels derived from calculations using 3GPP TS 45.005 table 2q shall be set according to the table below.

Table 14.16.5.1.5-1

GSM 900 and GSM 850		
PDTCH CS-1	C/dBm	-82,5
PDTCH CS-2	C/dBm	-79,5
PDTCH CS-3	C/dBm	-78,0
PDTCH CS-4	C/dBm	-70,0

Table 14.16.5.1.5-2

DCS 1 800 & PCS 1900		
PDTCH CS-1	C/dBm	-82,0
PDTCH CS-2	C/dBm	-79,0
PDTCH CS-3	C/dBm	-77,0
PDTCH CS-4	C/dBm	-65,5

14.16.5.2 Multiple interferers (DTS-2 / DTS-5)

14.16.5.2.1 Definition

The DARP phase II reference test scenarios DTS-2 and DTS-5 for multiple interferers define a set of interfering signals and the corresponding performance limits. These tests are a measure of the capability of the DARP phase II receivers to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted signals.

14.16.5.2.2 Conformance requirement

MS indicating support for Downlink Advanced Receiver Performance – phase II (see 3GPP TS 24.008) shall fulfil the requirements in table 2q for the test scenarios defined in annex N

The reference performance shall be:

- For packet switched channels (PDTCH) BLER:≤ 10 %

The values in table 2q are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex N).

3GPP TS 45.005; clause 6.3.

Reference Test Scenarios for synchronous multiple interferers

Reference Test Scenario	Interfering Signal	Interferer relative power level	TSC	Interferer Delay range
DTS-2	Co-channel 1	0 dB	none	no delay
	Co-channel 2	-10 dB	none	no delay
	Adjacent 1	3 dB	none	no delay
	AWGN	-17 dB	-	-

Reference Test Scenario for asynchronous multiple interferers

Reference Test Scenario	Interfering Signal	Interferer relative power level	TSC	Interferer Delay
DTS-5	Co-channel 1 Co-channel 2 Adjacent 1 AWGN	0 dB *) -10 dB 3 dB -17 dB	none none none -	74 symbols no delay no delay -
*)	The power of the delayed interferer burst, averaged over the active part of the wanted signal burst. The power of the delayed interferer burst, averaged over the active part of the delayed interferer burst is 3 dB higher.			

3GPP TS 45.005; Annex N.

GSM 900 and GSM 850		
Propagation condition: TU50 (no FH)		
Correlation=0; AGI=0 dB		
Channel type	**C/I**	
	DTS-2	**DTS-5**
PDTCH CS-1	0,5	**0,5**
PDTCH CS-2	3,0	**3,5**
PDTCH CS-3	5,0	**5,5**
PDTCH CS-4	12,0	**13,0**

GSM 1800 and PCS 1900		
Propagation condition: TU50 (no FH)		
Correlation=0; AGI=0 dB		
Channel type	**C/I**	
	DTS-2	**DTS-5**
PDTCH CS-1	0,0	**0,0**
PDTCH CS-2	3,0	**3,0**
PDTCH CS-3	4,5	**5,0**
PDTCH CS-4	12,5	**13,5**

3GPP TS 45.005 table 2q (excerpt for DTS-2 and DTS-5)

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP TS 45.005; sub clause 2

14.16.5.2.3 Test purpose

To verify that the MS does not exceed the conformance requirement for different coding schemes under the propagation condition TU50/noFH with an allowance for the statistical significance of the test.

14.16.5.2.4 Test method

14.16.5.2.4.1 Initial condition

The SS is configured for a single input and dual output configuration (SIDO) as defined in annex N.2 2 p icture N.2.2 of 3GPP 45.005

The diversity parameter for the antenna correlation is set to 0 and the antenna gain imbalance (AGI) is set to 0 dB

A call is set up according to the generic call set up procedure for packet switched on an ARFCN in the Mid range, on the maximum number of receive timeslots which the MS is capable to support, The MS is transmitting at maximum power. The power control parameter ALPHA (α) is set to 0.

The SS establish a downlink TBF.

The SS transmits Standard Test Signal C1 with TSC 0.

In addition to this wanted signal (C1), the SS produces multiple interfering signals for DTS-2 or DTS-5 scenarios as appropriate for the test procedure.

These interferers are:

Identical interferer types for DTS-2 and DTS-5:

- Co-channel 2 (I_{CoCh2}): Synchronous co-channel interferer of type I1 as specified in TS 51.010 annex 5.2
- Adjacent 1 (I_{AdjCh1}): Adjacent channel interferer of type I1 as specified in TS 51.010 annex 5.2
- AWGN (I_{AWGN}): AWGN interferer of type I3 as specified in TS51.010 annex 5.2

DTS-2 specific interferer:

- Co-channel 1 (I_{CoCh1}): Synchronous co-channel interferer of type I1 as specified in TS 51.010 annex 5.2

DTS-5 specific interferer:

- Co-channel 1 (I_{CoCh1}): Delayed co-channel interferer of type I5 as specified in TS 51.010 annex 5.2.

14.16.5.2.4.2 Test Procedure

14.16.5.2.4.2.1 DTS-2 Procedure

a) The DTS-2 co-channel interferer signal I_{CoCh1} is configured according to the DTS-2 configuration.

b) The co-channel interferer signal I_{CoCh1} set to -70 dBm.

c) The power levels of the interferers $I_{CoCh2,}$ I_{AdjCh1}, and I_{AWGN} are set according to table 14.16.5.2.21. The power levels are defined relative to I_{CoCh1}.

d) The fading characteristics of the wanted signal C1 and the interferer signals I_{CoCh1}, I_{CoCh2}, and I_{AdjCh1} are set to TU High. No FH applies.

e) The SS transmits packets using CS-1 coding on all allocated timeslots.

f) The SS sets the level of the wanted signal C1 1 dB above the value according to table 14.16.5.2.5-1 and table 14.16.5.2.5-2.

g) The SS transmits the number of blocks with current coding scheme accordingly with table 14.16-2 and counts the BLER based on the content of the ACK/NACK Description information element (see 3GPP TS 04.60, sub clause 12.3) in the Packet Downlink ACK/NACK as sent from the MS to the SS on the PACCH. The SS resets both counters.

h) The SS repeats the steps (e) to (g) for each of the coding schemes CS-2, CS-3 and CS-4.

14.16.5.2.4..2.2 DTS-5 Procedure

a) The DTS-5 co-channel interferer signal I_{CoCh1} is configured according to DTS-5 configuration.

b) The SS repeats the steps (b) to (h) identical to the DTS-2 procedure

14.16.5.2.5 Test requirement

The block error ratio calculated by the SS for different channels and under the TU High propagation conditions, shall not exceed the conformance requirement.

NOTE: The wanted signal levels derived from calculations using 3GPP TS 45.005 table 2q, shall be set according to the table below.

Table 14.16.5.2.5-1

GSM 900 and GSM 850			
Type of channel		**DARP II Test Scenario**	
		DTS-2	**DTS-5**
PDTCH CS-1	C/dBm	-69,5	-69,5
PDTCH CS-2	C/dBm	-67,0	-66,5
PDTCH CS-3	C/dBm	-65,0	-64,5
PDTCH CS-4	C/dBm	-58,0	-57,0

Table 14.16.5.2.5-2

DCS 1 800 & PCS 1900			
Type of channel		**DARP II Test Scenario**	
		DTS-2	**DTS-5**
PDTCH CS-1	C/dBm	-70,0	-70,0
PDTCH CS-2	C /dBm	-67,0	-67,0
PDTCH CS-3	C /dBm	-65,5	-65,0
PDTCH CS-4	C /dBm	-57,5	-56,5

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14.18 EGPRS receiver tests

Statistical testing of receiver BLER performance

Error Definition

Block Error Ratio (BLER):

The Block Error Ratio is the ratio of blocks received in error to the total number of received blocks, where a block is defined as received in error if the error detection functions in the receiver, operating in accordance with 3GPP TS 05.03, indicate an error as the result of the Block Check Sequence (BCS).

For USF the Block Error Ratio is the ratio of incorrectly interpreted USF to the total number of received USF.

Test criteria

In the receiver tests for circuit switched channels, test error rates have been defined in order not to pass MS with a performance worse than the specification by 1 dB, with tests to be performed at the sensitivity and interference levels defined in 3GPP TS 05.05. For circuit switched channels 3GPP TS 05.05 defines the error rates at a fixed sensitivity or interference level.

For packet switched channels 3GPP TS 05.05 defines the receive or interference level at which a fixed Block Error Ratio is met. Therefore, for EGPRS the receiver is tested with a 1 dB offset in the receive level and the interference level.

If the error events can be assumed to be random independent variables, outputs of stationary random processes with identical Gaussian distributions, the previous figures suggest a number of events not lower than 200 in AWGN channel and not lower than 600 in a multipath environment.

For multipath propagation conditions the hypothesis of stationary random processes does not generally hold. In case of non frequency hopping operation mode, the radio channel may be assumed to change 10 times per wavelength of travelled distance and to be short term stationary in between. So, in this case, the required observation time for having good statistical properties should not be lower (with some rounding) than that reported in table 14.18-1.

Table 14.18-1: Minimum test time according to propagation profile

	GSM 400, GSM 700, GSM 850 and GSM 900				DCS 1 800 and PCS 1 900			
Propagation Conditions	**TUlow**	**TUhigh**	**HT**	**RA**	**TUlow**	**TUhigh**	**HT**	**RA**
Min. test time (s)	500	30	15	6	500	15	7,5	6

Table 14.18-2 details, for the different test conditions, the minimum number of blocks required in order to meet points 1) to 3): the corresponding test time (point 4) can be consequently computed.

Table 14.18-2: Test conditions

Type of test	Type of sub-test	Propagation/ frequency conditions	Specified BLER %	Minimum No of RLC blocks
Sensitivity	PDTCH/MCS-1 to 4	static	10	2 000
"	PDTCH/MCS-1 to 4	TUhigh/no FH	10	6 000
"	PDTCH/MCS-1 to 4	TUhigh/FH	10	6 000
"	PDTCH/MCS-1 to 4	RA/no FH	10	6 000
"	PDTCH/MCS-1 to 4	HT/no FH	10	6 000
"	PDTCH/MCS-5 to 9	static	10	2 000
"	PDTCH/MCS-5 to 9	TUhigh/no FH	10 or 30	6 000 or 2 000
"	PDTCH/MCS-5 to 9	TUhigh/FH	10 or 30	6 000 or 2 000
"	PDTCH/MCS-5 to 9	RA/noFH	10 or 30	6 000 or 2 000
	PDTCH/MCS-5 to 9	HT/noFH	10 or 30	6 000 or 2 000
	PDTCH /DAS-5 to 7	static	10	2 000
	PDTCH /DAS-5 to 7	Tuhigh/noFH	10	6 000
	PDTCH /DAS-5 to 7	Tuhigh/FH	10	6 000
	PDTCH /DAS-5 to 7	RA/no FH	10	6 000
	PDTCH /DAS-5 to 7	HT/no FH	10	6 000
	PDTCH /DAS-8 to 9	static	10	2 000
	PDTCH /DAS-8 to 9	Tuhigh/noFH	10	6 000
	PDTCH /DAS-8 to 9	Tuhigh/FH	10	6 000
	PDTCH /DAS-8 to 9	RA/no FH	10	6 000
	PDTCH /DAS-8 to 9	HT/no FH	10 or 30	6 000 or 2 000
	PDTCH /DAS-10 to 12	static	10	2 000
	PDTCH /DAS-10 to 12	Tuhigh/noFH	10 or 30	6 000 or 2 000
	PDTCH /DAS-10 to 12	Tuhigh/FH	10 or 30	6 000 or 2 000
	PDTCH /DAS-10 to 12	RA/no FH	10 or 30	6 000 or 2 000
	PDTCH /DAS-10 to 12	HT/no FH	n/a	n/a
"	USF/MCS-1to 4	static	1	20 000
"	USF/MCS-1 to 4	TUhigh/no FH	1	60 000
"	USF/MCS-1 to 4	TUhigh/FH	1	60 000
"	USF/MCS-1 to 4	RA/no FH	1	60 000
"	USF/MCS-1 to 4	HT/no FH	1	60 000
	USF/MCS-5 to 9	static	1	20 000
	USF/MCS-5 to 9	Tuhigh/noFH	1	60 000
	USF/MCS-5 to 9	Tuhigh/FH	1	60 000
	USF/MCS-5 to 9	RA/no FH	1	60 000
	USF/MCS-5 to 9	HT/no FH	1	60 000
	USF/DAS-5 to 7	static	1	20 000
	USF/DAS-5 to 7	Tuhigh/noFH	1	60 000
	USF/DAS-5 to 7	Tuhigh/FH	1	60 000
	USF/DAS-5 to 7	RA/no FH	1	60 000
	USF/DAS-5 to 7	HT/no FH	1	60 000
	USF/DAS-8 to 9	static	1	20 000
	USF/DAS-8 to 9	Tuhigh/noFH	1	60 000
	USF/DAS-8 to 9	Tuhigh/FH	1	60 000
	USF/DAS-8 to 9	RA/no FH	1	60 000
	USF/DAS-8 to 9	HT/no FH	1	60 000
	USF/DAS-10 to 12	static	1	20 000

Type of test	Type of sub-test	Propagation/ frequency conditions	Specified BLER %	Minimum No of RLC blocks
	USF/DAS-10 to 12	Tuhigh/noFH	1	60 000
	USF/DAS-10 to 12	Tuhigh/FH	1	60 000
	USF/DAS-10 to 12	RA/no FH	1	60 000
	USF/DAS-10 to 12	HT/no FH	1	60 000
Co-channel	PDTCH/MCS-1 to 4	TUlow/no FH	10	6 000, but minimum of 500 s
,,	PDTCH/MCS-1 to 4	TUhigh/no FH	10	6 000
,,	PDTCHMCS-1 to 4	TUhigh/FH	10	6 000
,,	PDTCH/MCS-1 to 4	RA/no FH	10	6 000
,,	PDTCH/MCS-5 to 9	TUlow/no FH	10 or 30	6 000 or 2 000, but minimum of 500 s
,,	PDTCH/MCS-5 to 9	TUhigh/no FH	10 or 30	6 000 or 2 000
,,	PDTCH/MCS-5 to 9	TUhigh/FH	10 or 30	6 000 or 2 000
,,	PDTCH/MCS-5 to 9	RA/no FH	10 or 30	6 000 or 2 000
"	USF/MCS-1 to 4	TUlow/no FH	1	60 000
"	USF/MCS-1 to 4	TUhigh/no FH	1	60 000
"	USF/MCS-1 to 4	TUhigh/FH	1	60 000
"	USF/MCS-1 to 4	RA/no FH	1	60 000
"	USF/MCS-5 to 9	TUlow/no FH	1	60 000
"	USF/MCS-5 to 9	TUhigh/no FH	1	60 000
"	USF/MCS-5 to 9	TUhigh/FH	1	60 000
	USF/MCS-5 to 9	RA/no FH	1	60 000
Adjacent Channel 200kHz	PDTCH/MCS-1 to 4	TUlow/No FH	10	6 000
"	PDTCH/MCS-1 to 4	TUhigh/NoFH	10	6 000
"	PDTCH/MSC-5 to 9	TUlow/No FH	10 or 30	6 000 or 2 000
"	PDTCH/MSC-5 to 9	TUhigh/No FH	10 or 30	6 000 or 2 000
"	USF/MCS-1 to 4	TUlow/No FH	1	60 000
"	USF/MCS-1 to 4	TUhigh/No FH	1	60 000
"	USF/MCS-5 to 9	TUlow/No FH	1	60 000
	USF/MCS-5 to 9	TUhigh/No FH	1	60 000
Adjacent Channel 400kHz	PDTCH/MCS-1 to 4	TUhigh/No FH	10	6 000
"	PDTCH/MCS-5 to 9	TUhigh/No FH	10 or 30	6 000 or 2 000
"	USF/MCS-1 to 4	TUhigh/No FH	1	60 000
"	USF/MCS-5 to 9	TUhigh/No FH	1	60 000
Intermodula-tion Rejection	PDTCH/MCS-1 to 4	static	10	2 000
"	PDTCH/MCS-5 to 9	static	10	2 000
"	USF/MCS-1 to 4	static	1	20 000
"	USF/MCS-1 to 9	static	1	20 000
Blocking and Spurious	PDTCH/MCS-1 to 4	static	10	6 000
"	PDTCH/MCS-5 to 9	static	10 or 30	6 000 or 2 000
"	USF/MCS-1 to 4	static	1	60 000
"	USF/MCS-5 to 9	static	1	60 000

NOTE 1: For MCS-7, 8 and 9 the BLER of 10 % or 30 % is specified in the conformance requirements. For MCS-5 to 6 a BLER of 10 % is always applied.

NOTE 2: For PDTCH sub-tests under fading conditions the number of RLC blocks indicated above shall be transmitted on each downlink timeslot of the multislot configuration.

NOTE 3: For USF sub-tests under fading conditions, the number of RLC blocks indicated above shall be per uplink timeslot of the multislot configuration.

14.18.1 Minimum Input level for Reference Performance

14.18.1.1 Definition

The minimum input level is the signal level at the MS receiver input at which a certain BLER is met.

14.18.1.2 Conformance requirement

1. The block error rate (BLER) performance for PDTCH/MCS1 to 4 shall not exceed 10 % at input levels according to the table 14.18-3a; and for PDTCH/MCS5 to 9 shall not exceed 10 % or 30 % depending on Coding Schemes at input levels according to the table 14.18-3b.

Table 14.18-3a: PDTCH Sensitivity Input Level for GMSK modulation

Type of Channel		Propagation conditions				
		static	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)	HT (no FH)
GSM 400, GSM 700, GSM 850 and GSM 900						
PDTCH/MCS-1	dBm	-104	-102,5	-103	-103	-102
PDTCH/MCS-2	dBm	-104	-100,5	-101	-100.5	-100
PDTCH/MCS-3	dBm	-104	-96,5	-96,5	-92,5	-95,5
PDTCH/MCS-4	dBm	-101,5	-91	-91	(note)	(note)
DCS 1 800 and PCS 1 900						
PDTCH/MCS-1	dBm	-104	-102,5	-103	-103	-101,5
PDTCH/MCS-2	dBm	-104	-100,5	-101	-100,5	-99,5
PDTCH/MCS-3	dBm	-104	-96,5	-96,5	-92,5	-94,5
PDTCH/MCS-4	dBm	-101,5	-90,5	-90,5	(note)	(note)
NOTE: PDTCH/MCS-4 can not meet the reference performance for some propagation conditions.						

The input levels given in the above Table are applicable to GSM 400, GSM 700, GSM 850, GSM 900 and PCS 1 900 MS, and have to be corrected by the following values for the following classes of MS:

GSM 400 small MS +2 dB;

GSM 700, GSM 850, GSM 900 small MS +2 dB;

DCS 1800 class 1 or 2 MS +2/+4 dB**;

DCS 1800 class 3 MS +2 dB;

PCS 1 900 class 1 or 2 MS +2 dB.

** For all DCS 1 800 class 1 and class 2 MS, a correction offset of +2dB shall apply for the reference sensitivity performance as specified in table 1a for the normal conditions defined in Annex D and an offset of +4 dB shall be used to determine all other MS performances.

3GPP TS 05.05, table 1a; 3GPP TS 05.05, subclause 6.2.

Table 14.18-3b: PDTCH Sensitivity Input Level for MS for 8-PSK modulation

GSM 400, GSM 700, GSM 850 and GSM 900						
Type of channel		Propagation conditions				
		static	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)	HT (no FH)
PDTCH/MCS-5	dBm	-98	-93	-94	-93	-92
PDTCH/MCS-6	dBm	-96	-91	-91,5	-88	-89
PDTCH/MCS-7	dBm	-93	-84	-84	(note 2)	-83 (note 3)
PDTCH/MCS-8	dBm	-90,5	-83 (note 3)	-83 (note 3)	(note 2)	(note 2)
PDTCH/MCS-9	dBm	-86	-78,5 (note 3)	-78,5 (note 3)	(note 2)	(note 2)
DCS 1 800 and PCS 1 900						
Type of channel		Propagation conditions				
		static	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)	HT (no FH)
PDTCH/MCS-5	dBm	-98	-93,5	-93,5	-93	-89,5
PDTCH/MCS-6	dBm	-96	-91	-91	-88	-83,5
PDTCH/MCS-7	dBm	-93	-81,5	-80,5	(note 2)	(note 2)
PDTCH/MCS-8	dBm	-90,5	-80 (note 3)	-80 (note 3)	(note 2)	(note 2)
PDTCH/MCS-9	dBm	-86	(note 2)	(note 2)	(note 2)	(note 2)
NOTE 1: Ideal FH case assumes perfect decorrelation between bursts. This case may only be tested if such a decorrelation is ensured in the test. For TUhigh (ideal FH), sufficient decorrelation may be achieved with 4 frequencies spaced over 5 MHz.						
NOTE 2: PDTCH for MCS-x can not meet the reference performance for some propagation conditions.						
NOTE 3: Performance is specified at 30% BLER for some cases.						

The input levels given in the above Table are applicable to Class 4 or Class 5 MS for GSM 400, GSM 700, GSM 850 and GSM 900 and to Class 1 or Class 2 MS for DCS 1 800 and PCS 1 900. For all other MS the input levels have to be corrected by the value of -2 dB.

3GPP TS 05.05, tables 1c; 3GPP TS 05.05, subclause 6.2

2. The block error rate (BLER) performance for USF/MCS1 to 9 shall not exceed 1 % at input levels according to the tables 14.18-4a and 14.18-4b.

Table 14.18-4a: USF Sensitivity Input Level for GMSK modulation

Type of channel		Propagation conditions				
		static	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)	HT (no FH)
GSM 400, GSM 700, GSM 850 and GSM 900						
USF/MCS-1 to 4	dBm	-104	-102,5	-104	-104	-102,5
DCS 1 800 and PCS 1 900						
USF/MCS-1 to 4	dBm	-104	-104	-104	-104	-102,5

The input levels given in the above Table are applicable to GSM 400, GSM 700, GSM 850, GSM 900and PCS 1 900 MS, and have to be corrected by the following values for the following classes of MS:

GSM 400 small MS +2 dB;

GSM 700, GSM 850 and GSM 900 small MS +2 dB;

DCS 1800 class 1 or 2 MS +2/+4 dB**;

DCS 1800 class 3 MS +2 dB;

PCS 1 900 class 1 or 2 MS +2 dB.

** For all DCS 1 800 class 1 and class 2 MS, a correction offset of +2dB shall apply for the reference sensitivity performance as specified in table 1a for the normal conditions defined in Annex D and an offset of +4 dB shall be used to determine all other MS performances.

3GPP TS 05.05, table 1a; 3GPP TS 05.05, subclause 6.2.

Table 14.18-4b: USF Sensitivity Input Level for 8-PSK modulation

Type of Channel		Propagation conditions				
		static	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)	HT (no FH)
GSM 400, GSM 700, GSM 850 and GSM 900						
USF/MCS-5 to 9	dBm	-102	-97,5	-99	-100	-99
DCS 1 800 and PCS 1 900						
USF/MCS-5 to 9	dBm	-102	-99	-99	-100	-99

The input levels given in the above Table are applicable to Class 4 or Class 5 MS for GSM 400, GSM 700, GSM 850 and GSM 900 and to Class 1 or Class 2 MS for DCS 1 800 and PCS 1 900. For all other MS the input levels have to be corrected by the value of -2 dB.

3GPP TS 05.05, table 1c; 3GPP TS 05.05, subclause 6.2

3. The BLER shall not exceed the conformance requirements given in 1. and 2. under extreme conditions; 3GPP TS 05.05, subclause 6.2 and annex D subclauses D.2.1 and D.2.2.

4. The reference sensitivity performance specified above need not be met in the following cases:

   For MS at the static channel, if the received level on either of the two adjacent timeslots to the wanted exceed the wanted timeslot by more than 20 dB.

   For MS on a multislot configuration, if the received level on any of the timeslots belonging to the same multislot configuration as the wanted time slot, exceed the wanted time slot by more than 6 dB.

   The interfering adjacent time slots shall be static with valid GSM signals in all cases.

   3GPP TS 05.05, subclause 6.2.

5. For an MS allocated a USF on a PDCH with a random RF input or a valid PDCH signal with a random USF not equal to the allocated USF, the overall reception shall be such that the MS shall detect the allocated USF in less than 1 % of the radio blocks for GMSK modulated signals and 1 % for 8-PSK modulated signals. This requirement shall be met for all input levels up to -40 dBm for GMSK modulated signals and up to -40 dBm for 8-PSK modulated signals.

   3GPP TS 05.05, subclause 6.4

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.18.1.3 Test purpose

1. To verify that the MS sends a Packet Not Acknowledge in the Packet Downlink Ack/Nack in case of the Block Check Sequence indicating a Block Error.
2. To verify that the MS does not exceed conformance requirement 1 for PDTCH with different coding schemes and under different propagation conditions with an allowance for the statistical significance of the test.
3. To verify that the MS does not exceed conformance requirement 2 under HT propagation conditions with an allowance for the statistical significance of the test.
4. To verify that the MS does not exceed conformance requirement 3 under STATIC, TUhigh, HT and RA propagation conditions for the PDTCH, and under HT propagation conditions for the USF, with an allowance for the statistical significance of the test.
5. To verify that the MS meets the conformance requirements also 1 and 2 for the conditions allowed by conformance requirement 4, with an allowance for the statistical significance of the test.

6. To verify that the MS meets conformance requirement 5, with an allowance for the statistical significance of the test.

14.18.1.4 Method of test

Initial conditions

NOTE 1: The BA list sent on the BCCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range 15 dBμVemf( ) to 35 dBμVemf( ). Surrounding cell signal levels and cell reselection parameters are set so that the MS will not try a cell reselection.

NOTE 2: The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

NOTE 3: When frequency hopping is used under static conditions, the traffic channel may fall on any of the ARFCNs defined in clause 6. When frequency hopping is used under non-static conditions any ARFCNs shall be chosen.

NOTE 4: The PSI1 message is included in the PACCH when the MS is in packet transfer mode. The PBCCH_CHANGE_MARK value in PSI1 is not changed. This, together with preventing cell reselection as per Note 1, ensures that the MS is highly unlikely to suspend the TBF (3GPP TS 04.60 subclause 5.5.1.4.2 Suspension of operation to receive system operation), and thus making the effect of TBF suspension statistically insignificant for the test result.

For both GMSK and 8-PSK modulations, a downlink TBF is set up according to the generic procedure specified in clause 40 for packet switched on an ARFCN in the Mid range. The power control parameter ALPHA (α) is set to 0. The SS shall transmit on the maximum number of receive timeslots. The SS commands the MS to transmit at maximum power.

Test procedure

For GMSK Modulation:

a) The SS transmits packets under static conditions, using MCS-4 coding at a level of 1 dB above the level given in conformance reference 1. Out of the 400 blocks transmitted by the SS, 20 blocks are sent with incorrect BCS, at (pseudo) random positions. The SS checks, for the blocks it transmitted with incorrect BCS, whether or not the MS Packet Downlink Ack/Nack as sent by the MS indicates these blocks as not acknowledged.

b) The SS transmits packets under static conditions, with the MS commanded to hopping mode using the hopping sequence used in clause 6, and using MCS-4 coding to the MS on all allocated timeslots, at a level of 1 dB above the level given in the table in conformance requirement 1. On the time slots not allocated to the MS, the SS transmits at a level of 20 dB above the level given in the table in conformance requirement 1. This implicitly tests adjacent time slot rejection.

c) The SS counts the number of blocks transmitted with MCS-4 and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 5: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can sent this message.

d) Once the number of blocks transmitted with MCS-4 as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

e) The SS repeats step b) to d) with the following two fading conditions and hopping modes: TUhigh/noFH and TUhigh/FH. For these tests with fading channels , the SS does not transmit on the timeslots not allocated to the MS.

f) The SS repeats steps b) to d) using MCS-3 coding with RA/No FH, MCS-2 coding with HT/No FH and MCS-1 coding with TUhigh/No FH. For these tests, the SS does not transmit on the timeslots not allocated to the MS.

g) The SS repeats steps b) to e) under extreme test conditions for MCS-4 coding only.

h) This step is only performed for a multislot MS. The SS establishes the normal test conditions with the exceptions in the parameter settings of Packet Downlink Assignment message:

- P0 = 14 dB;
- BTS_PWR_CTRL_MODE = Mode A;
- PR_MODE = B.

Furthermore, the SS has to set the PR fields in the MAC headers of each downlink RLC data block to correspond the applied downlink power level, as defined below. The SS repeats steps b) to d) with only one of the active timeslots at 1 dB above the level at which the reference sensitivity performance shall be met, and all other timeslots belonging to the same multislot configuration at a level of 6 dB above this timeslot.

i) The SS establishes the normal test conditions, and sets the fading function to HT/noFH. An uplink TBF shall be established.

j) The SS sets the value of the USF/MCS-1 such as to allocate the uplink to the MS, transmitting at a level of 1 dB above the level given in the table in conformance requirement 2.

k) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

l) Once the number of USF/MCS-1 allocating the uplink for the MS as counted in step k) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters

m) The SS repeats steps i) to l) under extreme test conditions using MCS-4 coding.

n) The SS establishes normal test condition and a static channel. The SS sets the value of the USF/MCS-1 to all values randomly, with the exception of the one allocated to the MS, transmitting at 3 dB below the level at which reference performance shall be met, and counts the number of times the MS transmits on the uplink. This is done for 2 000 blocks.

For 8-PSK Modulation:

a) The SS transmits packets under static conditions, using MCS-8 coding at a level of 1 dB above the level given in conformance reference 1. Out of the 400 blocks transmitted by the SS, 20 blocks are sent with incorrect BCS, at (pseudo) random positions. The SS checks, for the blocks it transmitted with incorrect BCS, whether or not the MS Packet Downlink Ack/Nack as sent by the MS indicates these blocks as not acknowledged.

b) The SS transmits packets under static conditions, with the MS commanded to hopping mode using the hopping sequence used in clause 6, and using MCS-8 coding to the MS on all allocated timeslots, at a level of 1 dB above the level given in the table in conformance requirement 1. On the time slots not allocated to the MS, the SS transmits at a level of 20 dB above the level given in the table in conformance requirement 1. This implicitly tests adjacent time slot rejection.

c) The SS counts the number of blocks transmitted with MCS-8 and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 6: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can sent this message.

d) Once the number of blocks transmitted with MCS-8 as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

e) The SS repeats step b) to d) with the following two fading conditions and hopping modes: TUhigh/noFH and TUhigh/FH. For these tests with fading channels, the SS does not transmit on the timeslots not allocated to the MS.

f) The SS repeats steps b) to d) using MCS-9 with static condition, MCS-7 with TUhigh/FH, MSC-6 with HT/No FH and MSC-5 with RA/No FH. For these tests, the SS does not transmit on the timeslots not allocated to the MS.

g) The SS repeats steps b) to e) under extreme test conditions for MCS-8 coding only.

h) This step is only performed for a multislot MS. The SS establishes the normal test conditions with the exceptions in the parameter settings of Packet Downlink Assignment message:

- P0 = 14 dB;
- BTS_PWR_CTRL_MODE = Mode A;
- PR_MODE = B.

Furthermore, the SS has to set the PR fields in the MAC headers of each downlink RLC data block to correspond the applied downlink power level, as defined below. The SS repeats steps b) to d) with only one of the active timeslots at 1 dB above the level at which the reference sensitivity performance shall be met, and all other timeslots belonging to the same multislot configuration at a level of 6 dB above this timeslot.

i) The SS establishes the normal test conditions, and sets the fading function to HT/noFH. An uplink TBF shall be established.

j) The SS sets the value of the USF/MCS-5 such as to allocate the uplink to the MS, transmitting at a level of 1 dB above the level given in the table in conformance requirement 2.

k) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

l) Once the number of USF/MCS-5 allocating the uplink for the MS as counted in step k) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

m) The SS repeats steps j) to l) under extreme test conditions using MCS-9 coding.

n) The SS establishes normal test condition and a static channel. The SS sets the value of the USF/MCS-5 to all values randomly, with the exception of the one allocated to the MS, transmitting at 3 dB below the level at which reference performance shall be met, and counts the number of times the MS transmits on the uplink. This is done for 2 000 blocks.

14.18.1.5 Test requirements

In step a) the Packet Downlink Ack/Nack as sent by the MS shall indicate every block transmitted by the SS with incorrect BCS as not acknowledged.

The block error ratio, as calculated by the SS for different channels and under the different propagation conditions, under any combination of normal and extreme test voltages and ambient temperatures, shall not exceed the conformance requirement.

In step n) for both GMSK modulation and 8-PSK modulation the MS shall transmit no more than 25 times.

In the case when downlink power control is not used and the output power used on the transmitted blocks is not equal to (BCCH level – Pb) then the MS is not required to fulfil 3GPP TS 05.05 requirements for the first 25 blocks addressed to this MS (3GPP TS 05.08, subclause 10.2.2).

14.18.1a Minimum Input level for Reference Performance in EGPRS2A Configuration

14.18.1a.1 Definition

The minimum input level is the signal level at the MS receiver input at which a certain BLER is met.

14.18.1a.2 Conformance requirement

1. The block error rate (BLER) performance for PDTCH/DAS5 to 12 shall not exceed 10 % or 30 % depending on Modulation and Coding Schemes at input levels according to the table 14.18.1a-1.

Table 14.18.1a-1: PDTCH Sensitivity Input Level for 8-PSK, 16-QAM and 32-QAM modulated signals (Normal symbol rate, BTTI and turbo-coding) (EGPRS2-A DL)

GSM 900 and GSM 850						
Type of channel		Propagation conditions				
		static	TU50 (no FH)	TU50 (ideal FH)	RA250 (no FH)	HT100 (no FH)
PDTCH/DAS-5	dBm	[-100]	[-94]	[-94,5]	[-95,5]	[-92]
PDTCH/DAS-6	dBm	[-98,5]	[-93]	[-94]	[-94]	[-90,5]
PDTCH/DAS-7	dBm	[-97,5]	[-92]	[-92,5]	[-91,5]	[-88]
PDTCH/DAS-8	dBm	[-95]	[-89,5]	[-90]	[-88,5]	[-82,5]
PDTCH/DAS-9	dBm	[-94]	[-87]	[-87,5]	[[-82,5]	[-84,5**]
PDTCH/DAS-10	dBm	[-90]	[-83,5]	[-84]	[-82**]	[*]
PDTCH/DAS-11	dBm	[-88]	[-78,5]	[-79]	[*]	[*]
PDTCH/DAS-12	dBm	[-84]	[-76**]	[-76**]	[*]	[*]
DCS 1800 and PCS 1900						
Type of channel		Propagation conditions				
		static	TU50 (no FH)	TU50 (ideal FH)	RA250 (no FH)	HT100 (no FH)
PDTCH/DAS-5	dBm	(3)	[-94]	(3)	(3)	[-92]
PDTCH/DAS-6	dBm	(3)	[-93,5]	(3)	(3)	[-90]
PDTCH/DAS-7	dBm	(3)	[-92]	(3)	(3)	[-84]
PDTCH/DAS-8	dBm	(3)	[-89]	(3)	(3)	[-88**]
PDTCH/DAS-9	dBm	(3)	[-86]	(3)	(3)	[-80,5**]
PDTCH/DAS-10	dBm	(3)	[-82,5]	(3)	(3)	[*]
PDTCH/DAS-11	dBm	(3)	[-78,5**]	(3)	(3)	[*]
PDTCH/DAS-12	dBm	(3)	[*]	(3)	(3)	[*]
Performance is specified at 30% BLER for those cases identified with mark **.						
NOTE 1: Ideal FH case assumes perfect decorrelation between bursts. This case may only be tested if such a decorrelation is ensured in the test. For TU50 (ideal FH), sufficient decorrelation may be achieved with 4 frequencies spaced over 5 MHz.						
NOTE 2: PDTCH for DAS-x can not meet the reference performance for some propagation conditions (*).						
NOTE 3: The requirements for the DCS 1800 & PCS 1900 Static propagation condition are the same as for the GSM 850 & GSM 900 Static propagation condition, the requirements for DCS 1800 & PCS 1900 TU50 (ideal FH) propagation conditions are the same as for the DCS 1800 & PCS 1900 TU50 (no FH) propagation condition, and the requirements for the DCS 1800 & PCS 1900 RA130 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 RA250 (no FH) propagation condition.						

The input levels given in the above Table are applicable to GSM 400, GSM 700, GSM 850, GSM 900 and PCS 1 900 MS, and have to be corrected by the following values for the following classes of MS:

MS, QPSK, 8-PSK, 16-QAM and 32-QAM modulated signals	
for GSM 400, GSM 900, GSM 850 and GSM 700 small MS	0 dB
for other GSM 400, GSM 900, GSM 850 and GSM 700 MS	-2 dB
for DCS 1 800 and PCS 1900 class 1 or class 2 MS	0 dB
for other DCS 1 800 and PCS 1900 MS	-2 dB

3GPP TS 45.005, table 1l; 3GPP TS 45.005, subclause 6.2

2. The block error rate (BLER) performance for USF/DAS5 to 12 shall not exceed 1 % at input levels according to the table 14.18.1a-1 and 14.18.1a-2.

Table 14.18.1a-2: USF Sensitivity Input Level for 8-PSK, 16-QAM and 32-QAM modulated Signals (Normal symbol rate, BTTI and turbo-coding) (EGPRS2-A DL)

GSM 900 and GSM 850						
Type of channel		Propagation conditions				
		static	TU50 (no FH)	TU50 (ideal FH)	RA250 (no FH)	HT100 (no FH)
USF/DAS-5 to 7	dBm	(4)	(4)	(4)	(4)	(4)
USF/DAS-8 to 9	dBm	[tbd]	[tbd]	[tbd]	[tbd]	[tbd]
USF/DAS-10 to 12	dBm	[tbd]	[tbd]	[tbd]	[tbd]	[tbd]
DCS 1800 and PCS 1900						
Type of channel		Propagation conditions				
		static	TU50 (no FH)	TU50 (ideal FH)	RA250 (no FH)	HT100 (no FH)
USF/DAS-5 to 7	dBm	(3)	(4)	(3)	(3)	(4)
USF/DAS-8 to 9	dBm	(3)	[tbd]	(3)	(3)	[tbd]
USF/DAS-10 to 12	dBm	(3)	[tbd]	(3)	(3)	[tbd]
Performance is specified at 30% BLER for those cases identified with mark **.						
NOTE 1: Ideal FH case assumes perfect decorrelation between bursts. This case may only be tested if such a decorrelation is ensured in the test. For TU50 (ideal FH), sufficient decorrelation may be achieved with 4 frequencies spaced over 5 MHz.						
NOTE 2: PDTCH for DAS-x can not meet the reference performance for some propagation conditions (*).						
NOTE 3: The requirements for the DCS 1800 & PCS 1900 Static propagation condition are the same as for the GSM 850 & GSM 900 Static propagation condition, the requirements for DCS 1800 & PCS 1900 TU50 (ideal FH) propagation conditions are the same as for the DCS 1800 & PCS 1900 TU50 (no FH) propagation condition, and the requirements for the DCS 1800 & PCS 1900 RA130 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 RA250 (no FH) propagation condition.						
NOTE 4: The requirements for USF/DAS-5 to 7 are the same as for USF/MCS-5 to 9.						

3. The BLER shall not exceed the conformance requirements given in 1 and 2 under extreme conditions;
   3GPP TS 45.005, subclause 6.2 and annex D subclauses D.2.1 and D.2.2.

4. The reference sensitivity performance specified above need not be met in the following cases:

   For MS at the static channel, if the received level on either of the two adjacent timeslots to the wanted exceed the wanted timeslot by more than 20 dB.

   For MS on a multislot configuration, if the received level on any of the timeslots belonging to the same multislot configuration as the wanted time slot, exceed the wanted time slot by more than 6 dB.

   The interfering adjacent time slots shall be static with valid GSM signals in all cases.

   3GPP TS 45.005, subclause 6.2.

5. For an MS allocated a USF on a PDCH with a random RF input or a valid PDCH signal with a random USF not equal to the allocated USF, the overall reception shall be such that the MS shall detect the allocated USF in less than 1 % of the radio blocks for 8-PSK modulated signals and [1 %] for 16-QAM and 32-QAM modulated signals. This requirement shall be met for all input levels up to -40 dBm for 8-PSK modulated signals, and up to [-40 dBm] for 16-QAM and 32-QAM modulated signals.

   3GPP TS 45.005, subclause 6.4

3GPP TS 45.005 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.18.1a.3 Test purpose

1. To verify that the MS sends a Packet Not Acknowledge in the Packet Downlink Ack/Nack in case of the Block Check Sequence indicating a Block Error.

2. To verify that the MS does not exceed conformance requirement 1 for PDTCH with different coding schemes and under different propagation conditions with an allowance for the statistical significance of the test.

3. To verify that the MS does not exceed conformance requirement 2 under HT propagation conditions with an allowance for the statistical significance of the test.

4. To verify that the MS does not exceed conformance requirement 3 under STATIC, TUhigh, HT and RA propagation conditions for the PDTCH, and under HT propagation conditions for the USF, with an allowance for the statistical significance of the test.

5. To verify that the MS meets the conformance requirements also 1 and 2 for the conditions allowed by conformance requirement 4, with an allowance for the statistical significance of the test.

6. To verify that the MS meets conformance requirement 5, with an allowance for the statistical significance of the test.

14.18.1a.4 Method of test

Initial conditions

NOTE 1: The BA list sent on the BCCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range 15 dBµVemf( ) to xx35 dBµVemf( ). Surrounding cell signal levels and cell reselection parameters are set so that the MS will not try a cell reselection.

NOTE 2: The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

NOTE 3: When frequency hopping is used under static conditions, the traffic channel may fall on any of the ARFCNs defined in clause 6. When frequency hopping is used under non-static conditions any ARFCNs shall be chosen.

NOTE 4: The PSI1 message is included in the PACCH when the MS is in packet transfer mode. The PBCCH_CHANGE_MARK value in PSI1 is not changed. This, together with preventing cell reselection as per Note 1, ensures that the MS is highly unlikely to suspend the TBF (3GPP TS 04.60 subclause 5.5.1.4.2 Suspension of operation to receive system operation), and thus making the effect of TBF suspension statistically insignificant for the test result.

For 8-PSK, 16-QAM and 32-QAM modulations, a downlink TBF is set up according to the generic procedure specified in clause 40 for packet switched on an ARFCN in the Mid range. The power control parameter ALPHA (α) is set to 0. The SS shall transmit on the maximum number of receive timeslots. The SS commands the MS to transmit at maximum power.

Test procedure

For 8-PSK Modulation:

a) The SS transmits packets under static conditions, using DAS-7 coding at a level of 1 dB above the level given in conformance requirement 1. Out of the 400 blocks transmitted by the SS, 20 blocks are sent with incorrect BCS, at (pseudo) random positions. The SS checks, for the blocks it transmitted with incorrect BCS, whether or not the MS Packet Downlink Ack/Nack as sent by the MS indicates these blocks as not acknowledged.

b) The SS transmits packets under static conditions, with the MS commanded to hopping mode using the hopping sequence used in clause 6, and using DAS-7 coding to the MS on all allocated timeslots, at a level of 1 dB above the level given in the table in conformance requirement 1. On the time slots not allocated to the MS, the SS transmits at a level of 20 dB above the level given in the table in conformance requirement 1. This implicitly tests adjacent time slot rejection.

c) The SS counts the number of blocks transmitted with DAS-7 and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

d) Once the number of blocks transmitted with DAS-7 as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

e) The SS repeats step b) to d) with the following two fading conditions and hopping modes: TUhigh/noFH and TUhigh/FH. For these tests with fading channels, the SS does not transmit on the timeslots not allocated to the MS.

f) The SS repeats steps b) to d) using DAS-6 with HT/No FH and DAS-5 with RA/No FH. For these tests, the SS does not transmit on the timeslots not allocated to the MS.

g) The SS repeats steps b) to e) under extreme test conditions for DAS-7 coding only.

h) This step is only performed for a multislot MS. The SS establishes the normal test conditions with the exceptions in the parameter settings of Packet Downlink Assignment message:

- P0 = 14 dB;
- BTS_PWR_CTRL_MODE = Mode A;
- PR_MODE = B.

Furthermore, the SS has to set the PR fields in the MAC headers of each downlink RLC data block to correspond the applied downlink power level, as defined below. The SS repeats steps b) to d) with only one of the active timeslots at 1 dB above the level at which the reference sensitivity performance shall be met, and all other timeslots belonging to the same multislot configuration at a level of 6 dB above this timeslot.

i) The SS establishes the normal test conditions, and sets the fading function to HT/noFH. An uplink TBF shall be established.

j) The SS sets the value of the USF/DAS-5 such as to allocate the uplink to the MS, transmitting at a level of 1 dB above the level given in the table in conformance requirement 2.

k) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

l) Once the number of USF/ DAS-5 allocating the uplink for the MS as counted in step k) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

m) The SS repeats steps j) to l) under extreme test conditions using DAS-7 coding.

n) The SS establishes normal test condition and a static channel. The SS sets the value of the USF/DAS-5 to all values randomly, with the exception of the one allocated to the MS, transmitting at 3 dB below the level at which reference performance shall be met, and counts the number of times the MS transmits on the uplink. This is done for 2 000 blocks.

For 16-QAM Modulation:

a) The SS transmits packets under static conditions, using DAS-9 coding at a level of 1 dB above the level given in conformance requirement 1. Out of the 400 blocks transmitted by the SS, 20 blocks are sent with incorrect BCS, at (pseudo) random positions. The SS checks, for the blocks it transmitted with incorrect BCS, whether or not the MS Packet Downlink Ack/Nack as sent by the MS indicates these blocks as not acknowledged.

b) The SS transmits packets under static conditions, with the MS commanded to hopping mode using the hopping sequence used in clause 6, and using DAS-9 coding to the MS on all allocated timeslots, at a level of 1 dB above the level given in the table in conformance requirement 1. On the time slots not allocated to the MS, the SS transmits at a level of 20 dB above the level given in the table in conformance requirement 1. This implicitly tests adjacent time slot rejection.

c) The SS counts the number of blocks transmitted with DAS-9 and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

d) Once the number of blocks transmitted with DAS-9 as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

e) The SS repeats step b) to d) with the following two fading conditions and hopping modes: TUhigh/noFH and TUhigh/FH. For these tests with fading channels, the SS does not transmit on the timeslots not allocated to the MS.

f) The SS repeats steps b) to d) using DAS-8 with HT/No FH and RA/No FH. For these tests, the SS does not transmit on the timeslots not allocated to the MS.

g) The SS repeats steps b) to e) under extreme test conditions for DAS-9 coding only.

h) This step is only performed for a multislot MS. The SS establishes the normal test conditions with the exceptions in the parameter settings of Packet Downlink Assignment message:

- P0 = 14 dB;
- BTS_PWR_CTRL_MODE = Mode A;
- PR_MODE = B.

Furthermore, the SS has to set the PR fields in the MAC headers of each downlink RLC data block to correspond the applied downlink power level, as defined below. The SS repeats steps b) to d) with only one of the active timeslots at 1 dB above the level at which the reference sensitivity performance shall be met, and all other timeslots belonging to the same multislot configuration at a level of 6 dB above this timeslot.

i) The SS establishes the normal test conditions, and sets the fading function to HT/noFH. An uplink TBF shall be established.

j) The SS sets the value of the USF/DAS-8 such as to allocate the uplink to the MS, transmitting at a level of 1 dB above the level given in the table in conformance requirement 2.

k) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

l) Once the number of USF/ DAS-8 allocating the uplink for the MS as counted in step k) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

m) The SS repeats steps j) to l) under extreme test conditions using DAS-9 coding.

n) The SS establishes normal test condition and a static channel. The SS sets the value of the USF/DAS-8 to all values randomly, with the exception of the one allocated to the MS, transmitting at 3 dB below the level at which reference performance shall be met, and counts the number of times the MS transmits on the uplink. This is done for 2 000 blocks.

For 32-QAM Modulation:

a) The SS transmits packets under static conditions, using DAS-12 coding at a level of 1 dB above the level given in conformance requirement 1. Out of the 400 blocks transmitted by the SS, 20 blocks are sent with incorrect BCS, at (pseudo) random positions. The SS checks, for the blocks it transmitted with incorrect BCS, whether or not the MS Packet Downlink Ack/Nack as sent by the MS indicates these blocks as not acknowledged.

b) The SS transmits packets under static conditions, with the MS commanded to hopping mode using the hopping sequence used in clause 6, and using DAS-12 coding to the MS on all allocated timeslots, at a level of 1 dB above the level given in the table in conformance requirement 1. On the time slots not allocated to the MS, the SS transmits at a level of 20 dB above the level given in the table in conformance requirement 1. This implicitly tests adjacent time slot rejection.

c) The SS counts the number of blocks transmitted with DAS-12 and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

d) Once the number of blocks transmitted with DAS-12 as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

e) The SS repeats step b) to d) with the following two fading conditions and hopping modes: TUhigh/noFH and TUhigh/FH. For these tests with fading channels, the SS does not transmit on the timeslots not allocated to the MS.

f) The SS repeats steps b) to d) using DAS-11 with HT/No FH and DAS-10 with RA/No FH. For these tests, the SS does not transmit on the timeslots not allocated to the MS.

g) The SS repeats steps b) to e) under extreme test conditions for DAS-12 coding only.

h) This step is only performed for a multislot MS. The SS establishes the normal test conditions with the exceptions in the parameter settings of Packet Downlink Assignment message:

- P0 = 14 dB;
- BTS_PWR_CTRL_MODE = Mode A;
- PR_MODE = B.

Furthermore, the SS has to set the PR fields in the MAC headers of each downlink RLC data block to correspond the applied downlink power level, as defined below. The SS repeats steps b) to d) with only one of the active timeslots at 1 dB above the level at which the reference sensitivity performance shall be met, and all other timeslots belonging to the same multislot configuration at a level of 6 dB above this timeslot.

i) The SS establishes the normal test conditions, and sets the fading function to HT/noFH. An uplink TBF shall be established.

j) The SS sets the value of the USF/DAS-10 such as to allocate the uplink to the MS, transmitting at a level of 1 dB above the level given in the table in conformance requirement 2.

k) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

l) Once the number of USF/ DAS-10 allocating the uplink for the MS as counted in step k) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

m) The SS repeats steps j) to l) under extreme test conditions using DAS-12 coding.

n) The SS establishes normal test condition and a static channel. The SS sets the value of the USF/DAS-10 to all values randomly, with the exception of the one allocated to the MS, transmitting at 3 dB below the level at which reference performance shall be met, and counts the number of times the MS transmits on the uplink. This is done for 2 000 blocks.

14.18.1a.5 Test requirements

In step a) the Packet Downlink Ack/Nack as sent by the MS shall indicate every block transmitted by the SS with incorrect BCS as not acknowledged.

The block error ratio, as calculated by the SS for different channels and under the different propagation conditions, under any combination of normal and extreme test voltages and ambient temperatures, shall not exceed the conformance requirement.

In step n) for 8PSK, 16-QAM and 32-QAM modulation the MS shall transmit no more than 25 times.

In the case when downlink power control is not used and the output power used on the transmitted blocks is not equal to (BCCH level – Pb) then the MS is not required to fulfil 3GPP TS 45.005 requirements for the first 25 blocks addressed to this MS (3GPP TS 05.08, subclause 10.2.2).

14.18.1b Minimum Input level for Reference Performance in TIGHTER configuration

14.18.1b.1 Definition

The minimum input level is the signal level at the MS receiver input at which a certain BLER is met.

14.18.1b.2 Conformance requirement

For a MS indicating support for TIGHTER Capability (see 3GPP TS 24.008), the minimum input signal levels for which the reference performance shall be met are specified in table 1w, according to the propagation condition. The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 1w, except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60.

1. The block error rate (BLER) performance for PDTCH/MCS1 to 4 shall not exceed 10 % at input levels according to the table 14.18.1b-3a; and for PDTCH/MCS5 to 9 shall not exceed 10 % or 30 % depending on Coding Schemes at input levels according to the table 14.18.1b-3b.

Table 14.18.1b-3a: PDTCH Sensitivity Input Level for GMSK modulation

Type of Channel		Propagation conditions				
		static	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)	HT (no FH)
GSM 400, GSM 700, GSM 850 and GSM 900						
PDTCH/MCS-1	dBm	-105,5	-105	-105,5	-105,5	-103
PDTCH/MCS-2	dBm	-105,5	-103	-103,5	-103	-101
PDTCH/MCS-3	dBm	-105,5	-99	-99	-95	-96,5
PDTCH/MCS-4	dBm	-103	-93,5	-93,5	(note 2)	(note 2)
DCS 1 800 and PCS 1 900						
PDTCH/MCS-1	dBm	(note 3)	-104,5	-105,5	-105,5	-102,5
PDTCH/MCS-2	dBm	(note 3)	-102,5	-103,5	-103	-100,5
PDTCH/MCS-3	dBm	(note 3)	-98,5	-99	-95	-95,5
PDTCH/MCS-4	dBm	(note 3)	-92,5	-93	(note 2)	(note 2)
NOTE 2: PDTCH for MCS-x can not meet the reference performance for some propagation conditions.						
NOTE 3: The requirements for the DCS 1800 & PCS 1900 Static propagation condition are the same as for the GSM 850 & GSM 900 Static propagation condition, the requirements for the GSM 850 & GSM 900 TU50 (ideal FH) and DCS 1800 & PCS 1900 TU50 (ideal FH) propagation conditions are the same as for the DCS 1800 & PCS 1900 TU50 (no FH) propagation condition, and the requirements for the DCS 1800 & PCS 1900 RA130 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 RA250 (no FH) propagation condition.						

The input levels given in the above Table are applicable to GSM 400, GSM 700, GSM 850, GSM 900 and PCS 1 900 MS, and have to be corrected by the following values for the following classes of MS:

GSM 400 small MS	+2 dB;
GSM 700, GSM 850, GSM 900 small MS	+2 dB;
DCS 1800 class 1 or 2 MS	+2/+4 dB**;
DCS 1800 class 3 MS	+2 dB;
PCS 1 900 class 1 or 2 MS	+2 dB.

** For all DCS 1 800 class 1 and class 2 MS, a correction offset of +2dB shall apply for the reference sensitivity performance as specified in table 1a for the normal conditions defined in Annex D and an offset of +4 dB shall be used to determine all other MS performances.

3GPP TS 45.005, table 1w; 3GPP TS 45.005, subclause 6.2.

Table 14.18.1b-3b: PDTCH Sensitivity Input Level for MS for 8-PSK modulation

GSM 400, GSM 700, GSM 850 and GSM 900						
Type of channel		**Propagation conditions**				
		static	**TUhigh (no FH)**	**TUhigh (ideal FH)**	**RA (no FH)**	**HT (no FH)**
PDTCH/MCS-5	dBm	-101,5	-97,5	-98,5	-99	-97,5
PDTCH/MCS-6	dBm	-99,5	-95,5	-96	-94	-94,5
PDTCH/MCS-7	dBm	-96,5	-88,5	-88,5	(note 2)	-88,5**
PDTCH/MCS-8	dBm	-94	-87,5**	-87,5**	(note 2)	(note 2)
PDTCH/MCS-9	dBm	-89,5	-83**	-83**	(note 2)	(note 2)
DCS 1 800 and PCS 1 900						
Type of channel		**Propagation conditions**				
		static	**TUhigh (no FH)**	**TUhigh (ideal FH)**	**RA (no FH)**	**HT (no FH)**
PDTCH/MCS-5	dBm	(note 3)	-98,5	-98,5	-99	-95
PDTCH/MCS-6	dBm	(note 3)	-96	-96	-94	-89
PDTCH/MCS-7	dBm	(note 3)	-86,5	-85,5	(note 2)	(note 2)
PDTCH/MCS-8	dBm	(note 3)	-85 **	-85**	(note 2)	(note 2)
PDTCH/MCS-9	dBm	(note 3)	(note 2)	(note 2)	(note 2)	(note 2)

Performance is specified at 30% BLER for those cases identified with mark **.

NOTE 1: Ideal FH case assumes perfect decorrelation between bursts. This case may only be tested if such a decorrelation is ensured in the test. For TUhigh (ideal FH), sufficient decorrelation may be achieved with 4 frequencies spaced over 5 MHz.

NOTE 2: PDTCH for MCS-x cannot meet the reference performance for some propagation conditions.

NOTE 3: The requirements for the DCS 1800 & PCS 1900 Static propagation condition are the same as for the GSM 850 & GSM 900 Static propagation condition, the requirements for the GSM 850 & GSM 900 TU50 (ideal FH) and DCS 1800 & PCS 1900 TU50 (ideal FH) propagation conditions are the same as for the DCS 1800 & PCS 1900 TU50 (no FH) propagation condition, and the requirements for the DCS 1800 & PCS 1900 RA130 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 RA250 (no FH) propagation condition.

The input levels given in the above Table are applicable to Class 4 or Class 5 MS for GSM 400, GSM 700, GSM 850 and GSM 900 and to Class 1 or Class 2 MS for DCS 1 800 and PCS 1 900. For all other MS the input levels have to be corrected by the value of -2 dB.

3GPP TS 45.005, tables 1w; 3GPP TS 45.005, subclause 6.2

2. The block error rate (BLER) performance for USF/MCS1 to 9 shall not exceed 1 % at input levels according to the tables 14.18-4a and 14.18-4b.

Table 14.18-4a: USF Sensitivity Input Level for GMSK modulation

Type of channel		**Propagation conditions**				
		static	**TUhigh (no FH)**	**TUhigh (ideal FH)**	**RA (no FH)**	**HT (no FH)**
GSM 400, GSM 700, GSM 850 and GSM 900						
USF/MCS-1 to 4	dBm	-104	-102,5	-104	-104	-102,5
DCS 1 800 and PCS 1 900						
USF/MCS-1 to 4	dBm	-104	-104	-104	-104	-102,5

The input levels given in the above Table are applicable to GSM 400, GSM 700, GSM 850, GSM 900and PCS 1 900 MS, and have to be corrected by the following values for the following classes of MS:

GSM 400 small MS	+2 dB;
GSM 700, GSM 850 and GSM 900 small MS	+2 dB;
DCS 1800 class 1 or 2 MS	+2/+4 dB**;
DCS 1800 class 3 MS	+2 dB;

PCS 1 900 class 1 or 2 MS +2 dB.

** For all DCS 1 800 class 1 and class 2 MS, a correction offset of +2dB shall apply for the reference sensitivity performance as specified in table 1a for the normal conditions defined in Annex D and an offset of +4 dB shall be used to determine all other MS performances.

3GPP TS 45.005, table 1a; 3GPP TS 45.005, subclause 6.2.

Table 14.18-4b: USF Sensitivity Input Level for 8-PSK modulation

Type of Channel		Propagation conditions				
		static	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)	HT (no FH)
GSM 400, GSM 700, GSM 850 and GSM 900						
USF/MCS-5 to 9	dBm	-102	-97,5	-99	-100	-99
DCS 1 800 and PCS 1 900						
USF/MCS-5 to 9	dBm	-102	-99	-99	-100	-99

The input levels given in the above Table are applicable to Class 4 or Class 5 MS for GSM 400, GSM 700, GSM 850 and GSM 900 and to Class 1 or Class 2 MS for DCS 1 800 and PCS 1 900. For all other MS the input levels have to be corrected by the value of -2 dB.

3GPP TS 45.005, table 1c; 3GPP TS 45.005, subclause 6.2

3. The BLER shall not exceed the conformance requirements given in 1. and 2. under extreme conditions; 3GPP TS 45.005, subclause 6.2 and annex D subclauses D.2.1 and D.2.2.

4. The reference sensitivity performance specified above need not be met in the following cases:

   For MS at the static channel, if the received level on either of the two adjacent timeslots to the wanted exceed the wanted timeslot by more than 20 dB.

   For MS on a multislot configuration, if the received level on any of the timeslots belonging to the same multislot configuration as the wanted time slot, exceed the wanted time slot by more than 6 dB.

   The interfering adjacent time slots shall be static with valid GSM signals in all cases.

   3GPP TS 45.005, subclause 6.2.

5. For an MS allocated a USF on a PDCH with a random RF input or a valid PDCH signal with a random USF not equal to the allocated USF, the overall reception shall be such that the MS shall detect the allocated USF in less than 1 % of the radio blocks for GMSK modulated signals and 1 % for 8-PSK modulated signals. This requirement shall be met for all input levels up to -40 dBm for GMSK modulated signals and up to -40 dBm for 8-PSK modulated signals.

   3GPP TS 45.005, subclause 6.4

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.18.1b.3 Test purpose

1. To verify that the MS sends a Packet Not Acknowledge in the Packet Downlink Ack/Nack in case of the Block Check Sequence indicating a Block Error.

2. To verify that the MS does not exceed conformance requirement 1 for PDTCH with different coding schemes and under different propagation conditions with an allowance for the statistical significance of the test.

3. To verify that the MS does not exceed conformance requirement 2 under HT propagation conditions with an allowance for the statistical significance of the test.

4. To verify that the MS does not exceed conformance requirement 3 under STATIC, TUhigh, HT and RA propagation conditions for the PDTCH, and under HT propagation conditions for the USF, with an allowance for the statistical significance of the test.

5. To verify that the MS meets the conformance requirements also 1 and 2 for the conditions allowed by conformance requirement 4, with an allowance for the statistical significance of the test.

6. To verify that the MS meets conformance requirement 5, with an allowance for the statistical significance of the test.

14.18.1b.4 Method of test

Initial conditions

NOTE 1: The BA list sent on the BCCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range 15 dBμVemf( ) to 35 dBμVemf( ). Surrounding cell signal levels and cell reselection parameters are set so that the MS will not try a cell reselection.

NOTE 2: The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

NOTE 3: When frequency hopping is used under static conditions, the traffic channel may fall on any of the ARFCNs defined in clause 6. When frequency hopping is used under non-static conditions any ARFCNs shall be chosen.

NOTE 4: The PSI1 message is included in the PACCH when the MS is in packet transfer mode. The PBCCH_CHANGE_MARK value in PSI1 is not changed. This, together with preventing cell reselection as per Note 1, ensures that the MS is highly unlikely to suspend the TBF (3GPP TS 04.60 subclause 5.5.1.4.2 Suspension of operation to receive system operation), and thus making the effect of TBF suspension statistically insignificant for the test result.

For both GMSK and 8-PSK modulations, a downlink TBF is set up according to the generic procedure specified in clause 40 for packet switched on an ARFCN in the Mid range. The power control parameter ALPHA (α) is set to 0. The SS shall transmit on the maximum number of receive timeslots. The SS commands the MS to transmit at maximum power.

Test procedure

For GMSK Modulation:

a) The SS transmits packets under static conditions, using MCS-4 coding at a level of 1 dB above the level given in conformance reference 1. Out of the 400 blocks transmitted by the SS, 20 blocks are sent with incorrect BCS, at (pseudo) random positions. The SS checks, for the blocks it transmitted with incorrect BCS, whether or not the MS Packet Downlink Ack/Nack as sent by the MS indicates these blocks as not acknowledged.

b) The SS transmits packets under static conditions, with the MS commanded to hopping mode using the hopping sequence used in clause 6, and using MCS-4 coding to the MS on all allocated timeslots, at a level of 1 dB above the level given in the table in conformance requirement 1. On the time slots not allocated to the MS, the SS transmits at a level of 20 dB above the level given in the table in conformance requirement 1. This implicitly tests adjacent time slot rejection.

c) The SS counts the number of blocks transmitted with MCS-4 and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 5: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can sent this message.

d) Once the number of blocks transmitted with MCS-4 as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

e) The SS repeats step b) to d) with the following two fading conditions and hopping modes: TUhigh/noFH and TUhigh/FH. For these tests with fading channels , the SS does not transmit on the timeslots not allocated to the MS.

f) The SS repeats steps b) to d) using MCS-3 coding with RA/No FH, MCS-2 coding with HT/No FH and MCS-1 coding with TUhigh/No FH. For these tests, the SS does not transmit on the timeslots not allocated to the MS.

g) The SS repeats steps b) to e) under extreme test conditions for MCS-4 coding only.

h) This step is only performed for a multislot MS. The SS establishes the normal test conditions with the exceptions in the parameter settings of Packet Downlink Assignment message:

- P0 = 14 dB;
- BTS_PWR_CTRL_MODE = Mode A;
- PR_MODE = B.

Furthermore, the SS has to set the PR fields in the MAC headers of each downlink RLC data block to correspond the applied downlink power level, as defined below. The SS repeats steps b) to d) with only one of the active timeslots at 1 dB above the level at which the reference sensitivity performance shall be met, and all other timeslots belonging to the same multislot configuration at a level of 6 dB above this timeslot.

i) The SS establishes the normal test conditions, and sets the fading function to HT/noFH. An uplink TBF shall be established.

j) The SS sets the value of the USF/MCS-1 such as to allocate the uplink to the MS, transmitting at a level of 1 dB above the level given in the table in conformance requirement 2.

k) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

l) Once the number of USF/MCS-1 allocating the uplink for the MS as counted in step k) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters

m) The SS repeats steps i) to l) under extreme test conditions using MCS-4 coding.

n) The SS establishes normal test condition and a static channel. The SS sets the value of the USF/MCS-1 to all values randomly, with the exception of the one allocated to the MS, transmitting at 3 dB below the level at which reference performance shall be met, and counts the number of times the MS transmits on the uplink. This is done for 2 000 blocks.

For 8-PSK Modulation:

a) The SS transmits packets under static conditions, using MCS-8 coding at a level of 1 dB above the level given in conformance reference 1. Out of the 400 blocks transmitted by the SS, 20 blocks are sent with incorrect BCS, at (pseudo) random positions. The SS checks, for the blocks it transmitted with incorrect BCS, whether or not the MS Packet Downlink Ack/Nack as sent by the MS indicates these blocks as not acknowledged.

b) The SS transmits packets under static conditions, with the MS commanded to hopping mode using the hopping sequence used in clause 6, and using MCS-8 coding to the MS on all allocated timeslots, at a level of 1 dB above the level given in the table in conformance requirement 1. On the time slots not allocated to the MS, the SS transmits at a level of 20 dB above the level given in the table in conformance requirement 1. This implicitly tests adjacent time slot rejection.

c) The SS counts the number of blocks transmitted with MCS-8 and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 6: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can sent this message.

d) Once the number of blocks transmitted with MCS-8 as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

e) The SS repeats step b) to d) with the following two fading conditions and hopping modes: TUhigh/noFH and TUhigh/FH. For these tests with fading channels, the SS does not transmit on the timeslots not allocated to the MS.

f) The SS repeats steps b) to d) using MCS-9 with static condition, MCS-7 with TUhigh/FH, MSC-6 with HT/No FH and MSC-5 with RA/No FH. For these tests, the SS does not transmit on the timeslots not allocated to the MS.

g) The SS repeats steps b) to e) under extreme test conditions for MCS-8 coding only.

h) This step is only performed for a multislot MS. The SS establishes the normal test conditions with the exceptions in the parameter settings of Packet Downlink Assignment message:

- P0 = 14 dB;
- BTS_PWR_CTRL_MODE = Mode A;
- PR_MODE = B.

Furthermore, the SS has to set the PR fields in the MAC headers of each downlink RLC data block to correspond the applied downlink power level, as defined below. The SS repeats steps b) to d) with only one of the active timeslots at 1 dB above the level at which the reference sensitivity performance shall be met, and all other timeslots belonging to the same multislot configuration at a level of 6 dB above this timeslot.

i) The SS establishes the normal test conditions, and sets the fading function to HT/noFH. An uplink TBF shall be established.

j) The SS sets the value of the USF/MCS-5 such as to allocate the uplink to the MS, transmitting at a level of 1 dB above the level given in the table in conformance requirement 2.

k) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

l) Once the number of USF/MCS-5 allocating the uplink for the MS as counted in step k) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

m) The SS repeats steps j) to l) under extreme test conditions using MCS-9 coding.

n) The SS establishes normal test condition and a static channel. The SS sets the value of the USF/MCS-5 to all values randomly, with the exception of the one allocated to the MS, transmitting at 3 dB below the level at which reference performance shall be met, and counts the number of times the MS transmits on the uplink. This is done for 2 000 blocks.

14.18.1b.5 Test requirements

In step a) the Packet Downlink Ack/Nack as sent by the MS shall indicate every block transmitted by the SS with incorrect BCS as not acknowledged.

The block error ratio, as calculated by the SS for different channels and under the different propagation conditions, under any combination of normal and extreme test voltages and ambient temperatures, shall not exceed the conformance requirement.

In step n) for both GMSK modulation and 8-PSK modulation the MS shall transmit no more than 25 times.

In the case when downlink power control is not used and the output power used on the transmitted blocks is not equal to (BCCH level – Pb) then the MS is not required to fulfil 3GPP TS 45.005 requirements for the first 25 blocks addressed to this MS (3GPP TS 45.008, subclause 10.2.2).

14.18.1c Minimum Input level for Reference Performance – in TIGHTER configuration

14.18.1c.1 Definition

The minimum input level is the signal level at the MS receiver input at which a certain BLER is met.

14.18.1c.2 Conformance requirement

For a MS indicating support for TIGHTER Capability (see 3GPP TS 24.008), the minimum input signal levels for which the reference performance shall be met are specified in table 1w, according to the propagation condition. The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 1w, except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60.

1. The block error rate (BLER) performance for PDTCH/MCS1 to 4 shall not exceed 10 % at input levels according to the table 14.18.1c-1; and for PDTCH/MCS5 to 9 shall not exceed 10 % or 30 % depending on Coding Schemes at input levels according to the table 14.18.1c-1.

Table 14.18.1c-1: PDTCH Sensitivity Input Level for GMSK modulation

Type of Channel		Propagation conditions				
		static	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)	HT (no FH)
GSM 850 and GSM 900						
PDTCH/MCS-1	dBm	-105,5	-105	-105,5	-105,5	-103
PDTCH/MCS-2	dBm	-105,5	-103	-103,5	-103	-101
PDTCH/MCS-3	dBm	-105,5	-99	-99	-93,5	-96,5
PDTCH/MCS-4	dBm	-103	-93,5	-93,5	(note)	(note)
DCS 1 800 and PCS 1 900						
PDTCH/MCS-1	dBm	-105,5	-104,5	-105,5	-105,5	-102,5
PDTCH/MCS-2	dBm	-105,5	-102,5	-103,3	-103	-100,5
PDTCH/MCS-3	dBm	-105,5	-98,5	-99	-99,5	-95,5
PDTCH/MCS-4	dBm	-103	-92,5	-93	(note)	(note)
NOTE: PDTCH/MCS-4 cannot meet the reference performance for some propagation conditions.						

The input levels given in the above Table are applicable to GSM 400, GSM 700, GSM 850, GSM 900 and PCS 1 900 MS, and have to be corrected by the following values for the following classes of MS:

GSM 400 small MS +2 dB;

GSM 700, GSM 850, GSM 900 small MS +2 dB;

DCS 1800 class 1 or 2 MS +2/+4 dB**;

DCS 1800 class 3 MS +2 dB;

PCS 1 900 class 1 or 2 MS +2 dB.

** For all DCS 1 800 class 1 and class 2 MS, a correction offset of +2dB shall apply for the reference sensitivity performance as specified in table 1a for the normal conditions defined in Annex D and an offset of +4 dB shall be used to determine all other MS performances.

3GPP TS 45.005, table 1w; 3GPP TS 450.05, subclause 6.2.

Table 14.18.1c-2: PDTCH Sensitivity Input Level for MS for 8-PSK modulation

Type of channel		static	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)	HT (no FH)
GSM 850 and GSM 900						
PDTCH/MCS-5	dBm	-101,5	-97,5	-98,5	-99	-97,5
PDTCH/MCS-6	dBm	-99,5	-95,5	-96	-94	-94,5
PDTCH/MCS-7	dBm	-96,5	-88,5	-88,5	(note 2)	-88,5 (note 3)
PDTCH/MCS-8	dBm	-94	-87,5 (note 3)	-87,5 (note 3)	(note 2)	(note 2)
PDTCH/MCS-9	dBm	-89,5	-83 (note 3)	-83 (note 3)	(note 2)	(note 2)
DCS 1 800 and PCS 1 900						
PDTCH/MCS-5	dBm	-101,5	-98,5	-98,5	-99	-95
PDTCH/MCS-6	dBm	-99,5	-96	-96	-94	-89
PDTCH/MCS-7	dBm	-96,5	-86,5	-85,5	(note 2)	(note 2)
PDTCH/MCS-8	dBm	-94	-85 (note 3)	-85 (note 3)	(note 2)	(note 2)
PDTCH/MCS-9	dBm	-89,5	(note 2)	(note 2)	(note 2)	(note 2)
NOTE 1: Ideal FH case assumes perfect decorrelation between bursts. This case may only be tested if such a decorrelation is ensured in the test. For TUhigh (ideal FH), sufficient decorrelation may be achieved with 4 frequencies spaced over 5 MHz. NOTE 2: PDTCH for MCS-x can not meet the reference performance for some propagation conditions. NOTE 3: Performance is specified at 30% BLER for some cases.						

The input levels given in the above Table are applicable to Class 4 or Class 5 GSM 850 and GSM 900 and to Class 1 or Class 2 MS for DCS 1 800 and PCS 1 900. For all other MS the input levels have to be corrected by the value of -2 dB.

3GPP TS 45.005, tables 1w; 3GPP TS 45.005, subclause 6.2

2. The block error rate (BLER) performance for USF/MCS1 to 9 shall not exceed 1 % at input levels according to the tables 14.18.1c-3 and 14.18.1c-4.

Table 14.18.1c-3: USF Sensitivity Input Level for GMSK modulation

Type of channel		static	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)	HT (no FH)
GSM 400, GSM 700, GSM 850 and GSM 900						
USF/MCS-1 to 4	dBm	-104	-102,5	-104	-104	-102,5
DCS 1 800 and PCS 1 900						
USF/MCS-1 to 4	dBm	-104	-104	-104	-104	-102,5

The input levels given in the above Table are applicable to GSM 400, GSM 700, GSM 850, GSM 900and PCS 1 900 MS, and have to be corrected by the following values for the following classes of MS:

GSM 400 small MS	+2 dB;
GSM 700, GSM 850 and GSM 900 small MS	+2 dB;
DCS 1800 class 1 or 2 MS	+2/+4 dB**;
DCS 1800 class 3 MS	+2 dB;
PCS 1 900 class 1 or 2 MS	+2 dB.

** For all DCS 1 800 class 1 and class 2 MS, a correction offset of +2dB shall apply for the reference sensitivity performance as specified in table 1a for the normal conditions defined in Annex D and an offset of +4 dB shall be used to determine all other MS performances.

3GPP TS 45.005, table 1a; 3GPP TS 45.005, subclause 6.2.

Table 14.18.1c-4: USF Sensitivity Input Level for 8-PSK modulation

Type of Channel		Propagation conditions				
		static	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)	HT (no FH)
GSM 400, GSM 700, GSM 850 and GSM 900						
USF/MCS-5 to 9	dBm	-102	-97,5	-99	-100	-99
DCS 1 800 and PCS 1 900						
USF/MCS-5 to 9	dBm	-102	-99	-99	-100	-99

The input levels given in the above Table are applicable to Class 4 or Class 5 MS for GSM 400, GSM 700, GSM 850 and GSM 900 and to Class 1 or Class 2 MS for DCS 1 800 and PCS 1 900. For all other MS the input levels have to be corrected by the value of -2 dB.

3GPP TS 45.005, table 1c; 3GPP TS 45.005, subclause 6.2

3. The BLER shall not exceed the conformance requirements given in 1. and 2. under extreme conditions; 3GPP TS 45.005, subclause 6.2 and annex D subclauses D.2.1 and D.2.2.

4. The reference sensitivity performance specified above need not be met in the following cases:

   For MS at the static channel, if the received level on either of the two adjacent timeslots to the wanted exceed the wanted timeslot by more than 20 dB.

   For MS on a multislot configuration, if the received level on any of the timeslots belonging to the same multislot configuration as the wanted time slot, exceed the wanted time slot by more than 6 dB.

   The interfering adjacent time slots shall be static with valid GSM signals in all cases.

   3GPP TS 45.005, subclause 6.2.

5. For an MS allocated a USF on a PDCH with a random RF input or a valid PDCH signal with a random USF not equal to the allocated USF, the overall reception shall be such that the MS shall detect the allocated USF in less than 1 % of the radio blocks for GMSK modulated signals and 1 % for 8-PSK modulated signals. This requirement shall be met for all input levels up to -40 dBm for GMSK modulated signals and up to -40 dBm for 8-PSK modulated signals.

   3GPP TS 45.005, subclause 6.4

3GPP TS 45.005 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.18.1c.3 Test purpose

1. To verify that the MS sends a Packet Not Acknowledge in the Packet Downlink Ack/Nack in case of the Block Check Sequence indicating a Block Error.
2. To verify that the MS does not exceed conformance requirement 1 for PDTCH with different coding schemes and under different propagation conditions with an allowance for the statistical significance of the test.
3. To verify that the MS does not exceed conformance requirement 2 under HT propagation conditions with an allowance for the statistical significance of the test.
4. To verify that the MS does not exceed conformance requirement 3 under STATIC, TUhigh, HT and RA propagation conditions for the PDTCH, and under HT propagation conditions for the USF, with an allowance for the statistical significance of the test.
5. To verify that the MS meets the conformance requirements also 1 and 2 for the conditions allowed by conformance requirement 4, with an allowance for the statistical significance of the test.
6. To verify that the MS meets conformance requirement 5, with an allowance for the statistical significance of the test.

14.18.1c.4 Method of test

Initial conditions

NOTE 1: The BA list sent on the BCCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range 15 dBµVemf( ) to 35 dBµVemf( ). Surrounding cell signal levels and cell reselection parameters are set so that the MS will not try a cell reselection.

NOTE 2: The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

NOTE 3: When frequency hopping is used under static conditions, the traffic channel may fall on any of the ARFCNs defined in clause 6. When frequency hopping is used under non-static conditions any ARFCNs shall be chosen.

NOTE 4: The PSI1 message is included in the PACCH when the MS is in packet transfer mode. The PBCCH_CHANGE_MARK value in PSI1 is not changed. This, together with preventing cell reselection as per Note 1, ensures that the MS is highly unlikely to suspend the TBF (3GPP TS 04.60 subclause 5.5.1.4.2 Suspension of operation to receive system operation), and thus making the effect of TBF suspension statistically insignificant for the test result.

For both GMSK and 8-PSK modulations, a downlink TBF is set up according to the generic procedure specified in clause 40 for packet switched on an ARFCN in the Mid range. The power control parameter ALPHA (α) is set to 0. The SS shall transmit on the maximum number of receive timeslots. The SS commands the MS to transmit at maximum power.

Test procedure

For GMSK Modulation:

a) The SS transmits packets under static conditions, using MCS-4 coding at a level of 1 dB above the level given in conformance reference 1. Out of the 400 blocks transmitted by the SS, 20 blocks are sent with incorrect BCS, at (pseudo) random positions. The SS checks, for the blocks it transmitted with incorrect BCS, whether or not the MS Packet Downlink Ack/Nack as sent by the MS indicates these blocks as not acknowledged.

b) The SS transmits packets under static conditions, with the MS commanded to hopping mode using the hopping sequence used in clause 6, and using MCS-4 coding to the MS on all allocated timeslots, at a level of 1 dB above the level given in the table in conformance requirement 1. On the time slots not allocated to the MS, the SS transmits at a level of 20 dB above the level given in the table in conformance requirement 1. This implicitly tests adjacent time slot rejection.

c) The SS counts the number of blocks transmitted with MCS-4 and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 5: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can sent this message.

d) Once the number of blocks transmitted with MCS-4 as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

e) The SS repeats step b) to d) with the following two fading conditions and hopping modes: TUhigh/noFH and TUhigh/FH. For these tests with fading channels , the SS does not transmit on the timeslots not allocated to the MS.

f) The SS repeats steps b) to d) using MCS-3 coding with RA/No FH, MCS-2 coding with HT/No FH and MCS-1 coding with TUhigh/No FH. For these tests, the SS does not transmit on the timeslots not allocated to the MS.

g) The SS repeats steps b) to e) under extreme test conditions for MCS-4 coding only.

h) This step is only performed for a multislot MS. The SS establishes the normal test conditions with the exceptions in the parameter settings of Packet Downlink Assignment message:

- P0 = 14 dB;

- BTS_PWR_CTRL_MODE = Mode A;
- PR_MODE = B.

Furthermore, the SS has to set the PR fields in the MAC headers of each downlink RLC data block to correspond the applied downlink power level, as defined below. The SS repeats steps b) to d) with only one of the active timeslots at 1 dB above the level at which the reference sensitivity performance shall be met, and all other timeslots belonging to the same multislot configuration at a level of 6 dB above this timeslot.

i) The SS establishes the normal test conditions, and sets the fading function to HT/noFH. An uplink TBF shall be established.

j) The SS sets the value of the USF/MCS-1 such as to allocate the uplink to the MS, transmitting at a level of 1 dB above the level given in the table in conformance requirement 2.

k) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

l) Once the number of USF/MCS-1 allocating the uplink for the MS as counted in step k) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters

m) The SS repeats steps i) to l) under extreme test conditions using MCS-4 coding.

n) The SS establishes normal test condition and a static channel. The SS sets the value of the USF/MCS-1 to all values randomly, with the exception of the one allocated to the MS, transmitting at 3 dB below the level at which reference performance shall be met, and counts the number of times the MS transmits on the uplink. This is done for 2 000 blocks.

For 8-PSK Modulation:

a) The SS transmits packets under static conditions, using MCS-8 coding at a level of 1 dB above the level given in conformance reference 1. Out of the 400 blocks transmitted by the SS, 20 blocks are sent with incorrect BCS, at (pseudo) random positions. The SS checks, for the blocks it transmitted with incorrect BCS, whether or not the MS Packet Downlink Ack/Nack as sent by the MS indicates these blocks as not acknowledged.

b) The SS transmits packets under static conditions, with the MS commanded to hopping mode using the hopping sequence used in clause 6, and using MCS-8 coding to the MS on all allocated timeslots, at a level of 1 dB above the level given in the table in conformance requirement 1. On the time slots not allocated to the MS, the SS transmits at a level of 20 dB above the level given in the table in conformance requirement 1. This implicitly tests adjacent time slot rejection.

c) The SS counts the number of blocks transmitted with MCS-8 and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 6: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can sent this message.

d) Once the number of blocks transmitted with MCS-8 as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

e) The SS repeats step b) to d) with the following two fading conditions and hopping modes: TUhigh/noFH and TUhigh/FH. For these tests with fading channels, the SS does not transmit on the timeslots not allocated to the MS.

f) The SS repeats steps b) to d) using MCS-9 with static condition, MCS-7 with TUhigh/FH, MSC-6 with HT/No FH and MSC-5 with RA/No FH. For these tests, the SS does not transmit on the timeslots not allocated to the MS.

g) The SS repeats steps b) to e) under extreme test conditions for MCS-8 coding only.

h) This step is only performed for a multislot MS. The SS establishes the normal test conditions with the exceptions in the parameter settings of Packet Downlink Assignment message:

- P0 = 14 dB;
- BTS_PWR_CTRL_MODE = Mode A;
- PR_MODE = B.

Furthermore, the SS has to set the PR fields in the MAC headers of each downlink RLC data block to correspond the applied downlink power level, as defined below. The SS repeats steps b) to d) with only one of the active timeslots at 1 dB above the level at which the reference sensitivity performance shall be met, and all other timeslots belonging to the same multislot configuration at a level of 6 dB above this timeslot.

i) The SS establishes the normal test conditions, and sets the fading function to HT/noFH. An uplink TBF shall be established.

j) The SS sets the value of the USF/MCS-5 such as to allocate the uplink to the MS, transmitting at a level of 1 dB above the level given in the table in conformance requirement 2.

k) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

l) Once the number of USF/MCS-5 allocating the uplink for the MS as counted in step k) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

m) The SS repeats steps j) to l) under extreme test conditions using MCS-9 coding.

n) The SS establishes normal test condition and a static channel. The SS sets the value of the USF/MCS-5 to all values randomly, with the exception of the one allocated to the MS, transmitting at 3 dB below the level at which reference performance shall be met, and counts the number of times the MS transmits on the uplink. This is done for 2 000 blocks.

14.18.1c.5 Test requirements

In step a) the Packet Downlink Ack/Nack as sent by the MS shall indicate every block transmitted by the SS with incorrect BCS as not acknowledged.

The block error ratio, as calculated by the SS for different channels and under the different propagation conditions, under any combination of normal and extreme test voltages and ambient temperatures, shall not exceed the conformance requirement.

In step n) for both GMSK modulation and 8-PSK modulation the MS shall transmit no more than 25 times.

In the case when downlink power control is not used and the output power used on the transmitted blocks is not equal to (BCCH level – Pb) then the MS is not required to fulfil 3GPP TS 45.005 requirements for the first 25 blocks addressed to this MS (3GPP TS 05.008, subclause 10.2.2).

14.18.2 Co-channel rejection

14.18.2.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver. "Wanted signal" in this test is the signal generated by the transmitted RLC data blocks.

14.18.2.2 Conformance requirement

1. The block error rate (BLER) performance for PDTCH/MCS1 to 4 shall not exceed 10 % at co-channel interference ratios (C/I_c) exceeding those according to the table 14.18-5a; and for PDTCH/MCS5 to 9 shall not exceed 10 % or 30 % depending on Coding Schemes at co-channel interference ratios (C/Ic) exceeding those according to the table 14.18-5b.

Table 14.18-5a: PDTCH Co-channel Interference Ratio for GMSK modulation

Type of channel		Propagation conditions			
		TUlow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
GSM 400, GSM 700, GSM 850 and GSM 900					
PDTCH/MCS-1	dB	13	10,5	9,5	10
PDTCH/MCS-2	dB	15	12,5	12	12
PDTCH/MCS-3	dB	16,5	17	17	19
PDTCH/MCS-4	dB	19	22	22	(note)
DCS 1 800 and PCS 1 900					
PDTCH/MCS-1	dB	13	10	9,5	10
PDTCH/MCS-2	dB	15	12	12	12
PDTCH/MCS-3	dB	16,5	17	18	19
PDTCH/MCS-4	dB	19	23	23	(note)
NOTE: PDTCH/MCS-4 can not meet the reference performance for some propagation condition.					

3GPP TS 05.05, table 2a; 3GPP TS 05.05, subclause 6.3.

Table 14.18-5b: Co channel interference ratio for MS at reference performance for 8-PSK modulation

GSM 400, GSM 700, GSM 850 and GSM 900					
Type of channel		Propagation conditions			
		TUlow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
PDTCH/MCS-5	dB	19,5	15,5	14,5	16,5
PDTCH/MCS-6	dB	21,5	18	17,5	21
PDTCH/MCS-7	dB	26,5	25	24.5	(note 1)
PDTCH/MCS-8	dB	30,5	25,5 (note 2)	25,5**	(note 1)
PDTCH/MCS-9	dB	25,5 (note 2)	30,5 (note 2)	30,5**	(note 1)
DCS 1800 and PCS 1 900					
Type of channel		Propagation conditions			
		TUlow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
PDTCH/MCS-5	dB	19,5	15	15,5	16,5
PDTCH/MCS-6	dB	21,5	18	18,5	21
PDTCH/MCS-7	dB	26,5	27,5	28	(note 1)
PDTCH/MCS-8	dB	30,5	29,5 (note 2)	29 (note 2)	(note 1)
PDTCH/MCS-9	dB	25,5 (note 2)	(note 1)	(note 1)	(note 1)
NOTE 1: PDTCH/MCS-x can not meet the reference performance for some propagation condition. NOTE 2: Performance is specified at 30% BLER for some cases.					

3GPP TS 05.05, table 2c and subclause 6.3.

1. The block error rate (BLER) performance for USF/MCS1 to 9 shall not exceed 1 % at co-channel interference ratios (C/I_c) exceeding those according to the tables 14.18-6a and 14.18-6b.

Table 14.18-6a: USF Co-channel Interference Ratio for GMSK modulation

Type of channel		Propagation conditions			
		TUlow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
GSM 400, GSM 700, GSM 850 and GSM 900					
USF/MCS-1 to 4	dB	18	11	9,5	9,5
DCS 1 800 and PCS 1 900					
USF/MCS-1 to 4	dB	18	9,5	9,5	9,5

3GPP TS 05.05, tables 2a.

Table 14.18-6b: USF Co-channel Interference Ratio for 8-PSK modulation

Type of channel		Propagation conditions			
		TUlow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
GSM 400, GSM 700, GSM 850 and GSM 900					
USF/MCS-5 to 9	dB	17	11,5	9	9
DCS 1 800 and PCS 1 900					
USF/MCS-5 to 9	dB	17	10	9	9

3GPP TS 05.05, Tables 2c.

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.18.2.3 Test purpose

1. To verify that the MS does not exceed conformance requirement 1 for different coding schemes and under different propagation conditions with an allowance for the statistical significance of the test.

2. To verify that the MS does not exceed conformance requirement 2 under propagation condition TUhigh/noFH, with an allowance for the statistical significance of the test.

14.18.2.4 Method of test

Initial conditions

For both GMSK and 8-PSK modulations, a downlink TBF is set up according to the generic procedure specified in clause 40 for packet switched with an ARFCN in the mid ARFCN range, power control level set to maximum power. The power control parameter ALPHA (α) is set to 0.

The SS transmits EGPRS RLC data blocks containing random data. In addition to these data blocks, the SS produces an independent, uncorrelated interfering signal (I1).

Specific PICS statements:

- Support of DARP Phase 1 (TSPC_DARP_Phase1)

PIXIT Statements:

-

Test procedure

For GMSK Modulation:

a) The SS transmits packets on PDTCH using MCS-4 coding to the MS on all allocated timeslots.

b) The fading characteristic of the wanted signal and the interfering signal is TUlow, no FH applies.

c) The co-channel interference ratio is set to 1 dB above the ratio given in the table in conformance requirement 1. The interferer shall have the same frequency hopping sequence as the wanted signal, as well as be subject to the same fading profile.

d) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 1: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

e) Once the number of blocks transmitted with the current coding scheme as counted in step d) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

f) If the MS does not support DARP phase 1 the SS repeats step c) to e) with the TUhigh/noFH fading condition

g) The SS repeats the steps c) to e) for the coding schemes, MCS-2 with TUhigh/FH and for MCS-1 with RA/noFH and, if the MS does not support DARP phase 1, also the coding scheme MCS-3 with TUhigh/noFH.

h) The SS establishes the normal test conditions, and sets the fading function to TUhigh/noFH. An uplink TBF shall be established.

i) The SS sets the value of the USF/MCS-4 such as to allocate the uplink to the MS, using a co-channel interference ratio of 1 dB above the ratio given in the table in conformance requirement 2.

j) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

k) Once the number of USF/MCS-4 allocating the uplink for the MS as counted in step j) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

For 8-PSK Modulation:

a) The SS transmits packets on PDTCH using MCS-8 coding to the MS on all allocated timeslots.

b) The fading characteristic of the wanted signal and the interfering signal is TUlow, no FH applies.

c) The co-channel interference ratio is set to 1 dB above the ratio given in the table in conformance requirement 1. The interferer shall have the same frequency hopping sequence as the wanted signal, as well as be subject to the same fading profile.

d) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 2: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

e) Once the number of blocks transmitted with the current coding scheme as counted in step d) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

f) The SS repeats step c) to e) with the TUhigh/noFH fading condition.

g) The SS repeats steps c) to e) for MCS-9 with TUlow/NoFH, MCS-7 with TUhigh/noFH, MCS-6 with TUhigh/FH and MSC-5 with RA/noFH.

h) The SS sets the fading function to TUhigh/noFH. An uplink TBF shall be established.

i) The SS sets the value of the USF/MCS-9 such as to allocate the uplink to the MS, using a co-channel interference ratio of 1 dB above the ratio given in the table in conformance requirement 2.

j) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

k) Once the number of USF/MCS-9 allocating the uplink for the MS as counted in step j) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

14.18.2.5 Test requirements

The block error ratio, as calculated by the SS for different channels and under the different propagation conditions, shall not exceed the conformance requirement.

14.18.2a Co-channel rejection in EGPRS2A

14.18.2a.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver. "Wanted signal" in this test is the signal generated by the transmitted RLC data blocks.

14.18.2a.2 Conformance requirement

1. The block error rate (BLER) performance for PDTCH/DAS 5 to 7 shall not exceed 10 % at input levels according to the table 14.18-5c; and for PDTCH/DAS 8 to 9 shall not exceed 10 % or 30 % depending on Coding Schemes at input levels according to the table 14.18-5d; and for PDTCH/DAS 10 to 12 shall not exceed 10 % or 30 % depending on Coding Schemes at input levels according to the table 14.18-5e.

Table 14.18-5c: Co channel interference ratio for MS at reference performance for 8-PSK modulation

GSM 850 and GSM 900					
Type of channel		**Propagation conditions**			
		TUlow (no FH)	**TUhigh (no FH)**	**TUhigh (ideal FH)**	**RA (no FH)**
PDTCH/DAS-5	dB	[16,5]	[15]	[15]	[12,5]
PDTCH/DAS-6	dB	[18]	[16]	[15,5]	14,5]
PDTCH/DAS-7	dB	[19,5]	[17]	[17]	[16,5]
DCS 1 800 and PCS 1900					
Type of channel		**Propagation conditions**			
		TUlow (no FH)	**TUhigh (no FH)**	**TUhigh (ideal FH)**	**RA (no FH)**
PDTCH/DAS-5	dB	(2)	[15]	(2)	(2)
PDTCH/DAS-6	dB	(2)	[16]	(2)	(2)
PDTCH/DAS-7	dB	(2)	[17,5]	(2)	(2)

Performance is specified at 30% BLER for those cases identified with mark '**'
Performance is not specified for those cases identified with mark '-'

NOTE 1: Ideal FH case assumes perfect decorrelation between bursts. This case may only be tested if such a decorrelation is ensured in the test. For TU50 (ideal FH), sufficient decorrelation may be achieved with 4 frequencies spaced over 5 MHz.

NOTE 2: The requirements for the DCS 1800 & PCS 1900 TU1.5 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 TU3 (no FH) propagation condition, the requirements for the GSM 850 & GSM 900 TU3 (ideal FH), DCS 1800 & PCS 1900 TU1.5 (ideal FH) and DCS 1800 & PCS 1900 TU50 (ideal FH) propagation conditions are the same as for the DCS 1800 & PCS 1900 TU50 (no FH) propagation condition, and the requirements for the DCS 1800 & PCS 1900 RA130 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 RA250 (no FH) propagation condition.

NOTE 3: The requirements for USF/DAS-5 to 7 are the same as for USF/MCS-5 to 9.

3GPP TS 45.005, table 2s; 3GPP TS 45.005, subclause 6.3.

Table 14.18-5d: Co channel interference ratio for MS at reference performance for 16-QAM modulation

GSM 850 and GSM 900					
Type of channel		Propagation conditions			
		TUlow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
PDTCH/DAS-8	dB	[21,5]	[19,5]	[19]	[18,5]
PDTCH/DAS-9	dB	[24]	[22,5]	[22]	[24,5]
DCS 1 800 and PCS 1900					
Type of channel		Propagation conditions			
		TUlow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
PDTCH/DAS-8	dB	(2)	[20]	(2)	(2)
PDTCH/DAS-9	dB	(2)	[24]	(2)	(2)
Performance is specified at 30% BLER for those cases identified with mark '**' Performance is not specified for those cases identified with mark '-' NOTE 1: Ideal FH case assumes perfect decorrelation between bursts. This case may only be tested if such a decorrelation is ensured in the test. For TU50 (ideal FH), sufficient decorrelation may be achieved with 4 frequencies spaced over 5 MHz. NOTE 2: The requirements for the DCS 1800 & PCS 1900 TU1.5 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 TU3 (no FH) propagation condition, the requirements for the GSM 850 & GSM 900 TU3 (ideal FH), DCS 1800 & PCS 1900 TU1.5 (ideal FH) and DCS 1800 & PCS 1900 TU50 (ideal FH) propagation conditions are the same as for the DCS 1800 & PCS 1900 TU50 (no FH) propagation condition, and the requirements for the DCS 1800 & PCS 1900 RA130 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 RA250 (no FH) propagation condition.					

3GPP TS 45.005, table 2s; 3GPP TS 45.005, subclause 6.3.

Table 14.18-5e: Co channel interference ratio for MS at reference performance for 32-QAM modulation

GSM 850 and GSM 900					
Type of channel		Propagation conditions			
		TUlow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
PDTCH/DAS-10	dB	[27]	[25,5]	[25]	[24,5**]
PDTCH/DAS-11	dB	[30]	[31]	[30,5]	[-]
PDTCH/DAS-12	dB	[34,5]	[33**]	[32,5**]	[-]
DCS 1 800 and PCS 1900					
Type of channel		Propagation conditions			
		TUlow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
PDTCH/DAS-10	dB	(2)	[27]	(2)	(2)
PDTCH/DAS-11	dB	(2)	[32**]	(2)	(2)
PDTCH/DAS-12	dB	(2)	[-]	(2)	(2)
Performance is specified at 30% BLER for those cases identified with mark '**' Performance is not specified for those cases identified with mark '-' NOTE 1: Ideal FH case assumes perfect decorrelation between bursts. This case may only be tested if such a decorrelation is ensured in the test. For TU50 (ideal FH), sufficient decorrelation may be achieved with 4 frequencies spaced over 5 MHz. NOTE 2: The requirements for the DCS 1800 & PCS 1900 TU1.5 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 TU3 (no FH) propagation condition, the requirements for the GSM 850 & GSM 900 TU3 (ideal FH), DCS 1800 & PCS 1900 TU1.5 (ideal FH) and DCS 1800 & PCS 1900 TU50 (ideal FH) propagation conditions are the same as for the DCS 1800 & PCS 1900 TU50 (no FH) propagation condition, and the requirements for the DCS 1800 & PCS 1900 RA130 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 RA250 (no FH) propagation condition.					

3GPP TS 45.005, table 2s; 3GPP TS 45.005, subclause 6.3.

2. The block error rate (BLER) performance for USF/DAS 5 to 7 shall not exceed 1 % at input levels according to the tables 14.18-6c; and Block error rate (BLER) performance for USF/DAS 8 to 9 shall not exceed 1% at input levels according to the table 14.18.6d; and also Block error rate (BLER) performance for USF/DAS 10-12 shall not exceeded 1% at input levels according to table 14.18.6e.

Table 14.18-6c: USF Co-channel Interference Ratio for 8-PSK modulation

GSM 850 and GSM 900					
Type of channel		Propagation conditions			
		TUlow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
USF/DAS-5 to 7	dB	17	11,5	9	9
DCS 1 800 and PCS 1900					
Type of channel		**Propagation conditions**			
		TUlow (no FH)	**TUhigh (no FH)**	**TUhigh (ideal FH)**	**RA (no FH)**
USF/DAS-5 to 7	dB	17	10	9	9

3GPP TS 45.005, table 2s; 3GPP TS 45.005, subclause 6.3.

Table 14.18-6d: USF Co-channel Interference Ratio for 16-QAM modulation

GSM 850 and GSM 900					
Type of channel		Propagation conditions			
		TUow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
USF/DAS-8 to 9	dB	[tbd]	[tbd]	[tbd]	[tbd]
DCS 1 800 and PCS 1900					
Type of channel		**Propagation conditions**			
		TUlow (no FH)	**TUhigh (no FH)**	**TUhigh (ideal FH)**	**RA (no FH)**
USF/DAS-8 to 9	dB	(2)	[tbd]	(2)	(2)
Performance is specified at 30% BLER for those cases identified with mark '**' Performance is not specified for those cases identified with mark '-' NOTE 1: Ideal FH case assumes perfect decorrelation between bursts. This case may only be tested if such a decorrelation is ensured in the test. For TU50 (ideal FH), sufficient decorrelation may be achieved with 4 frequencies spaced over 5 MHz. NOTE 2: The requirements for the DCS 1800 & PCS 1900 TU1.5 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 TU3 (no FH) propagation condition, the requirements for the GSM 850 & GSM 900 TU3 (ideal FH), DCS 1800 & PCS 1900 TU1.5 (ideal FH) and DCS 1800 & PCS 1900 TU50 (ideal FH) propagation conditions are the same as for the DCS 1800 & PCS 1900 TU50 (no FH) propagation condition, and the requirements for the DCS 1800 & PCS 1900 RA130 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 RA250 (no FH) propagation condition. NOTE 3: The requirements for USF/DAS-5 to 7 are the same as for USF/MCS-5 to 9.					

3GPP TS 45.005, table 2s; 3GPP TS 45.005, subclause 6.3.

Table 14.18-6e: USF Co-channel Interference Ratio for 32-QAM modulation

GSM 850 and GSM 900					
Type of channel		Propagation conditions			
		TUlow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
USF/DAS-10 to 12	dB	[tbd]	[tbd]	[tbd]	[tbd]
DCS 1 800 and PCS 1900					
Type of channel		Propagation conditions			
		TUlow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
USF/DAS-10 to 12	dB	(2)	[tbd]	(2)	(2)
Performance is specified at 30% BLER for those cases identified with mark '**' Performance is not specified for those cases identified with mark '-' NOTE 1: Ideal FH case assumes perfect decorrelation between bursts. This case may only be tested if such a decorrelation is ensured in the test. For TU50 (ideal FH), sufficient decorrelation may be achieved with 4 frequencies spaced over 5 MHz. NOTE 2: The requirements for the DCS 1800 & PCS 1900 TU1.5 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 TU3 (no FH) propagation condition, the requirements for the GSM 850 & GSM 900 TU3 (ideal FH), DCS 1800 & PCS 1900 TU1.5 (ideal FH) and DCS 1800 & PCS 1900 TU50 (ideal FH) propagation conditions are the same as for the DCS 1800 & PCS 1900 TU50 (no FH) propagation condition, and the requirements for the DCS 1800 & PCS 1900 RA130 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 RA250 (no FH) propagation condition. NOTE 3: The requirements for USF/DAS-5 to 7 are the same as for USF/MCS-5 to 9.					

3GPP TS 45.005, table 2s; 3GPP TS 45.005, subclause 6.3.

14.18.2a.3 Test purpose

1. To verify that the MS does not exceed conformance requirement 1 for different coding schemes and under different propagation conditions with an allowance for the statistical significance of the test.

2. To verify that the MS does not exceed conformance requirement 2 under propagation condition TUhigh/noFH, with an allowance for the statistical significance of the test.

14.18.2a.4 Method of test

Initial conditions

For 8-PSK, 16QAM, and 32 QAM modulations, a downlink TBF is set up according to the generic procedure specified in clause 40 for packet switched with an ARFCN in the mid ARFCN range, power control level set to maximum power. The power control parameter ALPHA (α) is set to 0.

The SS transmits EGPRS RLC data blocks containing random data. In addition to these data blocks, the SS produces an independent, uncorrelated interfering signal (I1).

Specific PICS statements:

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PIXIT Statements:

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Test procedure

For 8-PSK Modulation:

a) The SS transmits packets on PDTCH using DAS-7 coding to the MS on all allocated timeslots.

b) The fading characteristic of the wanted signal and the interfering signal is TUlow, no FH applies.

c) The co-channel interference ratio is set to 1 dB above the ratio given in the table in conformance requirement 1. The interferer shall have the same frequency hopping sequence as the wanted signal, as well as be subject to the same fading profile.

d) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

e) Once the number of blocks transmitted with the current coding scheme as counted in step d) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

f) The SS repeats step c) to e) with the TUhigh/noFH fading condition.

g) The SS repeats steps c) to e) for, DAS-6 with TUhigh/FH and DAS-5 with RA/noFH.

h) The SS sets the fading function to TUhigh/noFH. An uplink TBF shall be established.

i) The SS sets the value of the USF/DAS-7 such as to allocate the uplink to the MS, using a co-channel interference ratio of 1 dB above the ratio given in the table in conformance requirement 2.

j) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

k) Once the number of USF/DAS-7 allocating the uplink for the MS as counted in step j) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

For 16-QAM Modulation:

a) The SS transmits packets on PDTCH using DAS-9 coding to the MS on all allocated timeslots.

b) The fading characteristic of the wanted signal and the interfering signal is TUlow, no FH applies.

c) The co-channel interference ratio is set to 1 dB above the ratio given in the table in conformance requirement 1. The interferer shall have the same frequency hopping sequence as the wanted signal, as well as be subject to the same fading profile.

d) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

e) Once the number of blocks transmitted with the current coding scheme as counted in step d) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

f) The SS repeats step c) to e) with the TUhigh/noFH fading condition.

g) The SS repeats steps c) to e) for, DAS-8 with TUhigh/FH

h) The SS sets the fading function to TUhigh/noFH. An uplink TBF shall be established.

i) The SS sets the value of the USF/DAS-9 such as to allocate the uplink to the MS, using a co-channel interference ratio of 1 dB above the ratio given in the table in conformance requirement 2.

j) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

k) Once the number of USF/DAS-9 allocating the uplink for the MS as counted in step j) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

For 32-QAM Modulation:

a) The SS transmits packets on PDTCH using DAS-12 coding to the MS on all allocated timeslots.

b) The fading characteristic of the wanted signal and the interfering signal is TUlow, no FH applies.

c) The co-channel interference ratio is set to 1 dB above the ratio given in the table in conformance requirement 1. The interferer shall have the same frequency hopping sequence as the wanted signal, as well as be subject to the same fading profile.

d) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

e) Once the number of blocks transmitted with the current coding scheme as counted in step d) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

f) The SS repeats step c) to e) with the TUhigh/noFH fading condition.

g) The SS repeats steps c) to e) for, DAS-11 with TUhigh/FH and DAS-10 with RA/noFH.

h) The SS sets the fading function to TUhigh/noFH. An uplink TBF shall be established.

i) The SS sets the value of the USF/DAS-12 such as to allocate the uplink to the MS, using a co-channel interference ratio of 1 dB above the ratio given in the table in conformance requirement 2.

j) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

k) Once the number of USF/DAS-12 allocating the uplink for the MS as counted in step j) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

14.18.2a.5 Test requirements

The block error ratio, as calculated by the SS for different channels and under the different propagation conditions, shall not exceed the conformance requirement.

14.18.2b Co-channel rejection – in TIGHTER configuration

14.18.2b.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver. "Wanted signal" in this test is the signal generated by the transmitted RLC data blocks.

14.18.2b.2 Conformance requirement

1. If MS indicating support for TIGHTER Capability (see 3GPP TS 24.008) shall also indicate support for DARP - phase I (see 3GPP TS 24.008), and shall fulfil the requirements in table 2ad for co channel interference (C/Ic)1.
 The block error rate (BLER) performance for PDTCH/MCS1 to 4 shall not exceed 10 % at co-channel interference ratios (C/I_c) exceeding those according to the table 14.18.2b-1; and for PDTCH/MCS5 to 9 shall not exceed 10 % or 30 % depending on Coding Schemes at co-channel interference ratios (C/Ic) exceeding those according to the table 14.18.2b-2.

Table 14.18.2b-1: PDTCH Co-channel Interference Ratio for GMSK modulation

Type of channel		Propagation conditions			
		TUlow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
GSM 850 and GSM 900					
PDTCH/MCS-1	dB	9	6,5	5,5	8
PDTCH/MCS-2	dB	11	8,5	8	10
PDTCH/MCS-3	dB	12,5	13	13	17
PDTCH/MCS-4	dB	15	18	18	(note)
DCS 1 800 and PCS 1 900					
PDTCH/MCS-1	dB	10	7,5	6	8
PDTCH/MCS-2	dB	12	9,5	8,5	10
PDTCH/MCS-3	dB	13,5	14	13,5	17
PDTCH/MCS-4	dB	16	19	18,5	(note)
NOTE: PDTCH/MCS-4 can not meet the reference performance for some propagation condition.					

3GPP TS 45.005, table 2ad; 3GPP TS 45.005, subclause 6.3.

Table 14.18.2b-2: Co channel interference ratio for MS at reference performance for 8-PSK modulation

GSM 850 and GSM 900					
Type of channel		Propagation conditions			
		TUlow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
PDTCH/MCS-5	dB	15,5	12	11	13,5
PDTCH/MCS-6	dB	17,5	14,5	145	18
PDTCH/MCS-7	dB	22,5	21,5	21	(note 1)
PDTCH/MCS-8	dB	26,5	22 (note 2)	22**	(note 1)
PDTCH/MCS-9	dB	21,5 (note 2)	27 (note 2)	27**	(note 1)
DCS 1800 and PCS 1 900					
Type of channel		Propagation conditions			
		TUlow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
PDTCH/MCS-5	dB	16	11,5	11,5	13,5
PDTCH/MCS-6	dB	18	14,5	14,5	18
PDTCH/MCS-7	dB	23	24	24	(note 1)
PDTCH/MCS-8	dB	27	26 (note 2)	25 (note 2)	(note 1)
PDTCH/MCS-9	dB	22 (note 2)	(note 1)	(note 1)	(note 1)
NOTE 1: PDTCH/MCS-x can not meet the reference performance for some propagation condition. NOTE 2: Performance is specified at 30% BLER for some cases.					

3GPP TS 45.005, table 2ad and subclause 6.3.

2. The block error rate (BLER) performance for USF/MCS1 to 9 shall not exceed 1 % at co-channel interference ratios (C/I_c) exceeding those according to the tables 14.18.2b-3 and 14.18.2b-4.

Table 14.18.2b-3: USF Co-channel Interference Ratio for GMSK modulation

Type of Channel		Propagation conditions			
		TUlow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
GSM 400, GSM 700, GSM 850 and GSM 900					
USF/MCS-1 to 4	dB	18	11	9,5	9,5
DCS 1 800 and PCS 1 900					
USF/MCS-1 to 4	dB	18	9,5	9,5	9,5

3GPP TS 45.005, tables 2a.

Table 14.18.2b-4: USF Co-channel Interference Ratio for 8-PSK modulation

Type of channel		Propagation conditions			
		TUlow (no FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
GSM 400, GSM 700, GSM 850 and GSM 900					
USF/MCS-5 to 9	dB	17	11,5	9	9
DCS 1 800 and PCS 1 900					
USF/MCS-5 to 9	dB	17	10	9	9

3GPP TS 45.005, Tables 2c,3GPP TS 45.005 subclause 2.

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.18.2b.3 Test purpose

1. To verify that the MS does not exceed conformance requirement 1 for different coding schemes and under different propagation conditions with an allowance for the statistical significance of the test.

2. To verify that the MS does not exceed conformance requirement 2 under propagation condition TUhigh/noFH, with an allowance for the statistical significance of the test.

14.18.2b.4 Method of test

Initial conditions

For both GMSK and 8-PSK modulations, a downlink TBF is set up according to the generic procedure specified in clause 40 for packet switched with an ARFCN in the mid ARFCN range, power control level set to maximum power. The power control parameter ALPHA (α) is set to 0.

The SS transmits EGPRS RLC data blocks containing random data. In addition to these data blocks, the SS produces an independent, uncorrelated interfering signal (I1).

Specific PICS statements:

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PIXIT Statements:

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Test procedure

For GMSK Modulation:

a) The SS transmits packets on PDTCH using MCS-4 coding to the MS on all allocated timeslots.

b) The fading characteristic of the wanted signal and the interfering signal is TUlow, no FH applies.

c) The co-channel interference ratio is set to 1 dB above the ratio given in the table in conformance requirement 1. The interferer shall have the same frequency hopping sequence as the wanted signal, as well as be subject to the same fading profile.

d) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 440.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 1: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

e) Once the number of blocks transmitted with the current coding scheme as counted in step d) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

f) The SS repeats the steps c) to e) for the coding schemes, MCS-2 with TUhigh/FH and for MCS-1 with RA/noFH.

g) The SS establishes the normal test conditions, and sets the fading function to TUhigh/noFH. An uplink TBF shall be established.

h) The SS sets the value of the USF/MCS-4 such as to allocate the uplink to the MS, using a co-channel interference ratio of 1 dB above the ratio given in the table in conformance requirement 2.

i) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

j) Once the number of USF/MCS-4 allocating the uplink for the MS as counted in step j) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

For 8-PSK Modulation:

a) The SS transmits packets on PDTCH using MCS-8 coding to the MS on all allocated timeslots.

b) The fading characteristic of the wanted signal and the interfering signal is TUlow, no FH applies.

c) The co-channel interference ratio is set to 1 dB above the ratio given in the table in conformance requirement 1. The interferer shall have the same frequency hopping sequence as the wanted signal, as well as be subject to the same fading profile.

d) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 2: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

e) Once the number of blocks transmitted with the current coding scheme as counted in step d) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

f) The SS repeats step c) to e) with the TUhigh/noFH fading condition.

g) The SS repeats steps c) to e) for MCS-9 with TUlow/NoFH, MCS-7 with TUhigh/noFH, MCS-6 with TUhigh/FH and MSC-5 with RA/noFH.

h) The SS sets the fading function to TUhigh/noFH. An uplink TBF shall be established.

i) The SS sets the value of the USF/MCS-9 such as to allocate the uplink to the MS, using a co-channel interference ratio of 1 dB above the ratio given in the table in conformance requirement 2.

j) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

k) Once the number of USF/MCS-9 allocating the uplink for the MS as counted in step j) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

14.18.2b.5 Test requirements

The block error ratio, as calculated by the SS for different channels and under the different propagation conditions, shall not exceed the conformance requirement.

14.18.2c Co-channel rejection in EGPRS2A with TIGHTER configuration

14.18.2c.1 Definition

The co-channel rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal with additional TIGHTER requirements, both signals being at the nominal frequency of the receiver. "Wanted signal" in this test is the signal generated by the transmitted RLC data blocks.

14.18.2c.2 Conformance requirement

1. The block error rate (BLER) performance for PDTCH/DAS 5 to 7 shall not exceed 10 % at input levels according to the table 14.18-5c; and for PDTCH/DAS 8 to 9 shall not exceed 10 % or 30 % depending on Coding Schemes at input levels according to the table 14.18-5d; and for PDTCH/DAS 10 to 12 shall not exceed 10 % or 30 % depending on Coding Schemes at input levels according to the table 14.18-5e.

Table 14.18-5c: Co channel interference ratio for MS at reference performance for 8-PSK modulation

GSM 850 and GSM 900						
Type of channel		**Propagation conditions**				
		TU3 (no FH)	**TU3 (ideal FH)**	**TU50 (no FH)**	**TU50 (ideal FH)**	**RA250 (no FH)**
PDTCH/DAS-5	dB	[14,5]	(2)	[12]	[11,5]	[12,5] (7)
PDTCH/DAS-6	dB	[16]	(2)	[13]	[12]	[14,5] (7)
PDTCH/DAS-7	dB	[17,5]	(2)	[14]	[13,5]	[16,5] (7)
DCS 1 800 and PCS 1900						
Type of channel		**Propagation conditions**				
		TU1,5 (no FH)	**TU1,5 (ideal FH)**	**TU50 (no FH)**	**TU50 (ideal FH)**	**RA130 (no FH)**
PDTCH/DAS-5	dB	(2)	(2)	[11,5]	(2)	(2)
PDTCH/DAS-6	dB	(2)	(2)	[12,5]	(2)	(2)
PDTCH/DAS-7	dB	(2)	(2)	[14]	(2)	(2)

Performance is specified at 30% BLER for those cases identified with mark '**'

NOTE 1: The specification for SDCCH applies also for BCCH, AGCH, PCH, SACCH. The actual performance of SACCH, particularly for the C/I TU3 (no FH) and TU 1.5 (no FH) cases should be better.

NOTE 2: The requirements for the DCS 1800 & PCS 1900 TU1.5 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 TU3 (no FH) propagation condition, the requirements for the GSM 850 & GSM 900 TU3 (ideal FH), DCS 1800 & PCS 1900 TU1.5 (ideal FH) and DCS 1800 & PCS 1900 TU50 (ideal FH) propagation conditions are the same as for the DCS 1800 & PCS 1900 TU50 (no FH) propagation condition, and the requirements for the DCS 1800 & PCS 1900 RA130 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 RA250 (no FH) propagation condition.

NOTE 3: Ideal FH case assumes perfect decorrelation between bursts. This case may only be tested if such a decorrelation is ensured in the test. For TU50 (ideal FH), sufficient decorrelation may be achieved with 4 frequencies spaced over 5 MHz.

NOTE 4: FER for CCHs takes into account frames which are signalled as being erroneous (by the FIRE code, parity bits, or other means) or where the stealing flags are wrongly interpreted.

NOTE 5: PDTCH/CS-4, PDTCH/MCS-x, PDTCH/DAS-x and PDTCH/DBS-x cannot meet the reference performance for some propagation conditions (-).

NOTE 6: The TU50 no FH TIGHTER requirement for these TCH are specified as a fixed tightening of the reference interference performance listed in Table 2 by 10 dB for GSM 850 & 900 and by 9,5 dB for DCS 1800 and PCS 1900.

NOTE 7: The requirement is identical to the EGPRS2-A or EGPRS2-B requirement in Table 2s or Table 2u, respectively.

3GPP TS 45.005, table 2ad; 3GPP TS 45.005, subclause 6.3.

Table 14.18-5d: Co channel interference ratio for MS at reference performance for 16-QAM modulation

GSM 850 and GSM 900						
Type of Channel		**Propagation conditions**				
		TU3 (no FH)	**TU3 (ideal FH)**	**TU50 (no FH)**	**TU50 (ideal FH)**	**RA250 (no FH)**
PDTCH/DAS-8	dB	[19,5]	(2)	[16]	[15,5]	[17,5]
PDTCH/DAS-9	dB	[21,5]	(2)	[19]	[19]	[22,5]
DCS 1 800 and PCS 1900						
Type of Channel		**Propagation conditions**				
		TU1,5 (no FH)	**TU1,5 (ideal FH)**	**TU50 (no FH)**	**TU50 (ideal FH)**	**RA130 (no FH)**
PDTCH/DAS-8	dB	(2)	(2)	[16]	(2)	(2)
PDTCH/DAS-9	dB	(2)	(2)	[20]	(2)	(2)

Performance is specified at 30% BLER for those cases identified with mark '**'

NOTE 1: The specification for SDCCH applies also for BCCH, AGCH, PCH, SACCH. The actual performance of SACCH, particularly for the C/I TU3 (no FH) and TU 1.5 (no FH) cases should be better.

NOTE 2: The requirements for the DCS 1800 & PCS 1900 TU1.5 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 TU3 (no FH) propagation condition, the requirements for the GSM 850 & GSM 900 TU3 (ideal FH), DCS 1800 & PCS 1900 TU1.5 (ideal FH) and DCS 1800 & PCS 1900 TU50 (ideal FH) propagation conditions are the same as for the DCS 1800 & PCS 1900 TU50 (no FH) propagation condition, and the requirements for the DCS 1800 & PCS 1900 RA130 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 RA250 (no FH) propagation condition.

NOTE 3: Ideal FH case assumes perfect decorrelation between bursts. This case may only be tested if such a decorrelation is ensured in the test. For TU50 (ideal FH), sufficient decorrelation may be achieved with 4 frequencies spaced over 5 MHz.

NOTE 4: FER for CCHs takes into account frames which are signalled as being erroneous (by the FIRE code, parity bits, or other means) or where the stealing flags are wrongly interpreted.

NOTE 5: PDTCH/CS-4, PDTCH/MCS-x, PDTCH/DAS-x and PDTCH/DBS-x cannot meet the reference performance for some propagation conditions (-).

NOTE 6: The TU50 no FH TIGHTER requirement for these TCH are specified as a fixed tightening of the reference interference performance listed in Table 2 by 10 dB for GSM 850 & 900 and by 9,5 dB for DCS 1800 and PCS 1900.

NOTE 7: The requirement is identical to the EGPRS2-A or EGPRS2-B requirement in Table 2s or Table 2u, respectively.

3GPP TS 45.005, table 2ad; 3GPP TS 45.005, subclause 6.3.

Table 14.18-5e: Co channel interference ratio for MS at reference performance for 32-QAM modulation

GSM 850 and GSM 900						
Type of channel		**Propagation conditions**				
		TU3 (no FH)	**TU3 (ideal FH)**	**TU50 (no FH)**	**TU50 (ideal FH)**	**RA250 (no FH)**
PDTCH/DAS-10	dB	[25]	(2)	[22]	[22]	[22,5**]
PDTCH/DAS-11	dB	[27,5]	(2)	[27,5]	[27,5]	-
PDTCH/DAS-12	dB	[31,5]	(2)	[29**]	[29**]	-
DCS 1 800 and PCS 1900						
Type of channel		**Propagation conditions**				
		TU1,5 (no FH)	**TU1,5 (ideal FH)**	**TU50 (no FH)**	**TU50 (ideal FH)**	**RA130 (no FH)**
PDTCH/DAS-10	dB	(2)	(2)	[22,5]	(2)	(2)
PDTCH/DAS-11	dB	(2)	(2)	[27,5**]	(2)	(2)
PDTCH/DAS-12	dB	(2)	(2)	-	(2)	(2)

Performance is specified at 30% BLER for those cases identified with mark '**'

NOTE 1: The specification for SDCCH applies also for BCCH, AGCH, PCH, SACCH. The actual performance of SACCH, particularly for the C/I TU3 (no FH) and TU 1.5 (no FH) cases should be better.

NOTE 2: The requirements for the DCS 1800 & PCS 1900 TU1.5 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 TU3 (no FH) propagation condition, the requirements for the GSM 850 & GSM 900 TU3 (ideal FH), DCS 1800 & PCS 1900 TU1.5 (ideal FH) and DCS 1800 & PCS 1900 TU50 (ideal FH) propagation conditions are the same as for the DCS 1800 & PCS 1900 TU50 (no FH) propagation condition, and the requirements for the DCS 1800 & PCS 1900 RA130 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 RA250 (no FH) propagation condition.

NOTE 3: Ideal FH case assumes perfect decorrelation between bursts. This case may only be tested if such a decorrelation is ensured in the test. For TU50 (ideal FH), sufficient decorrelation may be achieved with 4 frequencies spaced over 5 MHz.

NOTE 4: FER for CCHs takes into account frames which are signalled as being erroneous (by the FIRE code, parity bits, or other means) or where the stealing flags are wrongly interpreted.

NOTE 5: PDTCH/CS-4, PDTCH/MCS-x, PDTCH/DAS-x and PDTCH/DBS-x cannot meet the reference performance for some propagation conditions (-).

NOTE 6: The TU50 no FH TIGHTER requirement for these TCH are specified as a fixed tightening of the reference interference performance listed in Table 2 by 10 dB for GSM 850 & 900 and by 9,5 dB for DCS 1800 and PCS 1900.

NOTE 7: The requirement is identical to the EGPRS2-A or EGPRS2-B requirement in Table 2s or Table 2u, respectively.

3GPP TS 45.005, table 2ad; 3GPP TS 45.005, subclause 6.3.

2. The block error rate (BLER) performance for USF/DAS 5 to 7 shall not exceed 1 % at input levels according to the tables 14.18-6c; and Block error rate (BLER) performance for USF/DAS 8 to 9 shall not exceed 1% at input levels according to the table 14.18.6c; and also Block error rate (BLER) performance for USF/DAS 10-12 shall not exceeded 1% at input levels according to table 14.18.6c.

Table 14.18-6c: USF Co-channel Interference Ratio for 8-PSK modulation, 16-QAM modulation and 32-QAM modulation

GSM 850 and GSM 900						
Type of channel		Propagation conditions				
		TU3 (no FH)	TU3 (ideal FH)	TU50 (no FH)	TU50 (ideal FH)	RA250 (no FH)
USF/DAS-5 to 7	dB	(3)	(3)	(3)	(3)	(3)
USF/DAS-8 to 9	dB	10,0	(2)	6,0	4,5	4,0
USF/DAS-10 to 12	dB	10,0	(2)	7,0	4,5	4,0
DCS 1 800 and PCS 1900						
Type of channel		Propagation conditions				
		TU1,5 (no FH)	TU1,5 (ideal FH)	TU50 (no FH)	TU50 (ideal FH)	RA130 (no FH)
USF/DAS-5 to 7	dB	(3)	(3)	(3)	(3)	(3)
USF/DAS-8 to 9	dB	(2)	(2)	4,5	(2)	(2)
USF/DAS-10 to 12	dB	(2)	(2)	5,5	(2)	(2)

Performance is specified at 30% BLER for those cases identified with mark '**'
Performance is not specified for those cases identified with mark '-'
NOTE 1: Ideal FH case assumes perfect decorrelation between bursts. This case may only be tested if such a decorrelation is ensured in the test. For TU50 (ideal FH), sufficient decorrelation may be achieved with 4 frequencies spaced over 5 MHz.
NOTE 2: The requirements for the DCS 1800 & PCS 1900 TU1.5 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 TU3 (no FH) propagation condition, the requirements for the GSM 850 & GSM 900 TU3 (ideal FH), DCS 1800 & PCS 1900 TU1.5 (ideal FH) and DCS 1800 & PCS 1900 TU50 (ideal FH) propagation conditions are the same as for the DCS 1800 & PCS 1900 TU50 (no FH) propagation condition, and the requirements for the DCS 1800 & PCS 1900 RA130 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 RA250 (no FH) propagation condition.
NOTE 3: The requirements for USF/DAS-5 to 7 are the same as for USF/MCS-5 to 9.

3GPP TS 45.005, table 2s; 3GPP TS 45.005, subclause 6.3.

14.18.2c.3 Test purpose

1. To verify that the MS does not exceed conformance requirement 1 for different coding schemes and under different propagation conditions with an allowance for the statistical significance of the test.

2. To verify that the MS does not exceed conformance requirement 2 under propagation condition TUhigh/noFH, with an allowance for the statistical significance of the test.

14.18.2c.4 Method of test

Initial conditions

For 8-PSK, 16QAM, and 32 QAM modulations, a downlink TBF is set up according to the generic procedure specified in clause 40 for packet switched with an ARFCN in the mid ARFCN range, power control level set to maximum power. The power control parameter ALPHA (α) is set to 0.

The SS transmits EGPRS RLC data blocks containing random data. In addition to these data blocks, the SS produces an independent, uncorrelated interfering signal (I1).

Specific PICS statements:

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PIXIT Statements:

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Test procedure

For 8-PSK Modulation:

a) The SS transmits packets on PDTCH using DAS-7 coding to the MS on all allocated timeslots.

b) The fading characteristic of the wanted signal and the interfering signal is TUlow, no FH applies.

c) The co-channel interference ratio is set to 1 dB above the ratio given in the table in conformance requirement 1. The interferer shall have the same frequency hopping sequence as the wanted signal, as well as be subject to the same fading profile.

d) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

e) Once the number of blocks transmitted with the current coding scheme as counted in step d) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

f) The SS repeats step c) to e) with the TUhigh/noFH fading condition.

g) The SS repeats steps c) to e) for, DAS-6 with TUhigh/FH and DAS-5 with RA/noFH.

h) The SS sets the fading function to TUhigh/noFH. An uplink TBF shall be established.

i) The SS sets the value of the USF/DAS-7 such as to allocate the uplink to the MS, using a co-channel interference ratio of 1 dB above the ratio given in the table in conformance requirement 2.

j) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

k) Once the number of USF/DAS-7 allocating the uplink for the MS as counted in step j) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

For 16-QAM Modulation:

a) The SS transmits packets on PDTCH using DAS-9 coding to the MS on all allocated timeslots.

b) The fading characteristic of the wanted signal and the interfering signal is TUlow, no FH applies.

c) The co-channel interference ratio is set to 1 dB above the ratio given in the table in conformance requirement 1. The interferer shall have the same frequency hopping sequence as the wanted signal, as well as be subject to the same fading profile.

d) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

e) Once the number of blocks transmitted with the current coding scheme as counted in step d) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

f) The SS repeats step c) to e) with the TUhigh/noFH fading condition.

g) The SS repeats steps c) to e) for, DAS-8 with TUhigh/FH

h) The SS sets the fading function to TUhigh/noFH. An uplink TBF shall be established.

i) The SS sets the value of the USF/DAS-9 such as to allocate the uplink to the MS, using a co-channel interference ratio of 1 dB above the ratio given in the table in conformance requirement 2.

j) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

k) Once the number of USF/DAS-9 allocating the uplink for the MS as counted in step j) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

For 32-QAM Modulation:

a) The SS transmits packets on PDTCH using DAS-12 coding to the MS on all allocated timeslots.

b) The fading characteristic of the wanted signal and the interfering signal is TUlow, no FH applies.

c) The co-channel interference ratio is set to 1 dB above the ratio given in the table in conformance requirement 1. The interferer shall have the same frequency hopping sequence as the wanted signal, as well as be subject to the same fading profile.

d) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

e) Once the number of blocks transmitted with the current coding scheme as counted in step d) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

f) The SS repeats step c) to e) with the TUhigh/noFH fading condition.

g) The SS repeats steps c) to e) for, DAS-11 with TUhigh/FH and DAS-10 with RA/noFH.

h) The SS sets the fading function to TUhigh/noFH. An uplink TBF shall be established.

i) The SS sets the value of the USF/DAS-12 such as to allocate the uplink to the MS, using a co-channel interference ratio of 1 dB above the ratio given in the table in conformance requirement 2.

j) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

k) Once the number of USF/DAS-12 allocating the uplink for the MS as counted in step j) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

14.18.2c.5 Test requirements

The block error ratio, as calculated by the SS for different channels and under the different propagation conditions, shall not exceed the conformance requirement.

14.18.3 Adjacent channel rejection

14.18.3.1 Definition

The adjacent channel selectivity is a measure of the capability of the receiver to receive wanted data packets without exceeding a given degradation due to the presence of an interfering signal (I1) in the adjacent channel. "Wanted signal" in this test is the signal generated by the transmitted RLC data blocks.

The adjacent channel can be the adjacent in the RF spectrum or in time. There are therefore two types of adjacent channel selectivity:

1) Adjacent RF channel selectivity which is specifically tested in this subclause.

2) Adjacent Time Slot selectivity, which is implicitly tested in test 14.18.2.

14.18.3.2 Conformance requirement

1. For GMSK modulation, under adjacent channel interference at 200 kHz above and below the wanted signal frequency and at the adjacent interference ratio (C/Ia1) exceeding C/Ic - 18dB where C/Ic is the co-channel interference ratio specified in table 14.18-5a for PDTCH and table 14.18-6a for USF channels.

   1.1 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for PDTCH/MCS-1 to 4 shall not exceed 10 %; 3GPP TS 05.05, subclause 6.2.

   1.2 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for USF/MSC-1 to 4 shall not exceed 1 %; 3GPP TS 05.05, subclause 6.2.

   For 8-PSK modulation, under adjacent channel interference at 200 kHz above and below the wanted signal frequency and at the adjacent interference ratio (C/Ia1) specified in table 14.18-7a.

   1.3 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for PDTCH/MCS-5 to 9 shall not exceed 10 % or 30 % depending on Coding Scheme; 3GPP TS 05.05, subclause 6.2.

   1.4 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for USF/MSC-5 to 9 shall not exceed 1 %; 3GPP TS 05.05, subclause 6.2.

Table 14.18-7a: Adjacent channel interference ratio for MS at reference performance for 8-PSK modulation

GSM 400, GSM 700, GSM 850 and GSM 900						
Type of channel		Propagation conditions				
		TUlow (no FH)	TUlow (ideal FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
PDTCH/MCS-5	dB	2,5	-2	-1	-2	1
PDTCH/MCS-6	dB	5,5	0,5	2	1	6,5
PDTCH/MCS-7	dB	10,5	8	10	9	(note 1)
PDTCH/MCS-8	dB	15,5	9 (note 2)	11 (note 2)	10,5 (note 2)	(note 1)
PDTCH/MCS-9	dB	10 (note 2)	12,5 (note 2)	17 (note 2)	15,5 (note 2)	(note 1)
USF/MCS-5 to 9	dB	-1	-8,5	-8	-9,5	-9
DCS 1 800 and PCS 1 900						
Type of channel		Propagation conditions				
		TUlow (no FH)	TUlow (ideal FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
PDTCH/MCS-5	dB	2,5	-2	-2	-1,5	1
PDTCH/MCS-6	dB	5,5	0,5	1,5	1,5	6,5
PDTCH/MCS-7	dB	10,5	8	12,5	12	(note 1)
PDTCH/MCS-8	dB	15,5	9 (note 2)	16 (note 2)	15,5 (note 2)	(note 1)
PDTCH/MCS-9	dB	10 (note 2)	12,5 (note 2)	(note 1)	(note 1)	(note 1)
USF/MCS-5 to 9	dB	-1	-8,5	-9	-9,5	-9
NOTE1: PDTCH for MCS-x can not meet the reference performance for some propagation conditions. NOTE 2: Performance is specified at 30% BLER for some cases.						

3GPP TS 05.05, table 2g and subclause 6.3.

2 For both GMSK and 8-PSK modulations, under adjacent channel interference conditions with interfering signals at 400 kHz above and below the wanted signal frequency and at the adjacent interference ratio (C/Ia2) exceeding C/Ic - 50dB.

   2.1 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for PDTCH/MCS-1 to 4 shall not exceed 10 % for GMSK modulation; and for PDTCH/MCS-5 to 9 shall not exceed 10 % or 30 % depending on Coding Schemes; 3GPP TS 05.05, subclause 6.2.

   2.2 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for USF/MSC-1 to 9 shall not exceed 1 %; 3GPP TS 05.05, subclause 6.2.

   C/Ic is the co-channel interference ratio. For a PDTCH with GMSK modulation C/Ic is specified in table 14.18-5a; for a PDTCH with 8-PSK modulation C/Ic is specified in table 14.18-5b, for a USF with GMSK modulation C/Ic is specified in tables 14.18-6a; and for USF with 8-PSK modulation C/Ic is specified in table 14.18-6b. 3GPP TS 05.05, subclause 6.3.

3. The BLER shall not exceed the conformance requirements given in 1. and 2. under extreme conditions; 3GPP TS 05.05, subclause 6.2 and annex D subclauses D.2.1 and D.2.2.

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.18.3.3 Test purpose

1 To verify that the conformance requirements 1.1, 1.2, 1.3 and 1.4 are met with an allowance for the statistical significance of the test in the presence of a GMSK modulated adjacent channel interferer under propagation condition TUhigh at 200 kHz above and below the wanted signal frequency.

2 To verify that the conformance requirements 2.1 and 2.2 are met with an allowance for the statistical significance of the test in the presence of a GMSK modulated adjacent channel interferer under propagation condition TUhigh at 400 kHz above and below the wanted signal frequency.

3. To verify that Conformance Requirements are met under extreme conditions.

14.18.3.4 Method of test

Initial conditions

For both GMSK and 8-PSK modulations, a downlink TBF is set up according to the generic procedure specified in clause 40 for packet switched with an ARFCN in the mid ARFCN range, power control level set to maximum power. The power control parameter ALPHA (α) is set to 0. The SS transmits EGPRS RLC data blocks containing random data. In addition to the wanted test signal, the SS transmits an independent, uncorrelated interfering signal Standard Test Signal (I1). This unwanted signal is random, continuous and GMSK-modulated, and has no fixed relationship with the bit transitions of the wanted signal.

The fading characteristic of the wanted and the interfering signal is TUhigh/noFH

Test procedure

For GMSK Modulation:

a) The SS transmits packets on PDTCH using MCS-1 coding to the MS on all allocated timeslots.

b) The SS transmits the unwanted signal at a nominal frequency 200kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

c) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 1: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

d) Once the number of blocks transmitted with the current coding scheme as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

e) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

f) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

g) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

h) The SS repeats steps b) to g) for each of the coding schemes MCS-2 to 4.

i) The SS repeats steps a) to g) under extreme test conditions for MCS-4 coding scheme only.

j) The SS establishes the normal test conditions. An uplink TBF shall be established.

k) The SS sets the value of the USF/MCS-1 such as to allocate the uplink to the MS.

l) The SS transmits the unwanted signal at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

m) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

n) Once the number of USF/MCS-1 allocating the uplink for the MS as counted in step m) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

o) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set at to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

p) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

q) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

r) The SS repeats steps k) to q) under extreme test conditions for coding scheme USF/MCS-4.

For 8-PSK Modulation:

a) The SS transmits packets on PDTCH using MCS-5 coding to the MS on all allocated timeslots.

b) The SS transmits the unwanted signal at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

c) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 2: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

d) Once the number of blocks transmitted with the current coding scheme as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

e) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

f) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

g) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

h) The SS repeats steps b) to g) for each of the coding schemes MCS-6 to 8 and for the coding scheme MCS-9 with the TU low fading condition for both the wanted and the interfering signal.

i) The SS repeats steps a) to h) under extreme test conditions for coding scheme MCS-9 only.

j) The SS establishes the normal test conditions. An uplink TBF shall be established.

k) The SS sets the value of the USF/MCS-5 such as to allocate the uplink to the MS.

l) The SS transmits the unwanted signal at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

m) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

n) Once the number of USF/MCS-5 allocating the uplink for the MS as counted in step m) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

o) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

p) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

q) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

r) The SS repeats steps k) to q) under extreme test conditions for coding scheme MCS-9.

14.18.3.5 Test requirements

The block error ratio, as calculated by the SS for different channels with different coding schemes and under TUhigh propagation condition, under any combination of normal and extreme test voltages and ambient temperatures, shall not exceed the conformance requirement.

Testing of the conformance requirement for USF/MCS (1-9)can be done either with fixed minimum number of samples or based on the statistical test method that lead to an early pass/fail decision with test time significantly reduced for MS with BLER not on the limit.

14.18.3.5.1 Fixed limit test with minimum number of samples

The fixed testing of the conformance requirement is done using the minimum number of samples and the limit BLER given in table 14.18-2.

14.18.3.5.2 Statistical test with early pass / fail decision

Specific details on statistical testing of BER/BLER performance are defined in Annex 7.

Minimum test time due to fading conditions has to be considered before checking the conformance limits. The minimum test time for the specific fading condition are specified in the table 14.18.3.5-1.

Table 14.18.3.5-1: Minimum test time due to TU high fading conditions

TU high						
Frequency /MHz	400	700	850	900	1800	1900
Wave length / m	0,75	0,43	0,35	0,33	0,17	0,16
Min. Test time /s	214	204	201	190	95	90
hh:mm:ss	**00:03:34**	**00:03:24**	**00:03:21**	**00:03:10**	**00:01:35**	**00:01:30**

The statistical testing of the conformance requirement is done based on table 14.18.3.5-2. The table shows the values for MS with a single slot configuration. For MS multi slot configuration the number of blocks has to be increased accordingly.

Table 14.18.3.5-2: Statistical limits for adjacent channel rejection

GSM 400, GSM 700, GSM 850, GSM 900, DCS 1800 and PCS 1900						
Channel types	**Block per s**	**Org. BLER requirement**	**Derived test limit**	**Target number of samples**	**Target test time /s**	**Target test time /hh:mm:ss**
USF/MCS-1 to 9	50	0,01	0,01234	27958	559	00:09:19

14.18.3a Adjacent channel rejection in EGPRS2A configuration

14.18.3a.1 Definition

The adjacent channel selectivity is a measure of the capability of the receiver to receive wanted data packets without exceeding a given degradation due to the presence of an interfering signal (I1) in the adjacent channel. "Wanted signal" in this test is the signal generated by the transmitted RLC data blocks.

The adjacent channel can be the adjacent in the RF spectrum or in time. There are therefore two types of adjacent channel selectivity:

1) Adjacent RF channel selectivity which is specifically tested in this subclause.

2) Adjacent Time Slot selectivity, which is implicitly tested in test 14.18.2.

14.18.3a.2 Conformance requirement

1. For 8-PSK modulation, u under adjacent channel interference at 200 kHz above and below the wanted signal frequency and at the adjacent interference ratio (C/Ia1) specified in table 14.18-7b.

   1.1 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for PDTCH/DAS-5 to 7 shall not exceed 10 % depending on Coding Scheme; 3GPP TS 45.005, subclause 6.2.

   1.2 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for USF/DAS-5 to 7 shall not exceed 1 %; 3GPP TS 45.005, subclause 6.2.
   For 16-QAM modulation, under adjacent channel interference at 200 kHz above and below the wanted signal frequency and at the adjacent interference ratio (C/Ia1) specified in table 14.18-7c.

   1.3 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for PDTCH/DAS-8 to 9 shall not exceed 10 % depending on Coding Scheme; 3GPP TS 45.005, subclause 6.2.

   1.4 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for USF/DAS-8 to 9 shall not exceed 1 %; 3GPP TS 45.005, subclause 6.2.
   For 32-QAM modulation, under adjacent channel interference at 200 kHz above and below the wanted signal frequency and at the adjacent interference ratio (C/Ia1) specified in table 14.18-7d.

   1.5 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for PDTCH/DAS-10 to 12 shall not exceed 10 % or 30 % depending on Coding Scheme; 3GPP TS 45.005, subclause 6.2.

1.6 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for USF/DAS-10 to 12 shall not exceed 1 %; 3GPP TS 45.005, subclause 6.2.

Table 14.18-7b: Adjacent channel interference ratio at reference performance for 8-PSK modulated signals (EGPRS2-A DL)

GSM 850 and GSM 900						
Type of channel		Propagation conditions				
		TUlow (no FH)	TUlow (ideal FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
PDTCH/DAS-5	dB	3	(2)	-2,0	-3,0	-3
PDTCH/DAS-6	dB	3,5	(2)	-0,5	-1,5	-1
PDTCH/DAS-7	dB	4,5	(2)	1,5	0,5	2
USF/DAS-5 to 7	dB	(3)	(3)	(3)	(3)	(3)
DCS 1 800 and PCS 1900						
Type of channel		Propagation conditions				
		TUlow (no FH)	TUlow (ideal FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
PDTCH/DAS-5	dB	(2)	(2)	-2,5	(2)	(2)
PDTCH/DAS-6	dB	(2)	(2)	-0,5	(2)	(2)
PDTCH/DAS-7	dB	(2)	(2)	1,5	(2)	(2)
USF/DAS-5 to 7	dB	(3)	(3)	(3)	(3)	(3)

Performance is specified at 30% BLER for those cases identified with mark '**'
Performance is not specified for those cases identified with mark '-'

NOTE 1: Ideal FH case assumes perfect decorrelation between bursts. This case may only be tested if such a decorrelation is ensured in the test. For TUhigh (ideal FH), sufficient decorrelation may be achieved with 4 frequencies spaced over 5 MHz.

NOTE 2: The requirements for the DCS 1800 & PCS 1900 TUlow (no FH) propagation condition are the same as for the GSM 850 & GSM 900 TUlow (no FH) propagation condition, the requirements for the GSM 850 & GSM 900 TUlow (ideal FH), DCS 1800 & PCS 1900 TUlow (ideal FH) and DCS 1800 & PCS 1900 TUhigh (ideal FH) propagation conditions are the same as for the DCS 1800 & PCS 1900 TUhigh (no FH) propagation condition, and the requirements for the DCS 1800 & PCS 1900 RA (no FH) propagation condition are the same as for the GSM 850 & GSM 900 RA (no FH) propagation condition.

NOTE 3: The requirements for USF/DAS-5 to 7 are the same as for USF/MCS-5 to 9.

3GPP TS 45.005, table 2w and subclause 6.3.

Table 14.18-7c: Adjacent channel interference ratio at reference performance for 16-QAM modulated signals (EGPRS2-A DL)

GSM 850 and GSM 900						
Type of channel		Propagation conditions				
		TUlow (no FH)	TUlow (ideal FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
PDTCH/DAS-8	dB	7,5	(2)	4,5	4	5,5
PDTCH/DAS-9	dB	9,0	(2)	7,5	7	14,5
USF/DAS-8 to 9	dB	[tbd]	(2)	[tbd]	[tbd]	[tbd]
DCS 1 800 and PCS 1900						
Type of channel		Propagation conditions				
		TUlow (no FH)	TUlow (ideal FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
PDTCH/DAS-8	dB	(2)	(2)	5,0	(2)	(2)
PDTCH/DAS-9	dB	(2)	(2)	9,0	(2)	(2)
USF/DAS-8 to 9	dB	(2)	(2)	[tbd]	(2)	(2)

Performance is specified at 30% BLER for those cases identified with mark '**' Performance is not specified for those cases identified with mark '-' NOTE 1: Ideal FH case assumes perfect decorrelation between bursts. This case may only be tested if such a decorrelation is ensured in the test. For TUhigh (ideal FH), sufficient decorrelation may be achieved with 4 frequencies spaced over 5 MHz. NOTE 2: The requirements for the DCS 1800 & PCS 1900 TUlow (no FH) propagation condition are the same as for the GSM 850 & GSM 900 TUlow (no FH) propagation condition, the requirements for the GSM 850 & GSM 900 TUlow (ideal FH), DCS 1800 & PCS 1900 TUlow (ideal FH) and DCS 1800 & PCS 1900 TUhigh (ideal FH) propagation conditions are the same as for the DCS 1800 & PCS 1900 TUhigh (no FH) propagation condition, and the requirements for the DCS 1800 & PCS 1900 RA (no FH) propagation condition are the same as for the GSM 850 & GSM 900 RA (no FH) propagation condition.

3GPP TS 45.005, table 2w and subclause 6.3.

Table 14.18-7d: Adjacent channel interference ratio at reference performance for 32-QAM modulated signals (EGPRS2-A DL)

GSM 850 and GSM 900							
Type of channel		Propagation conditions					
		TUlow (no FH)	TUlow (ideal FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
PDTCH/DAS-10	dB	12,5	(2)	12	12	14,0**
PDTCH/DAS-11	dB	15,5	(2)	19	19,5	-
PDTCH/DAS-12	dB	17,5	(2)	19,5**	17,5**	-
USF/DAS-10 to 12	dB	[tbd]	(2)	[tbd]	[tbd]	[tbd]
DCS 1 800 and PCS 1900						
Type of channel		**Propagation conditions**				
		TUlow (no FH)	**TUlow (ideal FH)**	**TUhigh (no FH)**	**TUhigh (ideal FH)**	**RA (no FH)**
PDTCH/DAS-10	dB	(2)	(2)	16,0	(2)	(2)
PDTCH/DAS-11	dB	(2)	(2)	22,0**	(2)	(2)
PDTCH/DAS-12	dB	(2)	(2)	-	(2)	(2)
USF/DAS-10 to 12	dB	(2)	(2)	[tbd]	(2)	(2)
Performance is specified at 30% BLER for those cases identified with mark '**' Performance is not specified for those cases identified with mark '-' NOTE 1: Ideal FH case assumes perfect decorrelation between bursts. This case may only be tested if such a decorrelation is ensured in the test. For TUhigh (ideal FH), sufficient decorrelation may be achieved with 4 frequencies spaced over 5 MHz. NOTE 2: The requirements for the DCS 1800 & PCS 1900 TUlow (no FH) propagation condition are the same as for the GSM 850 & GSM 900 TUlow (no FH) propagation condition, the requirements for the GSM 850 & GSM 900 TUlow (ideal FH), DCS 1800 & PCS 1900 TUlow (ideal FH) and DCS 1800 & PCS 1900 TUhigh (ideal FH) propagation conditions are the same as for the DCS 1800 & PCS 1900 TUhigh (no FH) propagation condition, and the requirements for the DCS 1800 & PCS 1900 RA (no FH) propagation condition are the same as for the GSM 850 & GSM 900 RA (no FH) propagation condition.						

3GPP TS 45.005, table 2w and subclause 6.3.

2. For 8-PSK modulations, under adjacent channel interference conditions with interfering signals at 400 kHz above and below the wanted signal frequency and at the adjacent interference ratio (C/Ia2) exceeding C/Ic - 50dB. For 16-QAM and 32-QAM modulations, under adjacent channel interference conditions with interfering signals at 400 kHz above and below the wanted signal frequency and at the adjacent interference ratio (C/Ia2) exceeding C/Ic – 48dB.

   2.1 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for PDTCH/DAS-5 to 7 shall not exceed 10 % for 8PSK modulation; for PDTCH/DAS-8 to 9 shall not exceed 10 %; and for PDTCH/DAS-10 to 12 shall not exceed 10 % or 30 % depending on Coding Schemes; 3GPP TS 45.005, subclause 6.2.

   2.2 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for USF/DAS-5 to 12 shall not exceed 1 %; 3GPP TS 45.005, subclause 6.2.

C/Ic is the co-channel interference ratio. For a PDTCH with 8PSK modulation C/Ic is specified in table 14.18-5c; for a PDTCH with 16-QAM modulation C/Ic is specified in table 14.18-5d; for a PDTCH with 32-QAM modulation C/Ic is specified in table 14.18-5e, for a USF with 8-PSK modulation C/Ic is specified in tables 14.18-6c; for USF with 16-QAM modulation C/Ic is specified in table 14.18-6d; and for USF with 32-QAM modulation C/Ic is specified in table 14.18-6d.

3GPP TS 45.005, subclause 6.3.

3. The BLER shall not exceed the conformance requirements given in 1. and 2. under extreme conditions; 3GPP TS 45.005, subclause 6.2 and annex D subclauses D.2.1 and D.2.2.

3GPP TS 45.005 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.18.3a.3 Test purpose

1 To verify that the conformance requirements 1.1, 1.2, 1.3, 1.4, 1.5 and 1.6 are met with an allowance for the statistical significance of the test in the presence adjacent channel interferer under propagation condition TUhigh at 200 kHz above and below the wanted signal frequency.

2 To verify that the conformance requirements 2.1 and 2.2 are met with an allowance for the statistical significance of the test in the presence of a adjacent channel interferer under propagation condition TUhigh at 400 kHz above and below the wanted signal frequency.

3. To verify that Conformance Requirements are met under extreme conditions.

14.18.3a.4 Method of test

Initial conditions

For both 8-PSK, 16-QAM and 32-QAM modulations, a downlink TBF is set up according to the generic procedure specified in clause 40 for packet switched with an ARFCN in the mid ARFCN range, power control level set to maximum power. The power control parameter ALPHA (α) is set to 0. The SS transmits EGPRS RLC data blocks containing random data. In addition to the wanted test signal, the SS transmits an independent, uncorrelated interfering signal Standard Test Signal (I1). This unwanted signal is random, continuous and GMSK-modulated, and has no fixed relationship with the bit transitions of the wanted signal.

The fading characteristic of the wanted and the interfering signal is TUhigh/noFH

Test procedure

For 8-PSK Modulation:

a) The SS transmits packets on PDTCH using DAS-5 coding to the MS on all allocated timeslots.

b) The SS transmits the unwanted signal at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

c) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 44.060, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 2: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

d) Once the number of blocks transmitted with the current coding scheme as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

e) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

f) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

g) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

h) The SS repeats steps b) to g) for the coding scheme DAS-7 and for the coding scheme DAS-6 with the TU low fading condition for both the wanted and the interfering signal.

i) The SS repeats steps a) to h) under extreme test conditions for coding scheme DAS-6 only.

j) The SS establishes the normal test conditions. An uplink TBF shall be established.

k) The SS sets the value of the USF/DAS-5 such as to allocate the uplink to the MS.

l) The SS transmits the unwanted signal at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

m) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

n) Once the number of USF/DAS-5 allocating the uplink for the MS as counted in step m) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

o) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

p) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

q) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

r) The SS repeats steps k) to q) under extreme test conditions for coding scheme DAS-6.

For 16-QAM Modulation:

a) The SS transmits packets on PDTCH using DAS-8 coding to the MS on all allocated timeslots.

b) The SS transmits the unwanted signal at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

c) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 44.060, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 2: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

d) Once the number of blocks transmitted with the current coding scheme as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

e) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

f) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

g) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

h) The SS repeats steps b) to g) for each of the coding schemes DAS-9 and for the coding scheme DAS-9 with the TU low fading condition for both the wanted and the interfering signal.

i) The SS repeats steps a) to h) under extreme test conditions for coding scheme DAS-9 only.

j) The SS establishes the normal test conditions. An uplink TBF shall be established.

k) The SS sets the value of the USF/DAS-8 such as to allocate the uplink to the MS.

l) The SS transmits the unwanted signal at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

m) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

n) Once the number of USF/DAS-8 allocating the uplink for the MS as counted in step m) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

o) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

p) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

q) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

r) The SS repeats steps k) to q) under extreme test conditions for coding scheme DAS-9.

For 32-QAM Modulation:

a) The SS transmits packets on PDTCH using DAS-10 coding to the MS on all allocated timeslots.

b) The SS transmits the unwanted signal at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

c) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 44.060, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 2: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

d) Once the number of blocks transmitted with the current coding scheme as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

e) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

f) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

g) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

h) The SS repeats steps b) to g) for each of the coding schemes DAS-12 and for the coding scheme DAS-11 with the TU low fading condition for both the wanted and the interfering signal.

i) The SS repeats steps a) to h) under extreme test conditions for coding scheme DAS-11 only.

j) The SS establishes the normal test conditions. An uplink TBF shall be established.

k) The SS sets the value of the USF/DAS-10 such as to allocate the uplink to the MS.

l) The SS transmits the unwanted signal at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

m) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

n) Once the number of USF/DAS-10 allocating the uplink for the MS as counted in step m) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

o) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

p) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

q) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

r) The SS repeats steps k) to q) under extreme test conditions for coding scheme DAS-11.

14.18.3a.5 Test requirements

The block error ratio, as calculated by the SS for different channels with different coding schemes and under TUhigh propagation condition, under any combination of normal and extreme test voltages and ambient temperatures, shall not exceed the conformance requirement.

Testing of the conformance requirement for USF/DAS (5-12)can be done either with fixed minimum number of samples or based on the statistical test method that lead to an early pass/fail decision with test time significantly reduced for MS with BLER not on the limit.

14.18.3a.5.1 Fixed limit test with minimum number of samples

The fixed testing of the conformance requirement is done using the minimum number of samples and the limit BLER given in table 14.18-2.

14.18.3a.5.2 Statistical test with early pass / fail decision

Specific details on statistical testing of BER/BLER performance are defined in Annex 7.

Minimum test time due to fading conditions has to be considered before checking the conformance limits. The minimum test time for the specific fading condition are specified in the table 14.18.3a.5-1.

Table 14.18.3a.5-1: Minimum test time due to TU high fading conditions

TU high						
Frequency /MHz	400	700	850	900	1800	1900
Wave length / m	0,75	0,43	0,35	0,33	0,17	0,16
Min. Test time /s	214	204	201	190	95	90
hh:mm:ss	**00:03:34**	**00:03:24**	**00:03:21**	**00:03:10**	**00:01:35**	**00:01:30**

The statistical testing of the conformance requirement is done based on table 14.18.3a.5-2. The table shows the values for MS with a single slot configuration. For MS multi slot configuration the number of blocks has to be increased accordingly.

Table 14.18.3a.5-2: Statistical limits for adjacent channel rejection

GSM 400, GSM 700, GSM 850, GSM 900, DCS 1800 and PCS 1900						
Channel types	**Block per s**	**Org. BLER requirement**	**Derived test limit**	**Target number of samples**	**Target test time /s**	**Target test time /hh:mm:ss**
USF/MCS-1 to 9	50	0,01	0,01234	27958	559	00:09:19

14.18.3b Adjacent channel rejection for packet channels in TIGHTER configuration

14.18.3b.1 Definition

The adjacent channel selectivity is a measure of the capability of the receiver to receive wanted data packets without exceeding a given degradation due to the presence of an interfering signal (I1) in the adjacent channel. "Wanted signal" in this test is the signal generated by the transmitted RLC data blocks.

The adjacent channel can be the adjacent in the RF spectrum or in time. There are therefore two types of adjacent channel selectivity:

1) Adjacent RF channel selectivity which is specifically tested in this subclause.

2) Adjacent Time Slot selectivity, which is implicitly tested in test 14.18.2.

14.18.3b.2 Conformance requirement

For a MS indicating support for TIGHTER Capability (see 3GPP TS 24.008), the requirements for adjacent channel performance for packet switched channels in the tables 2g, 2i, 2l, 2n, 2w and 2af, are also valid for GSM 400 with the exception that MS speed is doubled, e.g. TU50 becomes TU100. For GSM 700 the values in tables 2g, 2i, 2l, 2n, 2v, 2w and 2af, are valid with the exception that GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60. the requirements for adjacent channel performance for packet switched channels in table 2y and 2af are also valid for GSM 400 with the exception that MS speed is doubled, e.g. TU50 becomes TU100. For GSM 700 the values in table 2y and 2af are valid with the exception that GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60.

1. For GMSK modulation, under adjacent channel interference at 200 kHz above and below the wanted signal frequency and at the adjacent interference ratio (C/Ia1) specified in table 14.18.3b-1.

Table 14.18.3b-1: Adjacent channel interference (C/Ia1) ratio for MS at reference performance for GMSK modulation (TIGHTER configuration)

GSM 850 and GSM 900						
Type of channel		Propagation conditions				
		TUlow (no FH)	TUlow (ideal FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
PDTCH/MCS-1	dB	-14	-17,5	-16,5	-18	-17
PDTCH/MCS-2	dB	-12	-14,5	-14,5	-15,5	-15
PDTCH/MCS-3	dB	-10,5	-1,5	-10	-10,5	-8
PDTCH/MCS-4	dB	-8	3,5	-5	-5,5	(note 1)
USF/MCS-1 to 4	(Note 3) dB	0	-8	-7	-8,5	-8,5
DCS 1 800 and PCS 1 900						
Type of Channel		Propagation conditions				
		TUlow (no FH)	TUlow (ideal FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
PDTCH/MCS-1	dB	-14	-17,5	-17	-18	-16
PDTCH/MCS-2	dB	-12	-15	-15	-15,5	-14
PDTCH/MCS-3	dB	-10,5	-10,5	-10	-9,5	-7
PDTCH/MCS-4	dB	-8	-5,5	-4	-4,5	(note 1)
USF/MCS-1 to 4	(Note 3) dB	0	-8	-8,5	-8,5	-8,5
NOTE1: PDTCH for MCS-x cannot meet the reference performance for some propagation conditions.						
NOTE 2: Performance is specified at 30% BLER for some cases.						
NOTE 3: For USF C/Ia1 = C/Ic - 18 dB (TS 45.005 subclause 6.3.3) applies, where C/Ic is stated in table 2a of TS 45.005. No TIGHTER values for USF are specified in table 2af of TS 45.005.						

3GPP TS 45.005, table 2af and subclause 6.3.3.

1.1 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for PDTCH/MCS-1 to 4 shall not exceed 10 %; 3GPP TS 45.005, subclause 6.2.

1.2 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for USF/MSC-1 to 4 shall not exceed 1 %; 3GPP TS 45.005, subclause 6.2.

For 8-PSK modulation, under adjacent channel interference at 200 kHz above and below the wanted signal frequency and at the adjacent interference ratio (C/Ia1) specified in table 14.18.3b-2.

1.3 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for PDTCH/MCS-5 to 9 shall not exceed 10 % or 30 % depending on Coding Scheme; 3GPP TS 45.005, subclause 6.2.

1.4 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for USF/MSC-5 to 9 shall not exceed 1 %; 3GPP TS 45.005, subclause 6.2.

Table 14.18.3b-2: Adjacent channel interference ratio (C/Ia1) for MS at reference performance for 8-PSK modulation (TIGHTER configuration)

GSM 850 and GSM 900						
Type of channel		**Propagation conditions**				
		TUlow (no FH)	**TUlow (ideal FH)**	**TUhigh (no FH)**	**TUhigh (ideal FH)**	**RA (no FH)**
PDTCH/MCS-5	dB	-9	-13,5	-12,5	-13,5	-13,5
PDTCH/MCS-6	dB	-7	-11	-10,5	-11,5	-10
PDTCH/MCS-7	dB	-2,5	-5	-4	-4	(note 1)
PDTCH/MCS-8	dB	5	-3(note 2)	-2,5(note 2)	-2,5(note 2)	(note 1)
PDTCH/MCS-9	dB	0.5 (note 2)	-1(note 2)	3(note 2)	3(note 2)	(note 1)
USF/MCS-5 to 9	dB	-1	-8,5	-8	-9,5	-9
DCS 1 800 and PCS 1 900						
Type of channel		**Propagation conditions**				
		TUlow (no FH)	**TUlow (ideal FH)**	**TUhigh (no FH)**	**TUhigh (ideal FH)**	**RA (no FH)**
PDTCH/MCS-5	dB	-9	-13,5	-13	-13	-13,5
PDTCH/MCS-6	dB	-7	-11	-11	-11	-10
PDTCH/MCS-7	dB	-2,5	-5	-2,5	-2,5	(note 1)
PDTCH/MCS-8	dB	5	-3(note 2)	0(note 2)	0(note 2)	(note 1)
PDTCH/MCS-9	dB	0(note 2)	1,5(note 2)	(note 1)	(note 1)	(note 1)
USF/MCS-5 to 9	dB	-1	-8,5	-9	-9,5	-9
NOTE1: PDTCH for MCS-x can not meet the reference performance for some propagation conditions. NOTE 2: Performance is specified at 30% BLER for some cases.						

3GPP TS 45.005, table 2af and subclause 6.3.3.

2 For both GMSK and 8-PSK modulations, under adjacent channel interference conditions with interfering signals at 400 kHz above and below the wanted signal frequency and at the adjacent interference ratio (C/Ia2) exceeding C/Ic - 50dB.

2.1 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for PDTCH/MCS-1 to 4 shall not exceed 10 % for GMSK modulation; and for PDTCH/MCS-5 to 9 shall not exceed 10 % or 30 % depending on Coding Schemes; 3GPP TS 45.005, subclause 6.2.

2.2 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for USF/MSC-1 to 9 shall not exceed 1 %; 3GPP TS 45.005, subclause 6.2.

C/Ic is the co-channel interference ratio. For a PDTCH with GMSK modulation C/Ic is specified in table 14.18-5a; for a PDTCH with 8-PSK modulation C/Ic is specified in table 14.18-5b, for a USF with GMSK modulation C/Ic is specified in tables 14.18-6a; and for USF with 8-PSK modulation C/Ic is specified in table 14.18-6b. 3GPP TS 45.005, subclause 6.3.

3. The BLER shall not exceed the conformance requirements given in 1. and 2. under extreme conditions; 3GPP TS 45.005, subclause 6.2 and annex D subclauses D.2.1 and D.2.2.

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.18.3b.3 Test purpose

1 To verify that the conformance requirements 1.1, 1.2, 1.3 and 1.4 are met with an allowance for the statistical significance of the test in the presence of a GMSK modulated adjacent channel interferer under propagation condition TUhigh at 200 kHz above and below the wanted signal frequency.

2 To verify that the conformance requirements 2.1 and 2.2 are met with an allowance for the statistical significance of the test in the presence of a GMSK modulated adjacent channel interferer under propagation condition TUhigh at 400 kHz above and below the wanted signal frequency.

3. To verify that Conformance Requirements are met under extreme conditions.

14.18.3b.4 Method of test

Initial conditions

For both GMSK and 8-PSK modulations, a downlink TBF is set up according to the generic procedure specified in clause 40 for packet switched with an ARFCN in the mid ARFCN range, power control level set to maximum power. The power control parameter ALPHA (α) is set to 0. The SS transmits EGPRS RLC data blocks containing random data. In addition to the wanted test signal, the SS transmits an independent, uncorrelated interfering signal Standard Test Signal (I1). This unwanted signal is random, continuous and GMSK-modulated, and has no fixed relationship with the bit transitions of the wanted signal.

The fading characteristic of the wanted and the interfering signal is TUhigh/noFH

Test procedure

For GMSK Modulation:

a) The SS transmits packets on PDTCH using MCS-1 coding to the MS on all allocated timeslots.

b) The SS transmits the unwanted signal at a nominal frequency 200kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

c) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 1: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

d) Once the number of blocks transmitted with the current coding scheme as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

e) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

f) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

g) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

h) The SS repeats steps b) to g) for each of the coding schemes MCS-2 to 4.

i) The SS repeats steps a) to g) under extreme test conditions for MCS-4 coding scheme only.

j) The SS establishes the normal test conditions. An uplink TBF shall be established.

k) The SS sets the value of the USF/MCS-1 such as to allocate the uplink to the MS.

l) The SS transmits the unwanted signal at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

m) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

n) Once the number of USF/MCS-1 allocating the uplink for the MS as counted in step m) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

o) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set at to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

p) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

q) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

r) The SS repeats steps k) to q) under extreme test conditions for coding scheme USF/MCS-4.

For 8-PSK Modulation:

a) The SS transmits packets on PDTCH using MCS-5 coding to the MS on all allocated timeslots.

b) The SS transmits the unwanted signal at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

c) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 2: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

d) Once the number of blocks transmitted with the current coding scheme as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

e) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

f) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

g) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

h) The SS repeats steps b) to g) for each of the coding schemes MCS-6 to 8 and for the coding scheme MCS-9 with the TU low fading condition for both the wanted and the interfering signal.

i) The SS repeats steps a) to h) under extreme test conditions for coding scheme MCS-9 only.

j) The SS establishes the normal test conditions. An uplink TBF shall be established.

k) The SS sets the value of the USF/MCS-5 such as to allocate the uplink to the MS.

l) The SS transmits the unwanted signal at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

m) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

n) Once the number of USF/MCS-5 allocating the uplink for the MS as counted in step m) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

o) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

p) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

q) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

r) The SS repeats steps k) to q) under extreme test conditions for coding scheme MCS-9.

14.18.3b.5 Test requirements

The block error ratio, as calculated by the SS for different channels with different coding schemes and under TUhigh propagation condition, under any combination of normal and extreme test voltages and ambient temperatures, shall not exceed the conformance requirement.

Testing of the conformance requirement for USF/MCS (1-9)can be done either with fixed minimum number of samples or based on the statistical test method that lead to an early pass/fail decision with test time significantly reduced for MS with BLER not on the limit.

14.18.3b.5.1 Fixed limit test with minimum number of samples

The fixed testing of the conformance requirement is done using the minimum number of samples and the limit BLER given in table 14.18-2.

14.18.3b.5.2 Statistical test with early pass / fail decision

Specific details on statistical testing of BER/BLER performance are defined in Annex 7.

Minimum test time due to fading conditions has to be considered before checking the conformance limits. The minimum test time for the specific fading condition are specified in the table 14.18.3b-3.

Table 14.18.3b-3: Minimum test time due to TU high fading conditions

TU high						
Frequency /MHz	400	700	850	900	1800	1900
Wave length / m	0,75	0,43	0,35	0,33	0,17	0,16
Min. Test time /s	214	204	201	190	95	90
hh:mm:ss	**00:03:34**	**00:03:24**	**00:03:21**	**00:03:10**	**00:01:35**	**00:01:30**

The statistical testing of the conformance requirement is done based on table 14.18.3b-4. The table shows the values for MS with a single slot configuration. For MS multi slot configuration the number of blocks has to be increased accordingly.

Table 14.18.3b-4: Statistical limits for adjacent channel rejection

GSM 400, GSM 700, GSM 850, GSM 900, DCS 1800 and PCS 1900						
Channel types	**Block per s**	**Org. BLER requirement**	**Derived test limit**	**Target number of samples**	**Target test time /s**	**Target test time /hh:mm:ss**
USF/MCS-1 to 9	50	0,01	0,01234	27958	559	00:09:19

14.18.3c Adjacent channel rejection in EGPRS2A configuration with TIGHTER configuration

14.18.3c.1 Definition

The adjacent channel selectivity is a measure of the capability of the receiver to receive wanted data packets without exceeding a given degradation due to the presence of an interfering signal (I1) in the adjacent channel. "Wanted signal" with additional TIGHTER requirements in this test is the signal generated by the transmitted RLC data blocks.

The adjacent channel can be the adjacent in the RF spectrum or in time. There are therefore two types of adjacent channel selectivity:

1) Adjacent RF channel selectivity which is specifically tested in this subclause.

2) Adjacent Time Slot selectivity, which is implicitly tested in test 14.18.2.

14.18.3c.2 Conformance requirement

1. For 8-PSK modulation, u under adjacent channel interference at 200 kHz above and below the wanted signal frequency and at the adjacent interference ratio (C/Ia1) specified in table 14.18-7b and table 14.18-7e.

   1.1 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for PDTCH/DAS-5 to 7 shall not exceed 10 % depending on Coding Scheme; 3GPP TS 45.005, subclause 6.2.

   1.2 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for USF/DAS-5 to 7 shall not exceed 1 %; 3GPP TS 45.005, subclause 6.2.
   For 16-QAM modulation, under adjacent channel interference at 200 kHz above and below the wanted signal frequency and at the adjacent interference ratio (C/Ia1) specified in table 14.18-7c and table 14.18-7e.

   1.3 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for PDTCH/DAS-8 to 9 shall not exceed 10 % depending on Coding Scheme; 3GPP TS 45.005, subclause 6.2.

   1.4 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for USF/DAS-8 to 9 shall not exceed 1 %; 3GPP TS 45.005, subclause 6.2.
   For 32-QAM modulation, under adjacent channel interference at 200 kHz above and below the wanted signal frequency and at the adjacent interference ratio (C/Ia1) specified in table 14.18-7d and table 14.18-7e.

   1.5 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for PDTCH/DAS-10 to 12 shall not exceed 10 % or 30 % depending on Coding Scheme; 3GPP TS 45.005, subclause 6.2.

   1.6 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for USF/DAS-10 to 12 shall not exceed 1 %; 3GPP TS 45.005, subclause 6.2.

Table 14.18-7b: Adjacent channel interference ratio at reference performance for 8-PSK modulated signals (EGPRS2-A DL)

GSM 850 and GSM 900						
Type of channel		Propagation conditions				
		TUlow (no FH)	TUlow (ideal FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
PDTCH/DAS-5	dB	[-8,5]	(2)	[-12]	[-13]	[-12]
PDTCH/DAS-6	dB	[-8]	(2)	[-10,5]	[-11,5]	[-10]
PDTCH/DAS-7	dB	[-7]	(2)	[-8,5]	[-9,5]	[-7]
DCS 1 800 and PCS 1900						
Type of channel		Propagation conditions				
		TUlow (no FH)	TUlow (ideal FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
PDTCH/DAS-5	dB	(2)	(2)	[-12,5]	(2)	(2)
PDTCH/DAS-6	dB	(2)	(2)	[-10,5]	(2)	(2)
PDTCH/DAS-7	dB	(2)	(2)	[-8,5]	(2)	(2)

Performance is specified at 30% BLER for those cases identified with mark '**'
NOTE 1: The specification for SDCCH applies also for BCCH, AGCH, PCH, SACCH. The actual performance of SACCH, particularly for the C/I TU3 (no FH) and TU 1.5 (no FH) cases should be better.
NOTE 2: The requirements for the DCS 1800 & PCS 1900 TU1.5 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 TU3 (no FH) propagation condition, the requirements for the GSM 850 & GSM 900 TU3 (ideal FH), DCS 1800 & PCS 1900 TU1.5 (ideal FH) and DCS 1800 & PCS 1900 TU50 (ideal FH) propagation conditions are the same as for the DCS 1800 & PCS 1900 TU50 (no FH) propagation condition, and the requirements for the DCS 1800 & PCS 1900 RA130 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 RA250 (no FH) propagation condition.

3GPP TS 45.005, table 2af and subclause 6.3.

Table 14.18-7c: Adjacent channel interference ratio at reference performance for 16-QAM modulated signals (EGPRS2-A DL)

GSM 850 and GSM 900						
Type of channel		Propagation conditions				
		TUlow (no FH)	TUlow (ideal FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
PDTCH/DAS-8	dB	[-2]	(2)	[-5,5]	[-5,5]	[-2]
PDTCH/DAS-9	dB	[-0,5]	(2)	[-2,5]	[-2,5]	[7]
DCS 1 800 and PCS 1900						
Type of channel		Propagation conditions				
		TUlow (no FH)	TUlow (ideal FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
PDTCH/DAS-8	dB	(2)	(2)	[-4]	(2)	(2)
PDTCH/DAS-9	dB	(2)	(2)	[0]	(2)	(2)
Performance is specified at 30% BLER for those cases identified with mark '**' NOTE 1: The specification for SDCCH applies also for BCCH, AGCH, PCH, SACCH. The actual performance of SACCH, particularly for the C/I TU3 (no FH) and TU 1.5 (no FH) cases should be better. NOTE 2: The requirements for the DCS 1800 & PCS 1900 TU1.5 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 TU3 (no FH) propagation condition, the requirements for the GSM 850 & GSM 900 TU3 (ideal FH), DCS 1800 & PCS 1900 TU1.5 (ideal FH) and DCS 1800 & PCS 1900 TU50 (ideal FH) propagation conditions are the same as for the DCS 1800 & PCS 1900 TU50 (no FH) propagation condition, and the requirements for the DCS 1800 & PCS 1900 RA130 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 RA250 (no FH) propagation condition.						

3GPP TS 45.005, table 2af and subclause 6.3.

Table 14.18-7d: Adjacent channel interference ratio at reference performance for 32-QAM modulated signals (EGPRS2-A DL)

GSM 850 and GSM 900						
Type of channel		Propagation conditions				
		TUlow (no FH)	TUlow (ideal FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
PDTCH/DAS-10	dB	[10,5]	(2)	[7]	[9]	[8,5**]
PDTCH/DAS-11	dB	[13,5]	(2)	[14]	[16,5]	-
PDTCH/DAS-12	dB	[15,5]	(2)	[14,5**]	[14,5**]	-
DCS 1 800 and PCS 1900						
Type of channel		Propagation conditions				
		TUlow (no FH)	TUlow (ideal FH)	TUhigh (no FH)	TUhigh (ideal FH)	RA (no FH)
PDTCH/DAS-10	dB	(2)	(2)	[8]	(2)	(2)
PDTCH/DAS-11	dB	(2)	(2)	[14**]	(2)	(2)
PDTCH/DAS-12	dB	(2)	(2)	-	(2)	(2)

Performance is specified at 30% BLER for those cases identified with mark '**' NOTE 1: The specification for SDCCH applies also for BCCH, AGCH, PCH, SACCH. The actual performance of SACCH, particularly for the C/I TU3 (no FH) and TU 1.5 (no FH) cases should be better. NOTE 2: The requirements for the DCS 1800 & PCS 1900 TU1.5 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 TU3 (no FH) propagation condition, the requirements for the GSM 850 & GSM 900 TU3 (ideal FH), DCS 1800 & PCS 1900 TU1.5 (ideal FH) and DCS 1800 & PCS 1900 TU50 (ideal FH) propagation conditions are the same as for the DCS 1800 & PCS 1900 TU50 (no FH) propagation condition, and the requirements for the DCS 1800 & PCS 1900 RA130 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 RA250 (no FH) propagation condition.

3GPP TS 45.005, table 2af and subclause 6.3.

Table 14.18-7e: USF Co-channel Interference Ratio for 8-PSK modulation, 16-QAM modulation and 32-QAM modulation

GSM 850 and GSM 900						
Type of channel		Propagation conditions				
		TU3 (no FH)	TU3 (ideal FH)	TU50 (no FH)	TU50 (ideal FH)	RA250 (no FH)
USF/DAS-5 to 7	dB	(3)	(3)	(3)	(3)	(3)
USF/DAS-8 to 9	dB	-6,0	(2)	-14,0	-15,5	-16,0
USF/DAS-10 to 12	dB	-5,5	(2)	-13,0	-14,5	-14,0
DCS 1 800 and PCS 1900						
Type of channel		Propagation conditions				
		TU1,5 (no FH)	TU1,5 (ideal FH)	TU50 (no FH)	TU50 (ideal FH)	RA130 (no FH)
USF/DAS-5 to 7	dB	(3)	(3)	(3)	(3)	(3)
USF/DAS-8 to 9	dB	(2)	(2)	-14,0	(2)	(2)
USF/DAS-10 to 12	dB	(2)	(2)	-13,5	(2)	(2)
Performance is specified at 30% BLER for those cases identified with mark '**' Performance is not specified for those cases identified with mark '-' NOTE 1: Ideal FH case assumes perfect decorrelation between bursts. This case may only be tested if such a decorrelation is ensured in the test. For TU50 (ideal FH), sufficient decorrelation may be achieved with 4 frequencies spaced over 5 MHz. NOTE 2: The requirements for the DCS 1800 & PCS 1900 TU1.5 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 TU3 (no FH) propagation condition, the requirements for the GSM 850 & GSM 900 TU3 (ideal FH), DCS 1800 & PCS 1900 TU1.5 (ideal FH) and DCS 1800 & PCS 1900 TU50 (ideal FH) propagation conditions are the same as for the DCS 1800 & PCS 1900 TU50 (no FH) propagation condition, and the requirements for the DCS 1800 & PCS 1900 RA130 (no FH) propagation condition are the same as for the GSM 850 & GSM 900 RA250 (no FH) propagation condition. NOTE 3: The requirements for USF/DAS-5 to 7 are the same as for USF/MCS-5 to 9.						

3GPP TS 45.005, table 2w and subclause 6.3.

2. For 8-PSK modulations, under adjacent channel interference conditions with interfering signals at 400 kHz above and below the wanted signal frequency and at the adjacent interference ratio (C/Ia2) exceeding C/Ic - 50dB. For 16-QAM and 32-QAM modulations, under adjacent channel interference conditions with interfering signals at 400 kHz above and below the wanted signal frequency and at the adjacent interference ratio (C/Ia2) exceeding C/Ic – 48dB.

   2.1 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for PDTCH/DAS-5 to 7 shall not exceed 10 % for 8PSK modulation; for PDTCH/DAS-8 to 9 shall not exceed 10 %; and for PDTCH/DAS-10 to 12 shall not exceed 10 % or 30 % depending on Coding Schemes; 3GPP TS 45.005, subclause 6.2.

   2.2 For a TUhigh faded wanted signal and a TUhigh adjacent channel interferer, The block error rate (BLER) performance for USF/DAS-5 to 12 shall not exceed 1 %; 3GPP TS 45.005, subclause 6.2.

   C/Ic is the co-channel interference ratio. For a PDTCH with 8PSK modulation C/Ic is specified in table 14.18-5c; for a PDTCH with 16-QAM modulation C/Ic is specified in table 14.18-5d; for a PDTCH with 32-QAM modulation C/Ic is specified in table 14.18-5e, for a USF with 8-PSK modulation C/Ic is specified in tables 14.18-6c; for USF with 16-QAM modulation C/Ic is specified in table 14.18-6d; and for USF with 32-QAM modulation C/Ic is specified in table 14.18-6d.

3GPP TS 45.005, subclause 6.3.

3. The BLER shall not exceed the conformance requirements given in 1. and 2. under extreme conditions; 3GPP TS 45.005, subclause 6.2 and annex D subclauses D.2.1 and D.2.2.

3GPP TS 45.005 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.18.3c.3 Test purpose

1 To verify that the conformance requirements 1.1, 1.2, 1.3, 1.4, 1.5 and 1.6 are met with an allowance for the statistical significance of the test in the presence adjacent channel interferer under propagation condition TUhigh at 200 kHz above and below the wanted signal frequency.

2 To verify that the conformance requirements 2.1 and 2.2 are met with an allowance for the statistical significance of the test in the presence of a adjacent channel interferer under propagation condition TUhigh at 400 kHz above and below the wanted signal frequency.

3. To verify that Conformance Requirements are met under extreme conditions.

14.18.3c.4 Method of test

Initial conditions

For both 8-PSK, 16-QAM and 32-QAM modulations, a downlink TBF is set up according to the generic procedure specified in clause 40 for packet switched with an ARFCN in the mid ARFCN range, power control level set to maximum power. The power control parameter ALPHA (α) is set to 0. The SS transmits EGPRS RLC data blocks containing random data. In addition to the wanted test signal, the SS transmits an independent, uncorrelated interfering signal Standard Test Signal (I1). This unwanted signal is random, continuous and GMSK-modulated, and has no fixed relationship with the bit transitions of the wanted signal.

The fading characteristic of the wanted and the interfering signal is TUhigh/noFH

Test procedure

For 8-PSK Modulation:

a) The SS transmits packets on PDTCH using DAS-5 coding to the MS on all allocated timeslots.

b) The SS transmits the unwanted signal at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

c) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 44.060, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 2: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

d) Once the number of blocks transmitted with the current coding scheme as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

e) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

f) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

g) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

h) The SS repeats steps b) to g) for the coding scheme DAS-7 and for the coding scheme DAS-6 with the TU low fading condition for both the wanted and the interfering signal.

i) The SS repeats steps a) to h) under extreme test conditions for coding scheme DAS-6 only.

j) The SS establishes the normal test conditions. An uplink TBF shall be established.

k) The SS sets the value of the USF/DAS-5 such as to allocate the uplink to the MS.

l) The SS transmits the unwanted signal at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

m) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

n) Once the number of USF/DAS-5 allocating the uplink for the MS as counted in step m) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

o) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

p) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

q) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

r) The SS repeats steps k) to q) under extreme test conditions for coding scheme DAS-6.

For 16-QAM Modulation:

a) The SS transmits packets on PDTCH using DAS-8 coding to the MS on all allocated timeslots.

b) The SS transmits the unwanted signal at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

c) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 44.060, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 2: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

d) Once the number of blocks transmitted with the current coding scheme as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

e) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

f) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

g) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

h) The SS repeats steps b) to g) for each of the coding schemes DAS-9 and for the coding scheme DAS-9 with the TU low fading condition for both the wanted and the interfering signal.

i) The SS repeats steps a) to h) under extreme test conditions for coding scheme DAS-9 only.

j) The SS establishes the normal test conditions. An uplink TBF shall be established.

k) The SS sets the value of the USF/DAS-8 such as to allocate the uplink to the MS.

l) The SS transmits the unwanted signal at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

m) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

n) Once the number of USF/DAS-8 allocating the uplink for the MS as counted in step m) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

o) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

p) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

q) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

r) The SS repeats steps k) to q) under extreme test conditions for coding scheme DAS-9.

For 32-QAM Modulation:

a) The SS transmits packets on PDTCH using DAS-10 coding to the MS on all allocated timeslots.

b) The SS transmits the unwanted signal at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

c) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 44.060, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 2: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

d) Once the number of blocks transmitted with the current coding scheme as counted in step c) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

e) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

f) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

g) The SS repeats steps c) and d) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

h) The SS repeats steps b) to g) for each of the coding schemes DAS-12 and for the coding scheme DAS-11 with the TU low fading condition for both the wanted and the interfering signal.

i) The SS repeats steps a) to h) under extreme test conditions for coding scheme DAS-11 only.

j) The SS establishes the normal test conditions. An uplink TBF shall be established.

k) The SS sets the value of the USF/DAS-10 such as to allocate the uplink to the MS.

l) The SS transmits the unwanted signal at a nominal frequency 200 kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

m) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

n) Once the number of USF/DAS-10 allocating the uplink for the MS as counted in step m) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

o) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 200 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

p) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz above the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

q) The SS repeats steps m) and n) with the unwanted signal transmitted at a nominal frequency 400 kHz below the nominal frequency of the wanted signal and its amplitude is set to achieve the adjacent interference ratio 1dB above that specified in the conformance requirements.

r) The SS repeats steps k) to q) under extreme test conditions for coding scheme DAS-11.

14.18.3c.5 Test requirements

The block error ratio, as calculated by the SS for different channels with different coding schemes and under TUhigh propagation condition, under any combination of normal and extreme test voltages and ambient temperatures, shall not exceed the conformance requirement.

Testing of the conformance requirement for USF/DAS (5-12)can be done either with fixed minimum number of samples or based on the statistical test method that lead to an early pass/fail decision with test time significantly reduced for MS with BLER not on the limit.

14.18.3c.5.1 Fixed limit test with minimum number of samples

The fixed testing of the conformance requirement is done using the minimum number of samples and the limit BLER given in table 14.18-2.

14.18.3c.5.2 Statistical test with early pass / fail decision

Specific details on statistical testing of BER/BLER performance are defined in Annex 7.

Minimum test time due to fading conditions has to be considered before checking the conformance limits. The minimum test time for the specific fading condition are specified in the table 14.18.3c.5-1.

Table 14.18.3c.5-1: Minimum test time due to TU high fading conditions

TU high						
Frequency/MHz	400	700	850	900	1800	1900
Wave length / m	0,75	0,43	0,35	0,33	0,17	0,16
Min. Test time /s	214	204	201	190	95	90
hh:mm:ss	**00:03:34**	**00:03:24**	**00:03:21**	**00:03:10**	**00:01:35**	**00:01:30**

The statistical testing of the conformance requirement is done based on table 14.18.3a.5-2. The table shows the values for MS with a single slot configuration. For MS multi slot configuration the number of blocks has to be increased accordingly.

Table 14.18.3c.5-2: Statistical limits for adjacent channel rejection

GSM 400, GSM 700, GSM 850, GSM 900, DCS 1800 and PCS 1900						
Channel types	**Block per s**	**Org. BLER requirement**	**Derived test limit**	**Target number of samples**	**Target test time /s**	**Target test time /hh:mm:ss**
USF/MCS-1 to 9	50	0,01	0,01234	27958	559	00:09:19

14.18.4 Intermodulation rejection

14.18.4.1 Definition

The intermodulation rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of two or more unwanted signals with a specific frequency relationship to the wanted signal frequency. "Wanted signal" in this test is the signal generated by the transmitted RLC data blocks.

14.18.4.2 Conformance requirement

In the presence of two unwanted signals with a specific frequency relationship to the wanted signal frequency in both GMSK and 8-PSK modulations

1. The block error rate (BLER) performance for PDTCH/MCS1 to 4 shall not exceed 10 % and for PDTCH/MCS5 to 9 shall not exceed 10 % or 30 % depending on Coding Schemes; 3GPP TS 05.05, subclause 6.2.

2. The block error rate (BLER) performance for USF/MSC-1 to 9 shall not exceed 1 %; 3GPP TS 05.05, subclause 6.2.

3. The BLER shall not exceed the conformance requirements given in 1. - 2. under extreme conditions; 3GPP TS 05.05, subclause 6.2 and annex D subclauses D.2.1 and D.2.2.

14.18.4.3 Test purpose

1. To verify that the MS does not exceed the conformance requirements for different channels and coding schemes under the static condition with an allowance for the statistical significance of the test.

2. To verify that Conformance Requirements are met under extreme conditions.

14.18.4.4 Method of test

NOTE: The measurements address the third order intermodulation, which represents the most serious case.

Initial conditions

For both GMSK and 8-PSK modulations, a downlink TBF is set up according to the generic procedure specified in clause 40 for packet switched with an ARFCN in the Mid ARFCN range, power control level set to maximum. The power control parameter ALPHA (α) is set to 0.

The SS transmits EGPRS RLC data blocks containing random data. The amplitude of the wanted signal is set to 4 dB above the reference sensitivity level with appropriate correction value as specified in table 14.18-3a for GMSK modulation and table 14.18-3b for 8-PSK modulation for PDTCH channel and in tables 14.18-4a for GMSK modulation and 14.18-4b for 8-PSK modulation for USF channel.

In addition to the static wanted test signal, the SS transmits two static interfering (unwanted) signals at the same time. There is no correlation in the modulation between the signals.

Test procedure

For GMSK modulation:

a) The SS transmits packets on PDTCH using MCS-4 coding to the MS on all allocated timeslots.

b) The first interfering signal is on a frequency equal to the centre frequency of an ARFCN four above the ARFCN of the wanted signal. This signal is static, continuous and unmodulated.

c) The second interfering signal is on an ARFCN eight above the ARFCN of the wanted signal. This signal is static, continuous and GMSK modulated by random data (I1).

The amplitude of both the interfering signals is set according to table 14.18-8.

d) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 1: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

e) Once the number of blocks transmitted with the current coding scheme as counted in step d) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

f) The SS repeats steps d) and e) with the two unwanted signals having frequencies corresponding to ARFCN four and eight below the ARFCN of the wanted signal.

g) The SS repeats steps a) to f) with the receiver operating on an ARFCN in the Low ARFCN.

h) The SS repeats steps a) to f) with the receiver operating on an ARFCN in the High ARFCN range.

i) The SS repeats steps a) to f) for each of the coding schemes MCS-1 to 3.

j) Steps a) to h) are repeated under extreme test conditions for MCS-4 only.

k) The SS establishes the normal test conditions. An uplink TBF shall be established.

l) The SS sets the value of the USF/MCS-4 such as to allocate the uplink to the MS.

m) The first interfering signal is on a frequency equal to the centre frequency of an ARFCN four above the ARFCN of the wanted signal. This signal is static, continuous and unmodulated.

n) The second interfering signal is on an ARFCN eight above the ARFCN of the wanted signal. This signal is static, continuous and GMSK modulated by random data (I1).

The amplitude of both the interfering signals is set according to table 14.18-8.

o) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

p) Once the number of USF/MCS-4 allocating the uplink for the MS as counted in step o) reaches or exceeds the minimum number of blocks as given in table 14-18-2, the SS calculates the Block error ratio. The SS resets both counters.

q) The SS repeats steps o) and p) with the two unwanted signals having frequencies corresponding to ARFCN four and eight below the ARFCN of the wanted signal.

r) The SS repeats steps l) to q) with the receiver operating on an ARFCN in the Low ARFCN.

s) The SS repeats steps l) to q) with the receiver operating on an ARFCN in the High ARFCN range.

t) The SS repeats steps l) to s) under extreme test conditions for MCS-4.

For 8-PSK Modulation:

a) The SS transmits packets on PDTCH using MCS-9 coding to the MS on all allocated timeslots.

b) The first interfering signal is on a frequency equal to the centre frequency of an ARFCN four above the ARFCN of the wanted signal. This signal is static, continuous and unmodulated.

c) The second interfering signal is on an ARFCN eight above the ARFCN of the wanted signal. This signal is static, continuous and GMSK modulated by random data (I1).

The amplitude of both the interfering signals is set according to table 14.18-8.

d) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 04.60, 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 2: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

e) Once the number of blocks transmitted with the current coding scheme as counted in step d) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

f) The SS repeats steps d) and e) with the two unwanted signals having frequencies corresponding to ARFCN four and eight below the ARFCN of the wanted signal.

g) The SS repeats steps a) to f) with the receiver operating on an ARFCN in the Low ARFCN.

h) The SS repeats steps a) to f) with the receiver operating on an ARFCN in the High ARFCN range.

i) The SS repeats steps a) to f) for each of the coding schemes MCS-5,6,7 and 8 with the receiver operating on an ARFCN in the Middle ARFCN range.

j) The SS repeats steps a) to h) under extreme test conditions for MCS-9 only.

k) The SS establishes the normal test conditions. An uplink TBF shall be established.

l) The SS sets the value of the USF/MCS-9 such as to allocate the uplink to the MS.

m) The first interfering signal is on a frequency equal to the centre frequency of an ARFCN four above the ARFCN of the wanted signal. This signal is static, continuous and unmodulated.

n) The second interfering signal is on an ARFCN eight above the ARFCN of the wanted signal. This signal is static, continuous and GMSK modulated by random data (I1).

The amplitude of both the interfering signals is set according to table 14.18-8.

o) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

p) Once the number of USF/MCS-9 allocating the uplink for the MS as counted in step o) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

q) The SS repeats steps o) and p) with the two unwanted signals having frequencies corresponding to ARFCN four and eight below the ARFCN of the wanted signal.

r) The SS repeats steps l) to q) with the receiver operating on an ARFCN in the Low ARFCN

s) The SS repeats steps l) to q) with the receiver operating on an ARFCN in the High ARFCN range.

t) The SS repeats steps l) to s) under extreme test conditions for MCS-9 only.

Table 14.18-8: Intermodulation interfering test signal levels

	GSM 400, GSM 700, T-GSM 810, GSM 850, GSM 900, PCS 1 900		DCS 1 800	
	Small MS	Other MS	Class 1 and 2	Class 3
FIRST INTERFERER dBμVemf( )	64	74	64	68
SECOND INTERFERER dBμVemf( )	63	63	64	68

NOTE: Some of the levels in table 14.18-8 are different to those specified in 3GPP TS 05.05 due to the consideration of the effect of modulation sideband noise from the second interferer.

14.18.4.5 Test requirements

The block error ratio, as calculated by the SS for different channels with different coding schemes and under static condition, under any combination of normal and extreme test voltages and ambient temperatures, shall not exceed the conformance requirement.

14.18.4a Intermodulation rejection in EGPRS2A configuration

14.18.4a.1 Definition

The intermodulation rejection is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of two or more unwanted signals with a specific frequency relationship to the wanted signal frequency. "Wanted signal" in this test is the signal generated by the transmitted RLC data blocks.

14.18.4a.2 Conformance requirement

In the presence of two unwanted signals with a specific frequency relationship to the wanted signal frequency in both GMSK and 8-PSK modulations

1. The block error rate (BLER) performance for PDTCH/DAS5 to 12 shall not exceed 10 % or 30 % depending on Coding Schemes.

   3GPP TS 45.005, subclause 6.2.

2. The block error rate (BLER) performance for USF/DAS-5 to 12 shall not exceed 1 %

   3GPP TS 45.005, subclause 6.2.

3. The BLER shall not exceed the conformance requirements given in 1. - 2. under extreme conditions

   3GPP TS 45.005, subclause 6.2 and annex D subclauses D.2.1 and D.2.2.

14.18.4a.3 Test purpose

1. To verify that the MS does not exceed the conformance requirements for different channels and coding schemes under the static condition with an allowance for the statistical significance of the test.

2. To verify that Conformance Requirements are met under extreme conditions.

14.18.4a.4 Method of test

NOTE: The measurements address the third order intermodulation, which represents the most serious case.

Initial conditions

For 8-PSK, 16QAM and 32QAM modulations, a downlink TBF is set up according to the generic procedure specified in clause 40 for packet switched with an ARFCN in the Mid ARFCN range, power control level set to maximum. The power control parameter ALPHA (α) is set to 0.

The SS transmits EGPRS RLC data blocks containing random data. The amplitude of the wanted signal is set to 4 dB above the reference sensitivity level with appropriate correction value as specified in table 14.18-3a for GMSK modulation and table 14.18.1a-1 for 8-PSK, 16QAM and 32QAM modulation for PDTCH channel and in tables 14.18-4a for GMSK modulation and 14.18.1a-2for 8-PSK, 16QAM and 32QAM modulation for USF channel.

In addition to the static wanted test signal, the SS transmits two static interfering (unwanted) signals at the same time. There is no correlation in the modulation between the signals.

Test procedure

For 8-PSK Modulation:

a) The SS transmits packets on PDTCH using DAS-7 coding to the MS on all allocated timeslots.

b) The first interfering signal is on a frequency equal to the centre frequency of an ARFCN four above the ARFCN of the wanted signal. This signal is static, continuous and unmodulated.

c) The second interfering signal is on an ARFCN eight above the ARFCN of the wanted signal. This signal is static, continuous and GMSK modulated by random data (I1).

The amplitude of both the interfering signals is set according to table 14.18-8a.

d) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 44.060, clause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

e) Once the number of blocks transmitted with the current coding scheme as counted in step d) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

f) The SS repeats steps d) and e) with the two unwanted signals having frequencies corresponding to ARFCN four and eight below the ARFCN of the wanted signal.

g) The SS repeats steps a) to f) with the receiver operating on an ARFCN in the Low ARFCN.

h) The SS repeats steps a) to f) with the receiver operating on an ARFCN in the High ARFCN range.

i) The SS repeats steps a) to f) for each of the coding schemes DAS-5 and 6 with the receiver operating on an ARFCN in the Middle ARFCN range.

j) The SS repeats steps a) to h) under extreme test conditions for DAS-7 only.

k) The SS establishes the normal test conditions. An uplink TBF shall be established.

l) The SS sets the value of the USF/DAS-7 such as to allocate the uplink to the MS.

m) The first interfering signal is on a frequency equal to the centre frequency of an ARFCN four above the ARFCN of the wanted signal. This signal is static, continuous and unmodulated.

n) The second interfering signal is on an ARFCN eight above the ARFCN of the wanted signal. This signal is static, continuous and GMSK modulated by random data (I1).

The amplitude of both the interfering signals is set according to table 14.18-8a.

o) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

p) Once the number of USF/DAS-7 allocating the uplink for the MS as counted in step o) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

q) The SS repeats steps o) and p) with the two unwanted signals having frequencies corresponding to ARFCN four and eight below the ARFCN of the wanted signal.

r) The SS repeats steps l) to q) with the receiver operating on an ARFCN in the Low ARFCN

s) The SS repeats steps l) to q) with the receiver operating on an ARFCN in the High ARFCN range.

t) The SS repeats steps l) to s) under extreme test conditions for DAS-7 only.

For 16QAM Modulation:

a) The SS transmits packets on PDTCH using DAS-9 coding to the MS on all allocated timeslots.

b) The first interfering signal is on a frequency equal to the centre frequency of an ARFCN four above the ARFCN of the wanted signal. This signal is static, continuous and unmodulated.

c) The second interfering signal is on an ARFCN eight above the ARFCN of the wanted signal. This signal is static, continuous and GMSK modulated by random data (I1).

The amplitude of both the interfering signals is set according to table 14.18-8a.

d) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 44.060, clause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

e) Once the number of blocks transmitted with the current coding scheme as counted in step d) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

f) The SS repeats steps d) and e) with the two unwanted signals having frequencies corresponding to ARFCN four and eight below the ARFCN of the wanted signal.

g) The SS repeats steps a) to f) with the receiver operating on an ARFCN in the Low ARFCN.

h) The SS repeats steps a) to f) with the receiver operating on an ARFCN in the High ARFCN range.

i) The SS repeats steps a) to f) for each of the coding schemes DAS- 8 with the receiver operating on an ARFCN in the Middle ARFCN range.

j) The SS repeats steps a) to h) under extreme test conditions for DAS-9 only.

k) The SS establishes the normal test conditions. An uplink TBF shall be established.

l) The SS sets the value of the USF/DAS-9 such as to allocate the uplink to the MS.

m) The first interfering signal is on a frequency equal to the centre frequency of an ARFCN four above the ARFCN of the wanted signal. This signal is static, continuous and unmodulated.

n) The second interfering signal is on an ARFCN eight above the ARFCN of the wanted signal. This signal is static, continuous and GMSK modulated by random data (I1).

The amplitude of both the interfering signals is set according to table 14.18-8a.

o) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

p) Once the number of USF/DAS-9 allocating the uplink for the MS as counted in step o) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

q) The SS repeats steps o) and p) with the two unwanted signals having frequencies corresponding to ARFCN four and eight below the ARFCN of the wanted signal.

r) The SS repeats steps l) to q) with the receiver operating on an ARFCN in the Low ARFCN

s) The SS repeats steps l) to q) with the receiver operating on an ARFCN in the High ARFCN range.

t) The SS repeats steps l) to s) under extreme test conditions for DAS-9 only.

For 32QAM Modulation:

a) The SS transmits packets on PDTCH using DAS-12 coding to the MS on all allocated timeslots.

b) The first interfering signal is on a frequency equal to the centre frequency of an ARFCN four above the ARFCN of the wanted signal. This signal is static, continuous and unmodulated.

c) The second interfering signal is on an ARFCN eight above the ARFCN of the wanted signal. This signal is static, continuous and GMSK modulated by random data (I1).

The amplitude of both the interfering signals is set according to table 14.18-8.

d) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 44.060, clause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

e) Once the number of blocks transmitted with the current coding scheme as counted in step d) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

f) The SS repeats steps d) and e) with the two unwanted signals having frequencies corresponding to ARFCN four and eight below the ARFCN of the wanted signal.

g) The SS repeats steps a) to f) with the receiver operating on an ARFCN in the Low ARFCN.

h) The SS repeats steps a) to f) with the receiver operating on an ARFCN in the High ARFCN range.

i) The SS repeats steps a) to f) for each of the coding schemes DAS-10 and 11 with the receiver operating on an ARFCN in the Middle ARFCN range.

j) The SS repeats steps a) to h) under extreme test conditions for DAS-12 only.

k) The SS establishes the normal test conditions. An uplink TBF shall be established.

l) The SS sets the value of the USF/DAS-12 such as to allocate the uplink to the MS.

m) The first interfering signal is on a frequency equal to the centre frequency of an ARFCN four above the ARFCN of the wanted signal. This signal is static, continuous and unmodulated.

n) The second interfering signal is on an ARFCN eight above the ARFCN of the wanted signal. This signal is static, continuous and GMSK modulated by random data (I1).

The amplitude of both the interfering signals is set according to table 14.18-8a.

o) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

p) Once the number of USF/DAS-12 allocating the uplink for the MS as counted in step o) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

q) The SS repeats steps o) and p) with the two unwanted signals having frequencies corresponding to ARFCN four and eight below the ARFCN of the wanted signal.

r) The SS repeats steps l) to q) with the receiver operating on an ARFCN in the Low ARFCN

s) The SS repeats steps l) to q) with the receiver operating on an ARFCN in the High ARFCN range.

t) The SS repeats steps l) to s) under extreme test conditions for DAS-12 only.

Table 14.18-8a: Intermodulation interfering test signal levels

	GSM 400, GSM 700, T-GSM 810, GSM 850, GSM 900, PCS 1 900		DCS 1 800	
	Small MS	Other MS	Class 1 and 2	Class 3
FIRST INTERFERER dBμVemf( )	64	74	64	68
SECOND INTERFERER dBμVemf( )	63	63	64	68

NOTE: Some of the levels in table 14.18-8a are different to those specified in 3GPP TS 45.005 due to the consideration of the effect of modulation sideband noise from the second interferer.

14.18.4a.5 Test requirements

The block error ratio, as calculated by the SS for different channels with different coding schemes and under static condition, under any combination of normal and extreme test voltages and ambient temperatures, shall not exceed the conformance requirement.

14.18.5 Blocking and spurious response

14.18.5.1 Definition

Blocking is a measure of the ability of the receiver to receive a modulated wanted input signal in the presence of an unwanted input signal, on frequencies other than those of the spurious responses or the adjacent channels, without exceeding a given degradation. "Wanted signal" in this test is the signal generated by the transmitted RLC data blocks.

14.18.5.2 Conformance requirement

1. The blocking characteristics of the receiver are specified separately for in-band and out-of-band performance as identified in 3GPP TS 05.05 subclause 5.1.

2. The block error rate (BLER) performance for PDTCH/MCS1 to 4 shall not exceed 10 % and for PDTCH/MCS5 to 9 shall not exceed 10 % or 30 % depending on Coding Schemes and for USF/MCS1 to 9 shall not exceed 1 % when the following signals are simultaneously input to the receiver; 3GPP TS 05.05, subclause 6.2:

   - a useful signal at frequency f_0, 3 dB above the reference sensitivity level specified in table 14.18-3a for GMSK modulation and table 14.18-3b for 8-PSK modulation for PDTCH channels; and in tables 14.18-4a for GMSK modulation and 14.18-4b for 8-PSK modulation for USF channel with correction values as specified in 3GPP TS 05.05 subclause 6.2;

   - a continuous, static sine wave unwanted signal at a level as in the table 14.18-9 below and at a frequency (f) which is an integer multiple of 200 kHz.

     with the following exceptions, called spurious response frequencies:

     a) GSM 400: in band, for a maximum of three occurrences. 3GPP TS 05.05, subclause 5.1.

        GSM 700, GSM 850 or GSM 900: in band, for a maximum of six occurrences (which if grouped shall not exceed three contiguous occurrences per group). 3GPP TS 05.05, subclause 5.1.

        DCS 1 800 and PCS 1 900: in band, for a maximum of twelve occurrences (which if grouped shall not exceed three contiguous occurrences per group). 3GPP TS 05.05, subclause 5.1.

     b) out of band, for a maximum of 24 occurrences (which if below f_0 and grouped shall not exceed three contiguous occurrences per group). 3GPP TS 05.05, subclause 5.1.

   where the above performance shall be met when the continuous sine wave signal (f) is set to a level of 70 dBμV (emf) (i.e. -43 dBm). 3GPP TS 05.05, subclause 5.1.

14.18.5.3 Test purpose

1. To verify that the in band blocking performance is met without exceeding the total number of allowed in band spurious responses. An allowance is made for the statistical significance of the test.

2. To verify that at selected out of band frequencies, the out of band blocking performance is met without exceeding the total number of allowed out of band spurious responses. An allowance is made for the statistical significance of the test.

NOTE: Not all of the possible out of band frequencies are tested as this results in excessive test time. However, the total number of out of band spurious responses, specified in 3GPP TS 05.05, are allowed to ensure a fair test of the MS.

14.18.5.4 Method of test

Initial conditions

A call is set up according to the generic call set up procedure, except the BCCH frequency list shall be empty, on a TCH with an arbitrary ARFCN in the range supported by the MS. The power control level is set to maximum power. The ARFCN of the BCCH shall be the same - or at an offset of +/- 2 channels, than that of the ARFCN for the TCH.

The SS transmits EGPRS RLC data blocks containing random data.

In addition to the wanted Test Signal, the SS transmit a static unmodulated continuous interfering signal (Standard Test Signal I0).

Test procedure

For the ACK/NACK test steps the maximum number of supported time slots shall be used, and for the USF test steps the maximum supported symmetrical UL slot configuration shall be used.

For GMSK Modulation:

a) The SS is set to produce a static GMSK wanted signal and a static interfering signal at the same time. The SS sets the amplitude of the wanted signal to 4 dB above the reference sensitivity level specified in table 14.18-3a for PDTCH channel and in table 14.18-4a for USF channel with correction values as specified in 3GPP TS 05.05 subclause 6.2.

b) The SS transmits packets on PDTCH using MCS-4 coding to MS on all allocated timeslots.

c) The unwanted signal is of frequency FB. It is applied in turn on the subset of frequencies calculated at step d) in the overall range 100 kHz to 12,75 GHz, where FB is an integer multiple of 200 kHz.

   However, frequencies in the range FR ± 600 kHz are excluded.

NOTE: Allowance must be made for possible spurious signals arising from the SS. These are particularly likely at sub harmonic frequencies nFB where n = 2, 3, 4, 5, etc.

d) The frequencies at which the test is performed (adjusted to an integer multiple of 200 kHz channels most closely approximating the absolute frequency of the calculated blocking signal frequency) are the combined frequencies from i), ii) and iii) which follow:

   i) The total frequency range formed by:

   GSM 400 the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n + 3,6 MHz)

   and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 3,6 MHz).

   GSM 700 the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n + 7,5 MHz)

   and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 7,5 MHz).

   GSM 850 the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n + 12,5 MHz)

   and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 12,5 MHz).

   P-GSM 900: the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n + 12,5 MHz)

   and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 12,5 MHz).

   E-GSM 900: the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n + 17,5 MHz)

and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 17,5 MHz).

DCS 1 800: the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n + 37,5 MHz)

and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 37,5 MHz).

PCS 1 900: the frequencies between Flo + (IF1 + IF2 + ... + IFn + 30 MHz)

and Flo - (IF1 + IF2 + ... + IFn + 30 MHz).

and

the frequencies +100 MHz and -100 MHz from the edge of the relevant receive band.

Measurement are made at 200 kHz intervals.

ii) The three frequencies IF_1, IF_1 + 200 kHz, IF_1 - 200 kHz.

iii) The frequencies:

$mF_{lo} + IF_1$;

$mF_{lo} - IF_1$;

mFR;

where m is all positive integers greater than or equal to 2 such that either sum lies in the range 100 kHz to 12,75 GHz.

The frequencies in step ii) and iii) lying in the range of frequencies defined by step i) above need not be repeated.

Where:

F_{lo}	- local oscillator applied to first receiver mixer
IF_1 ... IF_n	- are the n intermediate frequencies
F_{lo}, IF_1, IF_2 ... IF_n	- shall be declared by the manufacturer in the PIXIT statement 3GPP TS 51.010-1 annex 3.

e) The level of the unwanted signal is set according to table 14.18-9.

Table 14.18-9a: Level of unwanted signals

	GSM450		GSM480		GSM 900		DCS 1 800	PCS 1 900
	Small MS	Other MS	Small MS	Other MS	Small MS	Other MS		
FREQUENCY	LEVEL IN dBµVemf( )							
FR ±600 kHz to FR ±800 kHz	70	75	70	75	70	75	70	70
FR ±800 kHz to FR ±1,6 MHz	70	80	70	80	70	80	70	70
FR ±1,6 MHz to FR ±3 MHz	80	90	80	90	80	90	80	80
457,6 MHz to FR - 3 MHz	90	90	-	-	-	-	-	-
FR + 3 MHz to 473,6 MHz	90	90	-	-	-	-	-	-
486 MHz to FR - 3MHz	-	-	90	90	-	-	-	-
FR + 3MHz to 502 MHz	-	-	90	90	-	-	-	-
915 MHz to FR - 3 MHz	-	-	-	-	90	90	-	-
FR + 3 MHz to 980 MHz	-	-	-	-	90	90	-	-
1 785 MHz to FR - 3 MHz	-	-	-	-	-	-	87	-
FR + 3 MHz to 1 920 MHz	-	-	-	-	-	-	87	-
1 910 MHz to FR - 3 MHz	-	-	-	-	-	-	-	87
FR + 3 MHz to 2 010 MHz	-	-	-	-	-	-	-	87
100 kHz to < 457,6 MHz	113	113	-	-	-	-	-	-
> 473,6MHz to 12,750 MHz	113	113	-	-	-	-	-	-
100 kHz to < 486 MHz	-	-	113	113	-	-	-	-
> 502 MHz to 12,750 MHz	-	-	113	113	-	-	-	-
835 MHz to < 915 MHz	-	-	-	-	113	113	-	-
> 980 MHz to 1 000 MHz	-	-	-	-	113	113	-	-
100 kHz to < 835 MHz	-	-	-	-	113	113	-	-
> 1 000 MHz to 12,750 MHz	-	-	-	-	113	113	-	-
100 kHz to 1 705 MHz	-	-	-	-	-	-	113	-
> 1 705 MHz to < 1 785 MHz	-	-	-	-	-	-	101	-
> 1 920 MHz to 1 980 MHz	-	-	-	-	-	-	101	-
> 1 980 MHz to 12,750 MHz	-	-	-	-	-	-	113	-
100 kHz to < 1 830 MHz	-	-	-	-	-	-	-	113
1 830 MHz to < 1 910 MHz	-	-	-	-	-	-	-	101
> 2 010 MHz to 2 070 MHz	-	-	-	-	-	-	-	101
> 2 070 MHz to 12,750 MHz	-	-	-	-	-	-	-	113

Table 14-18-9b: Level of unwanted signals

	GSM 710	GSM 750	T-GSM 810	GSM 850
FREQUENCY	LEVEL IN dBμVemf( )			
FR ±600 kHz to FR ±800 kHz	70	70	70	70
FR ±800 kHz to FR ±1,6 MHz	70	70	70	70
FR ±1,6 MHz to FR ±3 MHz	80	80	80	80
678 MHz to FR - 3 MHz	90	-	-	-
FR + 3 MHz to 728 MHz	90	-	-	-
727 MHz to FR – 3 MHz	-	90	-	-
FR + 3 MHz to 777 MHz	-	90	-	-
831 MHz to FR - 3 MHz	-	-	90	-
FR + 3 MHz to 886 MHz	-	-	90	-
849 MHz to FR – 3 MHz	-	-	-	90
FR + 3 MHz to 914 MHz	-	-	-	90
678 MHz to FR - 3 MHz	113	-	-	-
FR + 3 MHz to 728 MHz	113	-	-	-
100 kHz to < 727 MHz	-	113	-	-
> 777 MHz to 12,75 GHz	-	113	-	-
100 kHz to 831 MHz	-	-	113	-
> 886 MHz to 12,75 MHz	-	-	113	-
100 kHz to < 849 MHz	-	-	-	113
> 914 MHz to 12,75 GHz	-	-	-	113

NOTE 1: For E-GSM 900 MS the level of the unwanted signal in the band 905 MHz to 915 MHz is relaxed to 108 dBuVemf( ). 3GPP TS 05.05, subclause 5.1.

NOTE 2: a) For R-GSM 900 MS the level of the unwanted signal in the band 880 MHz to 915 MHz is relaxed to 108 dBuVemf( ). 3GPP TS 05.05, subclause 5.1.

b) For R-GSM 900 small MS the level of the unwanted signal in the band 876 MHz to 915 MHz is relaxed to 106 dBuVemf( ). 3GPP TS 05.05, subclause 5.1.

NOTE 3: a) For GSM 450 small MS the level of the unwanted signal in the band 450,4 MHz to 457,6 MHz is relaxed to 108 dBuVemf( ). 3GPP TS 05.05, subclause 5.1.

b) For GSM 480 small MS the level of the unwanted signal in the band 478,8 MHz to 486 MHz is relaxed to 108 dBuVemf( ). 3GPP TS 05.05, subclause 5.1.

f) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, subclause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 1: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

g) Once the number of blocks transmitted with the current coding scheme as counted in step f) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters.

If a failure is indicated, it is noted and counted towards the allowed exemption total. In the case of failures discovered at the predicted frequencies at steps d i), ii) or iii) the test is repeated on the adjacent channels ±200 kHz away. If either of these two frequencies fail then the next channel 200 kHz beyond is also be tested. This process is repeated until all channels constituting the group of failures is known.

h) The SS sets the value of the USF/MCS-4 such as to allocate the uplink to the MS.

i) The unwanted signal is of frequency FB. It is applied in turn on the subset of frequencies calculated at step d) in the overall range 100 kHz to 12,75 GHz, where FB is an integer multiple of 200 kHz.

However, frequencies in the range FR ±600 kHz are excluded.

NOTE 2: Allowance must be made for possible spurious signals arising from the SS. These are particularly likely at sub harmonic frequencies nFB where n = 2, 3, 4, 5, etc.

j) The level of the unwanted signal is set according to table 14.18-9.

k) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

l) Once the number of USF/MCS-4 allocating the uplink for the MS as counted in step k) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters. If a failure is indicated, it is noted and counted towards the allowed exemption total.

   In the case of failures discovered at the predicted frequencies at steps d i), ii) or iii) the test is repeated on the adjacent channels ±200 kHz away. If either of these two frequencies fail then the next channel 200 kHz beyond is also be tested. This process is repeated until all channels constituting the group of failures is known.

For 8-PSK Modulation:

a) The SS is set to produce a static 8-PSK wanted signal and a static interfering signal at the same time. The SS sets the amplitude of the wanted signal to 4 dB above the reference sensitivity level specified in table 14.18-3b for PDTCH channel and in table 14.18-4b for USF channel with correction values as specified in 3GPP TS 05.05 subclause 6.2;

b) The SS transmits packets on PDTCH using MCS-9 coding to MS on all allocated timeslots.

c) The unwanted signal is of frequency FB. It is applied in turn on the subset of frequencies calculated at step d) in the overall range 100 kHz to 12,75 GHz, where FB is an integer multiple of 200 kHz.

   However, frequencies in the range FR ±600 kHz are excluded.

NOTE 3: Allowance must be made for possible spurious signals arising from the SS. These are particularly likely at sub harmonic frequencies nFB where n = 2, 3, 4, 5, etc.

d) The frequencies at which the test is performed (adjusted to an integer multiple of 200 kHz channels most closely approximating the absolute frequency of the calculated blocking signal frequency) are the combined frequencies from i), ii) and iii) which follow:

   i) The total frequency range formed by:

      GSM 400 the frequencies between Flo + (IF1 + IF2 + ... + IFn + 3,6 MHz)

         and Flo - (IF1 + IF2 + ... + IFn + 3,6 MHz).

      GSM 700 the frequencies between Flo + (IF1 + IF2 + ... + IFn + 7,5 MHz)

         and Flo - (IF1 + IF2 + ... + IFn + 7,5 MHz).

      GSM 850 the frequencies between Flo + (IF1 + IF2 + ... + IFn + 12,5 MHz)

         and Flo - (IF1 + IF2 + ... + IFn + 12,5 MHz).

      P-GSM 900: the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n + 12,5 MHz)

         and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 12,5 MHz).

      E-GSM 900: the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n + 17,5 MHz)

         and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 17,5 MHz).

      DCS 1 800: the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n + 37,5 MHz)

         and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 37,5 MHz).

      PCS 1 900: the frequencies between Flo + (IF1 + IF2 + ... + IFn + 30 MHz)

         and Flo - (IF1 + IF2 + ... + IFn + 30 MHz).

and

the frequencies +100 MHz and -100 MHz from the edge of the relevant receive band.

Measurement are made at 200 kHz intervals.

ii) The three frequencies IF_1, IF_1 + 200 kHz, IF_1 - 200 kHz.

iii) The frequencies:

$mF_{lo} + IF_1$;

$mF_{lo} - IF_1$;

mFR;

where m is all positive integers greater than or equal to 2 such that either sum lies in the range 100 kHz to 12,75 GHz.

The frequencies in step ii) and iii) lying in the range of frequencies defined by step i) above need not be repeated.

Where:

F_{lo}	- local oscillator applied to first receiver mixer
IF_1 ... IF_n	- are the n intermediate frequencies
F_{lo}, IF_1, IF_2 ... IF_n	- shall be declared by the manufacturer in the PIXIT statement 3GPP TS 51.010-1 annex 3.

e) The level of the unwanted signal is set according to table 14.18-9.

f) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 04.60, 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 4: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

g) Once the number of blocks transmitted with the current coding scheme as counted in step f) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters. If a failure is indicated, it is noted and counted towards the allowed exemption total.

In the case of failures discovered at the predicted frequencies at steps d i), ii) or iii) the test is repeated on the adjacent channels ±200 kHz away. If either of these two frequencies fail then the next channel 200 kHz beyond is also be tested. This process is repeated until all channels constituting the group of failures is known.

h) The SS sets the value of the USF/MCS-9 such as to allocate the uplink to the MS.

j) The unwanted signal is of frequency FB. It is applied in turn on the subset of frequencies calculated at step d) in the overall range 100 kHz to 12,75 GHz, where FB is an integer multiple of 200 kHz.

However, frequencies in the range FR ±600 kHz are excluded.

NOTE 5: Allowance must be made for possible spurious signals arising from the SS. These are particularly likely at sub harmonic frequencies nFB where n = 2, 3, 4, 5, etc.

k) The level of the unwanted signal is set according to table 14.18-9.

l) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

m) Once the number of USF/MCS-9 allocating the uplink for the MS as counted in step l) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters. If a failure is indicated, it is noted and counted towards the allowed exemption total.

In the case of failures discovered at the predicted frequencies at steps d i), ii) or iii) the test is repeated on the adjacent channels ±200 kHz away. If either of these two frequencies fail then the next channel 200 kHz beyond is also be tested. This process is repeated until all channels constituting the group of failures is known.

14.18.5.5 Test requirements

The block error ratio as calculated by the SS for different channels and coding schemes shall not exceed the conformance requirement. Testing the conformance requirement can be done either in the classical way with a fixed minimum number of samples (refer to section 14.18.5.5.2) or using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with performance not on the limit (refer to section 14.18.5.5.1). Both methods are based on a bad DUT factor M = 1.5.

This shall apply under normal test voltage and ambient temperature, and with the interfering signal at any frequency in the range specified.

The following exceptions are allowed:

GSM 400: A maximum of three failures in the band 457,6 MHz to 473,6 MHz for GSM450 and in the band 486,0 MHz to 502,0 MHz for GSM480

A maximum of 24 in the combined bands 100 kHz to 457,6 MHz and 473,6 MHz to 12,75 GHz for GSM 450 and in the combined bands 100 kHz to 486,0 MHz and 502,0 MHz to 12,75 GHz for GSM 480 (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

GSM 710: A maximum of six failures in the frequency band 678 MHz to 728 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 failures in the combined bands 100 kHz to 678 MHz and 728 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

GSM 750: A maximum of six failures in the frequency band 727 MHz to 782 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 failures in the combined bands 100 kHz to 727 MHz and 782 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

GSM 810: A maximum of six failures in the frequency band 831 MHz to 886 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 failures in the combined bands 100 kHz to 831 MHz and 886 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

GSM 850: A maximum of six failures in the frequency band 849 MHz to 914 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 failures in the combined bands 100 kHz to 849 MHz and 914 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

GSM 900: A maximum of six failures in the band 915 MHz to 980 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 in the combined bands 100 kHz to 915 MHz and 980 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

DCS 1 800: A maximum of twelve failures in the band 1 785 MHz to 1 920 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 in the combined bands 100 kHz to 1 785 MHz and 1 920 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

PCS 1 900: A maximum of twelve failures in the band 1 910 MHz to 2 010 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 in the combined bands 100 kHz to 1 910 MHz and 2 010 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

If the number of failures do not exceed the maximum allowed figures stated above, the test of 14.18.5.4 is repeated at the frequencies at which the failures occurred. The level of the unwanted signal is set to 70 dBuVemf( ) and the performance requirement is once again that stated above.

The number of Error Events recorded in this test shall not exceed the test limit error rate values given above, when using either the accelerated BLER method or the maximum number of samples.

No failures are allowed at this lower unwanted signal level.

14.18.5.5.1 Statistical testing of blocking and spurious response performance with early decision

For more information on statistical testing of blocking and spurious response performance, especially the definition of limit lines refer to Annex 7.

Wrong decision risk F for one single error rate test:

$F_{pass} \neq F_{fail}$ As the blocking test case comprises of many BLER tests the wrong decision risk for a fail decision of one single error rate test must be smaller than the wrong decision risk for a pass decision to avoid an increased probability of an erroneous fail decision.

F_{pass} = 0.2%

F_{fail} = 0.02%

Wrong decision probability D per test step:

$D_{pass} \neq D_{fail}$

D_{pass} = 0.008%

D_{fail} = 0.0008%

Parameters for limit lines:

1. D_{pass} = 0.008% wrong decision probability per test step for early pass decision.

   D_{fail} = 0.0008% wrong decision probability per test step for early fail decision.

2. M = 1.5 bad DUT factor

3. ne number of (error) events.

4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

For an early decision a minimum number of measured (error) events is necessary.

For an early pass decision	ne ≥ 1
For an early fail decision	ne ≥ 8

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The statistical testing of the conformance requirement is done using table 14.18.5-1.

Table 14.18.5-1: Statistical test limits for blocking performance of EGPRS mobiles

Blocking and spurious response for EGPRS mobiles						
		Orig. BLER	**Derived**	**Target number**	**Target test**	**Target test time**
	blocks per s	**requirement**	**test limit**	**of samples**	**time (s)**	**(hh:mm:ss)**
One time slot:						
PDTCH/MCS-4	50	0,100000	0,125100	3221	64	00:01:04
USF/MCS-4	50	0,010000	0,012510	32214	644	00:10:44
PDTCH/MCS-9	50	0,100000	0,125100	3221	64	00:01:04
USF/MCS-9	50	0,010000	0,012510	32214	644	00:10:44
Two time slots:						
PDTCH/MCS-4	100	0,100000	0,125100	3221	32	00:00:32
USF/MCS-4	100	0,010000	0,012510	32214	322	00:05:22
PDTCH/MCS-9	100	0,100000	0,125100	3221	32	00:00:32
USF/MCS-9	100	0,010000	0,012510	32214	322	00:05:22
Three time slots						
PDTCH/MCS-4	150	0,100000	0,125100	3221	21	00:00:21
USF/MCS-4	150	0,010000	0,012510	32214	215	00:03:35
PDTCH/MCS-9	150	0,100000	0,125100	3221	21	00:00:21
USF/MCS-9	150	0,010000	0,012510	32214	215	00:03:35
Four time slots						
PDTCH/MCS-4	200	0,100000	0,125100	3221	16	00:00:16
USF/MCS-4	200	0,010000	0,012510	32214	161	00:02:41
PDTCH/MCS-9	200	0,100000	0,125100	3221	16	00:00:16
USF/MCS-9	200	0,010000	0,012510	32214	161	00:02:41

14.18.5.5.2 Fixed testing of blocking and spurious response performance with minimum number of samples

The fixed testing of the conformance requirement is done using the minimum number of samples and the limit BLER given in table 14.18-2.

14.18.5a Blocking and spurious response in EGPRS2A configuration

14.18.5a.1 Definition

Blocking is a measure of the ability of the receiver to receive a modulated wanted input signal in the presence of an unwanted input signal, on frequencies other than those of the spurious responses or the adjacent channels, without exceeding a given degradation. "Wanted signal" in this test is the signal generated by the transmitted RLC data blocks.

14.18.5a.2 Conformance requirement

1. The blocking characteristics of the receiver are specified separately for in-band and out-of-band performance as identified in 3GPP TS 45.005 subclause 5.1.

2. The block error rate (BLER) performance for PDTCH/DAS-5 to 12 shall not exceed 10 % depending on Coding Schemes and for USF/DAS-5 to 12 shall not exceed 1 % when the following signals are simultaneously input to the receiver; 3GPP TS 45.005, subclause 6.2:

    - a useful signal at frequency f_0, 3 dB above the reference sensitivity level specified in table 14.18.1a-1 for 8-PSK, 16QAM and 32QAM modulation for PDTCH channels; and in tables 14.18.1a-2 for 8-PSK 16QAM and 32QAM modulation for USF channel with correction values as specified in 3GPP TS 45.005 subclause 6.2;

    - a continuous, static sine wave unwanted signal at a level as in the table 14.18-9a and 14.18.9b, and at a frequency (f) which is an integer multiple of 200 kHz.

with the following exceptions, called spurious response frequencies:

a) GSM 400: in band, for a maximum of three occurrences. 3GPP TS 45.005, subclause 5.1.

GSM 700, GSM 850 or GSM 900: in band, for a maximum of six occurrences (which if grouped shall not exceed three contiguous occurrences per group). 3GPP TS 45.005, subclause 5.1.

DCS 1 800 and PCS 1 900: in band, for a maximum of twelve occurrences (which if grouped shall not exceed three contiguous occurrences per group). 3GPP TS 45.005, subclause 5.1.

b) out of band, for a maximum of 24 occurrences (which if below f_0 and grouped shall not exceed three contiguous occurrences per group). 3GPP TS 45.005, subclause 5.1.

where the above performance shall be met when the continuous sine wave signal (f) is set to a level of 70 dBμV (emf) (i.e. -43 dBm). 3GPP TS 45.005, subclause 5.1.

14.18.5a.3 Test purpose

1. To verify that the in band blocking performance is met without exceeding the total number of allowed in band spurious responses. An allowance is made for the statistical significance of the test.
2. To verify that at selected out of band frequencies, the out of band blocking performance is met without exceeding the total number of allowed out of band spurious responses. An allowance is made for the statistical significance of the test.

NOTE: Not all of the possible out of band frequencies are tested as this results in excessive test time. However, the total number of out of band spurious responses, specified in 3GPP TS 45.005, are allowed to ensure a fair test of the MS.

14.18.5a.4 Method of test

Initial conditions

A call is set up according to the generic call set up procedure, except the BCCH frequency list shall be empty, on a TCH with an arbitrary ARFCN in the range supported by the MS. The power control level is set to maximum power. The ARFCN of the BCCH shall be the same - or at an offset of +/- 2 channels, than that of the ARFCN for the TCH.

The SS transmits EGPRS RLC data blocks containing random data.

In addition to the wanted Test Signal, the SS transmit a static unmodulated continuous interfering signal (Standard Test Signal I0).

Test procedure

For the ACK/NACK test steps the maximum number of supported time slots shall be used, and for the USF test steps the maximum supported symmetrical UL slot configuration shall be used.

For 8-PSK Modulation:

a) The SS is set to produce a static 8-PSK wanted signal and a static interfering signal at the same time. The SS sets the amplitude of the wanted signal to 4 dB above the reference sensitivity level specified in table 14.18.1a-1 for PDTCH channel and in table 14.18.1a-2 for USF channel with correction values as specified in 3GPP TS 45.005 subclause 6.2;

b) The SS transmits packets on PDTCH using DAS-5 coding to MS on all allocated timeslots.

c) The unwanted signal is of frequency FB. It is applied in turn on the subset of frequencies calculated at step d) in the overall range 100 kHz to 12,75 GHz, where FB is an integer multiple of 200 kHz.

However, frequencies in the range FR ±600 kHz are excluded.

NOTE 1: Allowance must be made for possible spurious signals arising from the SS. These are particularly likely at sub harmonic frequencies nFB where n = 2, 3, 4, 5, etc.

d) The frequencies at which the test is performed (adjusted to an integer multiple of 200 kHz channels most closely approximating the absolute frequency of the calculated blocking signal frequency) are the combined frequencies from i), ii) and iii) which follow:

i) The total frequency range formed by:

GSM 400 the frequencies between Flo + (IF1 + IF2 + ... + IFn + 3,6 MHz)

and Flo - (IF1 + IF2 + ... + IFn + 3,6 MHz).

GSM 700 the frequencies between Flo + (IF1 + IF2 + ... + IFn + 7,5 MHz)

and Flo - (IF1 + IF2 + ... + IFn + 7,5 MHz).

GSM 850 the frequencies between Flo + (IF1 + IF2 + ... + IFn + 12,5 MHz)

and Flo - (IF1 + IF2 + ... + IFn + 12,5 MHz).

P-GSM 900: the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n + 12,5 MHz)

and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 12,5 MHz).

E-GSM 900: the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n + 17,5 MHz)

and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 17,5 MHz).

DCS 1 800: the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n + 37,5 MHz)

and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 37,5 MHz).

PCS 1 900: the frequencies between Flo + (IF1 + IF2 + ... + IFn + 30 MHz)

and Flo - (IF1 + IF2 + ... + IFn + 30 MHz).

and

the frequencies +100 MHz and -100 MHz from the edge of the relevant receive band.

Measurement are made at 200 kHz intervals.

ii) The three frequencies IF_1, IF_1 + 200 kHz, IF_1 - 200 kHz.

iii) The frequencies:

$mF_{lo} + IF_1$;

$mF_{lo} - IF_1$;

mFR;

where m is all positive integers greater than or equal to 2 such that either sum lies in the range 100 kHz to 12,75 GHz.

The frequencies in step ii) and iii) lying in the range of frequencies defined by step i) above need not be repeated.

Where:

F_{lo} - local oscillator applied to first receiver mixer

IF_1 ... IF_n - are the n intermediate frequencies

F_{lo}, IF_1, IF_2 ... IF_n - shall be declared by the manufacturer in the PIXIT statement 3GPP TS 51.010-1 annex 3.

e) The level of the unwanted signal is set according to table 14.18-9a and 14.18-9b.

f) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 44.060, 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 2: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

g) Once the number of blocks transmitted with the current coding scheme as counted in step f) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters. If a failure is indicated, it is noted and counted towards the allowed exemption total.

In the case of failures discovered at the predicted frequencies at steps d i), ii) or iii) the test is repeated on the adjacent channels ±200 kHz away. If either of these two frequencies fail then the next channel 200 kHz beyond is also be tested. This process is repeated until all channels constituting the group of failures is known.

h) The SS sets the value of the USF/DAS-7 such as to allocate the uplink to the MS.

j) The unwanted signal is of frequency FB. It is applied in turn on the subset of frequencies calculated at step d) in the overall range 100 kHz to 12,75 GHz, where FB is an integer multiple of 200 kHz.

However, frequencies in the range FR ±600 kHz are excluded.

NOTE 3: Allowance must be made for possible spurious signals arising from the SS. These are particularly likely at sub harmonic frequencies nFB where n = 2, 3, 4, 5, etc.

k) The level of the unwanted signal is set according to table 14.18-9a and 14.18-9b.

l) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

m) Once the number of USF/DAS-7 allocating the uplink for the MS as counted in step l) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters. If a failure is indicated, it is noted and counted towards the allowed exemption total.

In the case of failures discovered at the predicted frequencies at steps d i), ii) or iii) the test is repeated on the adjacent channels ±200 kHz away. If either of these two frequencies fail then the next channel 200 kHz beyond is also be tested. This process is repeated until all channels constituting the group of failures is known.

For 16QAM Modulation:

a) The SS is set to produce a static 16QAM wanted signal and a static interfering signal at the same time. The SS sets the amplitude of the wanted signal to 4 dB above the reference sensitivity level specified in table 14.18.1a-1 for PDTCH channel and in table 14.18.1a-2 for USF channel with correction values as specified in 3GPP TS 45.005 subclause 6.2;

b) The SS transmits packets on PDTCH using DAS-8 coding to MS on all allocated timeslots.

c) The unwanted signal is of frequency FB. It is applied in turn on the subset of frequencies calculated at step d) in the overall range 100 kHz to 12,75 GHz, where FB is an integer multiple of 200 kHz.

However, frequencies in the range FR ±600 kHz are excluded.

NOTE 4: Allowance must be made for possible spurious signals arising from the SS. These are particularly likely at sub harmonic frequencies nFB where n = 2, 3, 4, 5, etc.

d) The frequencies at which the test is performed (adjusted to an integer multiple of 200 kHz channels most closely approximating the absolute frequency of the calculated blocking signal frequency) are the combined frequencies from i), ii) and iii) which follow:

i) The total frequency range formed by:

GSM 400 the frequencies between Flo + (IF1 + IF2 + ... + IFn + 3,6 MHz)

and Flo - (IF1 + IF2 + ... + IFn + 3,6 MHz).

GSM 700 the frequencies between Flo + (IF1 + IF2 + ... + IFn + 7,5 MHz)

and Flo - (IF1 + IF2 + ... + IFn + 7,5 MHz).

GSM 850 the frequencies between Flo + (IF1 + IF2 + ... + IFn + 12,5 MHz) and Flo - (IF1 + IF2 + ... + IFn + 12,5 MHz).

P-GSM 900: the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n + 12,5 MHz)

and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 12,5 MHz).

E-GSM 900: the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n + 17,5 MHz)

and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 17,5 MHz).

DCS 1 800: the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n + 37,5 MHz)

and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 37,5 MHz).

PCS 1 900: the frequencies between Flo + (IF1 + IF2 + ... + IFn + 30 MHz)

and Flo - (IF1 + IF2 + ... + IFn + 30 MHz).

and

the frequencies +100 MHz and -100 MHz from the edge of the relevant receive band.

Measurement are made at 200 kHz intervals.

ii) The three frequencies IF_1, IF_1 + 200 kHz, IF_1 - 200 kHz.

iii) The frequencies:

$mF_{lo} + IF_1$;

$mF_{lo} - IF_1$;

mFR;

where m is all positive integers greater than or equal to 2 such that either sum lies in the range 100 kHz to 12,75 GHz.

The frequencies in step ii) and iii) lying in the range of frequencies defined by step i) above need not be repeated.

Where:

F_{lo} - local oscillator applied to first receiver mixer

IF_1 ... IF_n - are the n intermediate frequencies

F_{lo}, IF_1, IF_2 ... IF_n - shall be declared by the manufacturer in the PIXIT statement
3GPP TS 51.010-1 annex 3.

e) The level of the unwanted signal is set according to table 14.18-9a and 14.18-9b.

f) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 44.060, 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 5: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

g) Once the number of blocks transmitted with the current coding scheme as counted in step f) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters. If a failure is indicated, it is noted and counted towards the allowed exemption total.

In the case of failures discovered at the predicted frequencies at steps d i), ii) or iii) the test is repeated on the adjacent channels ±200 kHz away. If either of these two frequencies fail then the next channel 200 kHz beyond is also be tested. This process is repeated until all channels constituting the group of failures is known.

h) The SS sets the value of the USF/DAS-9 such as to allocate the uplink to the MS.

j) The unwanted signal is of frequency FB. It is applied in turn on the subset of frequencies calculated at step d) in the overall range 100 kHz to 12,75 GHz, where FB is an integer multiple of 200 kHz.

However, frequencies in the range FR ±600 kHz are excluded.

NOTE 6: Allowance must be made for possible spurious signals arising from the SS. These are particularly likely at sub harmonic frequencies nFB where n = 2, 3, 4, 5, etc.

k) The level of the unwanted signal is set according to table 14.18-9a and 14.18-9b.

l) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

m) Once the number of USF/DAS-9 allocating the uplink for the MS as counted in step l) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters. If a failure is indicated, it is noted and counted towards the allowed exemption total.

In the case of failures discovered at the predicted frequencies at steps d i), ii) or iii) the test is repeated on the adjacent channels ±200 kHz away. If either of these two frequencies fail then the next channel 200 kHz beyond is also be tested. This process is repeated until all channels constituting the group of failures is known.

For 32QAM Modulation:

a) The SS is set to produce a static 32QAM wanted signal and a static interfering signal at the same time. The SS sets the amplitude of the wanted signal to 4 dB above the reference sensitivity level specified in table 14.18.1a-1 for PDTCH channel and in table 14.18.1a-2 for USF channel with correction values as specified in 3GPP TS 45.005 subclause 6.2;

b) The SS transmits packets on PDTCH using DAS-10 coding to MS on all allocated timeslots.

c) The unwanted signal is of frequency FB. It is applied in turn on the subset of frequencies calculated at step d) in the overall range 100 kHz to 12,75 GHz, where FB is an integer multiple of 200 kHz.

However, frequencies in the range FR ±600 kHz are excluded.

NOTE 7: Allowance must be made for possible spurious signals arising from the SS. These are particularly likely at sub harmonic frequencies nFB where n = 2, 3, 4, 5, etc.

d) The frequencies at which the test is performed (adjusted to an integer multiple of 200 kHz channels most closely approximating the absolute frequency of the calculated blocking signal frequency) are the combined frequencies from i), ii) and iii) which follow:

i) The total frequency range formed by:

GSM 400 the frequencies between Flo + (IF1 + IF2 + ... + IFn + 3,6 MHz)

and Flo - (IF1 + IF2 + ... + IFn + 3,6 MHz).

GSM 700 the frequencies between Flo + (IF1 + IF2 + ... + IFn + 7,5 MHz)

and Flo - (IF1 + IF2 + ... + IFn + 7,5 MHz).

GSM 850 the frequencies between Flo + (IF1 + IF2 + ... + IFn + 12,5 MHz)

and Flo - (IF1 + IF2 + ... + IFn + 12,5 MHz).

P-GSM 900: the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n + 12,5 MHz)

and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 12,5 MHz).

E-GSM 900: the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n + 17,5 MHz)

and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 17,5 MHz).

DCS 1 800: the frequencies between F_{lo} + (IF_1 + IF_2 + ... + IF_n + 37,5 MHz)

and F_{lo} - (IF_1 + IF_2 + ... + IF_n + 37,5 MHz).

PCS 1 900: the frequencies between Flo + (IF1 + IF2 + ... + IFn + 30 MHz)

and Flo - (IF1 + IF2 + ... + IFn + 30 MHz).

and

the frequencies +100 MHz and -100 MHz from the edge of the relevant receive band.

Measurement are made at 200 kHz intervals.

ii) The three frequencies IF_1, IF_1 + 200 kHz, IF_1 - 200 kHz.

iii) The frequencies:

$mF_{lo} + IF_1$;

$mF_{lo} - IF_1$;

mFR;

where m is all positive integers greater than or equal to 2 such that either sum lies in the range 100 kHz to 12,75 GHz.

The frequencies in step ii) and iii) lying in the range of frequencies defined by step i) above need not be repeated.

Where:

F_{lo} - local oscillator applied to first receiver mixer

IF_1 ... IF_n - are the n intermediate frequencies

F_{lo}, IF_1, IF_2 ... IF_n - shall be declared by the manufacturer in the PIXIT statement 3GPP TS 51.010-1 annex 3.

e) The level of the unwanted signal is set according to table 14.18-9a and 14.18-9b.

f) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 44.060, 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

NOTE 8: Due to the error rates related to the USF, the MS is likely to occasionally miss its USF for transmitting the Packet Downlink Ack/Nack. As this requirement is not verified in this part of the test, the SS then again assigns uplink resources so the MS can send this message.

g) Once the number of blocks transmitted with the current coding scheme as counted in step f) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters. If a failure is indicated, it is noted and counted towards the allowed exemption total.

In the case of failures discovered at the predicted frequencies at steps d i), ii) or iii) the test is repeated on the adjacent channels ±200 kHz away. If either of these two frequencies fail then the next channel 200 kHz beyond is also be tested. This process is repeated until all channels constituting the group of failures is known.

h) The SS sets the value of the USF/DAS-12 such as to allocate the uplink to the MS.

j) The unwanted signal is of frequency FB. It is applied in turn on the subset of frequencies calculated at step d) in the overall range 100 kHz to 12,75 GHz, where FB is an integer multiple of 200 kHz.

However, frequencies in the range FR ±600 kHz are excluded.

NOTE 9: Allowance must be made for possible spurious signals arising from the SS. These are particularly likely at sub harmonic frequencies nFB where n = 2, 3, 4, 5, etc.

k) The level of the unwanted signal is set according to table 14.18-9a and 14.18-9b.

l) The SS counts the number of times the USF is allocated to the MS, and the number of times the MS does not transmit while being allocated the uplink.

m) Once the number of USF/DAS-12 allocating the uplink for the MS as counted in step l) reaches or exceeds the minimum number of blocks as given in table 14.18-2, the SS calculates the Block error ratio. The SS resets both counters. If a failure is indicated, it is noted and counted towards the allowed exemption total.

In the case of failures discovered at the predicted frequencies at steps d i), ii) or iii) the test is repeated on the adjacent channels ±200 kHz away. If either of these two frequencies fail then the next channel 200 kHz beyond is also be tested. This process is repeated until all channels constituting the group of failures is known.

14.18.5a.5 Test requirements

The block error ratio as calculated by the SS for different channels and coding schemes shall not exceed the conformance requirement. Testing the conformance requirement can be done either in the classical way with a fixed minimum number of samples (refer to section 14.18.5a.5.2) or using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with performance not on the limit (refer to section 14.18.5a.5.1). Both methods are based on a bad DUT factor M = 1.5.

This shall apply under normal test voltage and ambient temperature, and with the interfering signal at any frequency in the range specified.

The following exceptions are allowed:

GSM 400: A maximum of three failures in the band 457,6 MHz to 473,6 MHz for GSM450 and in the band 486,0 MHz to 502,0 MHz for GSM480

A maximum of 24 in the combined bands 100 kHz to 457,6 MHz and 473,6 MHz to 12,75 GHz for GSM 450 and in the combined bands 100 kHz to 486,0 MHz and 502,0 MHz to 12,75 GHz for GSM 480 (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

GSM 710: A maximum of six failures in the frequency band 678 MHz to 728 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 failures in the combined bands 100 kHz to 678 MHz and 728 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

GSM 750: A maximum of six failures in the frequency band 727 MHz to 782 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 failures in the combined bands 100 kHz to 727 MHz and 782 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

GSM 810: A maximum of six failures in the frequency band 831 MHz to 886 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 failures in the combined bands 100 kHz to 831 MHz and 886 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

GSM 850: A maximum of six failures in the frequency band 849 MHz to 914 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 failures in the combined bands 100 kHz to 849 MHz and 914 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

GSM 900: A maximum of six failures in the band 915 MHz to 980 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 in the combined bands 100 kHz to 915 MHz and 980 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

DCS 1 800: A maximum of twelve failures in the band 1 785 MHz to 1 920 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 in the combined bands 100 kHz to 1 785 MHz and 1 920 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

PCS 1 900: A maximum of twelve failures in the band 1 910 MHz to 2 010 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 in the combined bands 100 kHz to 1 910 MHz and 2 010 MHz to 12,75 GHz (which, if below FR and grouped, shall not exceed three 200 kHz channels per group).

If the number of failures do not exceed the maximum allowed figures stated above, the test of 14.18.5a.4 is repeated at the frequencies at which the failures occurred. The level of the unwanted signal is set to 70 dBuVemf( ) and the performance requirement is once again that stated above.

The number of Error Events recorded in this test shall not exceed the test limit error rate values given above, when using either the accelerated BLER method or the maximum number of samples.

No failures are allowed at this lower unwanted signal level.

14.18.5a.5.1 Statistical testing of blocking and spurious response performance with early decision

For more information on statistical testing of blocking and spurious response performance, especially the definition of limit lines refer to Annex 7.

Wrong decision risk F for one single error rate test:

$F_{pass} \neq F_{fail}$ As the blocking test case comprises of many BLER tests the wrong decision risk for a fail decision of one single error rate test must be smaller than the wrong decision risk for a pass decision to avoid an increased probability of an erroneous fail decision.

F_{pass} = 0.2%

F_{fail} = 0.02%

Wrong decision probability D per test step:

$D_{pass} \neq D_{fail}$

D_{pass} = 0.008%

D_{fail} = 0.0008%

Parameters for limit lines:

1. D_{pass} = 0.008% wrong decision probability per test step for early pass decision.

   D_{fail} = 0.0008% wrong decision probability per test step for early fail decision.

2. M = 1.5 bad DUT factor
3. ne number of (error) events.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

For an early decision a minimum number of measured (error) events is necessary.

For an early pass decision ne $\geq$ 1

For an early fail decision ne $\geq$ 8

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The statistical testing of the conformance requirement is done using table 14.18.5a-1.

Table 14.18.5a-1: Statistical test limits for blocking performance of EGPRS mobiles

Blocking and spurious response for EGPRS mobiles						
		Orig. BLER	Derived	Target number	Target test	Target test time
	blocks per s	requirement	test limit	of samples	time (s)	(hh:mm:ss)
One time slot:						
PDTCH/DAS-5	50	0,100000	0,125100	3221	64	00:01:04
USF/DAS-5	50	0,010000	0,012510	32214	644	00:10:44
PDTCH/DAS-7	50	0,100000	0,125100	3221	64	00:01:04
USF/DAS-7	50	0,010000	0,012510	32214	644	00:10:44
PDTCH/DAS-8	50	0,100000	0,125100	3221	64	00:01:04
USF/DAS-8	50	0,010000	0,012510	32214	644	00:10:44
PDTCH/DAS-9	50	0,100000	0,125100	3221	64	00:01:04
USF/DAS-9	50	0,010000	0,012510	32214	644	00:10:44
PDTCH/DAS-10	50	0,100000	0,125100	3221	64	00:01:04
USF/DAS-10	50	0,010000	0,012510	32214	644	00:10:44
PDTCH/DAS-12	50	0,100000	0,125100	3221	64	00:01:04
USF/DAS-12	50	0,010000	0,012510	32214	644	00:10:44
Two time slots:						
PDTCH/DAS-5	100	0,100000	0,125100	3221	32	00:00:32
USF/DAS-5	100	0,010000	0,012510	32214	322	00:05:22
PDTCH/DAS-7	100	0,100000	0,125100	3221	32	00:00:32
USF/DAS-7	100	0,010000	0,012510	32214	322	00:05:22
PDTCH/DAS-8	100	0,100000	0,125100	3221	32	00:00:32
USF/DAS-8	100	0,010000	0,012510	32214	322	00:05:22
PDTCH/DAS-9	100	0,100000	0,125100	3221	32	00:00:32
USF/DAS-9	100	0,010000	0,012510	32214	322	00:05:22
PDTCH/DAS-10	100	0,100000	0,125100	3221	32	00:00:32
USF/DAS-10	100	0,010000	0,012510	32214	322	00:05:22
PDTCH/DAS-12	100	0,100000	0,125100	3221	32	00:00:32
USF/DAS-12	100	0,010000	0,012510	32214	322	00:05:22
Three time slots						
PDTCH/DAS-5	150	0,100000	0,125100	3221	21	00:00:21
USF/DAS-5	150	0,010000	0,012510	32214	215	00:03:35
PDTCH/DAS-7	150	0,100000	0,125100	3221	21	00:00:21
USF/DAS-7	150	0,010000	0,012510	32214	215	00:03:35
PDTCH/DAS-8	150	0,100000	0,125100	3221	21	00:00:21
USF/DAS-8	150	0,010000	0,012510	32214	215	00:03:35
PDTCH/DAS-9	150	0,100000	0,125100	3221	21	00:00:21
USF/DAS-9	150	0,010000	0,012510	32214	215	00:03:35
PDTCH/DAS-10	150	0,100000	0,125100	3221	21	00:00:21
USF/DAS-10	150	0,010000	0,012510	32214	215	00:03:35
PDTCH/DAS-12	150	0,100000	0,125100	3221	21	00:00:21
USF/DAS-12	150	0,010000	0,012510	32214	215	00:03:35
Four time slots						
PDTCH/DAS-5	200	0,100000	0,125100	3221	16	00:00:16
USF/DAS-5	200	0,010000	0,012510	32214	161	00:02:41
PDTCH/DAS-7	200	0,100000	0,125100	3221	16	00:00:16
USF/DAS-7	200	0,010000	0,012510	32214	161	00:02:41
PDTCH/DAS-8	200	0,100000	0,125100	3221	16	00:00:16
USF/DAS-8	200	0,010000	0,012510	32214	161	00:02:41

PDTCH/DAS-9	200	0,100000	0,125100	3221	16	00:00:16
USF/DAS-9	200	0,010000	0,012510	32214	161	00:02:41
PDTCH/DAS-10	200	0,100000	0,125100	3221	16	00:00:16
USF/DAS-10	200	0,010000	0,012510	32214	161	00:02:41
PDTCH/DAS-12	200	0,100000	0,125100	3221	16	00:00:16
USF/DAS-12	200	0,010000	0,012510	32214	161	00:02:41

14.18.5a.5.2 Fixed testing of blocking and spurious response performance with minimum number of samples

The fixed testing of the conformance requirement is done using the minimum number of samples and the limit BLER given in table 14.18-2.

14.18.6 EGPRS Usable receiver input level range

14.18.6.1 Definition

The usable receiver input level range is the range of the radio frequency input level of a specified modulated signal over which bit error ratio stay between specified limits.

14.18.6.2 Conformance requirement

1. The receiver input level range requirements of 3GPP TS 05.05 subclause 6.1 for raw data bits of GMSK modulation under static and EQ propagation conditions shall be met:

   1.1 Under normal conditions.

   1.2 Under extreme conditions.

2. The receiver input level range requirements of 3GPP TS 05.05 subclause 6.1 for raw data bits of 8PSK modulation under static condition shall be met:

   2.1 Under normal conditions.

   2.2 Under extreme conditions.

3. The receiver input level range requirements of 3GPP TS 05.05 subclause 6.1 for raw data bits of 8PSK modulation with random frequency offset under static condition shall be met:

   3.1 Under normal conditions.

   3.2 Under extreme conditions.

14.18.6.3 Test purpose

1. To verify that the MS does not exceed the conformance requirement with an allowance for the statistical significance of the test.

   1.1 Under normal conditions.

   1.2 Under extreme conditions.

14.18.6.4 Test Method

Initial Conditions

The MS is assumed to be EGPRS attached. The power control parameter ALPHA (α) is set to 0.

The SS establishes a downlink TBF on one timeslot.

The SS commands the MS to request an establishment of the TBF Uplink and to create a channel loop back after demodulation and before decoding. This is achieved by the EGPRS Switched Radio Loopback Mode (3GPP TS 04.14/44.014, subclause 5.5)

Test Procedure

For GMSK Modulation:

a) The SS shall transmit the pseudo-random data using the standard GMSK-modulated test signal in the Mid ARFCN range and the input level at the receiver input shall be 20 dB above the Reference Sensitivity Level.

b) The SS compares the data that it sends to the MS with the data which is looped back from the receiver after demodulation and before decoding.

   The SS tests the bit error ratio for the data bits, by examining sequences of at least the minimum number of samples specified in the test requirements. The number of error events is recorded.

c) Step b) is repeated with the input level at the receiver input increased to 73 dBµVemf().

d) Step b) is repeated with the input level at the receiver input increased to the following values:

   For GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900: 98 dBµVemf().

   For DCS 1 800 and PCS 1 900: 90 dBµVemf().

e) The SS fading function is set to EQ.

f) Step b) is repeated with the input level at the receiver input set to 20dB above the reference sensitivity level() and then increased to 73 dBµVemf().

g) Steps a) to f) are repeated under extreme test conditions.

For 8PSK Modulation:

a) The SS shall transmit the pseudo-random data using the standard 8PSK-modulated test signal in the Mid ARFCN range and the input level at the receiver input shall be -82 dBm, which level is subject to adjustment according to correction table in subclause 6.2. of 3GPP TS 05.05/45.005. For an EGPRS MS that only supports GMSK modulation in the uplink, a GMSK-modulated signal will be used for UL transmission.

b) The SS compares the data that it sends to the MS with the data which is looped back from the receiver after demodulation and before decoding.

   The SS tests the bit error ratio for the data bits, by examining sequences of at least the minimum number of samples specified in the test requirements. The number of error events is recorded.

c) Step b) is repeated with the input level at the receiver input increased to 73 dBµVemf().

d) Step b) is repeated with the input level at the receiver input increased to 87 dBµVemf().

e) Steps a) to d) are repeated under extreme test conditions.

For 8PSK Modulation with random frequency offset:

a) The SS shall transmit the pseudo-random data using the standard 8PSK-modulated test signal in the Mid ARFCN range and the input level at the receiver input shall be -82 dBm, which level is subject to adjustment according to correction table in subclause 6.2. of 3GPP TS 05.05/45.005. The 8-PSK modulated test signal is randomly offset, on a burst-by-burst basis, by a frequency offset of +/- 0,1ppm. For each burst, the sign of the frequency offset is chosen according to a 511-bit pseudo-random sequence, defined in ITU-T Recommendation O.153. For an EGPRS MS that only supports GMSK modulation in the uplink, a GMSK-modulated signal will be used for UL transmission.

b) The SS compares the data that it sends to the MS with the data which is looped back from the receiver after demodulation and before decoding.

   The SS tests the bit error ratio for the data bits, by examining sequences of at least the minimum number of samples specified in the test requirements. The number of error events is recorded.

c) Step b) is repeated with the input level at the receiver input increased to 73 dBµVemf().

d) Step a) to c) are repeated under extreme test conditions.

14.18.6.5 Test Requirements

The error rate measured in this test shall not exceed the test limit error rate values given in table 14.18-10. This shall apply for any combination of normal and extreme test voltages and ambient temperature, for the different propagation conditions and for any level of input signal to the receiver.

Table 14.18-10: Limits for input level range

			GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900		DCS 1 800 and PCS 1 900	
Type of test signals	**Type of measurement**	**Propagation Conditions**	**Test limit Error rate %**	**Minimum No. of samples**	**Test limit Error rate %**	**Minimum No. of samples**
GMSK	**BER**	Static <= 73dBμVemf()	0,012	1 640 000	0,012	1 640 000
		Static <= 98dBμVemf()	0,122	164 000		
		Static <= 90dBμVemf()			0,122	164 000
		EQ	3,25	120 000	3,25	60000
8PSK	**BER**	Static<= 73dBμVemf()	0,012	1 640 000	0,012	1 640 000
		Static <= 87dBμVemf()	0,122	164 000	0,122	164 000
8PSK with frequency offset within 0,1 ppm	**BER**	Static <= 73dBμVemf()	0,012	1 640 000	0,122	164 000

14.18.6a EGPRS Usable receiver input level range in EGPRS2A Configuration

14.18.6a.1 Definition

The usable receiver input level range is the range of the radio frequency input level of a specified modulated signal over which bit error ratio stay between specified limits.

14.18.6a.2 Conformance requirement

1. The receiver input level range requirements of 3GPP TS 45.005 subclause 6.1 for raw data bits of 8PSK modulation under static condition shall be met:

   1.1 Under normal conditions.

   1.2 Under extreme conditions.

2. The receiver input level range requirements of 3GPP TS 45.005 subclause 6.1 for raw data bits of 16-QAM modulation under static condition shall be met:

   3.1 Under normal conditions.

   3.2 Under extreme conditions.

3. The receiver input level range requirements of 3GPP TS 45.005 subclause 6.1 for raw data bits of 32-QAM modulation under static condition shall be met:

   5.1 Under normal conditions.

   5.2 Under extreme conditions.

14.18.6a.3 Test purpose

1. To verify that the MS does not exceed the conformance requirement with an allowance for the statistical significance of the test.

1.1 Under normal conditions.

1.2 Under extreme conditions.

14.18.6a.4 Test Method

Initial Conditions

The MS is assumed to be EGPRS attached. The power control parameter ALPHA (α) is set to 0.

The SS establishes a downlink TBF on one timeslot.

The SS commands the MS to request an establishment of the TBF Uplink and to create a channel loop back after demodulation and before decoding. This is achieved by the EGPRS Switched Radio Loopback Mode (3GPP TS 04.14/44.014, subclause 5.5)

Test Procedure

For 8PSK Modulation:

a) The SS shall transmit the pseudo-random data using the standard 8PSK-modulated test signal in the Mid ARFCN range and the input level at the receiver input shall be -82 dBm, which level is subject to adjustment according to correction table in subclause 6.2. of 3GPP TS 45.005.

b) The SS compares the data that it sends to the MS with the data which is looped back from the receiver after demodulation and before decoding.

   The SS tests the bit error ratio for the data bits, by examining sequences of at least the minimum number of samples specified in the test requirements. The number of error events is recorded.

c) Step b) is repeated with the input level at the receiver input increased to 73 dBμVemf().

d) Step b) is repeated with the input level at the receiver input increased to 87 dBμVemf().

e) Steps a) to d) are repeated under extreme test conditions.

For 16-QAM Modulation:

a) The SS shall transmit the pseudo-random data using the standard 16QAM-modulated test signal in the Mid ARFCN range and the input level at the receiver input shall be -80 dBm, which level is subject to adjustment according to correction table in subclause 6.2. of 3GPP TS 45.005.

b) The SS compares the data that it sends to the MS with the data which is looped back from the receiver after demodulation and before decoding.

   The SS tests the bit error ratio for the data bits, by examining sequences of at least the minimum number of samples specified in the test requirements. The number of error events is recorded.

c) Step b) is repeated with the input level at the receiver input increased to 73 dBμVemf().

d) Step b) is repeated with the input level at the receiver input increased to 84 dBμVemf().

e) Steps a) to d) are repeated under extreme test conditions.

For 32-QAM Modulation:

a) The SS shall transmit the pseudo-random data using the standard 32QAM -modulated test signal in the Mid ARFCN range and the input level at the receiver input shall be -77 dBm, which level is subject to adjustment according to correction table in subclause 6.2. of 3GPP TS 45.005. For an EGPRS MS that only supports 16QAM_modulation in the uplink, a 16QAM-modulated signal will be used for UL transmission.

b) The SS compares the data that it sends to the MS with the data which is looped back from the receiver after demodulation and before decoding.

   The SS tests the bit error ratio for the data bits, by examining sequences of at least the minimum number of samples specified in the test requirements. The number of error events is recorded.

c) Step b) is repeated with the input level at the receiver input increased to 73 dBµVemf().

d) Step b) is repeated with the input level at the receiver input increased to 84 dBµVemf().

e) Steps a) to d) are repeated under extreme test conditions.

14.18.6a.5 Test Requirements

The error rate measured in this test shall not exceed the test limit error rate values given in table 14.18-11. This shall apply for any combination of normal and extreme test voltages and ambient temperature, for the different propagation conditions and for any level of input signal to the receiver.

Table 14.18-11: Limits for input level range

			GSM 400, GSM 700, T-GSM 810, GSM 850 and GSM 900		DCS 1 800 and PCS 1 900	
Type of test signals	**Type of measurement**	**Propagation Conditions**	**Test limit Error rate %**	**Minimum No. of samples**	**Test limit Error rate %**	**Minimum No. of samples**
8PSK	**BER**	Static<= 73dBµVemf() Static <= 87dBµVemf()	0,012 0,122	1 640 000 164 000	0,012 0,122	1 640 000 164 000
16-QAM	**BER**	Static<= 73dBµVemf() Static <= 84dBµVemf()	0,012 0,122	1 640 000 164 000	0,012 0,122	1 640 000 164 000
32-QAM	**BER**	Static<= 73dBµVemf() Static <= 84dBµVemf()	0,012 0,122	1 640 000 164 000	0,012 0,122	1 640 000 164 000

14.18.7 Incremental Redundancy Performance

14.18.7.1 Definition

In Incremental Redundancy RLC mode, soft information from multiple, differently punctured versions of an RLC data block may be used when decoding the RLC data block. This significantly increases the link performance.

14.18.7.2 Conformance requirement

An EGPRS capable MS shall, under the conditions stated in the table below, achieve a long-term throughput of 20 kbps per time slot (see NOTE) measured between LLC and RLC/MAC layer.

Propagation conditions	Static, input level –97.0 dBm
Modulation and Coding Scheme	MCS-9
Acknowledgements polling period	32 RLC data blocks
Roundtrip time	120 ms
Number of timeslots	Maximum capability of the MS
Transmit window size	Maximum for the MS timeslot capability

NOTE: This corresponds to an equivalent block error rate of approximately 0.66 using the prescribed MCS-9.

3GPP TS 05.05, subclause 6.7 (3GPP 45.005, subclause 6.7).

14.18.7.3 Test purpose

To verify that the EGPRS MS can operate in Incremental Redundancy RLC mode for a sufficiently long time and that it achieves a long-term throughput of 20 kbps per timeslot, measured between LLC and RLC/MAC layer, under the conditions defined in conformance requirement.

14.18.7.4 Method of test

The SS establishes a downlink TBF in Incremental Redundancy RLC mode, beginning on a Mid ARFCN Range, under the conditions defined in the conformance requirement. The downlink data transfer is proceeded with random payload data according to the Incremental Redundancy RLC mode procedures using MCS-9. The throughput between LLC and RLC/MAC layer is determined by the SS on the basis of the amount of successfully delivered LLC data, i.e. the amount of data bits in acknowledged RLC data blocks in the correct order without gaps representing LLC or higher layer data. The long-term throughput is determined until at least 6000 RLC data blocks have been send from RLC/MAC layer to the LLC layer within the MS. The test is repeated in Low and High ARFCN range.

If the END_OF_WINDOW bit in the ack/nack message is not set, the SS shall poll the MS for the next partial bitmap irrespective of the polling period.

If the MS is setting the MS OUT OF MEMORY BIT to 1 in the EGPRS Packet Downlink ACK/NACK message the SS should take care that only NACKED RLC data blocks are retransmitted with MCS 9 and if the MS sets again the MS OUT OF MEMORY BIT to 0 the SS can continue transmitting also new data with MCS 9.

Initial conditions

The SS establishes a downlink EGPRS TBF in Incremental Redundancy RLC mode according to the generic procedures defined in sect. 50, on a Mid ARFCN Range. For the TBF, the SS allocates the maximum number of timeslots according to the multislot capability of the MS under test, applies MCS-9 as the Modulation and Coding Scheme and the maximum RLC downlink window size the number of used time slots allows for the data transfer. The SS commands the MS to use maximum transmit power in the uplink, decreases the transmit power to –96 dBm in the downlink and preserves the fading conditions as static. The power control parameter ALPHA (α) is set to 0.

Procedure

a) Using MSC-9 with Puncturing Scheme 1 (PS1), the SS continues the EGPRS TBF in the downlink by transmitting RLC data blocks with valid Block Sequence Numbers (BSN) within the RLC downlink window of maximum size according to MS's multislot class, and polls the MS for acknowledgements after every polling period of 32 RLC data blocks.

b) The SS updates its associated acknowledge state array V(B) according to the ack/nack bitmap in the EGPRS Downlink Ack/Nack message transmitted by the MS as a response to polling and shifts the RLC downlink window accordingly.

c) While continuing the transmission of further RLC data blocks with PS1, the SS retransmits, after a delay that corresponds to a round trip time of 120ms, all unacknowledged RLC data blocks with PS2 starting from the oldest unacknowledged RLC blocks.

d) The SS repeats the steps a) to c). For retransmissions of RLC data blocks that have already been retransmitted with PS2, the SS applies PS3 for such blocks and further again PS1 and PS2 in cyclic manner if necessary.

e) Steps a) to d) are repeated until at least 6000 RLC data blocks are transmitted from RLC to LLC layer within the MS, but never more then 18000 RLC data blocks from SS to MS.

NOTE: If the MS needs more than 18000 RLC data blocks received to send 6000 RLC blocks up to the LLC layer it will never fulfil the conformance requirements.

f) The SS calculates the data throughput per time slot between RLC/MAC and LLC layers on the basis of successfully transmitted LLC-data during steps a) to e). For this the lower end of the RLC downlink window can be used to measure the progress of the transmission in terms of amount of data passed on to the LLC.

   If n is the number of timeslots, x the position of the lower end of the RLC downlink window, and t is the duration from the beginning of the transmission of RLC data blocks to reaching the stop condition, then the average throughput per timeslot is $(x \cdot 592\ \text{bit})/(n \cdot t)$.

g) Steps a) to f) are repeated at Low and High ARFCN ranges.

Test requirements

The long-term throughput per time slot as a result of step f) of the test procedure shall equal or exceed 20kbps on low, mid and high ARFCN range.

14.18.7a Incremental Redundancy Performance in EGPRS2A configuration

14.18.7a.1 Definition

In Incremental Redundancy RLC mode, soft information from multiple, differently punctured versions of an RLC data block may be used when decoding the RLC data block. This significantly increases the link performance.

14.18.7a.2 Conformance requirement

An EGPRS2A capable MS shall, under the conditions stated in the table below, achieve a long-term throughput of 33 kbps per time slot measured between LLC and RLC/MAC layer.

Propagation conditions	Static, input level –94.0 dBm
Modulation and Coding Scheme	DAS-12
Acknowledgements polling period	32 RLC data blocks
Roundtrip time	120 ms
Number of timeslots	Maximum capability of the MS
Transmit window size	Maximum for the MS timeslot capability

3GPP 45.005, subclause 6.7

14.18.7a.3 Test purpose

To verify that the EGPRS2A MS can operate in Incremental Redundancy RLC mode for a sufficiently long time and that it achieves a long-term throughput of 33 kbps per timeslot, measured between LLC and RLC/MAC layer, under the conditions defined in conformance requirement.

14.18.7a.4 Method of test

The SS establishes a downlink TBF in Incremental Redundancy RLC mode, beginning on a Mid ARFCN Range, under the conditions defined in the conformance requirement. The downlink data transfer is proceeded with random payload data according to the Incremental Redundancy RLC mode procedures using DAS-12. The throughput between LLC and RLC/MAC layer is determined by the SS on the basis of the amount of successfully delivered LLC data, i.e. the amount of data bits in acknowledged RLC data blocks in the correct order without gaps representing LLC or higher layer data. The long-term throughput is determined until at least 6000 RLC data blocks have been send from RLC/MAC layer to the LLC layer within the MS. The test is repeated in Low and High ARFCN range.

If the END_OF_WINDOW bit in the ack/nack message is not set, the SS shall poll the MS for the next partial bitmap irrespective of the polling period.

If the MS is setting the MS OUT OF MEMORY BIT to 1 in the EGPRS2A Packet Downlink ACK/NACK message the SS should take care that only NACKED RLC data blocks are retransmitted with DAS 12 and if the MS sets again the MS OUT OF MEMORY BIT to 0 the SS can continue transmitting also new data with DAS 12.

Initial conditions

The SS establishes a downlink EGPRS2A TBF in Incremental Redundancy RLC mode according to the generic procedures defined in sect. 50, on a Mid ARFCN Range. For the TBF, the SS allocates the maximum number of timeslots according to the multislot capability of the MS under test, applies DAS-12 as the Modulation and Coding Scheme and the maximum RLC downlink window size the number of used time slots allows for the data transfer. The SS commands the MS to use maximum transmit power in the uplink, decreases the transmit power to –96 dBm in the downlink and preserves the fading conditions as static. The power control parameter ALPHA (α) is set to 0.

Procedure

a) Using DAS-12 with Puncturing Scheme 1 (PS1), the SS continues the EGPRS2A TBF in the downlink by transmitting RLC data blocks with valid Block Sequence Numbers (BSN) within the RLC downlink window of maximum size according to MS's multislot class, and polls the MS for acknowledgements after every polling period of 32 RLC data blocks.

b) The SS updates its associated acknowledge state array V(B) according to the ack/nack bitmap in the EGPRS2A Downlink Ack/Nack message transmitted by the MS as a response to polling and shifts the RLC downlink window accordingly.

c) While continuing the transmission of further RLC data blocks with PS1, the SS retransmits, after a delay that corresponds to a round trip time of 120ms, all unacknowledged RLC data blocks with PS2 starting from the oldest unacknowledged RLC blocks.

d) The SS repeats the steps a) to c). For retransmissions of RLC data blocks that have already been retransmitted with PS2, the SS applies PS3 for such blocks and further again PS1 and PS2 in cyclic manner if necessary.

g) Steps a) to d) are repeated until at least 6000 RLC data blocks are transmitted from RLC to LLC layer within the MS, but never more then 18000 RLC data blocks from SS to MS.

NOTE: If the MS needs more than 18000 RLC data blocks received to send 6000 RLC blocks up to the LLC layer it will never fulfil the conformance requirements.

h) The SS calculates the data throughput per time slot between RLC/MAC and LLC layers on the basis of successfully transmitted LLC-data during steps a) to e). For this the lower end of the RLC downlink window can be used to measure the progress of the transmission in terms of amount of data passed on to the LLC.

If n is the number of timeslots, x the position of the lower end of the RLC downlink window, and t is the duration from the beginning of the transmission of RLC data blocks to reaching the stop condition, then the average throughput per timeslot is $(x \cdot 592\ \text{bit})/(n \cdot t)$.

g) Steps a) to f) are repeated at Low and High ARFCN ranges.

Test requirements

The long-term throughput per time slot as a result of step f) of the test procedure shall equal or exceed 33kbps on low, mid and high ARFCN range.

14.18.8 DARP Phase 1 EGPRS tests

14.18.8.1 Synchronous single co-channel interferer (DTS-1)

14.18.8.1.1 Definition

The DARP reference test scenario DTS-1 for a single synchronous co-channel interferer defines an interfering signal and corresponding performance limits. This test is a measure of the capability of the DARP receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of this specific unwanted signals.

14.18.8.1.2 Conformance requirement

MS indicating support for Downlink Advanced Receiver Performance – phase I (see 3GPP TS 24.008) shall fulfil the requirements in table 2o for wanted signals on GMSK modulated channels under TU50 no FH propagation conditions and GMSK modulated interferers for the test scenarios defined in annex L. The reference performance shall be:

– For packet switched channels (PDTCH) BLER: ≤ 10 %

The values in table 2o are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex L).

3GPP TS 45.005; clause 6.3.

Reference Test Scenarios for Synchronous single co-channel interferer

Reference Test Scenario	Interfering Signal	Interferer relative power level	TSC	Interferer Delay range
DTS-1	Co-channel 1	0 dB	none	no delay

3GPP TS 45.005; Annex L.

GSM 900 and GSM 850	
Propagation condition	**TU50 no FH**
Type of channel	**C/I**
PDTCH MCS-1	3,5 dB
PDTCH MCS-2	5,5 dB
PDTCH MCS-3	11 dB
PDTCH MCS-4	18 dB

DCS 1 800 & PCS 1900	
Propagation condition	**TU50 no FH**
Type of channel	**C/I**
PDTCH MCS-1	3,5 dB
PDTCH MCS-2	6,5 dB
PDTCH MCS-3	11,5 dB
PDTCH MCS-4	19,5 dB

3GPP TS 45.005; table 2o (extracts)

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP TS 45.005; subclause 2

14.18.8.1.3 Test purpose

To verify that the MS does not exceed conformance requirement for different coding schemes and under the propagation condition TU50/noFH with an allowance for the statistical significance of the test.

14.18.8.1.4 Test method

14.18.8.1.4.1 Initial condition

A downlink TBF is established according to the generic call set up procedure with an ARFCN in the mid ARFCN range, power control level set to maximum power. The power control parameter ALPHA (α) is set to 0.

The SS establish a downlink TBF.

The SS transmits Standard Test Signal C1 with TSC 0.

In addition to this wanted signal (C1), the SS produces an independent, uncorrelated interfering signal (I1). This unwanted signal is random, continuous and GSM-modulated and has no fixed relationship with the bit transitions of the wanted signal.

14.18.8.1.4.2 Procedure

a) The co-channel interferer signal I1 (unwanted signal) is set to -80 dBm.

b) The fading characteristic of the wanted signal C1 and the interferer signal I1 is set to TU High. No FH applies.

c) The SS transmits packets using MCS-1 coding to the MS on all allocated timeslots.

d) The SS sets the level of the wanted signal 1 dB above the value according to table 14.18.8.1.4.3-1 and table 14.18.8.1.4.3-2.

e) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, sub clause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

f) Once the number of blocks transmitted with the current coding scheme as counted in step (e) reaches or exceeds the minimum number of blocks as given in table 14.18-2 the SS calculates the Block error ratio. The SS resets both counters.

g) The SS repeats the steps (c) to f) for each of the coding schemes MCS-2, MCS-3 and MCS-4

14.18.8.1.4.3 Test requirement

The block error ratio, as calculated by the SS for different channels under the TU High propagation conditions, shall not exceed the conformance requirement.

NOTE: The wanted signal levels derived from calculations using 3GPP TS 45.005 table 2ae shall be set according to the table 14.18.8.1.4.3-1 and 14.18.8.1.4.3-2.

Table 14.18.8.1.4.3-1

GSM 900, T-GSM 810 and GSM 850		
PDTCH MCS-1	C/dBm	- 76,5
PDTCH MCS-2	C/dBm	- 74,5
PDTCH MCS-3	C/dBm	- 69,0
PDTCH MCS-4	C/dBm	- 62,0

Table 14.18.8.1.4.3-2

DCS 1 800 & PCS 1900		
PDTCH MCS-1	C/dBm	- 76,5
PDTCH MCS-2	C/dBm	- 73,5
PDTCH MCS-3	C/dBm	- 68,5
PDTCH MCS-4	C/dBm	- 60,5

14.18.8.1a Synchronous single co-channel interferer (DTS-1) in TIGHTER configuration

14.18.8.1a.1 Definition

The DARP reference test scenario DTS-1 for a single synchronous co-channel interferer defines an interfering signal and corresponding performance limits. This test is a measure of the capability of the DARP receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of this specific unwanted signal.

14.18.8.1a.2 Conformance requirement

A MS indicating support for TIGHTER Capability (see 3GPP TS 24.008) shall fulfil the requirements in table 2ad for co channel interference (C/Ic), table 2af for adjacent channel (200 kHz) interference (C/Ia1), and the additional requirements in table 2ae for wanted signals on GMSK modulated channels for the test scenarios defined in annex L.

The reference performance shall be:

- For packet switched channels (PDTCH) BLER:≤ 10 %

The values in table 2ae are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex L).

3GPP TS 45.005; sub clause 6.3.5

Reference Test Scenarios for Synchronous single co-channel interferer

Reference Test Scenario	Interfering Signal	Interferer relative power level	TSC	Interferer Delay range
DTS-1	Co-channel 1	0 dB	none	no delay

3GPP TS 45.005; Annex L.

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP TS 45.005; sub clause 2

14.18.8.1a.3 Test purpose

To verify that the MS does not exceed conformance requirement for different coding schemes and under the propagation condition TU50/noFH with an allowance for the statistical significance of the test.

GSM 900 and GSM 850	
Propagation condition	**TU50 no FH**
Type of channel	**C/I**
PDTCH MCS-1	-6dB
PDTCH MCS-2	-4 dB
PDTCH MCS-3	1,5 dB
PDTCH MCS-4	8,5 dB

DCS 1 800 & PCS 1900	
Propagation condition	**TU50 no FH**
Type of channel	**C/I**
PDTCH MCS-1	-5,5 dB
PDTCH MCS-2	-3,5 dB
PDTCH MCS-3	2 dB
PDTCH MCS-4	9 dB

3GPP TS 45.005; table 2ae (excerpt)

14.18.8.1a.4 Test method

14.18.8.1a.4.1 Initial condition

A downlink TBF is established according to the generic call set up procedure with an ARFCN in the mid ARFCN range, power control level set to maximum power. The power control parameter ALPHA (α) is set to 0.

The SS establish a downlink TBF.

The SS transmits Standard Test Signal C1 with TSC 0.

In addition to this wanted signal (C1), the SS produces an independent, uncorrelated interfering signal (I1). This unwanted signal is random, continuous and GSM-modulated and has no fixed relationship with the bit transitions of the wanted signal.

14.18.8.1a.4.2 Procedure

a) The co-channel interferer signal I1 (unwanted signal) is set to -80 dBm.

b) The fading characteristic of the wanted signal C1 and the interferer signal I1 is set to TU High. No FH applies.

c) The SS transmits packets using MCS-1 coding to the MS on all allocated timeslots.

d) The SS sets the level of the wanted signal 1 dB above the value according to table 14.18.8.1a.4.3-1 and table 14.18.8.1a.4.3-2.

e) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, sub clause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

f) Once the number of blocks transmitted with the current coding scheme as counted in step (e) reaches or exceeds the minimum number of blocks as given in table 14.18-2 the SS calculates the Block error ratio. The SS resets both counters.

g) The SS repeats the steps (c) to f) for each of the coding schemes MCS-2, MCS-3 and MCS-4

14.18.8.1a.4.3 Test requirement

The block error ratio, as calculated by the SS for different channels under the TU High propagation conditions, shall not exceed the conformance requirement.

NOTE: The wanted signal levels derived from calculations using 3GPP TS 45.005 table 2o shall be set according to the table 14.18.8.1a.4.3-1 and 14.18.8.1a.4.3-2.

Table 14.18.8.1a.4.3-1

GSM 900, T-GSM 810 and GSM 850		
PDTCH MCS-1	C/dBm	- 86
PDTCH MCS-2	C/dBm	- 84
PDTCH MCS-3	C/dBm	- 78,5
PDTCH MCS-4	C/dBm	- 71,5

Table 14.18.8.1a.4.3-2

DCS 1 800 & PCS 1900		
PDTCH MCS-1	C/dBm	- -85,5
PDTCH MCS-2	C/dBm	- 83,5
PDTCH MCS-3	C/dBm	- 78
PDTCH MCS-4	C/dBm	- 71

14.18.8.2 Synchronous single co-channel interferer (DTS-2 / DTS-3)

14.18.8.2.1 Definition

The DARP reference test scenarios DTS-2 and DTS-3 for multiple synchronous interferers define a set of interfering signals and the corresponding performance limits. These tests are a measure of the capability of the DARP receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted signals.

14.18.8.2.2 Conformance requirement

The block error rate (BLER) performance for PDTCH / CS-1 to CS-4 shall not exceed 10 % at the multiple interference ratios (C/I_c) according to table 14.18.8.2.2-1.

Table 14.18.8.2.2-1: Reference Test Scenarios for synchronous multiple interferers

Reference Test Scenario	Interfering Signal	Interferer relative power level	TSC	Interferer Delay range
DTS-2	Co-channel 1 Co-channel 2 Adjacent 1 AWGN	0 dB -10 dB 3 dB -17 dB	none none none -	no delay no delay no delay -
DTS-3	Co-channel 1 Co-channel 2 Adjacent 1 AWGN	0 dB -10 dB 3 dB -17 dB	random none none -	-1 to +4 symbols no delay no delay -

The values in table 14.18.8.2.2-2 and table 14.18.8.2.2-3 are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (3GPP TS 45.005, annex L).

Table 14.18.8.2.2-2

GSM 900 and GSM 850		
Propagation condition	TU50 no FH	
Type of channel	C/I	
	DTS-2	DTS-3
PDTCH MCS-1	9,5 dB	10,5 dB
PDTCH MCS-2	11 dB	12 dB
PDTCH MCS-3	15 dB	15,5 dB
PDTCH MCS-4	20 dB	21 dB

Table 14.18.8.2.2-3

DCS 1 800 & PCS 1900		
Propagation condition	**TU50 no FH**	
Type of channel	**C/I**	
	DTS-2	**DTS-3**
PDTCH MCS-1	9 dB	10 dB
PDTCH MCS-2	11 dB	11,5 dB
PDTCH MCS-3	15 dB	15,5 dB
PDTCH MCS-4	22 dB	22,5 dB

Reference 3GPP TS 45.005, annex L, table 2o

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.18.8.2.3 Test purpose

To verify that the MS does not exceed the conformance requirement for different PDTCH / MSC 1-4 coding schemes under the propagation condition TU50/noFH with an allowance for the statistical significance of the test.

14.18.8.2.4 Test method

14.18.8.2.4.1 Initial condition

A TBF is established according to the generic call set up procedure for packet switched on an ARFCN in the Mid range, on the maximum number of receive timeslots which the MS is capable to support, The MS is transmitting at maximum power. The power control parameter ALPHA (α) is set to 0.

The SS establish a downlink TBF.

The SS transmits Standard Test Signal C1 with TSC 0.

In addition to this wanted signal (C1), the SS produces multiple interfering signals for DTS-2 or DTS-3 scenarios as appropriate for the test procedure.

These interferers are:

Identical interferer for DTS-2 and DTS-3:

- Co-channel 2 (I_{CoCh2}): Synchronous co-channel interferer of type I1 as specified in TS 51.010 annex 5.2
- Adjacent 1 (I_{AdjCh1}): Adjacent channel interferer of type I1 as specified in TS 51.010 annex 5.2
- AWGN (I_{AWGN}): AWGN interferer of type I3 as specified in TS51.010 annex 5.2

DTS-2 specific interferer:

- Co-channel 1 (I_{CoCh1}): Synchronous co-channel interferer of type I1 as specified in TS 51.010 annex 5.2

DTS-3 specific interferer:

- Co-channel 1 (I_{CoCh1}): Delayed co-channel interferer of type I4 as specified in TS 51.010 annex 5.2.

14.18.8.2.4.2 Test procedure

14.18.8.2.4.3 DTS-2 procedure

a) The DTS-2 co-channel interferer signal I_{CoCh1} is configured according to DTS-2 configuration.

b) The co-channel interferer signal I_{CoCh1} set to -80 dBm.

c) The power levels of the interferers I_{CoCh2} , I_{AdjCh1}, and I_{AWGN} are set according to table 14.18.8.2.2-1. The power levels are defined relative to I_{CoCh1}.

d) The fading characteristics of the wanted signal C1 and the interferer signals I_{CoCh1}, I_{CoCh2}, and I_{AdjCh1} are set to TU High. No FH applies.

e) The SS transmits packets using MCS-1 coding on all allocated timeslots.

f) The SS sets the level of the wanted signal C1 1 dB above the level according to table 14.18.8.2.4.5-1 and table 14.18.8.2.4.5-2.

g) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, sub clause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

h) Once the number of blocks transmitted with the current coding scheme as counted in step (e) reaches or exceeds the minimum number of blocks as given in table 14.18-2 the SS calculates the Block error ratio. The SS resets both counters.

i) SS repeats the steps (e) to (h) for each of the coding schemes MCS-2, MCS-3 and MCS-4.

14.18.8.2.4.4 Test method

a) The DTS-3 co-channel interferer signal I_{CoCh1} is configured according to DTS-3 configuration.

b) The SS repeats the steps (b) to (h) identical to the DTS-2 procedure

14.18.8.2.4.5 Test requirement

The block error ratio, as calculated by the SS for different channels and under the TU High propagation conditions, shall not exceed the conformance requirement.

NOTE: The wanted signal levels derived from calculations using 3GPP TS 45.005 (table 2o, annex L) , shall be set according to the table below.

Table 14.18.8.2.4.5-1

GSM 900, T-GSM 810 and GSM 850			
Type of channel		DARP Test Scenario	
		DTS-2	DTS-3
PDTCH MCS-1	C/dBm	- 70,5	- 69,5
PDTCH MCS-2	C/dBm	- 69,0	- 68,0
PDTCH MCS-3	C/dBm	- 65,0	- 64,5
PDTCH MCS-4	C/dBm	- 60,0	- 59,0

Table 14.18.8.2.4.5-2

DCS 1 800 & PCS 1900			
Type of channel		DARP Test Scenario	
		DTS-2	DTS-3
PDTCH MCS-1	C/dBm	- 71,0	- 70,0
PDTCH MCS-2	C /dBm	- 69,0	- 68,5
PDTCH MCS-3	C /dBm	- 65,0	- 64,5
PDTCH MCS-4	C /dBm	- 58,0	- 57,5

14.18.8.2a Synchronous single co-channel interferer (DTS-2 / DTS-3) in TIGHTER configuration

14.18.8.2a.1 Definition

The DARP reference test scenarios DTS-2 and DTS-3 for multiple synchronous interferers define a set of interfering signals and the corresponding performance limits. These tests are a measure of the capability of the DARP receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted signals.

14.18.8.2a.2 Conformance requirement

A MS indicating support for TIGHTER Capability (see 3GPP TS 24.008) shall fulfil the requirements in table 2ad for co channel interference (C/Ic), table 2af for adjacent channel (200 kHz) interference (C/Ia1), and the additional requirements in table 2ae for wanted signals on GMSK modulated channels for the test scenarios defined in annex L.

The reference performance shall be:

- For packet switched channel (PDTCH) BLER: ≤ 10 %

Reference Test Scenarios for synchronous multiple interferers

Reference Test Scenario	Interfering Signal	Interferer relative power level	TSC	Interferer Delay range
DTS-2	Co-channel 1 Co-channel 2 Adjacent 1 AWGN	0 dB -10 dB 3 dB -17 dB	none none none -	no delay no delay no delay -
DTS-3	Co-channel 1 Co-channel 2 Adjacent 1 AWGN	0 dB -10 dB 3 dB -17 dB	random none none -	-1 to +4 symbols no delay no delay -

3GPP TS 45.005; Annex L

The values in table 14.18.8.2a.2-2 and table 14.18.8.2a.2-3 are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (3GPP TS 45.005, annex L).

Reference 3GPP TS 45.005, annex L, table 2ae

3GPP TS 45.05 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.18.8.2a.3 Test purpose

To verify that the MS does not exceed the conformance requirement for different PDTCH / MSC 1-4 coding schemes under the propagation condition TU50/noFH with an allowance for the statistical significance of the test.

GSM 900 and GSM 850		
Propagation condition	TU50 no FH	
Type of channel	C/I	
	DTS-2	DTS-3
PDTCH MCS-1	7,5 dB	8,5 dB
PDTCH MCS-2	9 dB	10 dB
PDTCH MCS-3	13 dB	13,5 dB
PDTCH MCS-4	18 dB	19 dB

DCS 1 800 & PCS 1900		
Propagation condition	TU50 no FH	
Type of channel	C/I	
	DTS-2	DTS-3
PDTCH MCS-1	7 dB	8 dB
PDTCH MCS-2	9 dB	9,5 dB
PDTCH MCS-3	13 dB	13,5 dB
PDTCH MCS-4	20 dB	20,5 dB

14.18.8.2a.4 Test method

14.18.8.2a.4.1 Initial condition

A TBF is established according to the generic call set up procedure for packet switched on an ARFCN in the Mid range, on the maximum number of receive timeslots which the MS is capable to support, The MS is transmitting at maximum power. The power control parameter ALPHA (α) is set to 0.

The SS establish a downlink TBF.

The SS transmits Standard Test Signal C1 with TSC 0.

In addition to this wanted signal (C1), the SS produces multiple interfering signals for DTS-2 or DTS-3 scenarios as appropriate for the test procedure.

These interferers are:

Identical interferer for DTS-2 and DTS-3:

- Co-channel 2 (I_{CoCh2}): Synchronous co-channel interferer of type I1 as specified in TS 51.010 annex 5.2
- Adjacent 1 (I_{AdjCh1}): Adjacent channel interferer of type I1 as specified in TS 51.010 annex 5.2
- AWGN (I_{AWGN}): AWGN interferer of type I3 as specified in TS51.010 annex 5.2

DTS-2 specific interferer:

- Co-channel 1 (I_{CoCh1}): Synchronous co-channel interferer of type I1 as specified in TS 51.010 annex 5.2

DTS-3 specific interferer:

- Co-channel 1 (I_{CoCh1}): Delayed co-channel interferer of type I4 as specified in TS 51.010 annex 5.2.

14.18.8.2a.4.2 Test procedure

14.18.8.2a.4.3 DTS-2 procedure

a) The DTS-2 co-channel interferer signal I_{CoCh1} is configured according to DTS-2 configuration.

b) The co-channel interferer signal I_{CoCh1} set to -80 dBm.

c) The power levels of the interferers I_{CoCh2} , I_{AdjCh1}, and I_{AWGN} are set according to table 14.18.8.2a.2-1. The power levels are defined relative to I_{CoCh1}.

d) The fading characteristics of the wanted signal C1 and the interferer signals I_{CoCh1}, I_{CoCh2}, and I_{AdjCh1} are set to TU High. No FH applies.

e) The SS transmits packets using MCS-1 coding on all allocated timeslots.

f) The SS sets the level of the wanted signal C1 1 dB above the level according to table 14.18.8.2a.4.5-1 and table 14.18.8.2a.4.5-2.

g) The SS counts the number of blocks transmitted with current coding scheme and the number of these blocks not acknowledged based on the content of the Ack/Nack Description information element (see 3GPP TS 04.60, sub clause 12.3) in the Packet Downlink Ack/Nack as sent from the MS to the SS on the PACCH.

h) Once the number of blocks transmitted with the current coding scheme as counted in step (e) reaches or exceeds the minimum number of blocks as given in table 14.18-2 the SS calculates the Block error ratio. The SS resets both counters.

i) SS repeats the steps (e) to (h) for each of the coding schemes MCS-2, MCS-3 and MCS-4.

14.18.8.2a.4.4 Test method

a) The DTS-3 co-channel interferer signal I_{CoCh1} is configured according to DTS-3 configuration.

b) The SS repeats the steps (b) to (h) identical to the DTS-2 procedure

14.18.8.2a.4.5 Test requirement

The block error ratio, as calculated by the SS for different channels and under the TU High propagation conditions, shall not exceed the conformance requirement.

NOTE: The wanted signal levels derived from calculations using 3GPP TS 45.005 (table 2ae, annex L) , shall be set according to the table below.

Table 14.18.8.2a.4.5-1

GSM 900, T-GSM 810 and GSM 850			
Type of channel		DARP Test Scenario	
		DTS-2	DTS-3
PDTCH MCS-1	C/dBm	- 72,5	- 71,5
PDTCH MCS-2	C/dBm	- 71,0	- 70,0
PDTCH MCS-3	C/dBm	- 67,0	- 66,5
PDTCH MCS-4	C/dBm	- 62,0	- 61,0

Table 14.18.8.2a.4.5-2

DCS 1 800 & PCS 1900			
Type of channel		DARP Test Scenario	
		DTS-2	DTS-3
PDTCH MCS-1	C/dBm	- 73,0	- 72,0
PDTCH MCS-2	C /dBm	- 71,0	- 70,5
PDTCH MCS-3	C /dBm	- 67,0	- 66,5
PDTCH MCS-4	C /dBm	- 60,0	- 59,5

14.18.9 DARP Phase II EGPRS tests

14.18.9.1 Synchronous single co-channel interferer (DTS-1)

14.18.9.1.1 Definition

The DARP phase II reference test scenario DTS-1 for a single synchronous co-channel interferer defines an interfering signal and corresponding performance limits. This test is a measure of the capability of the DARP phase II receivers to receive a wanted modulated signal without exceeding a given degradation due to the presence of this specific unwanted signal.

14.18.9.1.2 Conformance requirement

MS indicating support for Downlink Advanced Receiver Performance – phase II (see 3GPP TS 24.008) shall fulfil the requirements in table 2q for the test scenarios defined in annex N

The reference performance shall be:

- For packet switched channels (PDTCH) BLER:≤ 10 %

The values in table 2q are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex N).

3GPP TS 45.005; clause 6.3.

Reference Test Scenario for synchronous single co-channel interferer

Reference Test Scenario	Interfering Signal	Interferer relative power level	TSC	Interferer Delay range
DTS-1	Co-channel 1	0 dB	none	no delay

3GPP TS 45.005; Annex N.

GSM 900 and GSM 850	
Propagation condition: TU50 (no FH)	
Correlation=0; AGI=0 dB	
PDTCH MCS-1	-11,5 dB
PDTCH MCS-2	-10,0 dB
PDTCH MCS-3	-6,5 dB
PDTCH MCS-4	-1,0 dB

GSM 1800 and GSM 1900	
Propagation condition: TU50 (no FH)	
Correlation=0; AGI=0 dB	
PDTCH MCS-1	-10,5 dB
PDTCH MCS-2	-8,5 dB
PDTCH MCS-3	-4,5 dB
PDTCH MCS-4	2,0 dB

3GPP TS 45.005; table 2q (excerpt for DTS-1).

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP TS 45.005; sub clause 2

14.18.9.1.3 Test purpose

To verify that the MS does not exceed conformance requirement for different coding schemes and under the propagation condition TU50/noFH with an allowance for the statistical significance of the test.

14.18.9.1.4 Test method

14.18.9.1.4.1 Initial condition

The SS is configured as defined in annex N.2 picture N.2.2 of 3GPP 45.005

The diversity parameter for the antenna correlation is set to 0 and the antenna gain imbalance (AGI) is set to 0 dB

A call is set up according to the generic call set up procedure with an ARFCN in the mid ARFCN range on the maximum number of receive timeslots which the MS is capable to support. The power control level set to maximum power.

The power control parameter ALPHA (α) is set to 0.

The SS establish a downlink TBF.

The SS transmits Standard Test Signal C1 with TSC 0.

In addition to this wanted signal (C1), the SS produces an independent, uncorrelated interfering signal (I1). This unwanted signal is random, continuous and GSM-modulated and has no fixed relationship with the bit transitions of the wanted signal.

14.18.9.1.4.2 Procedure

a) The co-channel interferer signal I1 (unwanted signal) is set to -70 dBm.

b) The fading characteristic of the wanted signal C1 and the interferer signal I1 is set to TU High. No FH applies.

c) The SS transmits packets using MCS-1 coding to the MS on all allocated timeslots.

d) The SS sets the level of the wanted signal 1dB above the value according the Table 14.18.9.1.5-1 and Table 14.18.9.1.5-2.

e) The SS transmits the number of blocks with current coding scheme accordingly with table 14.16-2 and counts the BLER based on the content of the ACK/NACK Description information element (see 3GPP TS 04.60, sub clause 12.3) in the Packet Downlink ACK/NACK as sent from the MS to the SS on the PACCH. The SS resets both counters.

f) The SS repeats the steps (c) to (e) for each of the coding schemes MCS-2 to MCS-4

14.18.9.1.5 Test requirement

The block error ratio, as calculated by the SS for different channels under the TU High propagation conditions, shall not exceed the conformance requirement.

NOTE: The wanted signal levels derived from calculations using 3GPP TS 45.005 table 2q shall be set according to the table below.

Table 14.18.9.1.5-1

GSM 900 and GSM 850		
PDTCH MCS-1	C/dBm	-81,5
PDTCH MCS-2	C/dBm	-80,0
PDTCH MCS-3	C/dBm	-76,5
PDTCH MCS-4	C/dBm	-71,0

Table 14.18.9.1.5-2

DCS 1 800 & PCS 1900		
PDTCH MCS-1	C/dBm	-80,5
PDTCH MCS-2	C/dBm	-78,5
PDTCH MCS-3	C/dBm	-74,5
PDTCH MCS-4	C/dBm	-68,0

14.18.9.2 Synchronous single co-channel interferer (DTS-1b)

14.18.9.2.1 Definition

The DARP phase II reference test scenario DTS-1 for a single synchronous co-channel interferer defines an interfering signal and corresponding performance limits. This test is a measure of the capability of the DARP phase II receivers to receive a wanted modulated signal without exceeding a given degradation due to the presence of this specific unwanted signal.

14.18.9.2.2 Conformance requirement

MS indicating support for Downlink Advanced Receiver Performance – phase II (see 3GPP TS 24.008) shall fulfil the requirements in table 2q for the test scenarios defined in annex N

The reference performance shall be:

- For packet switched channels (PDTCH) BLER:≤ 10 %

The values in table 2q are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex N).

3GPP TS 45.005; clause 6.3.

Reference Test Scenario for synchronous single co-channel interferer

Reference Test Scenario	Interfering Signal	Interferer relative power level	TSC	Interferer Delay range
DTS-1b	Co-channel 1 8PSK	0 dB	none	no delay

3GPP TS 45.005; Annex N.

GSM 900 and GSM 850	
Propagation condition: TU50 (no FH)	
Correlation=0; AGI=0 dB	
PDTCH MCS-5	-6,5 dB
PDTCH MCS-6	-4,0 dB
PDTCH MCS-7	1,5 dB
PDTCH MCS-8	1,5** dB
PDTCH MCS-9	6,0** dB

GSM 1800 and GSM 1900	
Propagation condition: TU50 (no FH)	
Correlation=0; AGI=0 dB	
PDTCH MCS-5	-6,0 dB
PDTCH MCS-6	-3,5 dB
PDTCH MCS-7	3,0 dB
PDTCH MCS-8	5,0** dB
PDTCH MCS-9	12,0** dB

NOTE: Performance is specified at 30% BLER for those cases identified with mark '**

NOTE 1: DARP Test Scenario 1 (DTS-1) is similar to testing of co-channel interference for non-DARP receivers with essentially at least as stringent requirements under TU50noFH propagation conditions. DTS-1b utilizes an 8-PSK modulated interferer and is to be applied for MCS5-MCS9.

3GPP TS 45.005; table 2q (excerpt for DTS-1b).

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP TS 45.005; sub clause 2

14.18.9.2.3 Test purpose

To verify that the MS does not exceed conformance requirement for different coding schemes and under the propagation condition TU50/noFH with an allowance for the statistical significance of the test.

14.18.9.2.4 Test method

14.18.9.2.4.1 Initial condition

The SS is configured as defined in annex N.2 picture N.2.2 of 3GPP 45.005.

The diversity parameter for the antenna correlation is set to 0 and the antenna gain imbalance (AGI) is set to 0 dB

A call is set up according to the generic call set up procedure with an ARFCN in the mid ARFCN range on the maximum number of receive timeslots which the MS is capable to support. The power control level set to maximum power.

The power control parameter ALPHA (α) is set to 0.

The SS establish a downlink TBF.

The SS transmits Standard Test Signal C1 with TSC 0.

In addition to this wanted signal (C1), the SS produces an independent, uncorrelated interfering signal (I1). This unwanted signal is random, continuous and GSM-modulated and has no fixed relationship with the bit transitions of the wanted signal.

14.18.9.2.4.2 Procedure

a) The co-channel interferer signal I1 (unwanted signal) is set to -70 dBm.

b) The fading characteristic of the wanted signal C1 and the interferer signal I1 is set to TU High. No FH applies.

c) The SS transmits packets using MCS-5 coding to the MS on all allocated timeslots.

d) The SS sets the level of the wanted signal 1dB above the value according the Table 14.18.9.2.5-1 and Table 14.18.9.2.5-2.

e) The SS transmits the number of blocks with current coding scheme accordingly with table 14.16-2 and counts the BLER based on the content of the ACK/NACK Description information element (see 3GPP TS 04.60, sub clause 12.3) in the Packet Downlink ACK/NACK as sent from the MS to the SS on the PACCH. The SS resets both counters.

f) The SS repeats the steps (c) to (e) for each of the coding schemes MCS-6 to MCS-9

14.18.9.2.5 Test requirement

The block error ratio, as calculated by the SS for different channels under the TU High propagation conditions, shall not exceed the conformance requirement.

NOTE: The wanted signal levels derived from calculations using 3GPP TS 45.005 table 2q shall be set according to the table below.

Table 14.18.9.2.5-1

GSM 900 and GSM 850		
PDTCH MCS-5	C/dBm	-76,5
PDTCH MCS-6	C/dBm	-74,0
PDTCH MCS-7	C/dBm	-68,5
PDTCH MCS-8	C/dBm	-68,5
PDTCH MCS-9	C/dBm	-64,0

Table 14.18.9.2.5-2

DCS 1 800 & PCS 1900		
PDTCH MCS-5	C/dBm	-76,0
PDTCH MCS-6	C/dBm	-73,5
PDTCH MCS-7	C/dBm	-67,0
PDTCH MCS-8	C/dBm	-65,0
PDTCH MCS-9	C/dBm	-58,0

14.18.9.3 Multiple interferers (DTS-2 / DTS-5)

14.18.9.3.1 Definition

The DARP phase II reference test scenarios DTS-2 and DTS-5 for multiple interferers define a set of interfering signals and the corresponding performance limits. These tests are a measure of the capability of the DARP phase II receivers to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted signals.

14.18.9.3.2 Conformance requirement

MS indicating support for Downlink Advanced Receiver Performance – phase II (see 3GPP TS 24.008) shall fulfil the requirements in table 2q for the test scenarios defined in annex N

The reference performance shall be:

- For packet switched channels (PDTCH) BLER:≤ 10 %

The values in table 2q are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex N).

3GPP TS 45.005; clause 6.3.

Reference Test Scenarios for synchronous multiple interferers

Reference Test Scenario	Interfering Signal	Interferer relative power level	TSC	Interferer Delay range
DTS-2	Co-channel 1 Co-channel 2 Adjacent 1 AWGN	0 dB -10 dB 3 dB -17 dB	none none none -	no delay no delay no delay -

Reference Test Scenario for asynchronous multiple interferers

Reference Test Scenario	Interfering Signal	Interferer relative power level	TSC	Interferer Delay
DTS-5	Co-channel 1 Co-channel 2 Adjacent 1 AWGN	0 dB *) -10 dB 3 dB -17 dB	none none none -	74 symbols no delay no delay -
*)	The power of the delayed interferer burst, averaged over the active part of the wanted signal burst. The power of the delayed interferer burst, averaged over the active part of the delayed interferer burst is 3 dB higher.			

3GPP TS 45.005; Annex N.

GSM 900 and GSM 850		
Propagation condition: TU50 (no FH)		
Correlation=0; AGI=0 dB		
Channel type	**C/I**	
	DTS-2	DTS-5
PDTCH MCS-1	1,0	1,5
PDTCH MCS-2	2,5	2,5
PDTCH ‘MCS-3	6,0	6,0
PDTCH MCS-4	11,0	12,5
PDTCH MCS-5	7,0	8,0
PDTCH MCS-6	9,0	10,5
PDTCH MCS-7	13,5	15,0
PDTCH MCS-8	20,0	20,5
PDTCH MCS-9	23,5	26,5

DCS 1800 and PCM 1900		
Propagation condition: TU50 (no FH)		
Correlation=0; AGI=0 dB		
Channel type	**C/I**	
	DTS-2	**DTS-5**
PDTCH MCS-1	1,0	**1,0**
PDTCH MCS-2	2,5	**2,5**
PDTCH ‘MCS-3	6,0	**6,0**
PDTCH MCS-4	11,1	**13,0**
PDTCH MCS-5	6,5	**7,5**
PDTCH MCS-6	8,5	**9,5**
PDTCH MCS-7	14,0	**15,0**
PDTCH MCS-8	20,5	**22,0**
PDTCH MCS-9	25,0	**25,5**

3GPP TS 45.005 table 2q (excerpt for DTS-2 and DTS-5)

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP TS 45.005; sub clause 2

14.18.9.3.3 Test purpose

To verify that the MS does not exceed the conformance requirement for different coding schemes under the propagation condition TU50/noFH with an allowance for the statistical significance of the test.

14.18.9.3.4 Test method

14.18.9.3.4.1 Initial condition

The SS is configured as defined in annex N.2 picture N.2.2 of 3GPP 45.005.

The diversity parameter for the antenna correlation is set to 0 and the antenna gain imbalance (AGI) is set to 0 dB

A call is set up according to the generic call set up procedure for packet switched on an ARFCN in the Mid range, on the maximum number of receive timeslots which the MS is capable to support, The MS is transmitting at maximum power. The power control parameter ALPHA (α) is set to 0.

The SS establish a downlink TBF.

The SS transmits Standard Test Signal C1 with TSC 0.

In addition to this wanted signal (C1), the SS produces multiple interfering signals for DTS-2 or DTS-5 scenarios as appropriate for the test procedure.

These interferers are:

Identical interferer types for DTS-2 and DTS-5:

- Co-channel 2 (I_{CoCh2}): Synchronous co-channel interferer $_{of}$ type I1 as specified in TS 51.010 annex 5.2
- Adjacent 1 (I_{AdjCh1}): Adjacent channel interferer of type I1 as specified in TS 51.010 annex 5.2
- AWGN (I_{AWGN}): AWGN interferer of type I3 as specified in TS51.010 annex 5.2

DTS-2 specific interferer:

- Co-channel 1 (I_{CoCh1}): Synchronous co-channel interferer of type I1 as specified in TS 51.010 annex 5.2

DTS-5 specific interferer:

- Co-channel 1 (I_{CoCh1}): Delayed co-channel interferer of type I5 as specified in TS 51.010 annex 5.2.

14.18.9.3.4.2 Test Procedure

14.18.9.3.4.2.1 DTS-2 Procedure

a) The DTS-2 co-channel interferer signal I_{CoCh1} is configured according to the DTS-2 configuration.

b) The co-channel interferer signal I_{CoCh1} set to -70 dBm.

c) The power levels of the interferers $I_{CoCh2,}$ I_{AdjCh1}, and I_{AWGN} are set according to table 14.18.9.3.21. The power levels are defined relative to I_{CoCh1}.

d) The fading characteristics of the wanted signal C1 and the interferer signals I_{CoCh1}, I_{CoCh2}, and I_{AdjCh1} are set to TU High. No FH applies.

e) The SS transmits packets using MCS-1 coding on all allocated timeslots.

f) The SS sets the level of the wanted signal C1 1 dB above the value according to table 14.18.9.3.5-1 and table 14.18.9.3.5-2.

g) The SS transmits the number of blocks with current coding scheme accordingly with table 14.16-2 and counts the BLER based on the content of the ACK/NACK Description information element (see 3GPP TS 04.60, sub clause 12.3) in the Packet Downlink ACK/NACK as sent from the MS to the SS on the PACCH. The SS resets both counters.

h) The SS repeats the steps (e) to (h) for each of the coding schemes MCS-2 to MSC-9.

14.18.9.3.4.2.2 DTS-5 Procedure

a) The DTS-5 co-channel interferer signal I_{CoCh1} is configured according to DTS-5 configuration.

b) The SS repeats the steps (b) to (i) identical to the DTS-2 procedure

14.18.9.3.5 Test requirement

The block error ratio calculated by the SS for different channels and under the TU High propagation conditions, shall not exceed the conformance requirement.

NOTE: The wanted signal levels derived from calculations using 3GPP TS 45.005 table 2q, shall be set according to the table below.

Table 14.18.9.3.5-1

GSM 900 and GSM 850			
Type of channel		**DARP II Test Scenario**	
		DTS-2	**DTS-5**
PDTCH MCS-1	C/dBm	-69,0	-68,5
PDTCH MCS-2	C/dBm	-67,5	-67,5
PDTCH MCS-3	C/dBm	-64,0	-64,0
PDTCH MCS-4	C/dBm	-59,0	-57,5
PDTCH MCS-5	C/dBm	-63,0	-62,0
PDTCH MCS-6	C/dBm	-61,0	-59,5
PDTCH MCS-7	C/dBm	-56,5	-55,0
PDTCH MCS-8	C/dBm	-50,0	-49,5
PDTCH MCS-9	C/dBm	-46,5	-43,5

Table 14.18.9.3.5-2

DCS 1 800 & PCS 1900			
Type of channel		**DARP II Test Scenario**	
		DTS-2	**DTS-5**
PDTCH MCS-1	C/dBm	-69,0	-69,0
PDTCH MCS-2	C /dBm	-67,5	-67,5
PDTCH MCS-3	C /dBm	-64,0	-64,0
PDTCH MCS-4	C /dBm	-58,5	-57,0
PDTCH MCS-5	C/dBm	-63,5	-62,5
PDTCH MCS-6	C/dBm	-61,5	-60,5
PDTCH MCS-7	C/dBm	-56,0	-55,0
PDTCH MCS-8	C/dBm	-49,5	-48,0
PDTCH MCS-9	C/dBm	-45,0	-44,5

14.18.10 Latency Reductions

14.18.10.1 Minimum Input level for Reference Performance for PAN

14.18.10.1.1 Definition

The minimum input level is the signal level at the MS receiver input at which a certain BLER is met.

14.18.10.1.2 Conformance requirement

1. The block error rate (BLER) performance of data blocks containing PAN for PDTCH/MCS mentioned in the table 14.18.10.1-1 shall not exceed 10 % of input levels according to the table 14.18.10.1-1.

Table 14.18.10.1-1: Input signal level (for MS) at reference performance for GMSK, and 8-PSK with PAN included; BTTI and RTTI (EGPRS DL)

All GSM bands	
Type of channel	**Propagation conditions Static**
PDTCH/MCS -1	[-104,0] dBm
PDTCH/MCS-2	[-104,0] dBm
PDTCH/MCS-3	[-101,5] dBm
PDTCH/MCS-5	[-99,0] dBm
PDTCH/MCS-6	[-97,0] dBm
PDTCH/MCS-7	[-94,0] dBm
PDTCH/MCS-8	[-90,5] dBm

These limits are corrected by the following values for the following classes of MS:

MS, GMSK modulated signals	
for DCS 1 800 class 1 or class 2 MS	+2/+4 dB**
for DCS 1 800 class 3 MS	+2 dB
for GSM 400 small MS, GSM 900 small MS GSM 850 small MS and GSM 700 small MS	+2 dB
for other GSM 400, GSM 900 MS and GSM 850 MS and GSM 700 MS	0 dB
for PCS 1900 class 1 or class 2 MS	+2 dB
for other PCS 1900 MS	0 dB
MS, QPSK, 8-PSK, 16-QAM and 32-QAM modulated signals	
for GSM 400, GSM 900, GSM 850 and GSM 700 small MS	0 dB
for other GSM 400, GSM 900, GSM 850 and GSM 700 MS	-2 dB
for DCS 1 800 and PCS 1900 class 1 or class 2 MS	0 dB
for other DCS 1 800 and PCS 1900 MS	-2 dB

3GPP TS 45.005, table 1o; 3GPP TS 45.005, subclause 6.2

2. The PAN error rate (incorrect decoding of PAN in downlink data blocks) at the mobile station shall not exceed 5% at input levels according to the table 14.18.10.1-2.

Table 14.18.10.1-2: Input signal level (for MS) at reference performance of PAN for GMSK and8-PSK, (EGPRS DL) ; BTTI and RTTI

All GSM bands	
Type of Channel	**Propagation conditions Static**
PDTCH/MCS-1 to 3	[-104,0] dBm
PDTCH/MCS-5 to 6	[-101,5] dBm
PDTCH/MCS-7	[-101,0] dBm
PDTCH/MCS-8	[-100,5] dBm

These limits are corrected by the following values for the following classes of MS:

MS, GMSK modulated signals	
for DCS 1 800 class 1 or class 2 MS	+2/+4 dB**
for DCS 1 800 class 3 MS	+2 dB
for GSM 400 small MS, GSM 900 small MS GSM 850 small MS and GSM 700 small MS	+2 dB
for other GSM 400, GSM 900 MS and GSM 850 MS and GSM 700 MS	0 dB
for PCS 1900 class 1 or class 2 MS	+2 dB
for other PCS 1900 MS	0 dB
MS, QPSK, 8-PSK, 16-QAM and 32-QAM modulated signals	
for GSM 400, GSM 900, GSM 850 and GSM 700 small MS	0 dB
for other GSM 400, GSM 900, GSM 850 and GSM 700 MS	-2 dB
for DCS 1 800 and PCS 1900 class 1 or class 2 MS	0 dB
for other DCS 1 800 and PCS 1900 MS	-2 dB

3GPP TS 45.005, table 1r; 3GPP TS 45.005, subclause 6.2

3. The BLER performance and PAN error rate shall not exceed the conformance requirements given in 1 and 2 above under extreme conditions; 3GPP TS 45.005, subclause 6.2 and annex D subclauses D.2.1 and D.2.2.

3GPP TS 45.005 subclause 2:

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

14.18.10.1.3 Test purpose

1. To verify that the MS does not exceed conformance requirement 1 for PDTCHs using different coding schemes and under static propagation conditions with an allowance for the statistical significance of the test.
2. To verify that the MS does not exceed conformance requirement 2 under static propagation conditions with an allowance for the statistical significance of the test.
3. To verify that the MS does not exceed conformance requirement 3 under static propagation conditions with an allowance for the statistical significance of the test.

14.18.10.1.4 Method of test

Initial conditions

NOTE 1: The BA list sent on the BCCH will indicate at least six surrounding cells with at least one near to each band edge. It is not necessary to generate any of these BCCHs but, if provided the signal strengths of BCCHs shall be in the range 15 dBμVemf to35 dBμVemf. Surrounding cell signal levels and cell reselection parameters are set so that the MS will not attempt a cell reselection.

NOTE 2: The ARFCN of any BCCH shall not be co-channel or on adjacent channels to the wanted traffic channel.

NOTE 3: When frequency hopping is used under static conditions, the traffic channel may fall on any of the ARFCNs defined in clause 6. When frequency hopping is used under non-static conditions any ARFCNs shall be chosen.

Test procedure

a) A downlink TBF with polled FANR enabled is established on an ARFCN in the mid-range using a BTTI configuration. The power control parameter ALPHA (α) is set to 0 and the SS commands the MS to transmit at maximum power. The SS allocates the maximum number of receive timeslots according to the MS's multislot class.

b) The SS transmits downlink RLC data blocks addressing the MS using the MCS-3 coding scheme at a level 1 dB above the level given in conformance requirement 1. A PAN field is included in each downlink RLC data block. Note : The PAN field in the downlink RLC data blocks does not address the MS as the MS does not have an uplink TBF active.

c) The SS polls the MS for (EGPRS) PACKET DOWNLINK ACK/NACK at a rate sufficient to prevent an RLC window stall condition in the MS.

d) The SS re-transmits any downlink RLC data blocks NACKED by the MS in the (EGPRS) PACKET DOWNLINK ACK/NACK message. Note : The SS shall not repeat the re-transmission of any particular block without having ascertained reception or non-reception of the previous re-transmission by again polling the MS.

e) The SS calculates the BLER performance as a percentage based on the number of re-transmitted downlink RLC data blocks (where each re-transmission instance counts as one sample) divided by the total number of downlink RLC data blocks transmitted (including all re-transmission instances) during the downlink TBF.

f) The SS terminates the downlink TBF by sending a PACKET TBF RELEASE message.

g) An uplink TBF with FANR enabled using BTTI USF Mode is established on an ARFCN in the mid-range using a BTTI configuration. The power control parameter ALPHA (α) is set to 0 and the SS commands the MS to transmit at maximum power. The SS allocates the maximum number of transmit timeslots according to the MS's multislot class. The SS commands the MS to send uplink RLC data blocks using the MCS-3 coding scheme.

h) During the uplink TBF, the SS sends downlink RLC data blocks at a level 1 dB above the level given in conformance requirement 2 using the same MCS as used for the uplink TBF in which the SS periodically includes a PAN field in the time based format. The reported bitmap in the PAN field shall set all blocks to ACKED. The SS shall include the PAN field sufficiently often to cover all uplink RLC data blocks received without gaps, but shall not send PAN fields in which the reported bitmaps overlap. Note : The downlink RLC data blocks do not address the MS as the MS does not have a downlink TBF active.

i) When including the PAN field, the SS shall note the set of uplink BSNs acknowledged by each PAN field. If the MS subsequently re-transmits one or more BSNs in any particular set, this counts as one error sample. The SS calculates the PAN error rate as a percentage based on the number of error samples divided by the number of PAN fields sent during the uplink TBF.

j) The SS terminates the uplink TBF by sending a PACKET TBF RELEASE message.

k) Steps a) to j) are repeated using the MCS-8 coding scheme in Steps b) and g).

14.18.10.1.5 Test requirements

The block error rate performance (BLER) as calculated by the SS for different MCSs under any combination of normal and extreme test voltages and ambient temperatures, shall not exceed the conformance requirement.

The PAN error rate as calculated by the SS under any combination of normal and extreme test voltages and ambient temperatures shall not exceed the conformance requirement.

14.19 DARP Phase II Speech bearer tests

14.19.1 TCH/FS

14.19.1.1 DTS-1

14.19.1.1.1 Definition

DARP Phase II, also referred as Mobile Station Receiver Diversity is a feature where the MS uses two receive antennas in order to improve performance under non-interfering and interfering scenarios.

The DARP Phase II reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the DARP Phase II receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.19.1.1.2 Conformance requirement

1. MS indicating support for Downlink Advanced Receiver Performance – phase II (see 3GPP TS 24.008) shall fulfil the requirements in table 2q for the test scenarios defined in annex N. The reference performance shall be:

   - For speech channels (TCH/FS, TCH/AFSx, TCH/AHSx) FER: ≤ 1 %

2. The values in table 2q are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex N).
   In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 2q at the corresponding C/I1.

The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 2q, except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60. 3GPP TS 45.005, subclause 6.3

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP TS 45.005; sub clause 2

14.19.1.1.3 Test purpose

To verify that the MS does not exceed the first conformance requirement for TCH/FS under propagation condition TUhigh with an allowance for the statistical significance of the test.

To verify that the MS does not exceed the second conformance requirement for TCH/FS under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.19.1.1.4 Method of test

14.19.1.1.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/FS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal).

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.19.1.1.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. The interfering signal level is set to -70 dBm.

   The fading characteristic of the wanted and the interfering signal is TUHigh. Antenna correlation is 0 and antenna gain imbalance is 0dB.

b) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14.19.1-2 or 14.19.1-3.

c) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the number of residual bit error events for the bits of the class II, by examining at least the minimum number of samples of consecutive bits of class II. Bits are only taken from those frames not signalled as erased.

f) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased.

Maximum/Minimum Duration of Test

Maximum: 10 minutes (GSM 400, GSM700, GSM850, GSM900), 10 minutes (DCS1800, PCS1900).

Minimum: 4 minutes (GSM 400, GSM700, GSM850, GSM900), 2 minutes (DCS1800, PCS1900).

14.19.1.1.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7 (A7.1.3.2)

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure Annex 7 figure A7.1.3.1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.19.1-1: Minimum test times due to TU high fading conditions

Full Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	-	-	0,35	0,33	0,17	0,16	m
min test time	-	-	201	190	95	90	s
	-	-	0:03:21	0:03:10	0:01:35	0:01:30	hh.mm:ss
Full Rate 60 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	-	0,43	-	-	-	-	m
min test time	-	204	-	-	-	-	s
	-	0:03:24	-	-	-	-	hh.mm:ss
Full Rate 100 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	-	-	-	-	-	m
min test time	214	-	-	-	-	-	s
	0:3:34	-	-	-	-	-	hh.mm:ss

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the “derived test limit”. In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision $ne \geq 1$ (inclusive artificial error)

For an early fail decision $ne \geq 7$

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14.19.1-2 or 14.19.1-3.

Table 14.19.1-2: Statistical test limits for bands other than DCS 1800 and PCS 1900 TCH/FS DARP Phase II DTS-1

DTS-1								
0.8 to 0.9 GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
FS	Frames	-82	50	0,010000	0,0123400	27958	560	00:09:20
	Class Ib	(as frames)	9100	0,000600	0,0007404	465965	51	00:00:51
	Class II	(as frames)	3900	0,053700	0,0662658	5207	2	00:00:02

Table 14.19.1-3: Statistical test limits for DCS 1 800 and PCS 1 900 TCH/FS DARP Phase II DTS-1

DTS-1								
1.8 to 1.9 GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
FS	Frames	-81.5	50	0,010000	0,0123400	27958	560	00:09:20
	Class Ib	(as frames)	9100	0,000800	0,0009872	349474	39	00:00:39
	Class II	(as frames)	3900	0,058600	0,0723124	4771	2	00:00:02

14.19.2 TCH/AFS

14.19.2.1 DTS-1

14.19.2.1.1 Definition

DARP Phase II, also referred as Mobile Station Receiver Diversity is a feature where the MS uses two receive antennas in order to improve performance under non-interfering and interfering scenarios.

The DARP Phase II reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the DARP Phase II receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.19.2.1.2 Conformance requirement

1. MS indicating support for Downlink Advanced Receiver Performance – phase II (see 3GPP TS 24.008) shall fulfil the requirements in table 2q for the test scenarios defined in annex N. The reference performance shall be:

   - For speech channels (TCH/FS, TCH/AFSx, TCH/AHSx) FER: ≤ 1 %

2. The values in table 2q are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex N).
   In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 2q at the corresponding C/I1.

The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 2q, except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60.

3GPP TS 45.005, subclause 6.3

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP TS 45.005; sub clause 2

14.19.2.1.3 Test purpose

To verify that the MS does not exceed the first conformance requirement for TCH/AFS under propagation condition TUhigh with an allowance for the statistical significance of the test.

To verify that the MS does not exceed the second conformance requirement for TCH/AFS under propagation condition TUhigh with an allowance for the statistical significance of the test for class Ib BER.

14.19.2.1.4 Method of test

14.19.2.1.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AFS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 12,2 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal), with training sequence code (TSC) = 0.

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.19.2.1.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I1 (unwanted signal).

   The unwanted signal is continuous and has no fixed relationship with the bit transitions of the wanted signal. The interfering signal level is set to -70 dBm.

   The fading characteristic of the wanted and the interfering signal is TUHigh. Antenna correlation is 0 and antenna gain imbalance is 0dB.

b) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14.19.2-2 or 14.19.2-3.

c) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 7,4 kbit/s and steps b) to e) are repeated.

g) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,9 kbit/s and steps b) to e) are repeated.

Maximum/Minimum Duration of Test

Maximum: 28 minutes (GSM 400, GSM700, GSM850, GSM900), 28 minutes (DCS1800, PCS1900).

Minimum: 11 minutes (GSM 400, GSM700, GSM850, GSM900), 5 minutes (DCS1800, PCS1900).

14.19.2.1.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7.

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure A7.1.3.2.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.19.2-1: Minimum test times due to TU high fading conditions

Full Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	-	-	0,35	0,33	0,17	0,16	m
min test time	-	-	201	190	95	90	s
	-	-	0:03:21	0:03:10	0:01:35	0:01:30	hh.mm:ss
Full Rate 60 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	-	0,43	-	-	-	-	m
min test time	-	204	-	-	-	-	s
	-	0:03:24	-	-	-	-	hh.mm:ss
Full Rate 100 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	-	-	-	-	-	m
min test time	214	-	-	-	-	-	s
	0:3:34	-	-	-	-	-	hh.mm:ss

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the "derived test limit". In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne ≥ 1 (inclusive artificial error)

For an early fail decision ne ≥ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14-63 or 14-64.

Table 14.19.2-2: Statistical test limits for bands other than DCS 1800 and PCS 1900 TCH/AFS DARP Phase II DTS-1

DTS-1								
0.8 to 0.9GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AFS 12.2	Frames	-81.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	8150	0,006900	0,0085146	40519	5	00:00:05
AFS 7.4	Frames	-83.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	4350	0,002100	0,0025914	133133	31	00:00:31
AFS 5.9	Frames	-85.0	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	3150	0,001700	0,0020978	164459	53	00:00:53

Table 14.19.2-3: Statistical test limits for DCS 1800 and PCS 1900 TCH/AFS DARP Phase II DTS-1

DTS-1								
1.8 to 1.9GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AFS 12.2	Frames	-80.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	8150	0,008400	0,0103656	33284	5	00:00:05
AFS 7.4	Frames	-83.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	4350	0,001800	0,0022212	155322	36	00:00:36
AFS 5.9	Frames	-84.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	3150	0,002000	0,002468	139790	45	00:00:45

14.19.2.2 DTS-2/5

14.19.2.2.1 Definition

DARP Phase II, also referred as Mobile Station Receiver Diversity is a feature where the MS uses two receive antennas in order to improve performance under non-interfering and interfering scenarios.

The DARP Phase II reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the DARP Phase II receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.19.2.2.2 Conformance requirement

1. MS indicating support for Downlink Advanced Receiver Performance – phase II (see 3GPP TS 24.008) shall fulfil the requirements in table 2q for the test scenarios defined in annex N. The reference performance shall be:

   - For speech channels (TCH/FS, TCH/AFSx, TCH/AHSx) FER: ≤ 1 %

2. The values in table 2q are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex N).
   In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 2q at the corresponding C/I1.

The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 2q, except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60.

3GPP TS 45.005, subclause 6.3

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP TS 45.005; sub clause 2

14.19.2.2.3 Test purpose

To verify that the MS does not exceed the first conformance requirement for TCH/AFS under propagation condition TUhigh with an allowance for the statistical significance of the test.

To verify that the MS does not exceed the second conformance requirement for TCH/AFS under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.19.2.2.4 Method of test

14.19.2.2.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AFS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 7,4 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal), with training sequence code (TSC) = 0.

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.19.2.2.4.2 Procedure

a) In addition to the wanted signal, the SS produces a further four interfering signals to produce scenario DTS-2.

   A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -70 dBm.

   A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -80 dBm.

   A signal of type I1 using an ARFCN one higher than C1, with fading characteristics of TUHigh, and signal level of -67 dBm.

   A signal of type I3 using the same ARFCN as C1, and signal level of -87 dBm.

b) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14.19.2.2-2 or 14.19.2.2-3, and sets the fading characteristic of the signal to TUHigh. Antenna correlation is set to 0 and antenna gain imbalance is set to 0dB.

c) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully it is not signalled as erased.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,9 kbit/s and steps b) to e) are repeated.

g) The SS discontinues all interfering signals.

h) In addition to the wanted signal, the SS produces a further four interfering signals to produce scenario DTS-5.

A signal of type I5 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -67 dBm.

A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -80 dBm.

A signal of type I1 using an ARFCN one higher than C1, with fading characteristics of TUHigh, and signal level of -67 dBm.

A signal of type I3 using the same ARFCN as C1, and signal level of -87 dBm.

i) The SS uses a Channel Mode Modify procedure to change the active codec set to 12,2 kbit/s and steps b) to e) are repeated.

Maximum/Minimum Duration of Test

Maximum: 28 minutes (GSM 400, GSM700, GSM850, GSM900), 28 minutes (DCS1800, PCS1900).

Minimum: 10 minutes (GSM 400, GSM700, GSM850, GSM900), 5 minutes (DCS1800, PCS1900).

14.19.2.2.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7.

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure A7.1.3.1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.19.2.2-1: Minimum test times due to TU 50 fading conditions

Full Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	-	-	0,35	0,33	0,17	0,16	m
min test time	-	-	201	190	95	90	s
	-	-	0:03:21	0:03:10	0:01:35	0:01:30	hh.mm:ss
Full Rate 60 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	-	0,43	-	-	-	-	m
min test time	-	204	-	-	-	-	s
	-	0:03:24	-	-	-	-	hh.mm:ss
Full Rate 100 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	-	-	-	-	-	m
min test time	214	-	-	-	-	-	s
	0:3:34	-	-	-	-	-	hh.mm:ss

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the "derived test limit". In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne ≥ 1 (inclusive artificial error)

For an early fail decision ne ≥ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14.19.2.2-2 or 14.19.2.2-3.

Table 14.19.2.2-2: Statistical test limits for bands other than DCS 1800 and PCS 1900 TCH/AFS DARP Phase II DTS-2/5

DTS-2/5								
0.8 to 0.9GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AFS 7.4 DTS-2	Frames	-70	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	4350	0,001500	0,001851	186386	43	00:00:43
AFS 5.9 DTS-2	Frames	-71.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	3150	0,001600	0,0019744	174737	56	00:00:56
AFS 12.2 DTS-5	Frames	-67.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	8150	0,006700	0,0082678	41729	6	00:00:06

Table 14.19.2.2-3: Statistical test limits for DCS 1800 and PCS 1900 TCH/AFS DARP Phase II DTS-2/5

DTS-2/5									
1.8 to 1.9GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AFS 7.4 DTS-2	Frames	-71	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	4350	0,001800	0,0022212	155322	36	00:00:36
AFS 5.9 DTS-2	Frames	-72	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	3150	0,001800	0,0022212	155322	50	00:00:50
AFS 12.2 DTS-5	Frames	-68.5	50	0,010000	0,012340	27958	560	00:09:20
	Class1b	(as frames)	8150	0,009400	0,0115996	29743	4	00:00:04

14.19.3 TCH/AHS

14.19.3.1 DTS-1

14.19.3.1.1 Definition

DARP Phase II, also referred as Mobile Station Receiver Diversity is a feature where the MS uses two receive antennas in order to improve performance under non-interfering and interfering scenarios.

The DARP Phase II reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the DARP Phase II receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.19.3.1.2 Conformance requirement

1. MS indicating support for Downlink Advanced Receiver Performance – phase II (see 3GPP TS 24.008) shall fulfil the requirements in table 2q for the test scenarios defined in annex N. The reference performance shall be:

   - For speech channels (TCH/FS, TCH/AFSx, TCH/AHSx) FER: ≤ 1 %

2. The values in table 2q are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex N).
   In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 2q at the corresponding C/I1.

The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 2q, except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60.

3GPP TS 45.005, subclause 6.3

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP TS 45.005; sub clause 2

14.19.3.1.3 Test purpose

To verify that the MS does not exceed the first conformance requirement for TCH/AHS under propagation condition TUhigh with an allowance for the statistical significance of the test.

To verify that the MS does not exceed the second conformance requirement for TCH/AHS under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.19.3.1.4 Method of test

14.19.3.1.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AHS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 7,4 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal), with training sequence code (TSC) = 0.

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.19.3.1.4.2 Procedure

a) In addition to the wanted signal, the SS produces one further interfering signal to produce scenario DTS-1.

   A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -70 dBm.

   The fading characteristic of the wanted signal is TUHigh. Antenna correlation is 0 and antenna gain imbalance is 0dB.

b) The SS sets the level of the wanted signal to that indicated by C_{lev} in table 14.19.3.1-2 or 14.19.3.1-3.

c) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of the class Ib and II, by examining at least the minimum number of samples of consecutive bits of class Ib and II. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully if it is not signalled as erased.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,9 kbit/s and steps b) to e) are repeated.

Maximum/Minimum Duration of Test

Maximum: 19 minutes (GSM 400, GSM700, GSM850, GSM900), 19 minutes (DCS1800, PCS1900).

Minimum: 14 minutes (GSM 400, GSM700, GSM850, GSM900), 7 minutes (DCS1800, PCS1900).

14.19.3.1.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7.

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure A7.1.3.2.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.19.3.1-1: Minimum test times due to TU high fading conditions

Half Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	-	-	0,35	0,33	0,17	0,16	m
min test time	-	-	403	380	190	180	s
	-	**-**	**0:06:43**	**0:06:20**	**0:03:10**	**0:03:00**	**hh.mm:ss**
Half Rate 60 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	-	0,43	-	-	-	-	m
min test time	-	408	-	-	-	-	s
	-	**0:06:48**	**-**	**-**	**-**	**-**	**hh.mm:ss**
Half Rate 100 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	-	-	-	-	-	m
min test time	428	-	-	-	-	-	s
	0:07:08	**-**	**-**	**-**	**-**	**-**	**hh.mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the “derived test limit”. In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne ≥ 1 (inclusive artificial error)

For an early fail decision ne ≥ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14.19.3.1-2 or 14.19.3.1-3.

Table 14.19.3.1-2: Statistical test limits for bands other than DCS 1800 and PCS 1900 TCH/AHS DARP Phase II DTS-1

DTS-1									
0.8 to 0.9GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AHS 7.4	Frames	-77.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2950	0.004000	0,004936	69895	24	0:00:24
	Class II	(as frames)	1400	0.018800	0,0231992	14872	11	0:00:11
AHS 5.9	Frames	-79.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2350	0.005100	0,0062934	54820	24	0:00:24
	Class II	(as frames)	800	0.032700	0,0403518	8550	11	0:00:11

Table 14.19.3.1-3: Statistical test limits for DCS 1 800 and PCS 1 900 TCH/AHS DARP Phase II DTS-1

DTS-1								
1.8 to 1.9 GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AHS 7.4	Frames	-77.0	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2950	0.005700	0,0070338	49049	17	0:00:17
	Class II	(as frames)	1400	0.021100	0,0260374	13251	10	0:00:10
AHS 5.9	Frames	-79.0	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2350	0.006200	0,0076508	45094	20	0:00:20
	Class II	(as frames)	800	0.035600	0,0439304	7854	10	0:00:10

14.19.3.2 DTS-2

14.19.3.2.1 Definition

DARP Phase II, also referred as Mobile Station Receiver Diversity is a feature where the MS uses two receive antennas in order to improve performance under non-interfering and interfering scenarios.

The DARP Phase II reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the DARP Phase II receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.19.3.2.2 Conformance requirement

1. MS indicating support for Downlink Advanced Receiver Performance – phase II (see 3GPP TS 24.008) shall fulfil the requirements in table 2q for the test scenarios defined in annex N. The reference performance shall be:

   - For speech channels (TCH/FS, TCH/AFSx, TCH/AHSx) FER: ≤ 1 %

2. The values in table 2q are given as the C/I1 ratio, where C is the power level of the wanted signal and I1 is the power level of the dominant co-channel interferer (Co-channel 1, see annex N).
   In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 2q at the corresponding C/I1.

The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 2q, except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60. 3GPP TS 45.005, subclause 6.3.

For T-GSM 810 the requirements for GSM 900 shall apply, apart for those parameters for which a separate requirement exists.

3GPP TS 45.005; sub clause 2

14.19.3.2.3 Test purpose

To verify that the MS does not exceed the first conformance requirement for TCH/AHS under propagation condition TUhigh with an allowance for the statistical significance of the test.

To verify that the MS does not exceed the second conformance requirement for TCH/AHS under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.19.3.2.4 Method of test

14.19.3.2.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AHS with an ARFCN in the mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 7,4 kbit/s.

The SS transmits Standard Test Signal C1 on the traffic channel (wanted signal), with training sequence code (TSC) = 0.

The SS commands the MS to create the traffic channel loop back, signalling erased frames (subclause 36).

14.19.3.2.4.2 Procedure

a) In addition to the wanted signal, the SS produces a further four interfering signals to produce scenario DTS-2.

   A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -70 dBm.

   A signal of type I1 using the same ARFCN as C1, with fading characteristics of TUHigh, and signal level of -80 dBm.

   A signal of type I1 using an ARFCN one higher than C1, with fading characteristics of TUHigh, and signal level of -67 dBm.

   A signal of type I3 using the same ARFCN as C1, and signal level of -87 dBm.

b) The SS sets the level of the wanted signal to that indicated by Clev in table 14.19.3.2-2 or 14.19.3.2-3, and sets the fading characteristic of the signal to TUHigh. Antenna correlation is set to 0 and antenna gain imbalance is set to 0dB.

c) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

d) The SS determines the number of residual bit error events for the bits of the class Ib and II, by examining at least the minimum number of samples of consecutive bits of class Ib and II. Bits are only taken from those frames not signalled as erased.

e) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully if it is not signalled as erased.

f) The SS uses a Channel Mode Modify procedure to change the active codec set to 5,9 kbit/s and steps b) to e) are repeated.

Maximum/Minimum Duration of Test

Maximum: 19 minutes (GSM 400, GSM700, GSM850, GSM900), 19 minutes (DCS1800, PCS1900).

Minimum: 14 minutes (GSM 400, GSM700, GSM850, GSM900), 7 minutes (DCS1800, PCS1900).

14.19.3.2.5 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7.

Wrong decision risk F for one single error rate test:

$F_{pass} = F_{fail} = F$ and $F = 0.2\%$

Wrong decision probability D per test step:

$D_{pass} = D_{fail} = D$ and $D = 0.0085\%$

Parameters for limit lines:

1. D = 0.000085 wrong decision probability per test step.
2. M = 1.5 bad DUT factor
3. ne number of (error) events. This parameter is the x-ordinate in figure A7.1.3.1.
4. ns number of samples. The error rate is calculated from ne and ns.

Limit checking

Before limit checking is valid the minimum test time due to fading needs to be considered:

Testing under multipath and interference conditions requires that at least 990 wavelengths are crossed with the speed given in the fading profile. This leads to a minimum test time depending on the frequency range. No early pass/fail decision is allowed until the minimum test time due to fading has elapsed.

Table 14.19.3.2-1: Minimum test times due to TU 50 fading conditions

Half Rate 50 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	-	-	0,35	0,33	0,17	0,16	m
min test time	-	-	403	380	190	180	s
	-	**-**	**0:06:43**	**0:06:20**	**0:03:10**	**0:03:00**	**hh.mm:ss**
Half Rate 60 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	-	0,43	-	-	-	-	m
min test time	-	408	-	-	-	-	s
	-	**0:06:48**	**-**	**-**	**-**	**-**	**hh.mm:ss**
Half Rate 100 km/h							
Frequency	0,4	0,7	0,85	0,9	1,8	1,9	GHz
Wavelength	0,75	-	-	-	-	-	m
min test time	428	-	-	-	-	-	s
	0:07:08	**-**	**-**	**-**	**-**	**-**	**hh.mm:ss**

If the minimum test time due to multipath conditions exceeds the target test time, then the test runs for the minimum test time due to multipath conditions and the decision is made by comparing the result with the "derived test limit". In this case early pass/fail decisions are obsolete.

If the target test time exceeds the minimum test time due to multipath conditions early pass/fail decisions can be headed for in order to accelerate test execution.

For an early decision a minimum number of (error) events is necessary.

For an early pass decision ne ≥ 1 (inclusive artificial error)

For an early fail decision ne ≥ 7

When the target test time has been reached the test is finished and a pass/fail decision can be made.

The error rate measured in this test shall be tested according to the values given in tables 14.19.3.2-2 or 14.19.3.2-3.

Table 14.19.3.2-2: Statistical test limits for bands other than DCS 1800 and PCS 1900 TCH/AHS DARP Phase II DTS-2

DTS-2								
0.8 to 0.9GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AHS 7.4 DTS-2	Frames	-65.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2950	0.005000	0,00617	55916	19	0:00:19
	Class II	(as frames)	1400	0.022500	0,027765	12426	9	0:00:09
AHS 5.9 DTS-2	Frames	-67	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2350	0.006400	0,0078976	43685	19	0:00:19
	Class II	(as frames)	800	0.038500	0.071572	4821	9	0:00:09

Table 14.19.3.2-3: Statistical test limits for DCS 1800 and PCS 1900 TCH/AHS DARP Phase II DTS-2

DTS-2								
1.8 to 1.9GHz		C_{lev} (dBm)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AHS 7.4 DTS-2	Frames	-65.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2950	0.005200	0,0064168	53766	19	0:00:19
	Class II	(as frames)	1400	0.022700	0,0280118	12317	9	0:00:09
AHS 5.9 DTS-2	Frames	-67	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	2350	0.007000	0,008638	39940	17	0:00:17
	Class II	(as frames)	800	0.037500	0,046275	7456	10	0:00:10

14.20 VAMOS speech bearer tests

14.20.1 TCH HS – VDTS-1,VDTS-2/3 and VDTS-4

14.20.1.1 Definition

The VAMOS reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the VAMOS receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.20.1.2 Conformance requirement

- For AQPSK modulated speech channels (TCH/HS, TCH/AFSx, TCH/AHSx, TCH/EFS, TCH/WFSx – in downlink), and their associated control channels, the applicable requirements are in tables 2aa for VAMOS I MS and 2ab for VAMOS II MS.

3GPP TS 45.005, subclause 6.3.2.1

- For AQPSK modulated speech channels and control channels in downlink, the wanted input signal level shall be: [-93] dBm + Ir, where Ir = the interference ratio according to tables 2aa for VAMOS I MS and 2ab for VAMOS II MS for VDTS-1, VDTS-2 and VDTS-3 (see subclause Q.1) for speech and associated control channels in VAMOS mode in downlink.
- For the adjacent (200 kHz) channel requirements of speech and control channels in VAMOS mode in downlink, the wanted input signal level of the AQPSK modulated signal shall be: [-75] dBm + Iar, where: Iar = the adjacent channel (200 kHz) interference ratio according to tables 2aa and 2ab for VAMOS I MS and VAMOS II MS respectively for VDTS-4 (see subclause Q.1).

3GPP TS 45.005, subclause 6.3.4

- For half rate speech channels (TCH/HS, TCH/AHSx) FER: ≤ 1 %

3GPP TS 45.005, subclause 6.2.1a

- The C/I1 values in tables 2aa and 2ab are ratios of received powers expressed in dB; where C is the received power of the downlink signal using Normal burst for AQPSK (see 3GPP TS 45.002) and I1 is the received power of the dominant external interferer (Co-channel 1 in tables Q.1-1 to Q.1-3) for VDTS-1 to VDTS-3.

3GPP TS 45.005, subclause Q.1

14.20.1.3 Test purpose

To verify that the MS does not exceed the conformance requirements for TCH/H under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.20.1.4 Method of test

14.20.1.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/H with an ARFCN in the mid ARFCN range. The power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The SS transmits a Standard Test Signal C1 (AQPSK) (wanted signal) on the active VAMOS subchannel (subchannel 2) using trainings sequence 5 from TSC set 2. The other VAMOS subchannel (subchannel 1) uses trainings sequences 5 from TSC set 1.

The SCPIR_DL is set to +4 dB.

Specific PICS Statements:

- VAMOS type I supported (TSPC_VAMOS_Type1)
- VAMOS type II 2 supported (TSPC_VAMOS_Type 2)

14.20.1.4.2 Procedure

a) The fading function is set to TUhigh.

b) In addition to the wanted signal, the SS produces a further interferer signal to produce scenario VDTS-1 according to TS 45.005 Q.1.

c) The SS sets the level of the wanted signal to (-93+Ir)dBm that indicated by Ir in table 14.20.1-2 or 14.20.1-3 for VAMOS type I or table 14.20.1-4 or 14.20.1-5 for VAMOS type II.

d) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

e) The SS determines the number of residual bit error events for the bits of the class Ib and II, by examining at least the minimum number of samples of consecutive bits of class Ib and II. Bits are only taken from those frames not signalled as erased.

f) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully if it is not signalled as erased.

g) The SS repeats step c) to f) with SCPIR_DL values 0 dB and -4 dB.

h) If the MS signals VAMOS type II support step c) to f) shall be repeated with SCPIR_DL values -8 dB and -10 dB.

i) The SS discontinues all interfering signals.

j) In addition to the wanted signal, the SS produces a further four interfering signals to produce scenario VDTS-2 according to TS 45.005 Q.1.

k) The SS repeats step c) to f) with SCPIR_DL values 4 dB, 0 dB and -4 dB.

l) If the MS signals VAMOS type II support step c) to f) shall be repeated with SCPIR_DL values -8 dB and -10 dB.

m) The SS discontinues all interfering signals.

n) In addition to the wanted signal, the SS produces a further one interference signal to produce scenario VDTS-3 according to TS 45.005 Q.1.

o) The SS repeats step c) to f) with SCPIR_DL values 4 dB, 0 dB and -4 dB.

p) If the MS signals VAMOS type II support step c) to f) shall be repeated with SCPIR_DL values -8 dB and -10 dB.

q) The SS discontinues all interfering signals.

r) In addition to the wanted signal, the SS produces a further one interference signal to produce scenario VDTS-4 according to TS 45.005 Q.1.

s) The SS repeats step c) to f) with SCPIR_DL values 4 dB, 0 dB and -4 dB.

t) If the MS signals VAMOS type II support step c) to f) shall be repeated with SCPIR_DL values -8 dB and -10 dB.

14.20.1.4.3 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7 (A 7.1.3.2)

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.20.1-1: Minimum test times due to TU high fading conditions

Fading speed 50km/h				
Frequency /MHz	850	900	1800	1900
Wave length / m	0,35	0,33	0,17	0,16
Min. Test time /s	403	380	190	180
hh:mm:ss	00:06:43	00:06:20	00:03:10	00:03:00

The error rate measured in this test shall be tested according to the values given in table 14.20.1-2 to table 14.20.1-5 depending on the indicated VAMOS type.

Table 14.20.1-2: Statistical test limits for GSM 850 and GSM 900 TCH/H (VAMOS type I MS)

VDTS1/ VDTS-2/3 and VDTS-4								
0.8 to 0.9GHz		Ir (C/I) / dB	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
TCH/H SCPIR_DL = 4dB VDTS-1	Frames	11.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001000	0.001234	279578	77	0:01:17
	Class II	(as frames)	850	0.039000	0.048126	7168	9	0:00:09
TCH/H SCPIR_DL = 0dB VDTS-1	Frames	12.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.002400	0.002962	116491	32	0:00: 32
	Class II	(as frames)	850	0.047000	0.057998	5948	7	0:00:07
TCH/H SCPIR_DL = -4dB VDTS-1	Frames	15.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.000800	0.000987	349473	96	0:01: 36
	Class II	(as frames)	850	0.041200	0.050841	6786	8	0:00:08
TCH/H SCPIR_DL = 4dB VDTS-2	Frames	12.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002200	0,002715	127081	35	00:00:35
	Class II	(as frames)	850	0,048600	0,059972	5753	7	00:00:07
TCH/H SCPIR_DL = 0dB VDTS-2	Frames	14.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.002500	0.003085	111831	31	0:00: 31
	Class II	(as frames)	850	0.049000	0.060466	5706	7	0:00:07
TCH/H SCPIR_DL = -4dB VDTS-2	Frames	17.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002200	0,002715	127081	35	00:00:35
	Class II	(as frames)	850	0,047400	0,058492	5898	7	00:00:07
TCH/H SCPIR_DL = 4dB VDTS-3	Frames	9.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002400	0,002962	116491	32	00:00:32
	Class II	(as frames)	850	0,051500	0,063551	5429	6	00:00:06
TCH/H SCPIR_DL = 0dB VDTS-3	Frames	11.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.002400	0.002962	116491	32	0:00:32
	Class II	(as frames)	850	0.050100	0.061823	5580	7	0:00:07
TCH/H SCPIR_DL = -4dB VDTS-3	Frames	16	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,000700	0,000864	399398	109	00:01:49
	Class II	(as frames)	850	0,039900	0,049237	7007	8	00:00:08
TCH/H SCPIR_DL = 4dB VDTS-4	Frames	-11	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002600	0,003208	107530	29	00:00:29
	Class II	(as frames)	850	0,045500	0,056147	6145	7	00:00:07
TCH/H SCPIR_DL = 0dB VDTS-4	Frames	-6.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.002500	0.003085	111831	31	0:00:31
	Class II	(as frames)	850	0.047400	0.058492	5898	7	0:00:07
TCH/H SCPIR_DL = -4dB VDTS-4	Frames	-0.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002500	0,003085	111831	31	00:00:31
	Class II	(as frames)	850	0,047900	0,059109	5837	7	00:00:07

Table 14.20.1-3: Statistical test limits for DCS 1 800 and 1900 TCH/H (VAMOS type I MS)

VDTS1/ **VDTS-2/3 and VDTS-4**								
1.8 to 1.9GHz		Ir (C/I) / dB	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
TCH/H SCPIR_DL = 4dB VDTS-1	Frames	11.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001000	0.001234	279578	77	0:01:17
	Class II	(as frames)	850	0.04000	0.04936	6990	9	0:00:09
TCH/H SCPIR_DL = 0dB VDTS-1	Frames	12.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.002300	0.002838	121556	33	0:00: 33
	Class II	(as frames)	850	0.046500	0.057381	6012	7	0:00:07
TCH/H SCPIR_DL = -4dB VDTS-1	Frames	15.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.002100	0.002591	133133	36	0:00: 36
	Class II	(as frames)	850	0.046200	0.057011	6052	8	0:00:08
TCH/H SCPIR_DL = 4dB VDTS-2	Frames	12.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002900	0,003579	96406	26	00:00:26
	Class II	(as frames)	850	0,054000	0,066636	5177	6	0:00:06
TCH/H SCPIR_DL = 0dB VDTS-2	Frames	15	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001000	0.001234	279579	77	0:01:17
	Class II	(as frames)	850	0.036000	0.044424	7767	10	0:00:10
TCH/H SCPIR_DL = -4dB VDTS-2	Frames	18	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002200	0,002715	127081	35	00:00:35
	Class II	(as frames)	850	0,047300	0,058368	5911	7	00:00:07
TCH/H SCPIR_DL = 4dB VDTS-3	Frames	10	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002400	0,002962	116491	32	00:00:32
	Class II	(as frames)	850	0,050000	0,061700	5592	7	00:00:07
TCH/H SCPIR_DL = 0dB VDTS-3	Frames	12	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.002800	0.003455	99850	28	0:00:28
	Class II	(as frames)	850	0.049900	0.061577	5603	7	0:00:07
TCH/H SCPIR_DL = -4dB VDTS-3	Frames	16	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,000800	0,000987	349473	96	00:01:36
	Class II	(as frames)	850	0,040700	0,050224	6869	8	00:00:08
TCH/H SCPIR_DL = 4dB VDTS-4	Frames	-10.5	50	0.010000	0.012340	27959	560	00:09:20
	Class1b	(as frames)	3650	0,002400	0,002962	116491	32	00:00:32
	Class II	(as frames)	850	0,046400	0,057258	6025	7	00:00:07
TCH/H SCPIR_DL = 0dB VDTS-4	Frames	-6	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.002500	0.003085	111832	31	0:00:31
	Class II	(as frames)	850	0.048600	0.0599729	5753	7	0:00:07
TCH/H SCPIR_DL = -4dB VDTS-4	Frames	1	50	0.010000	0.012340	27959	560	00:09:20
	Class1b	(as frames)	3650	0,002300	0,002838	121556	33	00:00:33
	Class II	(as frames)	850	0,047200	0,058245	5923	7	00:00:07

Table 14.20.1-4: Statistical test limits for GSM 850 and GSM 900 TCH/H (VAMOS type II MS)

VDTS1/ VDTS-2/3 and VDTS-4									
0.8 to 0.9GHz		Ir (C/I) / dB	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
TCH/H	Frames	10	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 4dB	Class1b	(as frames)	3650	0.00090	0,001111	310643	85	0:01: 25
VDTS-1	Class II	(as frames)	850	0.0424	0,052322	6594	8	0:00:08
TCH/H	Frames	11.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 0dB	Class1b	(as frames)	3650	0.002	0,002468	139789	38	0:00: 38
VDTS-1	Class II	(as frames)	850	0.0529	0,065279	5286	7	0:00:07
TCH/H	Frames	13.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -4dB	Class1b	(as frames)	3650	0.0021	0,002591	133133	36	0:00: 36
VDTS-1	Class II	(as frames)	850	0.0559	0,068981	5002	6	0:00:06
TCH/H	Frames	17.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -8dB	Class1b	(as frames)	3650	0.002	0,002468	139789	38	0:00: 38
VDTS-1	Class II	(as frames)	850	0.0542	0,066883	5159	7	0:00:07
TCH/H	Frames	19	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -10dB	Class1b	(as frames)	3650	0.0022	0,002715	127081	35	0:00: 35
VDTS-1	Class II	(as frames)	850	0.057	0,070338	4905	6	0:00:06
TCH/H	Frames	11,5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 4 dB	Class1b	(as frames)	3650	0,001800	0,002221	155321	43	0:00:43
VDTS-2	Class II	(as frames)	850	0,050300	0,062070	5558	7	0:00:07
TCH/H	Frames	13	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 0 dB	Class1b	(as frames)	3650	0.001800	0,002221	155322	43	0:00:43
VDTS-2	Class II	(as frames)	850	0.049700	0,061330	5626	7	0:00:07
TCH/H	Frames	15.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -4 dB	Class1b	(as frames)	3650	0,002000	0,002468	139789	38	0:00:38
VDTS-2	Class II	(as frames)	850	0,052000	0,064168	5377	6	0:00:06
TCH/H	Frames	19	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -8 dB	Class1b	(as frames)	3650	0,002100	0,002591	133133	36	0:00:36
VDTS-2	Class II	(as frames)	850	0,052100	0,064291	5366	6	0:00:06
TCH/H	Frames	21	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -10 dB	Class1b	(as frames)	3650	0,001200	0,001481	232982	64	0:00:04
VDTS-2	Class II	(as frames)	850	0,050000	0,061700	5592	7	0:00:07
TCH/H	Frames	9.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 4 dB	Class1b	(as frames)	3650	0,000500	0,000617	559157	153	0:02:33
VDTS-3	Class II	(as frames)	850	0,048100	0,059355	5812	7	0:00:07
TCH/H	Frames	11	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 0dB	Class1b	(as frames)	3650	0.002100	0,002591	133133	37	0:00:37
VDTS-3	Class II	(as frames)	850	0.049600	0,061206	5637	7	0:00:07
TCH/H	Frames	13.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -4 dB	Class1b	(as frames)	3650	0,002300	0,002838	121556	33	0:00:33
VDTS-3	Class II	(as frames)	850	0,050000	0,061700	5592	7	0:00:07
TCH/H	Frames	17.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -8 dB	Class1b	(as frames)	3650	0,002600	0,003208	107530	29	0:00:29
VDTS-3	Class II	(as frames)	850	0,055000	0,067870	5083	6	0:00:06
TCH/H	Frames	19	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -10 dB	Class1b	(as frames)	3650	0,002400	0,002962	116491	32	0:00:32
VDTS-3	Class II	(as frames)	850	0,055000	0,067870	5083	6	0:00:06

TCH/H	Frames	-11.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 4 dB	Class1b	(as frames)	3650	0,002400	0,002962	116491	32	0:00:32
VDTS-4	Class II	(as frames)	850	0,050900	0,062811	5493	6	0:00:06
TCH/H	Frames	-8	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 0dB	Class1b	(as frames)	3650	0.002400	0,002962	116492	32	0:00:32
VDTS-4	Class II	(as frames)	850	0.051200	0,063181	5461	7	0:00:07
TCH/H	Frames	-3.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -4 dB	Class1b	(as frames)	3650	0,002200	0,002715	127081	35	0:00:35
VDTS-4	Class II	(as frames)	850	0,050500	0,062317	5536	7	0:00:07
TCH/H	Frames	-3.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -8 dB	Class1b	(as frames)	3650	0,001400	0,001728	199699	55	0:00:55
VDTS-4	Class II	(as frames)	850	0,059000	0,072806	4739	6	0:00:06
TCH/H	Frames	-0.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -10 dB	Class1b	(as frames)	3650	0,001700	0,002098	164458	45	0:00:45
VDTS-4	Class II	(as frames)	850	0,065100	0,080333	4295	5	0:00:05

Table 14.20.1-5: Statistical test limits for DCS 1 800 and 1900 TCH/H (VAMOS type II MS)

VDTS1/ VDTS-2/3 and VDTS-4								
1.8 to 1.9GHz		**Ir (C/I) / dB**	**Samples per second**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time (s)**	**Target test time (hh:mm:ss)**
TCH/H SCPIR_DL = 4dB VDTS-1	Frames	10	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.0017	0,002098	164458	45	0:00: 45
	Class II	(as frames)	850	0.0524	0,064662	5336	7	0:00:07
TCH/H SCPIR_DL = 0dB VDTS-1	Frames	11.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.0019	0,002345	147147	41	0:00:41
	Class II	(as frames)	850	0.0546	0,067376	5121	7	0:00:07
TCH/H SCPIR_DL = -4dB VDTS-1	Frames	14	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.002	0,002468	139790	39	0:00:39
	Class II	(as frames)	850	0.058	0,071572	4821	6	0:00:06
TCH/H SCPIR_DL = -8dB VDTS-1	Frames	18	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.002	0,002468	139790	39	0:00:39
	Class II	(as frames)	850	0.0571	0,070461	4897	6	0:00:06
TCH/H SCPIR_DL = -10dB VDTS-1	Frames	19.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.0021	0,002591	133133	37	0:00:37
	Class II	(as frames)	850	0.0596	0,073546	4691	6	0:00:06
TCH/H SCPIR_DL = 4 dB VDTS-2	Frames	11.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001900	0,002345	147147	40	0:00:40
	Class II	(as frames)	850	0,055200	0,068117	5065	6	0:00:06
TCH/H SCPIR_DL = 0dB VDTS-2	Frames	13	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.002000	0,002468	139790	39	0:00:39
	Class II	(as frames)	850	0.056100	0,069227	4984	6	0:00:06
TCH/H SCPIR_DL = -4 dB VDTS-2	Frames	15.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002000	0,002468	139789	38	0:00:38
	Class II	(as frames)	850	0,057300	0,070708	4879	6	0:00:06
TCH/H SCPIR_DL = -8 dB VDTS-2	Frames	19	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002500	0,003085	111831	31	0:00:31
	Class II	(as frames)	850	0,059200	0,073053	4723	6	0:00:06
TCH/H SCPIR_DL = -10 dB VDTS-2	Frames	21	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002600	0,003208	107530	29	0:00:29
	Class II	(as frames)	850	0,063100	0,077865	4431	5	0:00:05
TCH/H SCPIR_DL = 4 dB VDTS-3	Frames	9.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002000	0,002468	139789	38	0:00:38
	Class II	(as frames)	850	0,048800	0,060219	5729	7	0:00:07
TCH/H SCPIR_DL = 0dB VDTS-3	Frames	11.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.002100	0,002591	133133	37	0:00:37
	Class II	(as frames)	850	0.045500	0,056147	6145	8	0:00:08
TCH/H SCPIR_DL = -4 dB VDTS-3	Frames	14	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002100	0,002591	133133	36	0:00:36
	Class II	(as frames)	850	0,050000	0,061700	5592	7	0:00:07
TCH/H SCPIR_DL = -8 dB VDTS-3	Frames	18	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001900	0,002345	147147	40	0:00:40
	Class II	(as frames)	850	0,055000	0,067870	5083	6	0:00:06
TCH/H SCPIR_DL = -10 dB VDTS-3	Frames	20	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002000	0,002468	139789	38	0:00:38
	Class II	(as frames)	850	0,055000	0,067870	5083	6	0:00:06

TCH/H SCPIR_DL = 4 dB VDTS-4	Frames	-11	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002300	0,002838	121556	33	0:00:33
	Class II	(as frames)	850	0,051100	0,063057	5471	6	0:00:06
TCH/H SCPIR_DL = 0dB VDTS-4	Frames	-7.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.002400	0,002962	116492	32	0:00:32
	Class II	(as frames)	850	0.052000	0,064168	5377	7	0:00:07
TCH/H SCPIR_DL = -4 dB VDTS-4	Frames	-2.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002200	0,002715	127081	35	0:00:35
	Class II	(as frames)	850	0,052000	0,064168	5377	6	0:00:06
TCH/H SCPIR_DL = -8 dB VDTS-4	Frames	-1	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001400	0,001728	199699	55	0:00:55
	Class II	(as frames)	850	0,041900	0,051705	6673	8	0:00:08
TCH/H SCPIR_DL = -10 dB VDTS-4	Frames	1.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001500	0,001851	186386	51	0:00:51
	Class II	(as frames)	850	0,051100	0,063057	5471	6	0:00:06

14.20.2 TCH EFS – VDTS-1, VDTS-2/3 and VDTS-4

14.20.2.1 Definition

The VAMOS reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the VAMOS receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.20.2.2 Conformance requirement

- For AQPSK modulated speech channels (TCH/HS, TCH/AFSx, TCH/AHSx, TCH/EFS, TCH/WFSx – in downlink), and their associated control channels, the applicable requirements are in tables 2aa for VAMOS I MS and 2ab for VAMOS II MS.

3GPP TS 45.005, subclause 6.3.2.1

- For AQPSK modulated speech channels and control channels in downlink, the wanted input signal level shall be: [-93] dBm + Ir, where Ir = the interference ratio according to tables 2aa for VAMOS I MS and 2ab for VAMOS II MS for VDTS-1, VDTS-2 and VDTS-3 (see subclause Q.1) for speech and associated control channels in VAMOS mode in downlink.

3GPP TS 45.005, subclause 6.3.4

- For signalling channels (TCH/FS, TCH/AFSx, TCH/EFS, TCH/WFSx) FER: ≤ 1 %

3GPP TS 45.005, subclause 6.2.1a

- The C/I1 values in tables 2aa and 2ab are ratios of received powers expressed in dB; where C is the received power of the downlink signal using Normal burst for AQPSK (see 3GPP TS 45.002) and I1 is the received power of the dominant external interferer (Co-channel 1 in tables Q.1-1 to Q.1-3) for VDTS-1 to VDTS-3.

3GPP TS 45.005, subclause Q.1

- For the adjacent (200 kHz) channel requirements of speech and control channels in VAMOS mode in downlink, the wanted input signal level of the AQPSK modulated signal shall be: [-75] dBm + Iar, where: Iar = the adjacent channel (200 kHz) interference ratio according to tables 2aa and 2ab for VAMOS I MS and VAMOS II MS respectively for VDTS-4 (see subclause Q.1).

14.20.2.3 Test purpose

To verify that the MS does not exceed the conformance requirements for TCH/EFS under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.20.2.4 Method of test

14.20.2.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/H with an ARFCN in the mid ARFCN range. The power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The SS transmits a Standard Test Signal C1 (AQPSK) (wanted signal) on the active VAMOS subchannel (subchannel 2) using trainings sequence 5 form TSC set 2. The other VAMOS subchannel (subchannel 1) uses trainings sequences 5 from TSC set 1.

The SCPIR_DL is set to +4 dB.

Specific PICS Statements:

- VAMOS type I supported (TSPC_VAMOS_Type1)
- VAMOS type II supported (TSPC_VAMOS_Type 2)

14.20.2.4.2 Procedure

a) The fading function is set to TUhigh.

b) In addition to the wanted signal, the SS produces a further interferer signal to produce scenario VDTS-1 according to TS 45.005 Q.1.

c) The SS sets the level of the wanted signal to (-93+Ir)dBm that indicated by Ir in table 14.20.2-2 or 14.20.2-3 for VAMOS type I or table 14.20.2-4 or 14.20.2-5 for VAMOS type II.

d) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

e) The SS determines the number of residual bit error events for the bits of the class Ib and II, by examining at least the minimum number of samples of consecutive bits of class Ib and II. Bits are only taken from those frames not signalled as erased.

f) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully if it is not signalled as erased.

g) The SS repeats step c) to f) with SCPIR_DL values 0 dB and -4 dB.

h) If the MS signals VAMOS type II support step c) to f) shall be repeated with SCPIR_DL values -8 dB and -10 dB.

i) The SS discontinues all interfering signals.

j) In addition to the wanted signal, the SS produces a further four interfering signals to produce scenario VDTS-2 according to TS 45.005 Q.1.

k) The SS repeats step c) to f) with SCPIR_DL values 4 dB, 0 dB and -4 dB.

l) If the MS signals VAMOS type II support step c) to f) shall be repeated with SCPIR_DL values -8 dB and -10 dB.

m) The SS discontinues all interfering signals.

n) In addition to the wanted signal, the SS produces a further one interference signal to produce scenario VDTS-3 according to TS 45.005 Q.1.

o) The SS repeats step c) to f) with SCPIR_DL values 4 dB, 0 dB and -4 dB.

p) If the MS signals VAMOS type II support step c) to f) shall be repeated with SCPIR_DL values -8 dB and -10 dB.

q) The SS discontinues all interfering signals.

r) In addition to the wanted signal, the SS produces a further one interference signal to produce scenario VDTS-4 according to TS 45.005 Q.1.

s) The SS repeats step c) to f) with SCPIR_DL values 4 dB, 0 dB and -4 dB.t) If the MS signals VAMOS type II support step c) to f) shall be repeated with SCPIR_DL values -8 dB and -10 dB.

14.20.2.4.3 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7 (A7.1.3.2)

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.20.2-1: Minimum test times due to TU high fading conditions

Fading speed 50km/h				
Frequency /MHz	850	900	1800	1900
Wave length / m	0,35	0,33	0,17	0,16
Min. Test time /s	201	190	95	90
hh:mm:ss	00:03:21	00:03:10	00:01:35	00:01:30

The error rate measured in this test shall be tested according to the values given in table 14.20.2-2 to table 14.20.2-5 depending on the indicated VAMOS type.

Table 14.20.2-2: Statistical test limits for GSM 850 and GSM 900 TCH/EFS (VAMOS type I MS)

VDTS-1, VDTS-2/VDTS-3 and VDTS-4								
0.8 to 0.9 GHz		**Ir (C/I) / dB**	**Samples per second**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time (s)**	**Target test time (hh:mm:ss)**
TCH/EFS SCPIR_DL =4dB VDTS-1	Frames	12	50	0.010000	0.012340	27959	560	0:09:20
	Class 1b	(as frames)	6000	0.0004	0,000494	698947	117	0:01:57
	Class II	(as frames)	3700	0.0362	0,044671	7723	2	0:00:02
TCH/EFS SCPIR_DL =0dB VDTS-1	Frames	13.5	50	0.010000	0.012340	27959	560	0:09:20
	Class 1b	(as frames)	6000	0.0006	0,00074	465964	78	0:01:18
	Class II	(as frames)	3700	0.0377	0,046522	7416	3	0:00:03
TCH/EFS SCPIR_DL =-4dB VDTS-1	Frames	16.5	50	0.010000	0.012340	27959	560	0:09:20
	Class 1b	(as frames)	6000	0.0003	0,000370	931929	155	0:02:35
	Class II	(as frames)	3700	0.0355	0,043807	7875	2	0:00:02
TCH/ EFS SCPIR_DL = 4dB VDTS-2	Frames	14	50	0.010000	0.012340	27959	560	0:09:20
	Class 1b	(as frames)	6000	0,000300	0,000370	931929	155	0:02:35
	Class II	(as frames)	3700	0,034700	0,042820	8057	2	0:00:02
TCH/EFS SCPIR_DL =0dB VDTS-2	Frames	15.5	50	0.010000	0.012340	27959	560	0:09:20
	Class 1b	(as frames)	6000	0.0003	0,00037	931929	156	0:02:36
	Class II	(as frames)	3700	0.0359	0,044301	7788	3	0:00:03
TCH/ EFS SCPIR_DL = -4dB VDTS-2	Frames	19	50	0.010000	0.012340	27959	560	0:09:20
	Class 1b	(as frames)	6000	0,000400	0,000494	698947	116	0:01:56
	Class II	(as frames)	3700	0,033500	0,041339	8346	2	0:00:02
TCH/ EFS SCPIR_DL = 4dB VDTS-3	Frames	11.5	50	0.010000	0.012340	27959	560	0:09:20
	Class 1b	(as frames)	6000	0,000300	0,000370	931929	155	0:02:35
	Class II	(as frames)	3700	0,039500	0,048743	7078	2	0:00:02
TCH/EFS SCPIR_DL =0dB VDTS-3	Frames	13	50	0.010000	0.012340	27959	560	0:09:20
	Class 1b	(as frames)	6000	0.0003	0,00037	931929	156	0:02:36
	Class II	(as frames)	3700	0.0362	0,044671	7724	3	0:00:03
TCH/ EFS SCPIR_DL = -4dB VDTS-3	Frames	16	50	0.010000	0.012340	27959	560	0:09:20
	Class 1b	(as frames)	6000	0,000300	0,000370	931929	155	0:02:35
	Class II	(as frames)	3700	0,036700	0,045288	7618	2	0:00:02
TCH/ EFS SCPIR_DL = 4dB VDTS-4	Frames	-8.5	50	0.010000	0.012340	27959	560	0:09:20
	Class 1b	(as frames)	6000	0,000500	0,000617	559157	93	0:01:33
	Class II	(as frames)	3700	0,035800	0,044177	7809	2	0:00:02
TCH/EFS SCPIR_DL =0dB VDTS-4	Frames	-4.5	50	0.010000	0.012340	27959	560	0:09:20
	Class 1b	(as frames)	6000	0.000300	0,00037	931929	156	0:02:36
	Class II	(as frames)	3700	0.038900	0,048003	7188	2	0:00:02
TCH/ EFS SCPIR_DL = -4dB VDTS-4	Frames	2	50	0.010000	0.012340	27959	560	0:09:20
	Class 1b	(as frames)	6000	0,000300	0,000370	931929	155	0:02:35
	Class II	(as frames)	3700	0,038000	0,046892	7357	2	0:00:02

Table 14.20.2-3: Statistical test limits for DCS 1 800 and 1900 TCH/EFS (VAMOS type I MS)

VDTS-1, VDTS-2/VDTS-3 and VDTS-4								
1.8 to 1.9GHz		Ir (C/I) / dB	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
TCH/EFS SCPIR_DL = 4dB VDTS-1	Frames	11	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0006	0,00074	465964	78	0:01:18
	Class II	(as frames)	3700	0.0461	0,056887	6065	2	0:00:02
TCH/EFS SCPIR_DL = 0dB VDTS-1	Frames	13	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0006	0,00074	465964	78	0:01:18
	Class II	(as frames)	3700	0.0462	0,057011	6052	2	0:00:02
TCH/EFS SCPIR_DL = -4dB VDTS-1	Frames	15.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0007	0,000864	399398	67	0:01:07
	Class II	(as frames)	3700	0.0477	0,058862	5862	2	0:00:02
TCH/ EFS SCPIR_DL = 4dB VDTS-2	Frames	13	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,000700	0,000864	399398	67	0:01:67
	Class II	(as frames)	3700	0,047400	0,058492	5899	2	0:00:02
TCH/EFS SCPIR_DL = 0dB VDTS-2	Frames	14.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0006	0,00074	465964	78	0:01:18
	Class II	(as frames)	3700	0.0502	0,061947	5569	2	0:00:02
TCH/ EFS SCPIR_DL = -4dB VDTS-2	Frames	17.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,000800	0,000987	349473	58	0:00:58
	Class II	(as frames)	3700	0,051200	0,063181	5461	1	0:00:01
TCH/ EFS SCPIR_DL = 4dB VDTS-3	Frames	10	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,000400	0,000494	698947	116	0:01:56
	Class II	(as frames)	3700	0,048900	0,060343	5717	2	0:00:02
TCH/EFS SCPIR_DL = 0dB VDTS-3	Frames	12	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0003	0,00037	931929	156	0:02:36
	Class II	(as frames)	3700	0.0492	0,060713	5683	2	0:00:02
TCH/ EFS SCPIR_DL = -4dB VDTS-3	Frames	15	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,000300	0,000370	931929	155	00:02:35
	Class II	(as frames)	3700	0,049500	0,061083	5648	2	0:00:02
TCH/ EFS SCPIR_DL = 4dB VDTS-4	Frames	-9.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,000500	0,000617	559157	93	0:01:33
	Class II	(as frames)	3700	0,042900	0,052939	6517	2	0:00:02
TCH/EFS SCPIR_DL = 0dB VDTS-4	Frames	-5.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.000300	0,00037	931929	156	0:02:36
	Class II	(as frames)	3700	0.048000	0,059232	5825	2	0:00:02
TCH/ EFS SCPIR_DL = -4dB VDTS-4	Frames	1	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,000400	0,000494	698947	116	0:01:56
	Class II	(as frames)	3700	0,048200	0,059479	5800	2	0:00:02

Table 14.20.2-4: Statistical test limits for GSM 850 and GSM 900 TCH/EFS (VAMOS type II MS)

VDTS-1, VDTS-2/VDTS-3 and VDTS-4								
0.8 to 0.9GHz		**Ir (C/I) / dB**	**Samples per second**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time (s)**	**Target test time (hh:mm:ss)**
TCH/EFS	Frames	11.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 4dB	Class1b	(as frames)	6000	0.0005	0,000617	559157	94	0:01:34
VDTS-1	Class II	(as frames)	3700	0.0373	0,046028	7496	3	0:00:03
TCH/EFS	Frames	13	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 0dB	Class1b	(as frames)	6000	0.0004	0,000494	698947	117	0:01:57
VDTS-1	Class II	(as frames)	3700	0.036	0,044424	7767	3	0:00:03
TCH/EFS	Frames	15.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -4dB	Class1b	(as frames)	6000	0.0006	0,00074	465964	78	0:01:18
VDTS-1	Class II	(as frames)	3700	0.0377	0,046522	7416	3	0:00:03
TCH/EFS	Frames	19	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -8dB	Class1b	(as frames)	6000	0.0004	0,000494	698947	117	0:01:57
VDTS-1	Class II	(as frames)	3700	0.0366	0,045164	7639	3	0:00:03
TCH/EFS	Frames	21	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -10dB	Class1b	(as frames)	6000	0.0006	0,00074	465964	78	0:01:18
VDTS-1	Class II	(as frames)	3700	0.0406	0,0501	6887	2	0:00:02
TCH/ EFS	Frames	13	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 4 dB	Class1b	(as frames)	6000	0,000300	0,000370	931929	155	0:02:35
VDTS-2	Class II	(as frames)	3700	0,035800	0,044177	7809	2	0:00:02
TCH/EFS	Frames	15	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 0dB	Class1b	(as frames)	6000	0.0003	0,00037	931929	156	0:02:36
VDTS-2	Class II	(as frames)	3700	0.0345	0,042573	8104	3	0:00:03
TCH/ EFS	Frames	17	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -4 dB	Class1b	(as frames)	6000	0,000400	0,000494	698947	116	0:01:56
VDTS-2	Class II	(as frames)	3700	0,038000	0,046892	7357	2	0:00:02
TCH/ EFS	Frames	20	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -8 dB	Class1b	(as frames)	6000	0,000500	0,000617	559157	93	0:01:33
VDTS-2	Class II	(as frames)	3700	0,042500	0,052445	6578	2	0:00:02
TCH/ EFS	Frames	22	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -10 dB	Class1b	(as frames)	6000	0,000400	0,000494	698947	116	0:01:56
VDTS-2	Class II	(as frames)	3700	0,041700	0,051458	6705	2	0:00:02
TCH/ EFS	Frames	10	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 4 dB	Class1b	(as frames)	6000	0,000500	0,000617	559157	93	0:01:33
VDTS-3	Class II	(as frames)	3700	0,042300	0,052198	6609	2	0:00:02
TCH/EFS	Frames	12	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 0dB	Class1b	(as frames)	6000	0.0005	0,000617	559157	94	0:01:34
VDTS-3	Class II	(as frames)	3700	0.0385	0,047509	7262	2	0:00:02
TCH/ EFS	Frames	15	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -4 dB	Class1b	(as frames)	6000	0,000700	0,000864	399398	67	0:01:07
VDTS-3	Class II	(as frames)	3700	0,037500	0,046275	7455	2	0:00:02
TCH/ EFS	Frames	18.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -8 dB	Class1b	(as frames)	6000	0,000700	0,000864	399398	67	0:01:07
VDTS-3	Class II	(as frames)	3700	0,036900	0,045535	7577	2	0:00:02
TCH/ EFS	Frames	20.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -10 dB	Class1b	(as frames)	6000	0,000600	0,000740	465964	78	0:01:18
VDTS-3	Class II	(as frames)	3700	0,037600	0,046398	7436	2	0:00:02

TCH/ EFS	Frames	-8.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 4 dB	Class1b	(as frames)	6000	0,000500	0,000617	559157	93	0:01:33
VDTS-4	Class II	(as frames)	3700	0,035800	0,044177	7809	2	0:00:02
TCH/EFS	Frames	-5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 0dB	Class1b	(as frames)	6000	0.000600	0,00074	465965	78	0:01:18
VDTS-4	Class II	(as frames)	3700	0.037500	0,046275	7456	3	0:00:03
TCH/ EFS	Frames	-0.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -4 dB	Class1b	(as frames)	6000	0,000500	0,000617	559157	93	0:01:33
VDTS-4	Class II	(as frames)	3700	0,037400	0,046152	7475	2	0:00:02
TCH/ EFS	Frames	-2.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -8 dB	Class1b	(as frames)	6000	0,000400	0,000494	698947	116	0:01:56
VDTS-4	Class II	(as frames)	3700	0,049900	0,061577	5603	2	0:00:02
TCH/ EFS	Frames	1	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -10 dB	Class1b	(as frames)	6000	0,000300	0,000370	931929	155	0:02:35
VDTS-4	Class II	(as frames)	3700	0,031900	0,039365	8764	2	0:00:02

Table 14.20.2-5: Statistical test limits for DCS 1 800 and 1900 TCH/EFS (VAMOS type II MS)

VDTS-1, VDTS-2/VDTS-3 and VDTS-4								
1.8 to 1.9GHz		**Ir (C/I) / dB**	**Samples per second**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time (s)**	**Target test time (hh:mm:ss)**
TCH/EFS	Frames	10	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 4dB	Class1b	(as frames)	6000	0.0005	0,000617	559157	94	0:01:34
VDTS-1	Class II	(as frames)	3700	0.0502	0,061947	5570	2	0:00:02
TCH/EFS	Frames	11.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 0dB	Class1b	(as frames)	6000	0.0004	0,000494	698947	117	0:01:57
VDTS-1	Class II	(as frames)	3700	0.0535	0,066019	5226	2	0:00:02
TCH/EFS	Frames	14.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -4dB	Class1b	(as frames)	6000	0.0006	0,00074	465964	78	0:01:18
VDTS-1	Class II	(as frames)	3700	0.0532	0,065649	5256	2	0:00:02
TCH/EFS	Frames	18	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -8dB	Class1b	(as frames)	6000	0.0004	0,000494	698947	117	0:01:57
VDTS-1	Class II	(as frames)	3700	0.0533	0,065772	5246	2	0:00:02
TCH/EFS	Frames	20	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL =- 10dB	Class1b	(as frames)	6000	0.0004	0,000494	698947	117	0:01:57
VDTS-1	Class II	(as frames)	3700	0.0558	0,068857	5011	2	0:00:02
TCH/ EFS	Frames	12	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 4 dB	Class1b	(as frames)	6000	0,000300	0,000370	931929	155	0:02:35
VDTS-2	Class II	(as frames)	3700	0,045700	0,056394	6118	2	0:00:02
TCH/EFS	Frames	13.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 0dB	Class1b	(as frames)	6000	0.0007	0,000864	399398	67	0:01:07
VDTS-2	Class II	(as frames)	3700	0.0489	0,060343	5718	2	0:00:02
TCH/ EFS	Frames	16	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -4 dB	Class1b	(as frames)	6000	0,000600	0,000740	465964	78	0:01:18
VDTS-2	Class II	(as frames)	3700	0,051600	0,063674	5418	1	0:00:01
TCH/ EFS	Frames	19.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -8 dB	Class1b	(as frames)	6000	0,000500	0,000617	559157	93	0:01:33
VDTS-2	Class II	(as frames)	3700	0,053800	0,066389	5197	1	0:00:01
TCH/ EFS	Frames	21.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -10 dB	Class1b	(as frames)	6000	0,000500	0,000617	559157	93	0:01:33
VDTS-2	Class II	(as frames)	3700	0,056200	0,069351	4975	1	0:00:01
TCH/ EFS	Frames	9	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 4 dB	Class1b	(as frames)	6000	0,000400	0,000494	698947	116	0:01:56
VDTS-3	Class II	(as frames)	3700	0,052700	0,065032	5305	1	0:00:01
TCH/EFS	Frames	10.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 0dB	Class1b	(as frames)	6000	0.0006	0,00074	465964	78	0:01:18
VDTS-3	Class II	(as frames)	3700	0.054	0,066636	5178	2	0:00:02
TCH/ EFS	Frames	14	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -4 dB	Class1b	(as frames)	6000	0,000500	0,000617	559157	93	0:01:33
VDTS-3	Class II	(as frames)	3700	0,043300	0,053432	6457	2	0:00:01
TCH/ EFS	Frames	18	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -8 dB	Class1b	(as frames)	6000	0,000700	0,000864	399398	67	0:01:07
VDTS-3	Class II	(as frames)	3700	0,047700	0,058862	5861	2	0:00:01
TCH/ EFS	Frames	19.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -10 dB	Class1b	(as frames)	6000	0,000500	0,000617	559157	93	0:01:33
VDTS-3	Class II	(as frames)	3700	0,048500	0,059849	5765	2	0:00:02

TCH/ EFS	Frames	-9.5	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 4 dB	Class1b	(as frames)	6000	0,000500	0,000617	559157	93	0:01:33
VDTS-4	Class II	(as frames)	3700	0,042900	0,052939	6517	2	0:00:02
TCH/EFS	Frames	-6	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = 0dB	Class1b	(as frames)	6000	0.0006	0,00074	465965	78	0:01:18
VDTS-4	Class II	(as frames)	3700	0.0455	0,056147	6145	2	0:00:02
TCH/ EFS	Frames	-1	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -4 dB	Class1b	(as frames)	6000	0,000600	0,000740	465964	78	0:01:18
VDTS-4	Class II	(as frames)	3700	0,046100	0,056887	6065	2	0:00:02
TCH/ EFS	Frames	-2	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -8 dB	Class1b	(as frames)	6000	0,000300	0,000370	931929	155	0:01:35
VDTS-4	Class II	(as frames)	3700	0,039800	0,049113	7025	2	0:00:02
TCH/ EFS	Frames	2	50	0.010000	0.012340	27959	560	0:09:20
SCPIR_DL = -10 dB	Class1b	(as frames)	6000	0,000400	0,000494	698947	116	0:01:56
VDTS-4	Class II	(as frames)	3700	0,040900	0,050471	6836	2	0:00:02

14.20.3 TCH AFS – VDTS-1, VDTS-2/3 and VDTS-4

14.20.3.1 Definition

The VAMOS reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the VAMOS receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.20.3.2 Conformance requirement

- For AQPSK modulated speech channels (TCH/HS, TCH/AFSx, TCH/AHSx, TCH/EFS, TCH/WFSx – in downlink), and their associated control channels, the applicable requirements are in tables 2aa for VAMOS I MS and 2ab for VAMOS II MS.

3GPP TS 45.005, subclause 6.3.2.1

- For AQPSK modulated speech channels and control channels in downlink, the wanted input signal level shall be: [-93] dBm + Ir, where Ir = the interference ratio according to tables 2aa for VAMOS I MS and 2ab for VAMOS II MS for VDTS-1, VDTS-2 and VDTS-3 (see subclause Q.1) for speech and associated control channels in VAMOS mode in downlink.

For the adjacent (200 kHz) channel requirements of speech and control channels in VAMOS mode in downlink, the wanted input signal level of the AQPSK modulated signal shall be: [-75] dBm + Iar, where: Iar = the adjacent channel (200 kHz) interference ratio according to tables 2aa and 2ab for VAMOS I MS and VAMOS II MS respectively for VDTS-4 (see subclause Q.1).

3GPP TS 45.005, subclause 6.3.4

- For full rate speech channels (TCH/FS, TCH/AFSx, TCH/EFS, TCH/WFSx) FER: ≤ 1 %

3GPP TS 45.005, subclause 6.2.1a

The C/I1 values in tables 2aa and 2ab are ratios of received powers expressed in dB; where C is the received power of the downlink signal using Normal burst for AQPSK (see 3GPP TS 45.002) and I1 is the received power of the dominant external interferer (Co-channel 1 in tables Q.1-1 to Q.1-3) for VDTS-1 to VDTS-3 or the received power of the adjacent channel interferer for VDTS-4 (Adjacent 1 in table Q.1-4).

3GPP TS 45.005, subclause Q.1

14.20.3.3 Test purpose

To verify that the MS does not exceed the conformance requirements for TCH/AFS under propagation condition TUhigh, no hopping with an allowance for the statistical significance of the test.

14.20.3.4 Method of test

14.20.3.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AFS with an ARFCN in the mid ARFCN range. The power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 12.20 kbit/s.

The SS transmits a Standard Test Signal C1 (AQPSK) (wanted signal) on the active VAMOS subchannel (subchannel 2) using trainings sequence 5 from TSC set 2. The other VAMOS subchannel (subchannel 1) uses trainings sequences 5 from TSC set 1.

The SCPIR_DL is set to +4 dB.

Specific PICS Statements:

- VAMOS type I supported (TSPC_VAMOS_Type1)
- VAMOS type 2 supported (TSPC_VAMOS_Type 2)

14.20.3.4.2 Procedure

a) The fading function is set to TUhigh, no Hopping.

b) In addition to the wanted signal, the SS produces a further interferer signal to produce scenario VDTS-1 according to TS 45.005 Q.1.

c) The SS sets the level of the wanted signal to (-93+Ir)dBm that indicated by Ir in table 14.20.3-2 or 14.20.3-3 for VAMOS type I or table 14.20.3-4 or 14.20.3-5 for VAMOS type II.

d) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

e) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

f) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully if it is not signalled as erased.

g) The SS repeats step c) to f) with SCPIR_DL values 0 dB and -4 dB.

h) If the MS signals VAMOS type II support step c) to f) shall be repeated with SCPIR_DL values -8 dB and -10 dB.

i) The SS uses a Channel Mode Modify procedure to change the active codec set to 4.75 kbit/s with SCPIR_DL value set to +4 dB and steps b) to h) are repeated.

j) The SS discontinues all interfering signals.

k) In addition to the wanted signal, the SS produces a further four interfering signals to produce scenario VDTS-2 according to TS 45.005 Q.1.

l) The SS repeats step c) to f) with SCPIR_DL values 4 dB, 0 dB and -4 dB.

m) If the MS signals VAMOS type II support step c) to f) shall be repeated with SCPIR_DL values -8 dB and -10 dB.

n) The SS discontinues all interfering signals.

o) In addition to the wanted signal, the SS produces a further one interference signal to produce scenario VDTS-3 according to TS 45.005 Q.1.

p) The SS repeats step c) to f) with SCPIR_DL values 4 dB, 0 dB and -4 dB.

q) If the MS signals VAMOS type II support step c) to f) shall be repeated with SCPIR_DL values -8 dB and -10 dB.

r) The SS discontinues all interfering signals.

s) In addition to the wanted signal, the SS produces a further one interference signal to produce scenario VDTS-4 according to TS 45.005 Q.1.

t) The SS repeats step c) to f) with SCPIR_DL values 4 dB, 0 dB and -4 dB.u) If the MS signals VAMOS type II support step c) to f) shall be repeated with SCPIR_DL values -8 dB and -10 dB.

14.20.3.4.3 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7 (A7.1.3.2)

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.20.3-1: Minimum test times due to TU high fading conditions

Fading speed 50km/h				
Frequency /MHz	850	900	1800	1900
Wave length / m	0,35	0,33	0,17	0,16
Min. Test time /s	201	190	95	90
hh:mm:ss	00:03:21	00:03:10	00:01:35	00:01:30

The error rate measured in this test shall be tested according to the values given in table 14.20.3-2 to table 14.20.3-5 depending on the indicated VAMOS type.

Table 14.20.3-2: Statistical test limits for GSM 850 and GSM 900 TCH/AFS (VAMOS type I MS)

VDTS-1, VDTS-2/VDTS-3,VDTS-4								
0.8 to 0.9GHz		Ir (C/I)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
TCH/AFS 12.20 SCPIR=4 VDTS-1	Frames	12	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0049	0,006047	57057	10	0:00:10
TCH/AFS 4.75 SCPIR=4 VDTS-1	Frames	6.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0012	0.0015	232982	39	0:00:39
TCH/AFS 12.20 SCPIR=0 VDTS-1	Frames	13.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0051	0,0006293	54820	10	0:00:10
TCH/AFS 4.75 SCPIR=0 VDTS-1	Frames	8	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0010	0.0012	279579	47	0:00:47
TCH/AFS 12.20 SCPIR=-4 VDTS-1	Frames	16.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0053	0,000654	52751	9	0:00:09
TCH/AFS 4.75 SCPIR=-4 VDTS-1	Frames	10.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0010	0.001234	279579	47	0:00:47
TCH/AFS 4.75 SCPIR=4 VDTS-2	Frames	8.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0012	0.0015	232982	39	0:00:39
TCH/AFS 4.75 SCPIR=0 VDTS-2	Frames	10	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0012	0,001481	232983	39	0:00:39
TCH/AFS 4.75 SCPIR=-4 VDTS-2	Frames	13	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0012	0.0015	232982	39	0:00:39
TCH/AFS 4.75 SCPIR=4 VDTS-3	Frames	5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001000	0,001234	279579	47	00:00:47
TCH/AFS 4.75 SCPIR=0 VDTS-3	Frames	6.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0011	0,001357	254163	43	0:00:43
TCH/AFS 4.75 SCPIR=-4 VDTS-3	Frames	9	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001500	0,001851	186386	31	00:00:31
TCH/AFS 4.75 SCPIR=4 VDTS-4	Frames	-16.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001000	0,001234	279579	47	00:00:47
TCH/AFS 4.75 SCPIR=0 VDTS-4	Frames	-13.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0013	0,001604	215061	36	0:00:36
TCH/AFS 4.75 SCPIR=-4 VDTS-4	Frames	-8	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001300	0,001604	215060	36	00:00:36

Table 14.20.3-3: Statistical test limits for DCS 1 800 and 1900 TCH/AFS (VAMOS type I MS)

VDTS-1, VDTS-2/VDTS-3,VDTS-4								
1.8 to 1.9GHz		Ir (C/I)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
TCH/AFS 12.20 SCPIR=4 VDTS-1	Frames	11.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0069	0,008515	40519	7	0:00:07
TCH/AFS 4.75 SCPIR=4 VDTS-1	Frames	5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0014	0.0017	199699	33	0:00:33
TCH/AFS 12.20 SCPIR=0 VDTS-1	Frames	13	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0065	0,008021	43013	8	0:00:08
TCH/AFS 4.75 SCPIR=0 VDTS-1	Frames	6.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0017	0.0021	164458	27	0:00:27
TCH/AFS 12.20 SCPIR=-4 VDTS-1	Frames	15.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.007	0,00864	39940	7	0:00:07
TCH/AFS 4.75 SCPIR=-4 VDTS-1	Frames	9	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0013	0.0016	215060	36	0:00:36
TCH/AFS 4.75 SCPIR=4 VDTS-2	Frames	7.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001400	0,001728	199699	33	00:00:33
TCH/AFS 4.75 SCPIR=0 VDTS-2	Frames	9	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0014	0,001728	199700	34	0:00:34
TCH/AFS 4.75 SCPIR=-4 VDTS-2	Frames	11.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001400	0,001728	199699	33	00:00:33
TCH/AFS 4.75 SCPIR=4 VDTS-3	Frames	3	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001500	0,001851	186386	31	00:00:31
TCH/AFS 4.75 SCPIR=0 VDTS-3	Frames	5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0015	0,001851	186386	32	0:00:32
TCH/AFS 4.75 SCPIR=-4 VDTS-3	Frames	7.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,002000	0,002468	139789	23	00:00:23
TCH/AFS 4.75 SCPIR=4 VDTS-4	Frames	-18	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001500	0,001851	186386	31	00:00:31
TCH/AFS 4.75 SCPIR=0 VDTS-4	Frames	-15	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0015	0,001851	186386	32	0:00:32
TCH/AFS 4.75 SCPIR=-4 VDTS-4	Frames	-9	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001700	0,002098	164458	27	00:00:27

Table 14.20.3-4: Statistical test limits for GSM 850 and GSM 900 TCH/AFS (VAMOS type II MS)

VDTS-1, VDTS-2/VDTS-3,VDTS-4									
0.8 to 0.9GHz		Ir (C/I)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
TCH/AFS 12.20 SCPIR=4 VDTS-1	Frames	11.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0045	0,005553	62129	11	0:00:11
TCH/AFS 4.75 SCPIR=4 VDTS-1	Frames	5.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0014	0.0017	199699	33	0:00:33
TCH/AFS 12.20 SCPIR=0 VDTS-1	Frames	13	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0045	0,005553	62129	11	0:00:11
TCH/AFS 4.75 SCPIR=0 VDTS-1	Frames	7	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0013	0.0016	215060	36	0:00:36
TCH/AFS 12.20 SCPIR=-4 VDTS-1	Frames	15.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0047	0,0058	59485	10	0:00:10
TCH/AFS 4.75 SCPIR=-4 VDTS-1	Frames	9	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0014	0.0017	199699	33	0:00:33
TCH/AFS 12.20 SCPIR=-8 VDTS-1	Frames	19	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.004	0,00494	69895	12	0:00:12
TCH/AFS 4.75 SCPIR=-8 VDTS-1	Frames	13	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0011	0.0014	254162	42	0:00:42
TCH/AFS 12.20 SCPIR=-10 VDTS-1	Frames	21	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0047	0,0058	59485	10	0:00:10
TCH/AFS 4.75 SCPIR=-10 VDTS-1	Frames	15	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0012	0.0015	232982	39	0:00:39
TCH/AFS 4.75 SCPIR=4 VDTS-2	Frames	7	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001100	0,001357	254162	42	00:00:42
TCH/AFS 4.75 SCPIR=0 VDTS-2	Frames	8.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0016	0,001974	174737	30	0:00:30
TCH/AFS 4.75 SCPIR=-4 VDTS-2	Frames	11	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001400	0,001728	199699	33	00:00:33
TCH/AFS 4.75 SCPIR=-8 VDTS-2	Frames	14.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001100	0,001357	254162	42	00:00:42
TCH/AFS 4.75 SCPIR=-10 VDTS-2	Frames	16	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,000900	0,001111	310643	52	00:00:52

TCH/AFS 4.75 SCPIR=4 VDTS-3	Frames	4.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001800	0,002221	155321	26	00:00:26
TCH/AFS 4.75 SCPIR=0 VDTS-3	Frames	6	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0021	0,002591	133133	23	0:00:23
TCH/AFS 4.75 SCPIR=-4 VDTS-3	Frames	8.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001800	0,002221	155321	26	00:00:26
TCH/AFS 4.75 SCPIR=-8 VDTS-3	Frames	11.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001800	0,002221	155321	26	00:00:26
TCH/AFS 4.75 SCPIR=-10 VDTS-3	Frames	13.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,002100	0,002591	133133	23	00:00:23
TCH/AFS 4.75 SCPIR=4 VDTS-4	Frames	-18.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,002200	0,002715	127081	21	00:00:21
TCH/AFS 4.75 SCPIR=0 VDTS-4	Frames	-15	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0014	0,001728	199700	34	0:00:34
TCH/AFS 4.75 SCPIR=-4 VDTS-4	Frames	-12	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001300	0,001604	215060	36	00:00:36
TCH/AFS 4.75 SCPIR=-8 VDTS-4	Frames	-10.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001800	0,002221	155321	26	00:00:26
TCH/AFS 4.75 SCPIR=-10 VDTS-4	Frames	-8.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001700	0,002098	164458	27	00:00:27

Table 14.20.3-5: Statistical test limits for DCS 1 800 and 1900 TCH/AFS (VAMOS type II MS)

VDTS-1, VDTS-2/VDTS-3,VDTS-4								
1.8 to 1.9GHz		Ir (C/I)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
TCH/AFS 12.20 SCPIR=4 VDTS-1	Frames	10.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0076	0,009378	36787	7	0:00:07
TCH/AFS 4.75 SCPIR=4 VDTS-1	Frames	3.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0011	0.0014	254162	42	0:00:42
TCH/AFS 12.20 SCPIR=0 VDTS-1	Frames	12	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0074	0,009132	37781	7	0:00:07
TCH/AFS 4.75 SCPIR=0 VDTS-1	Frames	5.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0012	0.0015	232982	39	0:00:39
TCH/AFS 12.20 SCPIR=-4 VDTS-1	Frames	14.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0074	0,009132	37781	7	0:00:07
TCH/AFS 4.75 SCPIR=-4 VDTS-1	Frames	7.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0017	0.0021	164458	27	0:00:27
TCH/AFS 12.20 SCPIR=-8 VDTS-1	Frames	18	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.008	0,009872	34948	6	0:00:06
TCH/AFS 4.75 SCPIR=-8 VDTS-1	Frames	11.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0012	0.0015	232982	39	0:00:39
TCH/AFS 12.20 SCPIR=-10 VDTS-1	Frames	20	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0085	0,010489	32892	6	0:00:06
TCH/AFS 4.75 SCPIR=-10 VDTS-1	Frames	13.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0013	0.0016	215060	36	0:00:36
TCH/AFS 4.75 SCPIR=4 VDTS-2	Frames	6	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001500	0,001851	186386	31	00:00:31
TCH/AFS 4.75 SCPIR=0 VDTS-2	Frames	7.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0015	0,001851	186386	32	0:00:32
TCH/AFS 4.75 SCPIR=-4 VDTS-2	Frames	9.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001500	0,001851	186386	31	00:00:31
TCH/AFS 4.75 SCPIR=-8 VDTS-2	Frames	13	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001900	0,002345	147147	25	00:00:25
TCH/AFS 4.75	Frames	15	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001300	0,001604	215060	36	00:00:36

SCPIR=-10 VDTS-2								
TCH/AFS 4.75 SCPIR=4 VDTS-3	Frames	2.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001800	0,002221	155321	26	00:00:26
TCH/AFS 4.75 SCPIR=0 VDTS-3	Frames	4.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0011	0,001357	254163	43	0:00:43
TCH/AFS 4.75 SCPIR=-4 VDTS-3	Frames	7	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001500	0,001851	186386	31	00:00:31
TCH/AFS 4.75 SCPIR=-8 VDTS-3	Frames	10.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001600	0,001974	174737	29	00:00:29
TCH/AFS 4.75 SCPIR=-10 VDTS-3	Frames	12.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,001600	0,001974	174737	29	00:00:29
TCH/AFS 4.75 SCPIR=4 VDTS-4	Frames	-19.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,002100	0,002591	133133	22	00:00:22
TCH/AFS 4.75 SCPIR=0 VDTS-4	Frames	-16.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0.0016	0,001974	174737	30	0:00:30
TCH/AFS 4.75 SCPIR=-4 VDTS-4	Frames	-13.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,002100	0,002591	133133	22	00:00:22
TCH/AFS 4.75 SCPIR=-8 VDTS-4	Frames	-11.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,002200	0,002715	127081	21	00:00:21
TCH/AFS 4.75 SCPIR=-10 VDTS-4	Frames	-9.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	6000	0,002200	0,002715	127081	21	00:00:21

14.20.4 TCH AHS – VDTS-1,VDTS-2/3 and VDTS-4

14.20.4.1 Definition

The VAMOS reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the VAMOS receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.20.4.2 Conformance requirement

- For AQPSK modulated speech channels (TCH/HS, TCH/AFSx, TCH/AHSx, TCH/EFS, TCH/WFSx – in downlink), and their associated control channels, the applicable requirements are in tables 2aa for VAMOS I MS and 2ab for VAMOS II MS.

3GPP TS 45.005, subclause 6.3.2.1

- For AQPSK modulated speech channels and control channels in downlink, the wanted input signal level shall be: [-93] dBm + Ir, where Ir = the interference ratio according to tables 2aa for VAMOS I MS and 2ab for VAMOS II MS for VDTS-1, VDTS-2 and VDTS-3 (see subclause Q.1) for speech and associated control channels in VAMOS mode in downlink.

- For the adjacent (200 kHz) channel requirements of speech and control channels in VAMOS mode in downlink, the wanted input signal level of the AQPSK modulated signal shall be: [-75] dBm + Iar, where: Iar = the adjacent channel (200 kHz) interference ratio according to tables 2aa and 2ab for VAMOS I MS and VAMOS II MS respectively for VDTS-4 (see subclause Q.1).

3GPP TS 45.005, subclause 6.3.4

- For half rate speech channels (TCH/HS, TCH/AHSx) FER: ≤ 1 %

3GPP TS 45.005, subclause 6.2.1a

The C/I1 values in tables 2aa and 2ab are ratios of received powers expressed in dB; where C is the received power of the downlink signal using Normal burst for AQPSK (see 3GPP TS 45.002) and I1 is the received power of the dominant external interferer (Co-channel 1 in tables Q.1-1 to Q.1-3) for VDTS-1 to VDTS-3 or the received power of the adjacent channel interferer for VDTS-4 (Adjacent 1 in table Q.1-4).

3GPP TS 45.005, subclause Q.1

14.20.4.3 Test purpose

To verify that the MS does not exceed the conformance requirements for TCH/AHS under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.20.4.4 Method of test

14.20.4.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AHS with an ARFCN in the mid ARFCN range. The power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 4.75 kbit/s.

The SS transmits a Standard Test Signal C1 (AQPSK) (wanted signal) on the active VAMOS subchannel (subchannel 2) using trainings sequence 5 from TSC set 2. The other VAMOS subchannel (subchannel 1) uses trainings sequences 5 from TSC set 1.

The SCPIR_DL is set to +4 dB.

Specific PICS Statements:

- VAMOS type I supported (TSPC_VAMOS_Type1)
- VAMOS type 2 supported (TSPC_VAMOS_Type 2)

14.20.4.4.2 Procedure

a) The fading function is set to TUhigh.

b) In addition to the wanted signal, the SS produces a further interferer signal to produce scenario VDTS-1 according to TS 45.005 Q.1.

c) The SS sets the level of the wanted signal to (-93+Ir)dBm that indicated by Ir in table 14.20.4-2 or 14.20.4-3 for VAMOS type I or table 14.20.4-4 or 14.20.4-5 for VAMOS type II.

d) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

e) The SS determines the number of residual bit error events for the bits of the class Ib and II, by examining at least the minimum number of samples of consecutive bits of class Ib and II. Bits are only taken from those frames not signalled as erased.

f) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully if it is not signalled as erased.

g) The SS repeats step c) to f) with SCPIR_DL values 0 dB and -4 dB.

h) If the MS signals VAMOS type II support step c) to f) shall be repeated with SCPIR_DL values -8 dB and -10 dB.

i) The SS uses a Channel Mode Modify procedure to change the active codec set to 7.4 kbit/s with SCPIR_DL value set to +4 dB and steps c) to h) are repeated.

j) The SS discontinues all interfering signals.

k) In addition to the wanted signal, the SS produces a further four interfering signals to produce scenario VDTS-2 according to TS 45.005 Q.1.

l) The SS repeats step c) to f) with SCPIR_DL values 4 dB, 0 dB and -4 dB.

m) If the MS signals VAMOS type II support step c) to f) shall be repeated with SCPIR_DL values -8 dB and -10 dB.

n) The SS discontinues all interfering signals.

o) In addition to the wanted signal, the SS produces a further one interference signal to produce scenario VDTS-3 according to TS 45.005 Q.1.

p) The SS repeats step c) to f) with SCPIR_DL values 4 dB, 0 dB and -4 dB.

q) If the MS signals VAMOS type II support step c) to f) shall be repeated with SCPIR_DL values -8 dB and -10 dB.

r) The SS discontinues all interfering signals.

s) In addition to the wanted signal, the SS produces a further one interference signal to produce scenario VDTS-4 according to TS 45.005 Q.1.

t) The SS repeats step c) to f) with SCPIR_DL values 4 dB, 0 dB and -4 dB.

u) If the MS signals VAMOS type II support step c) to f) shall be repeated with SCPIR_DL values -8 dB and -10 dB.

14.20.4.4.3 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7 (A7.1.3.2)

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.20.4-1: Minimum test times due to TU high fading conditions

Fading speed 50km/h				
Frequency /MHz	850	900	1800	1900
Wave length / m	0,35	0,33	0,17	0,16
Min. Test time /s	403	380	190	180
hh:mm:ss	00:06:43	00:06:20	00:03:10	00:03:00

The error rate measured in this test shall be tested according to the values given in table 14.20.4-2 to table 14.20.4-5 depending on the indicated VAMOS type.

Table 14.20.4-2: Statistical test limits for GSM 850 and GSM 900 TCH/AHS (VAMOS type I MS)

VDTS-1, VDTS-2/VDTS-3,VDTS-4								
0.8 to 0.9GHz		**Ir (C/I)**	**Samples per second**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time (s)**	**Target test time (hh:mm:ss)**
AHS 7.4 SCPIR=4 VDTS-1	Frames	15	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001500	0.001851	186386	52	0:00:52
	Class II	(as frames)	850	0.016000	0.019744	17474	21	0:00:21
AHS 4.75 SCPIR=4 VDTS-1	Frames	10.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001400	0.0017	199699	55	0:00:55
	Class II	(as frames)	850	0.052200	0.0644	5356	6	0:00:06
AHS 7.4 SCPIR=0 VDTS-1	Frames	17	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001500	0.001851	186386	52	0:00:52
	Class II	(as frames)	850	0.016100	0.019867	17366	21	0:00:21
AHS 4.75 SCPIR=0 VDTS-1	Frames	12	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001000	0.0012	279579	77	0:01:17
	Class II	(as frames)	850	0.045000	0.0555	6213	7	0:00:07
AHS 7.4 SCPIR=-4 VDTS-1	Frames	19.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001600	0.0019744	174737	48	0:00:48
	Class II	(as frames)	850	0.017500	0.021595	15976	19	0:00:19
AHS 4.75 SCPIR=-4 VDTS-1	Frames	14.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001200	0.0015	232982	64	0:01:04
	Class II	(as frames)	850	0.051800	0.0639	5397	6	0:00:06
AHS 7.4 SCPIR=4 VDTS-2	Frames	17	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001300	0,001604	215060	59	00:00:59
	Class II	(as frames)	850	0,015800	0,019497	17695	21	00:00:21
AHS 7.4 SCPIR=0 VDTS-2	Frames	19	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001300	0.001604	215061	59	0:00:59
	Class II	(as frames)	850	0.016000	0.019744	17474	21	0:00:21
AHS 7.4 SCPIR=-4 VDTS-2	Frames	21.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001600	0,001974	174737	48	00:00:48
	Class II	(as frames)	850	0,018200	0,022459	15361	18	00:00:18
AHS 7.4 SCPIR=4 VDTS-3	Frames	13.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001300	0,001604	215060	59	00:00:59
	Class II	(as frames)	850	0,017400	0,021472	16068	19	00:00:19
AHS 7.4 SCPIR=0 VDTS-3	Frames	16	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001400	0.001728	199700	55	0:00:55
	Class II	(as frames)	850	0.017500	0.021595	15976	19	0:00:19
AHS 7.4 SCPIR=-4 VDTS-3	Frames	19.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001400	0,001728	199699	55	00:00:55
	Class II	(as frames)	850	0,017800	0,021965	15707	18	00:00:18
AHS 7.4 SCPIR=4 VDTS-4	Frames	-2.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001300	0,001604	215060	59	00:00:59
	Class II	(as frames)	850	0,016600	0,020484	16842	20	00:00:20
AHS 7.4 SCPIR=0 VDTS-4	Frames	2.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001300	0.001604	215061	59	0:00:59
	Class II	(as frames)	850	0.015900	0.019621	17584	21	0:00:21
AHS 7.4 SCPIR=-4 VDTS-4	Frames	7	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001400	0,001728	199699	55	00:00:55
	Class II	(as frames)	850	0,015900	0,019621	17584	21	00:00:21

Table 14.20.4-3: Statistical test limits for DCS 1 800 and 1900 TCH/AHS (VAMOS type I MS)

VDTS-1, VDTS-2/VDTS-3,VDTS-4								
1.8 to 1.9GHz		Ir (C/I)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AHS 7.4 SCPIR=4 VDTS-1	Frames	15.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001500	0.001851	186386	52	0:00:52
	Class II	(as frames)	850	0.016400	0.020238	17048	21	0:00:21
AHS 4.75 SCPIR=4 VDTS-1	Frames	10.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001300	0.0016	215060	59	0:00:59
	Class II	(as frames)	850	0.054400	0.0671	5139	6	0:00:06
AHS 7.4 SCPIR=0 VDTS-1	Frames	17.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001400	0.001728	199700	55	0:00:55
	Class II	(as frames)	850	0.016000	0.019744	17474	21	0:00:21
AHS 4.75 SCPIR=0 VDTS-1	Frames	12	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001200	0.0015	232982	64	0:01:04
	Class II	(as frames)	850	0.051700	0.0638	5408	6	0:00:06
AHS 7.4 SCPIR=-4 VDTS-1	Frames	20.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001500	0.001851	186386	52	0:00:52
	Class II	(as frames)	850	0.015800	0.019497	17695	21	0:00:21
AHS 4.75 SCPIR=-4 VDTS-1	Frames	15	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001100	0.0014	254162	70	0:01:10
	Class II	(as frames)	850	0.051700	0.0638	5408	6	0:00:06
AHS 7.4 SCPIR=4 VDTS-2	Frames	17.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001400	0,001728	199699	55	00:00:55
	Class II	(as frames)	850	0,016500	0,020361	16944	20	00:00:20
AHS 7.4 SCPIR=0 VDTS-2	Frames	19.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001400	0.001728	199700	55	0:00:55
	Class II	(as frames)	850	0.016600	0.020484	16843	20	0:00:20
AHS 7.4 SCPIR=-4 VDTS-2	Frames	22.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001600	0,001974	174737	48	00:00:48
	Class II	(as frames)	850	0,016900	0,020855	16543	19	00:00:19
AHS 7.4 SCPIR=4 VDTS-3	Frames	14	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001500	0,001851	186386	51	00:00:51
	Class II	(as frames)	850	0,017400	0,021472	16068	19	00:00:19
AHS 7.4 SCPIR=0 VDTS-3	Frames	16.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001600	0.001974	174737	48	0:00:48
	Class II	(as frames)	850	0.018100	0.022335	15447	19	0:00:19
AHS 7.4 SCPIR=-4 VDTS-3	Frames	20	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001600	0,001974	174737	48	00:00:48
	Class II	(as frames)	850	0,018400	0,022706	15194	18	00:00:18
AHS 7.4 SCPIR=4 VDTS-4	Frames	-2	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001900	0,002345	147147	40	00:00:40
	Class II	(as frames)	850	0,017500	0,021595	15976	19	00:00:19
AHS 7.4 SCPIR=0 VDTS-4	Frames	3.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001600	0.001974	174737	48	0:00:48
	Class II	(as frames)	850	0.016800	0.020731	16642	20	0:00:20
AHS 7.4 SCPIR=-4 VDTS-4	Frames	9	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002000	0,002468	139789	38	00:00:38
	Class II	(as frames)	850	0,020000	0,024680	13979	16	00:00:16

Table 14.20.4-4: Statistical test limits for GSM 850 and GSM 900 TCH/AHS (VAMOS type II MS)

VDTS-1, VDTS-2/VDTS-3,VDTS-4									
0.8 to 0.9GHz		Ir (C/I)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AHS 7.4 SCPIR=4 VDTS-1	Frames	14	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001600	0,001974	174737	48	0:00:48
	Class II	(as frames)	850	0.016700	0,020608	16742	20	0:00:20
AHS 4.75 SCPIR=4 VDTS-1	Frames	9.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001500	0.0019	186386	51	0:00:51
	Class II	(as frames)	850	0.054200	0.0669	5158	6	0:00:06
AHS 7.4 SCPIR=0 VDTS-1	Frames	16	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001200	0,001481	232983	64	0:01:04
	Class II	(as frames)	850	0.015600	0,01925	17922	22	0:00:22
AHS 4.75 SCPIR=0 VDTS-1	Frames	11	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001300	0.0016	215060	59	0:00:59
	Class II	(as frames)	850	0.055200	0.0681	5065	6	0:00:06
AHS 7.4 SCPIR=-4 VDTS-1	Frames	18.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001300	0,001604	215061	59	0:00:59
	Class II	(as frames)	850	0.016100	0,019867	17366	21	0:00:21
AHS 4.75 SCPIR=-4 VDTS-1	Frames	13.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001500	0.0019	186386	51	0:00:51
	Class II	(as frames)	850	0.058700	0.0724	4763	6	0:00:06
AHS 7.4 SCPIR=-8 VDTS-1	Frames	22	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001700	0,002098	164459	46	0:00:46
	Class II	(as frames)	850	0.019200	0,023693	14562	18	0:00:18
AHS 4.75 SCPIR=-8 VDTS-1	Frames	17	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001500	0.0019	186386	51	0:00:51
	Class II	(as frames)	850	0.058500	0.0722	4779	6	0:00:06
AHS 7.4 SCPIR=-10 VDTS-1	Frames	24	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001700	0,002098	164459	46	0:00:46
	Class II	(as frames)	850	0.020100	0,024803	13910	17	0:00:17
AHS 4.75 SCPIR=-10 VDTS-1	Frames	18.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001900	0.0023	147147	40	0:00:40
	Class II	(as frames)	850	0.063400	0.0782	4410	5	0:00:05
AHS 7.4 SCPIR=4 VDTS-2	Frames	15.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001500	0,001851	186386	51	00:00:51
	Class II	(as frames)	850	0,018400	0,022706	15194	18	00:00:18
AHS 7.4 SCPIR=0 VDTS-2	Frames	17.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001500	0,001851	186386	52	0:00:52
	Class II	(as frames)	850	0.018200	0,022459	15362	19	0:00:19
AHS 7.4 SCPIR=-4 VDTS-2	Frames	19	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001000	0,001234	279579	77	00:01:17
	Class II	(as frames)	850	0,018900	0,023323	14793	17	00:00:17
AHS 7.4 SCPIR=-8 VDTS-2	Frames	23.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001200	0,001481	232982	64	00:01:04
	Class II	(as frames)	850	0,020300	0,025050	13772	16	00:00:16
AHS 7.4 SCPIR=-10 VDTS-2	Frames	25	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001200	0,001481	232982	64	00:01:04
	Class II	(as frames)	850	0,021500	0,026531	13004	15	00:00:15
AHS 7.4 SCPIR=4 VDTS-3	Frames	13	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002000	0,002468	139789	38	00:00:38
	Class II	(as frames)	850	0,021100	0,026037	13250	16	00:00:16

AHS 7.4 SCPIR=0 VDTS-3	Frames	15	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.002100	0,002591	133133	37	0:00:37
	Class II	(as frames)	850	0.020000	0,02468	13979	17	0:00:17
AHS 7.4 SCPIR=-4 VDTS-3	Frames	18	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002300	0,002838	121556	33	00:00:33
	Class II	(as frames)	850	0,020000	0,024680	13979	16	00:00:16
AHS 7.4 SCPIR=-8 VDTS-3	Frames	21.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002600	0,003208	107530	29	00:00:29
	Class II	(as frames)	850	0,022000	0,027148	12708	15	00:00:15
AHS 7.4 SCPIR=-10 VDTS-3	Frames	23.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002400	0,002962	116491	32	00:00:32
	Class II	(as frames)	850	0,025000	0,030850	11183	13	00:00:13
AHS 7.4 SCPIR=4 VDTS-4	Frames	-9.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002000	0,002468	139789	38	00:00:38
	Class II	(as frames)	850	0,021600	0,026654	12943	15	00:00:15
AHS 7.4 SCPIR=0 VDTS-4	Frames	-2	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001600	0,001974	174737	48	0:00:48
	Class II	(as frames)	850	0.016700	0,020608	16742	20	0:00:20
AHS 7.4 SCPIR=-4 VDTS-4	Frames	0	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001100	0,001357	254162	70	00:01:10
	Class II	(as frames)	850	0,011800	0,014561	23693	28	00:00:28
AHS 7.4 SCPIR=-8 VDTS-4	Frames	2.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002700	0,003332	103548	28	00:00:28
	Class II	(as frames)	850	0,029700	0,036650	9413	11	00:00:11
AHS 7.4 SCPIR=-10 VDTS-4	Frames	7	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001200	0,001481	232982	64	00:01:04
	Class II	(as frames)	850	0,017400	0,021472	16068	19	00:00:19

Table 14.20.4-5: Statistical test limits for DCS 1 800 and 1900 TCH/AHS (VAMOS type II MS)

VDTS-1, VDTS-2/VDTS-3,VDTS-4								
1.8 to 1.9GHz		Ir (C/I)	Samples per second	Orig. BER requirement	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
AHS 7.4 SCPIR=4 VDTS-1	Frames	14.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001600	0,001974	174737	48	0:00:48
	Class II	(as frames)	850	0.016900	0,020855	16544	20	0:00:20
AHS 4.75 SCPIR=4 VDTS-1	Frames	9.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001200	0.0015	232982	64	0:01:04
	Class II	(as frames)	850	0.057800	0.0713	4837	6	0:00:06
AHS 7.4 SCPIR=0 VDTS-1	Frames	16	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001400	0,001728	199700	55	0:00:55
	Class II	(as frames)	850	0.017700	0,021842	15796	19	0:00:19
AHS 4.75 SCPIR=0 VDTS-1	Frames	11	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001300	0.0016	215060	59	0:00:59
	Class II	(as frames)	850	0.058500	0.0722	4779	6	0:00:06
AHS 7.4 SCPIR=-4 VDTS-1	Frames	18.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001200	0,001481	232983	64	0:00:64
	Class II	(as frames)	850	0.017900	0,022089	15619	19	0:00:19
AHS 4.75 SCPIR=-4 VDTS-1	Frames	13.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001100	0.0014	254162	70	0:01:10
	Class II	(as frames)	850	0.060000	0.0740	4660	5	0:00:05
AHS 7.4 SCPIR=-8 VDTS-1	Frames	23	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001500	0,001851	186386	52	0:00:52
	Class II	(as frames)	850	0.019200	0,023693	14562	18	0:00:18
AHS 4.75 SCPIR=-8 VDTS-1	Frames	17.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001300	0.0016	215060	59	0:00:59
	Class II	(as frames)	850	0.060900	0.0752	4591	5	0:00:05
AHS 7.4 SCPIR=-10 VDTS-1	Frames	24.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001600	0,001974	174737	48	0:00:48
	Class II	(as frames)	850	0.022800	0,028135	12263	15	0:00:15
AHS 4.75 SCPIR=-10 VDTS-1	Frames	19.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001200	0.0015	232982	64	0:01:04
	Class II	(as frames)	850	0.064100	0.0791	4362	5	0:00:05
AHS 7.4 SCPIR=4 VDTS-2	Frames	16	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001200	0,001481	232982	64	00:01:04
	Class II	(as frames)	850	0,018500	0,022829	15112	18	00:00:18
AHS 7.4 SCPIR=0 VDTS-2	Frames	17.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001300	0,001604	215061	59	0:00:59
	Class II	(as frames)	850	0.019600	0,024186	14265	17	0:00:17
AHS 7.4 SCPIR=-4 VDTS-2	Frames	20	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001400	0,001728	199699	55	00:00:55
	Class II	(as frames)	850	0,020100	0,024803	13909	16	00:00:16
AHS 7.4 SCPIR=-8 VDTS-2	Frames	24	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001600	0,001974	174737	48	00:00:48
	Class II	(as frames)	850	0,022500	0,027765	12426	15	00:00:15
AHS 7.4 SCPIR=-10 VDTS-2	Frames	26.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001500	0,001851	186386	51	00:00:51
	Class II	(as frames)	850	0,023600	0,029122	11847	14	00:00:14
AHS 7.4 SCPIR=4 VDTS-3	Frames	13.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002300	0,002838	121556	33	00:00:33
	Class II	(as frames)	850	0,020000	0,024680	13979	16	00:00:16

AHS 7.4 SCPIR=0 VDTS-3	Frames	16	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.002200	0,002715	127082	35	0:00:35
	Class II	(as frames)	850	0.020000	0,02468	13979	17	0:00:17
AHS 7.4 SCPIR=-4 VDTS-3	Frames	18.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002300	0,002838	121556	33	00:00:33
	Class II	(as frames)	850	0,020000	0,024680	13979	16	00:00:16
AHS 7.4 SCPIR=-8 VDTS-3	Frames	22.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002200	0,002715	127081	35	00:00:35
	Class II	(as frames)	850	0,022000	0,027148	12708	15	00:00:15
AHS 7.4 SCPIR=-10 VDTS-3	Frames	24.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002100	0,002591	133133	36	00:00:36
	Class II	(as frames)	850	0,025000	0,030850	11183	13	00:00:13
AHS 7.4 SCPIR=4 VDTS-4	Frames	-9.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002000	0,002468	139789	38	00:00:38
	Class II	(as frames)	850	0,021800	0,026901	12825	15	00:00:15
AHS 7.4 SCPIR=0 VDTS-4	Frames	-1	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0.001800	0,002221	155322	43	0:00:43
	Class II	(as frames)	850	0.017600	0,021718	15886	19	0:00:19
AHS 7.4 SCPIR=-4 VDTS-4	Frames	0	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002300	0,002838	121556	33	00:00:33
	Class II	(as frames)	850	0,025000	0,030850	11183	13	00:00:13
AHS 7.4 SCPIR=-8 VDTS-4	Frames	4.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,001700	0,002098	164458	45	00:00:45
	Class II	(as frames)	850	0,019000	0,023446	14715	17	00:00:17
AHS 7.4 SCPIR=-10 VDTS-4	Frames	9.5	50	0.010000	0.012340	27959	560	0:09:20
	Class1b	(as frames)	3650	0,002500	0,003085	111831	31	00:00:31
	Class II	(as frames)	850	0,029500	0,036403	9477	11	00:00:11

14.20.5 TCH WFS – VDTS-1, VDTS-2/3 and VDTS-4

14.20.5.1 Definition

The VAMOS reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the VAMOS receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.20.5.2 Conformance requirement

- For AQPSK modulated speech channels (TCH/HS, TCH/AFSx, TCH/AHSx, TCH/EFS, TCH/WFSx – in downlink), and their associated control channels, the applicable requirements are in tables 2aa for VAMOS I MS and 2ab for VAMOS II MS.

3GPP TS 45.005, subclause 6.3.2.1

- For AQPSK modulated speech channels and control channels in downlink, the wanted input signal level shall be: [-93] dBm + Ir, where Ir = the interference ratio according to tables 2aa for VAMOS I MS and 2ab for VAMOS II MS for VDTS-1, VDTS-2 and VDTS-3 (see subclause Q.1) for speech and associated control channels in VAMOS mode in downlink.

- For the adjacent (200 kHz) channel requirements of speech and control channels in VAMOS mode in downlink, the wanted input signal level of the AQPSK modulated signal shall be: [-75] dBm + Iar, where: Iar = the adjacent channel (200 kHz) interference ratio according to tables 2aa and 2ab for VAMOS I MS and VAMOS II MS respectively for VDTS-4 (see subclause Q.1).

3GPP TS 45.005, subclause 6.3.4

- For signalling channels (TCH/FS, TCH/AFSx, TCH/EFS, TCH/WFSx) FER: ≤ 1 %

3GPP TS 45.005, subclause 6.2.1a

- The C/I1 values in tables 2aa and 2ab are ratios of received powers expressed in dB; where C is the received power of the downlink signal using Normal burst for AQPSK (see 3GPP TS 45.002) and I1 is the received power of the dominant external interferer (Co-channel 1 in tables Q.1-1 to Q.1-3) for VDTS-1 to VDTS-3 or the received power of the adjacent channel interferer for VDTS-4 (Adjacent 1 in table Q.1-4).

3GPP TS 45.005, subclause Q.1

14.20.5.3 Test purpose

To verify that the MS does not exceed the conformance requirements for TCH/WFS under propagation condition TUhigh noFH with an allowance for the statistical significance of the test.

14.20.5.4 Method of test

14.20.5.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/WFS with an ARFCN in the mid ARFCN range. The power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The multirate configuration indicates the use of a codec set limited to 6.60 kbit/s

The SS transmits a Standard Test Signal C1 (AQPSK) (wanted signal) on the active VAMOS subchannel (subchannel 2) using trainings sequence 5 from TSC set 2. The other VAMOS subchannel (subchannel 1) uses trainings sequences 5 from TSC set 1.

The SS commands the MS to create traffic channel loop back signalling erased frames.

Specific PICS Statements:

- VAMOS type I supported (TSPC_VAMOS_Type1)
- VAMOS II type II supported (TSPC_VAMOS_Type 2)

14.20.5.4.2 Procedure

a) The fading function is set to TUhigh noFH.

b) The SS sets SCPIR_DL to +4 dB.

c) In addition to the wanted signal, the SS produces a further interferer signal to produce scenario VDTS-1 according to TS 45.005 Q.1.

d) The SS sets the level of the wanted signal to (-93+Ir)dBm that indicated by Ir in tables 14.20.5-2 to 14.20.5-9 for VAMOS type I MS or tables 14.20.5-10 to 14.20.5-17 for VAMOS type II MS, depending on the used interfering scenario and frequency band.

e) The SS compares the modulation of the signal that it sends to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

f) The SS determines the number of residual bit error events for the bits of the class Ib, by examining at least the minimum number of samples of consecutive bits of class Ib. Bits are only taken from those frames not signalled as erased.

g) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully if it is not signalled as erased.

h) The SS repeats step c) to g) with SCPIR_DL values 0 dB and -4 dB.

i) If the MS signals VAMOS type II support step c) to g) shall be repeated with SCPIR_DL values -8 dB and -10 dB.

j) The SS uses a Channel Mode Modify procedure to change the active codec set to 12.65 kbit/s and steps b) to i) are repeated

k) The SS discontinues all interfering signals.

l) In addition to the wanted signal, the SS produces further four interfering signals to simulate the scenario VDTS-2 according to TS 45.005 Q.1.

m) The SS uses SCPIR_DL value 4dB, steps d) to i) are repeated.

n) The SS discontinues all interfering signals.

o) In addition to the wanted signal, the SS produces one interference signal to simulate scenario VDTS-3 according to TS 45.005 Q.1.

p) The SS uses SCPIR_DL value 4dB, steps d) to i) are repeated.

q) The SS discontinues all interfering signals.

r) In addition to the wanted signal, the SS produces one interference signal to simulate scenario VDTS-4 according to TS 45.005 Q.1.

s) The SS uses SCPIR_DL value 4dB, steps d) to i) are repeated.

14.20.5.4.3 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7 (A7.1.3.2)

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.20.5-1: Minimum test times due to TU high fading conditions

Fading speed 50km/h				
Frequency /MHz	850	900	1800	1900
Wave length / m	0,35	0,33	0,17	0,16
Min. Test time /s	201	190	95	90
hh:mm:ss	00:03:21	00:03:10	00:01:35	00:01:30

The error rate measured in this test shall be tested according to the values given in table 14.20.5-2 to table 14.20.5-17 depending on the indicated VAMOS MS type.

Note: The statistical test procedure for FER is based on 50 frames per second

Table 14.20.5-2: Statistical test limits TCH/WFS VDTS-1 (VAMOS type I MS)

GSM 900 and GSM 850								
Channel	VDTS	SCPIR _DL / dB	Codec	FER /dB Class1b /s	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/WFS	1	4	12,65	12	0,010000	0,012340	27958	00:09:19
				3900	0,004400	0,005430	63541	00:00:16
			6,60	8,5	0,010000	0,012340	27958	00:09:19
				9050	0,001100	0,001357	254162	00:00:28
		0	12,65	13,5	0,010000	0,012340	27958	00:09:19
				3900	0,004500	0,005553	62129	00:00:16
			6,60	10	0,010000	0,012340	27958	00:09:19
				9050	0,001400	0,001728	199699	00:00:22
		-4	12,65	16,5	0,010000	0,012340	27958	00:09:19
				3900	0,003900	0,004813	71687	00:00:18
			6,60	12,5	0,010000	0,012340	27958	00:09:19
				9050	0,002200	0,002715	127081	00:00:14

Table 14.20.5-3: Statistical test limits TCH/WFS VDTS-1 (VAMOS type I MS)

DCS 1800 and PCS 1900								
Channel	VDTS	SCPIR_DL / dB	Codec	FER /dB Class1b /s	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/WFS	1	4	12,65	11,5	0,010000	0,012340	27958	00:09:19
				3900	0,004800	0,005923	58246	00:00:15
			6,60	7	0,010000	0,012340	27958	00:09:19
				9050	0,002100	0,002591	133133	00:00:15
		0	12,65	13	0,010000	0,012340	27958	00:09:19
				3900	0,005400	0,006664	51774	00:00:13
			6,60	8,5	0,010000	0,012340	27958	00:09:19
				9050	0,002100	0,002591	133133	00:00:15
		-4	12,65	15,5	0,010000	0,012340	27958	00:09:19
				3900	0,004700	0,005800	59485	00:00:15
			6,60	11	0,010000	0,012340	27958	00:09:19
				9050	0,003100	0,003825	90187	00:00:10

Table 14.20.5-4: Statistical test limits for TCH/WFS VDTS-2 (VAMOS type I MS)

GSM 900 and GSM 850								
Channel	VDTS	SCPIR_DL / dB	Codec	FER /dB Class1b /s	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/WFS	2	4	12,65	14,5	0,010000	0,012340	27958	00:09:19
				3900	0,003400	0,004196	82229	00:00:21
		0		16,5	0,010000	0,012340	27958	00:09:19
				3900	0,003100	0,003825	90187	00:00:23
		-4		19	0,010000	0,012340	27958	00:09:19
				3900	0,003100	0,003825	90187	00:00:23

Table 14.20.5-5: Statistical test limits for TCH/WFS VDTS-2 (VAMOS type I MS)

DCS 1800 and PCS 1900								
Channel	VDTS	SCPIR_DL / dB	Codec	FER /dB Class1b /s	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/WFS	2	4	12,65	13,5	0,010000	0,012340	27958	00:09:19
				3900	0,004400	0,005430	63541	00:00:16
		0		15,5	0,010000	0,012340	27958	00:09:19
				3900	0,004500	0,005553	62129	00:00:16
		-4		18	0,010000	0,012340	27958	00:09:19
				3900	0,005900	0,007281	47386	00:00:12

Table 14.20.5-6: Statistical test limits for TCH/WFS VDTS-3 (VAMOS type I MS)

GSM 900 and GSM 850								
Channel	VDTS	SCPIR_DL / dB	Codec	FER /dB Class1b /s	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/WFS	3	4	12,65	11	0,010000	0,012340	27958	00:09:19
				3900	0,004200	0,005183	66566	00:00:17
		0		13,5	0,010000	0,012340	27958	00:09:19
				3900	0,004000	0,004936	69895	00:00:18
		-4		16,5	0,010000	0,012340	27958	00:09:19
				3900	0,003800	0,004689	73573	00:00:19

Table 14.20.5-7: Statistical test limits for TCH/WFS VDTS-3 (VAMOS type I MS)

DCS 1800 and PCS 1900								
Channel	VDTS	SCPIR_DL / dB	Codec	FER /dB Class1b /s	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/WFS	3	4	12,65	10	0,010000	0,012340	27958	00:09:19
				3900	0,006200	0,007651	45093	00:00:12
		0		12,5	0,010000	0,012340	27958	00:09:19
				3900	0,005900	0,007281	47386	00:00:12
		-4		15,5	0,010000	0,012340	27958	00:09:19
				3900	0,003000	0,003702	93193	00:00:24

Table 14.20.5-8: Statistical test limits for TCH/WFS VDTS-4 (VAMOS type I MS)

GSM 900 and GSM 850								
Channel	VDTS	SCPIR_DL / dB	Codec	FER /dB Class1b /s	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/WFS	4	4	12,65	-8	0,010000	0,012340	27958	00:09:19
				3900	0,003700	0,004566	75562	00:00:19
		0		-3,5	0,010000	0,012340	27958	00:09:19
				3900	0,003200	0,003949	87368	00:00:22
		-4		2	0,010000	0,012340	27958	00:09:19
				3900	0,004700	0,005800	59485	00:00:15

Table 14.20.5-9: Statistical test limits for TCH/WFS VDTS-4 (VAMOS type I MS)

DCS 1800 and PCS 1900								
Channel	VDTS	SCPIR_DL / dB	Codec	FER /dB Class1b /s	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/WFS	4	4	12,65	-9	0,010000	0,012340	27958	00:09:19
				3900	0,005500	0,006787	50832	00:00:13
		0		-5	0,010000	0,012340	27958	00:09:19
				3900	0,004800	0,005923	58246	00:00:15
		-4		1,5	0,010000	0,012340	27958	00:09:19
				3900	0,006300	0,007774	44378	00:00:11

Table 14.20.5-10: Statistical test limits TCH/WFS VDTS-1 (VAMOS type II MS)

GSM 900 and GSM 850								
Channel	VDTS	SCPIR_DL / dB	Codec	FER / dB Class1b /s	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/WFS	1	4	12,65	11,5	0,010000	0,012340	27958	00:09:19
				3900	0,003400	0,004196	82229	00:00:21
			6,60	7,5	0,010000	0,012340	27958	00:09:19
				9050	0,002000	0,002468	139789	00:00:15
		0	12,65	13	0,010000	0,012340	27958	00:09:19
				3900	0,003600	0,004442	77661	00:00:20
			6,60	9	0,010000	0,012340	27958	00:09:19
				9050	0,002000	0,002468	139789	00:00:15
		-4	12,65	15,5	0,010000	0,012340	27958	00:09:19
				3900	0,003800	0,004689	73573	00:00:19
			6,60	11,5	0,010000	0,012340	27958	00:09:19
				9050	0,001300	0,001604	215060	00:00:24
		-8	12,65	19	0,010000	0,012340	27958	00:09:19
				3900	0,003600	0,004442	77661	00:00:20
			6,60	15,5	0,010000	0,012340	27958	00:09:19
				9050	0,001300	0,001604	215060	00:00:24
		-10	12,65	21	0,010000	0,012340	27958	00:09:19
				3900	0,003600	0,004442	77661	00:00:20
			6,60	17	0,010000	0,012340	27958	00:09:19
				9050	0,001500	0,001851	186386	00:00:21

Table 14.20.5-11: Statistical test limits for TCH/WFS VDTS-1 (VAMOS type II MS)

DCS 1800 and PCS 1900								
Channel	VDTS	SCPIR_DL / dB	Codec	FER / dB Class1b /s	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/WFS	1	4	12,65	10,5	0,010000	0,012340	27958	00:09:19
				3900	0,004900	0,006047	57057	00:00:15
			6,60	6	0,010000	0,012340	27958	00:09:19
				9050	0,002700	0,003332	103548	00:00:11
		0	12,65	12	0,010000	0,012340	27958	00:09:19
				3900	0,005300	0,006540	52751	00:00:14
			6,60	7,5	0,010000	0,012340	27958	00:09:19
				9050	0,002800	0,003455	99850	00:00:11
		-4	12,65	15	0,010000	0,012340	27958	00:09:19
				3900	0,005200	0,006417	53765	00:00:14
			6,60	10	0,010000	0,012340	27958	00:09:19
				9050	0,002100	0,002591	133133	00:00:15
		-8	12,65	18,5	0,010000	0,012340	27958	00:09:19
				3900	0,006400	0,007898	43684	00:00:11
			6,60	14	0,010000	0,012340	27958	00:09:19
				9050	0,001500	0,001851	186386	00:00:21
		-10	12,65	20	0,010000	0,012340	27958	00:09:19
				3900	0,006000	0,007404	46596	00:00:12
			6,60	16	0,010000	0,012340	27958	00:09:19
				9050	0,001700	0,002098	164458	00:00:18

Table 14.20.5-12: Statistical test limits for TCH/WFS VDTS-2 (VAMOS type II MS)

GSM 900 and GSM 850								
Channel	VDTS	SCPIR_DL / dB	Codec	FER / dB Class1b /s	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/WFS	2	4	12,65	13	0,010000	0,012340	27958	00:09:19
				3900	0,003900	0,004813	71687	00:00:18
		0		15	0,010000	0,012340	27958	00:09:19
				3900	0,003400	0,004196	82229	00:00:21
		-4		17	0,010000	0,012340	27958	00:09:19
				3900	0,003600	0,004442	77661	00:00:20
		-8		20	0,010000	0,012340	27958	00:09:19
				3900	0,004000	0,004936	69895	00:00:18
		-10		22	0,010000	0,012340	27958	00:09:19
				3900	0,004000	0,004936	69895	00:00:18

Table 14.20.5-13: Statistical test limits for TCH/WFS VDTS-2 (VAMOS type II MS)

DCS 1800 and PCS 1900								
Channel	VDTS	SCPIR_DL / dB	Codec	FER / dB Class1b /s	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/WFS	2	4	12,65	12	0,010000	0,012340	27958	00:09:19
				3900	0,004600	0,005676	60778	00:00:16
		0		13,5	0,010000	0,012340	27958	00:09:19
				3900	0,005700	0,007034	49049	00:00:13
		-4		16	0,010000	0,012340	27958	00:09:19
				3900	0,005400	0,006664	51774	00:00:13
		-8		20	0,010000	0,012340	27958	00:09:19
				3900	0,004300	0,005306	65018	00:00:17
		-10		22	0,010000	0,012340	27958	00:09:19
				3900	0,005200	0,006417	53765	00:00:14

Table 14.20.5-14: Statistical test limits for TCH/WFS VDTS-3 (VAMOS type II MS)

GSM 900 and GSM 850								
Channel	VDTS	SCPIR_DL / dB	Codec	FER / dB Class1b /s	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/WFS	3	4	12,65	10	0,010000	0,012340	27958	00:09:19
				3900	0,004000	0,004936	69895	00:00:18
		0		13	0,010000	0,012340	27958	00:09:19
				3900	0,003800	0,004689	73573	00:00:19
		-4		15	0,010000	0,012340	27958	00:09:19
				3900	0,004300	0,005306	65018	00:00:17
		-8		19	0,010000	0,012340	27958	00:09:19
				3900	0,004200	0,005183	66566	00:00:17
		-10		21	0,010000	0,012340	27958	00:09:19
				3900	0,004200	0,005183	66566	00:00:17

Table 14.20.5-15: Statistical test limits for TCH/WFS VDTS-3 (VAMOS type II MS)

DCS 1800 and PCS 1900								
Channel	VDTS	SCPIR_DL / dB	Codec	FER / dB Class1b /s	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/WFS	3	4	12,65	9	0,010000	0,012340	27958	00:09:19
				3900	0,006300	0,007774	44378	00:00:11
		0		11,5	0,010000	0,012340	27958	00:09:19
				3900	0,005100	0,006293	54819	00:00:14
		-4		14	0,010000	0,012340	27958	00:09:19
				3900	0,005000	0,006170	55916	00:00:14
		-8		18	0,010000	0,012340	27958	00:09:19
				3900	0,004400	0,005430	63541	00:00:16
		-10		20	0,010000	0,012340	27958	00:09:19
				3900	0,004800	0,005923	58246	00:00:15

Table 14.20.5-16: Statistical test limits for TCH/WFS VDTS-4 (VAMOS type II MS)

GSM 900 and GSM 850								
Channel	VDTS	SCPIR_DL / dB	Codec	FER / dB Class1b /s	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/WFS	4	4	12,65	-8	0,010000	0,012340	27958	00:09:19
				3900	0,003700	0,004566	75562	00:00:19
		0		-3,5	0,010000	0,012340	27958	00:09:19
				3900	0,003200	0,003949	87368	00:00:22
		-4		0	0,010000	0,012340	27958	00:09:19
				3900	0,003900	0,004813	71687	00:00:18
		-8		-3	0,010000	0,012340	27958	00:09:19
				3900	0,007300	0,009008	38298	00:00:10
		-10		0,5	0,010000	0,012340	27958	00:09:19
				3900	0,004600	0,005676	60778	00:00:16

Table 14.20.5-17: Statistical test limits for TCH/WFS VDTS-4 (VAMOS type II MS)

DCS 1800 and PCS 1900								
Channel	VDTS	SCPIR_DL / dB	Codec	FER / dB Class1b /s	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (hh:mm:ss)
TCH/WFS	4	4	12,65	-9	0,010000	0,012340	27958	00:09:19
				3900	0,005500	0,006787	50832	00:00:13
		0		-5	0,010000	0,012340	27958	00:09:19
				3900	0,004800	0,005923	58246	00:00:15
		-4		-0,5	0,010000	0,012340	27958	00:09:19
				3900	0,005700	0,007034	49049	00:00:13
		-8		-2,5	0,010000	0,012340	27958	00:09:19
				3900	0,005200	0,006417	53765	00:00:14
		-10		1	0,010000	0,012340	27958	00:09:19
				3900	0,005400	0,006664	51774	00:00:13

14.20.6 FACCH/F – VDTS-1

14.20.6.1 Definition

The VAMOS reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the VAMOS receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.20.6.2 Conformance requirement

- For AQPSK modulated speech channels (TCH/HS, TCH/AFSx, TCH/AHSx, TCH/EFS, TCH/WFSx – in downlink), and their associated control channels, the applicable requirements are in tables 2aa for VAMOS I MS and 2ab for VAMOS II MS.

3GPP TS 45.005, subclause 6.3.2.1

- For AQPSK modulated speech channels and control channels in downlink, the wanted input signal level shall be: [-93] dBm + Ir, where Ir = the interference ratio according to tables 2aa for VAMOS I MS and 2ab for VAMOS II MS for VDTS-1, VDTS-2 and VDTS-3 (see subclause Q.1) for speech and associated control channels in VAMOS mode in downlink.

3GPP TS 45.005, subclause 6.3.4

- For signalling channels (FACCH/F, FACCH/H, SACCH) FER: ≤ 5 %

3GPP TS 45.005, subclause 6.2.1a

- The C/I1 values in tables 2aa and 2ab are ratios of received powers expressed in dB; where C is the received power of the downlink signal using Normal burst for AQPSK (see 3GPP TS 45.002) and I1 is the received power of the dominant external interferer (Co-channel 1 in tables Q.1-1 to Q.1-3) for VDTS-1 to VDTS-3.

3GPP TS 45.005, subclause Q.1

14.20.6.3 Test purpose

To verify that the MS does not exceed the conformance requirements for FACCH/F under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.20.6.4 Method of test

14.20.6.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/F with an ARFCN in the mid ARFCN range. The power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The SS transmits a Standard Test Signal C1 (AQPSK) (wanted signal) on the active VAMOS subchannel (subchannel 2) using trainings sequence 5 from TSC set 2. The other VAMOS subchannel (subchannel 1) uses trainings sequences 5 from TSC set 1.

The SCPIR_DL is set to +4 dB.

Specific PICS Statements:

- VAMOS type 1 supported (TSPC_VAMOS_Type1)
- VAMOS type II supported (TSPC_VAMOS_Type 2)

14.20.6.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I_1 (unwanted signal). The modulation of I_1 shall be AQPSK and the SCPIR_DL shall be set to 0 dB (scenario VDTS-1). Signal I_1 is continuous and has no fixed relationship with the bit transitions of the wanted signal. The interfering signal level is set to [-93] dBm and the fading characteristic of the wanted and the interfering signal is TUHigh noFH.

b) Depending of the indicated VAMOS type the SS sets the level of the wanted signal specified by C_{lev} in table 14.20.6-2 or table 14.20.6-3.

c) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Each repeated L2 frame indicates a frame erasure event.

d) The SS determines the number of frame erasure events during at least the minimum number of samples of FACCH/F frames.

e) The SS repeats step b) to d) with SCPIR_DL values 0 dB and -4 dB.

f) If the MS signals VAMOS type II support step b) to d) shall be repeated with SCPIR_DL values -8 dB and -10 dB.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.

14.20.6.4.3 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7 (A7.1.3.2)

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.20.6-1: Minimum test times due to TU high fading conditions

Full Rate 50 km/h					
Frequency	0,85	0,9	1,8	1,9	GHz
Wavelength	0,35	0,33	0,17	0,16	m
min test time	629	594	297	281	s
	00:10:29	00:09:54	00:04:57	00:04:41	hh:mm:ss

The error rate measured in this test shall be tested according to the values given in table 14-12.20.6-2 and 12.20.6-3 depending on the indicated VAMOS type.

Table 14-12.20.6-2: Statistical test limits for FACCH/F (VAMOS type I MS)

VDTS-1 (GSM 900 / 850)									
Channel	**SCPIR_DL /dB**	**C_{lev} /dBm -93 +Ir**	**Samples per s**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time /s**	**Target test time (hh:mm:ss)**
FACCH/F	4	-83,5	16	0.05	0.0617	5592	350	00:05:50
	0	-81,5						
	-4	-78,5						
VDTS-1 (GSM 1800 / 1900)								
FACCH/F	4	-84,5						
	0	-82,5						
	-4	-79,5						

Table 14-12.20.6-3: Statistical test limits for FACCH/F (VAMOS type II MS)

VDTS-1 (GSM 900 / 850)								
Channel	**SCPIR_DL /dB**	**C_{lev} /dBm -93 +Ir**	**Samples per s**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time /s**	**Target test time (hh:mm:ss)**
FACCH/F	4	-83,5	16	0.05	0.0617	5592	350	00:05:50
	0	-81,5						
	-4	-79,5						
	-8	-76						
	-10	-74,5						
VDTS-1 (GSM 1800 / 1900)								
FACCH/F	4	-84,5						
	0	-82,5						
	-4	-80						
	-8	-77						
	-10	-75						

14.20.7 FACCH/H – VDTS-1

14.20.7.1 Definition

The VAMOS reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the VAMOS receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.20.7.2 Conformance requirement

- For AQPSK modulated speech channels (TCH/HS, TCH/AFSx, TCH/AHSx, TCH/EFS, TCH/WFSx – in downlink), and their associated control channels, the applicable requirements are in tables 2aa for VAMOS I MS and 2ab for VAMOS II MS.

3GPP TS 45.005, subclause 6.3.2.1

- For AQPSK modulated speech channels and control channels in downlink, the wanted input signal level shall be: [-93] dBm + Ir, where Ir = the interference ratio according to tables 2aa for VAMOS I MS and 2ab for VAMOS II MS for VDTS-1, VDTS-2 and VDTS-3 (see subclause Q.1) for speech and associated control channels in VAMOS mode in downlink.

3GPP TS 45.005, subclause 6.3.4

- For signalling channels (FACCH/F, FACCH/H, SACCH) FER: ≤ 5 %

3GPP TS 45.005, subclause 6.2.1a

- The C/I1 values in tables 2aa and 2ab are ratios of received powers expressed in dB; where C is the received power of the downlink signal using Normal burst for AQPSK (see 3GPP TS 45.002) and I1 is the received power of the dominant external interferer (Co-channel 1 in tables Q.1-1 to Q.1-3) for VDTS-1 to VDTS-3.

3GPP TS 45.005, subclause Q.1

14.20.7.3 Test purpose

To verify that the MS does not exceed the conformance requirements for FACCH/H under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.20.7.4 Method of test

14.20.7.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/H with an ARFCN in the mid ARFCN range. The power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The SS transmits a Standard Test Signal C1 (AQPSK) (wanted signal) on the active VAMOS subchannel (subchannel 2) using trainings sequence 5 from TSC set 2. The other VAMOS subchannel (subchannel 1) uses trainings sequences 5 from TSC set 1.

The SCPIR_DL is set to +4 dB.

Specific PICS Statements:

- VAMOS type I supported (TSPC_VAMOS_Type1)
- VAMOS type II supported (TSPC_VAMOS_Type 2)

14.20.7.4.2 Procedure

a) In addition to the wanted signal, the SS produces an independent, uncorrelated interfering signal, Standard Test Signal I_1 (unwanted signal). The modulation of I_1 shall be AQPSK and the SCPIR_DL shall be set to 0 dB (scenario VDTS-1). Signal I_1 is continuous and has no fixed relationship with the bit transitions of the wanted signal. The interfering signal level is set to [-93] dBm and the fading characteristic of the wanted and the interfering signal is TUHigh noFH.

b) Depending of the indicated VAMOS type the SS sets the level of the wanted signal specified by C_{lev} in table 14.20.7-2 and table 14.20.7-3.

c) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Each repeated L2 frame indicates a frame erasure event.

d) The SS determines the number of frame erasure events during at least the minimum number of samples of FACCH/H frames.

e) The SS repeats step b) to d) with SCPIR_DL values 0 dB and -4 dB

f) If the MS signals VAMOS type II support step b) to d) shall be repeated with SCPIR_DL values -8 dB and -10 dB.

NOTE: These frames will not be consecutive but it is expected that the statistical significance of the tests will not be unduly degraded.

14.20.7.4.3 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7 (A7.1.3.2)

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.20.7-1: Minimum test times due to TU high fading conditions

Fading speed 50km/h				
Frequency /MHz	850	900	1800	1900
Wave length / m	0,35	0,33	0,17	0,16
Min. Test time /s	629	594	297	281
hh:mm:ss	00:10:29	00:09:54	00:04:57	00:04:41

The error rate measured in this test shall be tested according to the values given in table 14-12.20.7-2 and 12.20.7-3 depending on the indicated VAMOS type.

Table 14-12.20.7-2: Statistical test limits for FACCH/H (VAMOS type I MS)

<table>
<tr><th colspan="3">VDTS-1 (GSM 900 / 850)</th><th colspan="6"></th></tr>
<tr><th>Channel</th><th>SCPIR_DL /dB</th><th>C_{lev} /dBm [-93] +Ir</th><th>Samples per s</th><th>Orig. BER requirement</th><th>Derived test limit</th><th>Target number of samples</th><th>Target test time /s</th><th>Target test time (hh:mm:ss)</th></tr>
<tr><td rowspan="3">FACCH/H</td><td>4</td><td>-84</td><td rowspan="8">16</td><td rowspan="8">0.05</td><td rowspan="8">0.0617</td><td rowspan="8">5592</td><td rowspan="8">350</td><td rowspan="8">00:05:50</td></tr>
<tr><td>0</td><td>-82</td></tr>
<tr><td>-4</td><td>-79</td></tr>
<tr><td colspan="3">VDTS-1 (GSM 1800 / 1900)</td></tr>
<tr><td rowspan="3">FACCH/H</td><td>4</td><td>-84</td></tr>
<tr><td>0</td><td>-82</td></tr>
<tr><td>-4</td><td>-79,5</td></tr>
</table>

Table 14-12.20.7-3: Statistical test limits for FACCH/H (VAMOS type II MS)

VDTS-1 (GSM 900 / 850)									
Channel	SCPIR_DL /dB	C_{lev} /dBm [-93] +Ir	Samples per s	Orig. BER requirement	Derived test limit	Target number of samples	Target test time /s	Target test time (hh:mm:ss)
FACCH/H	4	-84	16	0.05	0.0617	5592	350	00:05:50
	0	-82						
	-4	-79,5						
	-8	-76,5						
	-10	-74,5						
VDTS-1 (GSM 1800 / 1900)								
FACCH/H	4	-84						
	0	-82						
	-4	-79,5						
	-8	-76						
	-10	-74						

14.20.8 SACCH – VDTS-1

14.20.8.1 Definition

The VAMOS reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the VAMOS receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.20.8.2 Conformance requirement.

- For AQPSK modulated speech channels (TCH/HS, TCH/AFSx, TCH/AHSx, TCH/EFS, TCH/WFSx – in downlink), and their associated control channels, the applicable requirements are in tables 2aa for VAMOS I MS and 2ab for VAMOS II MS.

3GPP TS 45.005, subclause 6.3.2.1

- For AQPSK modulated speech channels and control channels in downlink, the wanted input signal level shall be: [-93] dBm + Ir, where Ir = the interference ratio according to tables 2aa for VAMOS I MS and 2ab for VAMOS II MS for VDTS-1, VDTS-2 and VDTS-3 (see subclause Q.1) for speech and associated control channels in VAMOS mode in downlink.

3GPP TS 45.005, subclause 6.3.4

- For signalling channels (FACCH/F, FACCH/H, SACCH) FER: $\leq$ 5 %

3GPP TS 45.005, subclause 6.2.1a

- The C/I1 values in tables 2aa and 2ab are ratios of received powers expressed in dB; where C is the received power of the downlink signal using Normal burst for AQPSK (see 3GPP TS 45.002) and I1 is the received power of the dominant external interferer (Co-channel 1 in tables Q.1-1 to Q.1-3) for VDTS-1 to VDTS-3.

3GPP TS 45.005, subclause Q.1

14.20.8.3 Test purpose

To verify that the MS does not exceed the conformance requirement under TUhigh propagation condition with an allowance for the statistical significance of the test.

14.20.8.4 Method of test

14.20.8.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/F with an ARFCN in the Mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The SS transmits a Standard Test Signal C1 (AQPSK) (wanted signal) on the active VAMOS subchannel (subchannel 2) using trainings sequence 5 form TSC set 2. The other VAMOS subchannel (subchannel 1) uses trainings sequences 5 from TSC set 1.

The SCPIR_DL is set to +4 dB.

Specific PICS Statements:

- VAMOS type I supported (TSPC_VAMOS_Type1)
- VAMOS type II supported (TSPC_VAMOS_Type 2)

14.20.8.4.2 Procedure

a) In addition to the wanted signal, the SS generates an independent, uncorrelated interfering signal, Standard Test Signal I_1 (unwanted signal). The modulation of I_1 shall be AQPSK and the SCPIR_DL shall be set to 0 dB (scenario VDTS-1). Signal I_1 is continuous and has no fixed relationship with the bit transitions of the wanted signal. The interfering signal level is set to [-93] dBm and the fading characteristic of the wanted and the interfering signal is TUHigh noFH.

b) Depending on the indicated VAMOS type the SS sets the level of the wanted signal specified by C_{lev} in table 14.20.8-3 and table 14.20.8-4.

c) Following the reception of the last burst of the MS UL SACCH corresponding to the second SACCH block of a SACCH interval, the SS shall compute the PCL value to use in the SS DL SACCH blocks for the next SACCH interval using Table 14.20.8-1.

   i) The first two columns of Table 14.20.8-1 are inputs, the last column is a output.

   ii) Last commanded PCL by SS refers to the PCL used in the DL SACCH L1 header of SACCH block N

   iii) Corresponding reported MS PCL refers to the PCL reported in the UL SACCH L1 header of SACCH block N

   iv) Next commanded PCL by SS refers to the PCL that the SS will use in the DL SACCH L1 headers for SACCH block N+1.

Table 14.20.8-1: Power Control Level Used by SS

Last commanded PCL by SS	Corresponding Reported MS PCL	Next commanded PCL by SS
7	7	8
7	8	9
7	9	8
8	7	9
8	8	9
8	9	7
9	7	8
9	8	7
9	9	7

d) The SS compares the MS reported PCL in the uplink SACCH L1 header of the SACCH block against the expected PCL (based on the previously commanded PCL in the downlink SACCH L1 header taking into account round-trip delays). If the MS reported PCL in the uplink SACCH L1 header is different than the expected PCL, this will invoke a frame erasure event.

e) The SS determines the frame erasure events during at least the minimum number of samples of SACCH frames.

f) The SS repeats step b) to e) with SCPIR_DL values 0 dB and -4 dB

g) For MS indicating VAMOS type II support step b) to e) are repeated with SCPIR_DL -8 dB and -10 dB..

14.20.8.5 Test Requirements

Testing should be performed using statistical methods that could lead to an early pass/fail decision with test time significantly reduced for MS with FER not on the limit.

For information on statistical testing refer to Annex 7 (A7.1.3.2)

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.20.8-2: Minimum test times due to TU high fading conditions

Full Rate @ 50km/h				
Frequency /MHz	850	900	1800	1900
Wave length / m	0,35	0,33	0,17	0,16
Min. Test time /s	4835	4566	2283	2163
hh:mm:ss	01:20:35	01:16:06	00:38:03	00:36:03

NOTE: Minimum test time calculation due to fading based on the 480ms schedule

The error rates measured shall not exceed the test limit error rate values given in table 14.20.8-3 and 14.20.8-4 depending on the indicated VAMOS type.

Table 14.20.8-3: Limits for SACCH VDTS-1(VAMOS I MS)

VDTS-1 (GSM 900 / 850)									
Channel	**SCPIR_DL /dB**	**C_{lev} /dBm [-93] +Ir**	**Samples per s**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time /s**	**Target test time (hh:mm:ss)**
SACCH	4	-83,5						
	0	-81,5						
	-4	-78						
VDTS-1 (GSM 1800 / 1900)			2.08	0.05	0.0617	5592	2688	00:44:48
SACCH	4	-83,5						
	0	-81,5						
	-4	-78						

Table 14.20.8-4: Limits for SACCH VDTS-1 (VAMOS II MS)

VDTS-1 (GSM 900 / 850)								
Channel	**SCPIR_DL /dB**	**C_{lev} /dBm [-93] +Ir**	**Samples per s**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**	**Target test time /s**	**Target test time (hh:mm:ss)**
SACCH	4	-83,5						
	0	-81,5						
	-4	-79						
	-8	-76						
	-10	-74						
VDTS-1 (GSM 1800 / 1900)			2.08	0.05	0.0617	5592	2688	00:44:48
SACCH	4	-83,5						
	0	-81,5						
	-4	-79						
	-8	-75,5						
	-10	-73,5						

14.20.9 Repeated FACCH/F – VDTS-1

14.20.9.1 Definition

The VAMOS reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the VAMOS receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.20.9.2 Conformance requirement

- The reference performance for the Repeated Associated control channel performance in *VAMOS mode* shall be according to subclause 6.2.4.

3GPP TS 45.005 subclause 6.2.1a

- For Repeated Downlink FACCH and Repeated SACCH (see 3GPP TS 44.006), the minimum input signal level for which the reference performance shall be met is specified in table 1i, 1s, 1t, 1u and 1v, according to the propagation condition and type of equipment. The performance requirements for GSM 400 and GSM 700 systems are as for GSM 900 in table 1i, 1s, 1t, 1u and 1v, except that the GSM 400 MS speed is doubled from that of GSM 900, e.g. TU50 becomes TU100, and the GSM 700 MS speed is increased by a factor of 1.2, e.g. TU50 becomes TU60.

3GPP TS 45.005 subclause 6.2.4

- The reference performance for Repeated Downlink FACCH and Repeated SACCH shall be FER $\leq$ 5%.

3GPP TS 45.005 subclause 6.2.4

- When calculating FER, a FACCH frame and its repetition or a SACCH frame and its repetition respectively, shall be counted as one frame and a frame erasure shall be counted when neither the FACCH frame nor its repetition or neither the SACCH frame nor its repetition respectively, could be successfully decoded.

3GPP TS 45.005 subclause 6.2.4

- For AQPSK modulated speech channels and control channels in downlink, the wanted input signal level shall be: [-93] dBm + Ir, where Ir = the interference ratio according to tables 2aa for VAMOS I MS and 2ab for VAMOS II MS for VDTS-1, VDTS-2 and VDTS-3 (see subclause Q.1) for speech and associated control channels in VAMOS mode in downlink.

3GPP TS 45.005, subclause 6.3.4

- The C/I1 values in tables 2aa and 2ab are ratios of received powers expressed in dB; where C is the received power of the downlink signal using Normal burst for AQPSK (see 3GPP TS 45.002) and I1 is the received power of the dominant external interferer (Co-channel 1 in tables Q.1-1 to Q.1-3) for VDTS-1 to VDTS-3.

3GPP TS 45.005, subclause Q.1

14.20.9.3 Test purpose

To verify that the MS does not exceed the conformance requirements for Repeated FACCH/F in a VDTS-1 configuration under propagation condition TUhigh with an allowance for the statistical significance of the test.

14.20.9.4 Method of test

14.20.9.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/F with an ARFCN in the mid ARFCN range. The power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The SS transmits a Standard Test Signal C1 (AQPSK) (wanted signal) on the active VAMOS subchannel (subchannel 2) using trainings sequence 5 from TSC set 2. The other VAMOS subchannel (subchannel 1) uses trainings sequences 5 from TSC set 1.

The SCPIR_DL is set to +0 dB.

Specific PICS Statements:

- VAMOS type I supported (TSPC_VAMOS_Type1)
- VAMOS type II supported (TSPC_VAMOS_Type 2)

14.20.9.4.2 Procedure

a) In addition to the wanted signal, the SS generates an independent, uncorrelated interfering signal, Standard Test Signal I_1 (unwanted signal). The modulation of I_1 shall be AQPSK and the SCPIR_DL shall be set to 0 dB (scenario VDTS-1). Signal I_1 is continuous and has no fixed relationship with the bit transitions of the wanted signal. The interfering signal level is set to [-93] dBm and the fading characteristic of the wanted and the interfering signal is TUHigh noFH.

b) Depending on the indicated VAMOS type the SS sets the level of the wanted signal specified by C_{lev} in table 14.20.9-2 and table 14.20.9-3.

c) The SS sends a Layer 3 message which does not require a Layer 3 response from the MS. Each repeated L2 frame indicates a frame erasure event.

d) The SS determines the number of frame erasure events during at least the minimum number of samples of FACCH/F frames.

14.20.9.4.3 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER is not on the limit.

For more information on statistical testing refer to Annex 7 (A7.1.3.2)

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.20.9-1: Minimum test times due to TU high fading conditions

TCH/F @ 50 km/h				
Frequency /MHz	850	900	1800	1900
Wave length / m	0,35	0,33	0,17	0,16
Min. Test time /s	604	570	285	270
hh:mm:ss	00:10:04	00:09:30	00:04:45	00:04:30

NOTE: Minimum test time calculation due to fading is based on the best rate 50/3 frame relation in table 14.20.9-4

The error rate measured in this test shall be tested according to the values given in table 14-12.20.9-2 and 12.20.9-3 depending on the indicated VAMOS type.

Table 14.20.9-2: Statistical test limits for Repeated FACCH/F (VAMOS type I MS)

VDTS-1 (GSM 900 / 850)					
Channel	SCPIR_DL/dB	C_{lev} /dBm [-93] +Ir	Orig. BER requirement	Derived test limit	Target number of samples
FACCH/F	0	-86	0.05	0.0617	5592
VDTS-1 (GSM 1800 / 1900)					
FACCH/F	0	-86,5			

Table 14.20.9-3: Statistical test limits for Repeated FACCH/F (VAMOS type II MS)

VDTS-1 (GSM 900 / 850)					
Channel	**SCPIR _DL/dB**	**C_{lev} /dBm [-93] +Ir**	**Orig. BER requirement**	**Derived test limit**	**Target number of samples**
FACCH/F	0	-86	0.05	0.0617	5592
VDTS-1 (GSM 1800 / 1900)					
FACCH/F	0	-86,5			

Table 14.20.9-4: Estimated test times

Estimated test time (best rate 50/3 per second) (s)	Estimated test time (best rate 50/3 per second) (hh:mm:ss)	Estimated test time (worst rate 50/6 per second) (s)	Estimated test time (worst rate 50/6 per second) (hh:mm:ss)
336	00:05:36	671	00:11:11

14.20.10 Repeated SACCH – VDTS-1

14.20.10.1 Definition

The VAMOS reference test scenarios define a set of interfering signals and corresponding performance limits. These tests are a measure of the capability of the VAMOS receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of these specific unwanted modulated signals.

14.20.10.2 Conformance requirement

- For AQPSK modulated speech channels (TCH/HS, TCH/AFSx, TCH/AHSx, TCH/EFS, TCH/WFSx – in downlink), and their associated control channels, the applicable requirements are in tables 2aa for VAMOS I MS and 2ab for VAMOS II MS.

3GPP TS 45.005, subclause 6.3.2.1

- For AQPSK modulated speech channels and control channels in downlink, the wanted input signal level shall be: [-93] dBm + Ir, where Ir = the interference ratio according to tables 2aa for VAMOS I MS and 2ab for VAMOS II MS for VDTS-1, VDTS-2 and VDTS-3 (see subclause Q.1) for speech and associated control channels in VAMOS mode in downlink.

3GPP TS 45.005, subclause 6.3.4

- For signalling channels (FACCH/F, FACCH/H, SACCH) FER: ≤ 5 %

3GPP TS 45.005, subclause 6.2.1a

- The C/I1 values in tables 2aa and 2ab are ratios of received powers expressed in dB; where C is the received power of the downlink signal using Normal burst for AQPSK (see 3GPP TS 45.002) and I1 is the received power of the dominant external interferer (Co-channel 1 in tables Q.1-1 to Q.1-3) for VDTS-1 to VDTS-3.

3GPP TS 45.005, subclause Q.1

14.20.10.3 Test purpose

To verify that the MS does not exceed the conformance requirement under TUhigh propagation condition with an allowance for the statistical significance of the test.

14.20.10.4 Method of test

For details on Repeated SACCH Layer 1 test method, please refer to Annex 10.

14.20.10.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/F with an ARFCN in the Mid ARFCN range, power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The SS transmits a Standard Test Signal C1 (AQPSK) (wanted signal) on the active VAMOS subchannel (subchannel 2) using trainings sequence 5 from TSC set 2. The other VAMOS subchannel (subchannel 1) uses trainings sequences 5 from TSC set 1.

The SCPIR_DL is set to 0 dB.

Specific PICS Statements:

- VAMOS type 1 supported (TSPC_VAMOS_Type1)
- VAMOS type II supported (TSPC_VAMOS_Type 2)

14.20.10.4.2 Procedure

a) In addition to the wanted signal, the SS generates an independent, uncorrelated interfering signal, Standard Test Signal I_1 (unwanted signal). The modulation of I_1 shall be AQPSK and the SCPIR_DL shall be set to 0 dB (scenario VDTS-1). Signal I_1 is continuous and has no fixed relationship with the bit transitions of the wanted signal. The interfering signal level is set to [-93] dBm and the fading characteristic of the wanted and the interfering signal is TUHigh noFH.

b) Depending of the indicated VAMOS type the SS sets the level of the wanted signal specified by C_{lev} in table 14.20.10-3 or table 14.20.10-4.

c) Following the reception of the last burst of the MS UL SACCH corresponding to the second SACCH block of a SACCH interval, the SS shall compute the PCL value to use in the SS DL SACCH blocks for the next SACCH interval using Table 14.20.10-1.

   i) The first two columns of Table 14.20.10-1 are inputs, the last column is a output.

   ii) Last commanded PCL by SS refers to the PCL used in the DL SACCH L1 header of SACCH block N

   iii) Corresponding reported MS PCL refers to the PCL reported in the UL SACCH L1 header of SACCH block N

   iv) Next commanded PCL by SS refers to the PCL that the SS will use in the DL SACCH L1 headers for SACCH block N+1.

Table 14.20.10-1: Power Control Level Used by SS

Last commanded PCL by SS	Corresponding Reported MS PCL	Next commanded PCL by SS
7	7	8
7	8	9
7	9	8
8	7	9
8	8	9
8	9	7
9	7	8
9	8	7
9	9	7

d) The SS compares the MS reported PCL in the uplink SACCH L1 header of the SACCH block against the expected PCL (based on the previously commanded PCL in the downlink SACCH L1 header taking into account round-trip delays). If the MS reported PCL in the uplink SACCH L1 header is different than the expected PCL, this will invoke a frame erasure event.

e) The SS determines the frame erasure events during at least the minimum number of samples of SACCH frames.

14.20.10.5 Test Requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER not on the limit.

For information on statistical testing refer to Annex 7 (A7.1.3.2)

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.20.10-2: Minimum test times due to TU50 fading conditions

TCH/F @ 50 km/h				
Frequency /MHz	850	900	1800	1900
Wave length / m	0,35	0,33	0,17	0,16
Min. Test time /s	9676	9138	4569	4329
hh:mm:ss	02:41:16	02:32:18	01:16:09	01:12:09

NOTE: Minimum test time calculation due to fading is based on the 960 ms schedule for two SACCH frames

The error rates measured shall not exceed the test limit error rate values given in table 14.20.10-3 and 14.20.10-4 depending on the indicated VAMOS type.

Table 14.20.10-3: Limits for Repeated SACCH VDTS-1(VAMOS I MS)

<table>
<tr><th colspan="3">VDTS-1 (GSM 900 / 850)</th><th colspan="6"></th></tr>
<tr><th>Channel</th><th>SCPIR_DL /dB</th><th>C_{lev} /dBm [-93] +Ir</th><th>Samples per s</th><th>Orig. BER requirement</th><th>Derived test limit</th><th>Target number of samples</th><th>Target test time /s</th><th>Target test time (hh:mm:ss)</th></tr>
<tr><td>SACCH</td><td>0</td><td>-88</td><td rowspan="3">1.04</td><td rowspan="3">0.05</td><td rowspan="3">0.0617</td><td rowspan="3">5592</td><td rowspan="3">5377</td><td rowspan="3">01:29:37</td></tr>
<tr><td colspan="3">VDTS-1 (GSM 1800 / 1900)</td></tr>
<tr><td>SACCH</td><td>0</td><td>-88</td></tr>
</table>

Table 14.20.10-4: Limits for Repeated SACCH VDTS-1 (VAMOS II MS)

<table>
<tr><th colspan="3">VDTS-1 (GSM 900 / 850)</th><th colspan="6"></th></tr>
<tr><th>Channel</th><th>SCPIR_DL /dB</th><th>C_{lev} /dBm -93 +Ir</th><th>Samples per s</th><th>Orig. BER requirement</th><th>Derived test limit</th><th>Target number of samples</th><th>Target test time /s</th><th>Target test time (hh:mm:ss)</th></tr>
<tr><td>SACCH</td><td>0</td><td>-88</td><td rowspan="3">1.04</td><td rowspan="3">0.05</td><td rowspan="3">0.0617</td><td rowspan="3">5592</td><td rowspan="3">5377</td><td rowspan="3">01:29:37</td></tr>
<tr><td colspan="3">VDTS-1 (GSM 1800 / 1900)</td></tr>
<tr><td>SACCH</td><td>0</td><td>-88</td></tr>
</table>

14.20.11 Downlink DTX TCH / AHS in VAMOS configuration

14.20.2.1 Definition

The reference sensitivity is the signal level at the MS receiver input at which a certain BER and FER must be achieved.

14.20.11.2 Conformance requirement

- For speech channels in *VAMOS Mode*, and their associated control channels, the minimum input signal level for which the reference performance shall be met is specified in table 1s, 1t, 1u and 1v according to the propagation condition and type of equipment.

- For half rate speech channels (TCH/HS, TCH/AHSx) FER: ≤ 1 %

- In addition for speech channels the residual class Ib BER and residual class II BER performance shall not exceed the specified values in table 1s, 1t, 1u and 1v at the corresponding signal level in dBm.

3GPP TS 45.005, subclause 6.2.1a

14.20.11.3 Test purpose

The purpose of this test case is to verify the VAMOS II mobile receiver performance when the paired VAMOS subchannel user goes into and comes out of DTX and to verify that the MS does not exceed conformance requirements under propagation condition TUhigh with no frequency hopping with an allowance for the statistical significance of the test.

14.20.11.4 Method of test

The test is performed according the VAMOS DTX test scenario in downlink specified in 3GPP 45.005 Q.6

14.20.11.4.1 Initial conditions

A call is set up according to the generic call set up procedure on a TCH/AHS 7.4 with an ARFCN in the mid ARFCN range. The power control level set to maximum power. RADIO_LINK_TIMEOUT is set to maximum.

The SS transmits a Standard Test Signal C1 (AQPSK) (wanted signal) on the active VAMOS subchannel (subchannel 2) using trainings sequence 5 form TSC set 2. The other VAMOS subchannel (subchannel 1) uses trainings sequences 5 from TSC set 1.

DTX is set on the VAMOS subchannel 1 according to the probability ration specified in 3GPP 45.005 Q.6

Specific PICS Statements:

-

14.20.11.4.2 Procedure

a) The fading profile for the wanted is set to TUHigh.

b) The SCPIR_DL is set to -10 dB.

c) Depending on the network frequency the SS sets the signal level for the AQPSK- and GMSK modulated signal indicated in table 14.20.11-2

d) The SS compares the modulation of the signal sent to the MS with the signal which is looped back from the receiver after demodulation and decoding, and checks the frame erasure indication.

e) The SS determines the number of residual bit error events for the bits of the class Ib and II, by examining at least the minimum number of samples of consecutive bits of class Ib and II. Bits are only taken from those frames not signalled as erased.

f) The SS also determines the frame erasure events by examining at least the minimum number of samples of consecutive frames and assuming a frame is received successfully if it is not signalled as erased.

14.20.11.4.3 Test requirements

Testing should be performed using statistical methods that lead to an early pass/fail decision with test time significantly reduced for MS with FER/BER not on the limit.

For more information on statistical testing of BER/BLER performance, especially the definition of limit lines refer to Annex 7 (A7.1.3.2)

Before limit checking is valid the minimum test time due to fading needs to be considered:

Table 14.20.11-1: Minimum test times due to TU high fading conditions

Fading speed 50km/h				
Frequency /MHz	850	900	1800	1900
Wave length / m	0,35	0,33	0,17	0,16
Min. Test time /s	403	380	190	180
hh:mm:ss	00:06:43	00:06:20	00:03:10	00:03:00

The error rate measured in this test shall be tested according to the values given in table 14.20.11-3 to table 14.20.11-4 depending .

Note: The wanted signal level are derived form calculation using 3GPP TS 45.005 table 1u and Q.6 (VAMOS DTX scenario in downlink)

Table 14.20.11-2: Signal level for AQPSK and GMSK

Frequency band	Signal level /dBm	
	AQPSK	GMSK
GSM 900 and GSM 850	-86,15	-96,65
DCS 1800 and PCS 1900	-85,15	-95,65

Table 14.20.11-3: Statistical test limits for GSM 850 and GSM 900 TCH/AHS 7.4

0.4 to 0.9 GHz			Frames per s	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
Channel	SCPI / dB	Channel	clas1b per s / class II per s					
AHS 7.4	-10	Frames	50	0.010000	0.012340	27958	560	00:09:19
		Class1b	2950	0,002500	0,003085	111831	38	00:00:38
		Class II	1400	0,022800	0,028135	12262	9	00:00:09

Table 14.20.11-4: Statistical test limits for DCS 1800 and PCS 1900 TCH/AHS 7.4

1.8 to 1.9 GHz			Frames per s	Orig. BER requirements	Derived test limit	Target number of samples	Target test time (s)	Target test time (hh:mm:ss)
Channel	SCPI / dB	Channel	clas1b per s / class II per s					
AHS 7.4	-10	Frames	50	0.010000	0.012340	27958	560	00:09:19
		Class1b	2950	0,0028	0,003455	99850	34	00:00:34
		Class II	1400	0,027	0,033318	10355	7	00:00:07