14 Receiver

In this section 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 section 1.1.3 (General Conditions).

In practice the temporary antenna connector may be used for transmitter measurements described in section 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 sections of 3.

Wherever in this section, 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 GSM 05.03, indicate an error (BFI = 1). For full rate or half rate speech this is the result of the 3 bit 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 GSM 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 GSM 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 GSM 06.41.)

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 section.

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 and GSM 900				DCS 1 800			
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		1,7				1,7		
TCH/HS class Ib (BFI=0)		2,2				2,0		
TCH/HS class II (BFI=0)		1,2	1,2	1,2		1,2	1,2	1,2
TCH/HS UFR		2,0				1,9		
TCH/HS class Ib (BFI=0 and UFI=0)		1,8				1,7		
Reference interference:								
TCH/HS FER		1,6				1,6		
TCH/HS class Ib (BFI=0)		1,8				1,8		
TCH/HS class II (BFI=0)		1,2				1,2		
TCH/HS UFR		1,6				1,6		
TCH/HS class Ib (BFI or UFI)=0		1,4				1,4		
EVSIDR	1,2				1,2			
RBER (SID=2 & (BFI or UFI)=0	1,3				1,3			
ESIDR	1,3				1,3			
RBER (SID=1 or SID=2)	1,3				1,3			

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 and GSM 900				DCS 1 800			
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.

Table 14-3: Test conditions for GSM 400 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
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/HS Class Ib (BFI or UFI)=0	TUhigh/No FH	0,240	0,269	227000	99,721	0,432	<0,001
,,	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/F9,6&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
,,	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

Table 14-3: Test conditions for GSM 400 and GSM 900 (concluded)

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	TCH/FS	TUhigh/No FH	6,000*α	6,742*α	8900	99,825	7,560*α	0,162
channel	TCH/FS Class Ib	TUhigh/No FH	0,400/α	0,420/α	1000000	99,919	0,504/α	<0,001
200 kHz	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	TCH/FS	TUhigh/No FH	10,200*α	11,461*α	8900	99,995	12,852*α	0,004
channel	TCH/FS Class Ib	TUhigh/No FH	0,720/α	0,756/α	1000000	99,999	0,9077/α	<0,001
400 kHz	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 & 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

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
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	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
,,	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
,,	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

Table 14-4: Test conditions for DCS 1 800 (concluded)

Type of test	Type of channel	Propagation/ Frequency conditions	Specified	Test limit FER/BER %	Minimum No of samples	Prob that good unit will pass %	Bad unit FER/BER %	Risk that bad unit will pass
Adjacent	TCH/FS	TUhigh/No FH	3,000*α	3,371*α	17800	99,797	3,780*α	0,194
channel	TCH/FS Class Ib	TUhigh/No FH	0,250/α	0,270/α	2000000	100,000	0,315/α	<0,001
200 kHz	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	TCH/FS	TUhigh/No FH	5,100*α	5,714*α	10500	99,773	6,426*α	0,134
channel	TCH/FS Class Ib	TUhigh/No FH	0,450/α	0,483/α	1200000	100,000	0,567/α	<0,001
400 kHz	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 & 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 and applicability

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.

The requirements and this test only apply to MS supporting speech.

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 seconds will be measured; GSM 05.05, 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 and applicability

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.

The requirements and this test only apply to MS supporting speech.

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. GSM 05.05, 6.4 c.

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 and applicability

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.

The requirements and this test only apply to MS supporting half rate speech.

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; GSM 05.05, 6.4 b.

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 and applicability

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.

The requirements and this test only apply to MS supporting half rate speech.

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. GSM 05.05, 6.4 c.

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 Bad frame indication - TCH/FS - Frequency hopping and downlink DTX - Phase 2 MS in a phase 1 network

14.1.3.1 Definition and applicability

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.

Annex A of GSM 05.02 requires that a phase 2 MS behave properly in a phase 1 network.

The requirements and this test only apply to MS supporting speech.

14.1.3.2 Conformance requirement

On a full rate speech TCH (TCH/FS) in DTX conditions with a transmitted burst 20 dB above reference sensitivity and static conditions, 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; GSM 05.05, 6.4 b.

14.1.3.3 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.

14.1.3.4 Method of test

14.1.3.4.1 Initial conditions

Initial conditions 1

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.

When downlink DTX is activated with frequency hopping including the C0 radio frequency, the following configuration applies for filling the bursts on the C0 carrier:

C0 filling on the TCH	Half burst filling	Dummy bursts stealing flag	Half burst Filling stealing flag
Dummy bursts with (BN61, BN 62,...) mapped from the TSC bits of normal bursts. See section A.2.1.3 of GSM 05.02	Partial SID information. See section A.2.2.1 of GSM 05.02.	0	0

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

Initial conditions 2

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.

When downlink DTX is activated with frequency hopping including the C0 radio frequency, the following configuration applies for filling the bursts on the C0 carrier:

C0 filling on the TCH	Half burst filling	Dummy bursts stealing flag	Half burst Filling stealing flag
Partial SID information. See section A.2.1.4 of GSM 05.02	Partial SID information. See section A.2.2.1 of GSM 05.02.	1	1

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

Initial conditions 3

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.

When downlink DTX is activated with frequency hopping including the C0 radio frequency, the following configuration applies for filling the bursts on the C0 carrier:

C0 filling on the TCH	Half burst filling	Dummy bursts stealing flag	Half burst Filling stealing flag
Dummy bursts with 'C0 filling training sequence'. See section A.2.1.4 of GSM 05.02	Dummy bursts mixed bits. See section A.2.2.2 of GSM 05.02.	1	1

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.

14.1.3.4.2 Procedure

The two following steps are repeated 3 times, once for each initial condition specified in the previous clause.

a) The SS sets downlink DTX on.

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.

14.1.3.5 Test requirements

after each repetition of steps a) + b) the following requirements are applied:

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.

14.1.4 Bad frame indication - TCH/HS - Frequency hopping and downlink DTX - Phase 2 MS in a phase 1 network

14.1.4.1 Definition and applicability

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.

Annex A of GSM 05.02 requires that a phase 2 MS behave properly in a phase 1 network.

The requirements and this test only apply to MS supporting half rate speech.

14.1.4.2 Conformance requirement

On a half rate speech TCH (TCH/HS) in DTX conditions with a transmitted burst 20 dB above reference sensitivity and static conditions, 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; GSM 05.05, 6.4 b.

14.1.4.3 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.

14.1.4.4 Method of test

14.1.4.4.1 Initial conditions

Initial conditions 1

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.

When downlink DTX is activated with frequency hopping including the C0 radio frequency, the following configuration applies for filling the bursts on the C0 carrier:

C0 filling on the TCH	Half burst filling	Dummy bursts stealing flag	Half burst Filling stealing flag
Dummy bursts with (BN61, BN 62,...) mapped from the TSC bits of normal bursts. See section A.2.1.3 of GSM 05.02	Partial SID information. See section A.2.2.1 of GSM 05.02.	0	0

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

Initial conditions 2

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.

When downlink DTX is activated with frequency hopping including the C0 radio frequency, the following configuration applies for filling the bursts on the C0 carrier:

C0 filling on the TCH	Half burst filling	Dummy bursts stealing flag	Half burst Filling stealing flag
Partial SID information. See section A.2.1.4 of GSM 05.02	Partial SID information. See section A.2.2.1 of GSM 05.02.	1	1

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

Initial conditions 3

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.

When downlink DTX is activated with frequency hopping including the C0 radio frequency, the following configuration applies for filling the bursts on the C0 carrier:

C0 filling on the TCH	Half burst filling	Dummy bursts stealing flag	Half burst Filling stealing flag
Dummy bursts with 'C0 filling training sequence'. See section A.2.1.4 of GSM 05.02	Dummy bursts mixed bits. See section A.2.2.2 of GSM 05.02.	1	1

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.

14.1.4.4.2 Procedure

The two following steps are repeated 3 times, once for each initial condition specified in the previous clause.

a) The SS sets downlink DTX on.

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.

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.

14.1.4.5 Test requirements

After each repetition of steps a) + b) the following requirements are applied:

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.

14.2 Reference sensitivity

14.2.1 Reference sensitivity - TCH/FS

14.2.1.1 Definition and applicability

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

The requirements and this test apply to MS supporting speech.

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 GSM 05.05; GSM 05.05, 6.2.

2 At reference sensitivity level, the TCH/FS class I RBER shall meet the reference sensitivity performance of table 1 in GSM 05.05; GSM 05.05, 6.2.

3 At reference sensitivity level, the TCH/FS class II RBER shall meet the reference sensitivity, performance of table 1 in GSM 05.05: GSM 05.05, 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; GSM 05.05, 6.2, GSM 05.05, annex D D.2.1, 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 section 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 and DCS 1800 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 and DCS 1800 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 section 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 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	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

Table 14-6: Limits for DCS 1 800 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	13400					0,122*α	164000
class Ib(RBER)	0,32/α	1500000					0,41/α	20000000
class II(RBER)	8,333	60000	7,5	24000	9,333	30000	2,439	8200

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.

14.2.2 Reference sensitivity - TCH/HS (Speech frames)

14.2.2.1 Definition and applicability

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.

The requirements and this test apply to MS supporting half rate speech.

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 GSM 05.05; GSM 05.05, 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 GSM 05.05; GSM 05.05 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 GSM 05.05: GSM 05.05, 6.2.

4. At reference sensitivity level, the TCH/HS UFR shall meet the reference sensitivity performance of table 1 in GSM 05.05; GSM 05.05 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 GSM 05.05; GSM 05.05, 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: 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: 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 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)	4,598	13050				
TCH/HS Class Ib (BFI=0)	0,404	148500				
TCH/HS Class II (BFI=0)	7,725	25500	8,500	20000	7,600	20000
TCH/HS (UFR)	6,250	9600				
TCH/HS Class Ib ((BFI or UFI)=0)	0,269	227000				

Table 14-8: Limits for DCS 1800 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)	4,706	12750				
TCH/HS Class Ib (BFI=0)	0,426	141000				
TCH/HS Class II (BFI=0)	7,725	25500	8,735	20000	7,600	20000
TCH/HS (UFR)	6,383	9400				
TCH/HS Class Ib ((BFI or UFI)=0)	0,291	206000				

14.2.3 Reference sensitivity - FACCH/F

14.2.3.1 Definition and applicability

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

The requirements and this test apply to all types of MS.

14.2.3.2 Conformance requirement.

At reference sensitivity level, the FACCH/F FER shall meet the reference sensitivity performance of table 1 in GSM 05.05; (GSM 05.05, 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 and GSM 900		DCS 1 800	
Channels	**Type of measure-ments**	**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

14.2.4 Reference sensitivity - FACCH/H

14.2.4.1 Definition and applicability

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

The requirements and this test apply to MS supporting half rate channels.

14.2.4.2 Conformance requirement.

At reference sensitivity level, the FACCH/H FER shall meet the reference sensitivity performance of table 1 in GSM 05.05; (GSM 05.05, 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 a TCH/H 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 and GSM 900		DCS 1 800	
Channels	**Type of measure-ments**	**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	

14.2.5 Reference sensitivity - full rate data channels

14.2.5.1 Definition and applicability

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

The requirements and this test apply to MS supporting data.

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 GSM 05.05; (GSM 05.05, 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. (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 and GSM 900		DCS 1 800	
Channels	**Type of measure-ments**	**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 and applicability

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

The requirements and this test apply to MS supporting half rate data.

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 GSM 05.05; (GSM 05.05, 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. (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 and GSM 900		DCS 1 800	
Channels	**Type of measure-ments**	**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 and applicability

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

The requirements and this test apply to MS supporting speech.

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 GSM 05.05; GSM 05.05, 6.2.

2 At reference sensitivity level, the TCH/EFS class I RBER shall meet the reference sensitivity performance of table 1 in GSM 05.05; GSM 05.05, 6.2.

3 At reference sensitivity level, the TCH/EFS class II RBER shall meet the reference sensitivity, performance of table 1 in GSM 05.05: GSM 05.05, 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; GSM 05.05, 6.2, GSM 05.05, annex D D.2.1, 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 section 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 and DCS 1800 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 and DCS 1800 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 section 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 table 14-4 or 14-13a, 14-13b:

Table 14-13a: Limits for GSM 400 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 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

14.2.8 Reference sensitivity - full rate data channels in multislot configuration

14.2.8.1 Definition and applicability

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

The requirements and this test apply to all types of GSM 400, GSM 900 and DCS 1800 MS and any multiband MS which are capable of HSCSD multislot operation.

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 GSM 05.05; (GSM 05.05, 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 and GSM 900		DCS 1 800	
Channels	**Type of measure-ments**	**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 and applicability

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

The requirements and this test apply to R-GSM MS supporting speech.

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 GSM 05.05; GSM 05.05, 6.2.

2 At reference sensitivity level, the TCH/FS class I RBER shall meet the reference sensitivity performance of table 1 in GSM 05.05; GSM 05.05, 6.2.

3 At reference sensitivity level, the TCH/FS class II RBER shall meet the reference sensitivity, performance of table 1 in GSM 05.05: GSM 05.05, 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; GSM 05.05, 6.2, GSM 05.05, annex D D.2.1, 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 section 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 72nd and 71st 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 section 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

14.3 Usable receiver input level range

14.3.1 Definition and applicability

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.

The requirements and this test apply to MS supporting speech.

14.3.2 Conformance requirement

1. The receiver input level range requirements of GSM 05.05 section 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. (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 900: 98 dBµVemf( )

   DCS 1 800: 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 and GSM 900		DCS 1 800	
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	1640000
Static 98 dBμVemf( )	0,122	164000		
Static 90 dBμVemf( )			0,122	164000
EQ	3,25	120000	3,25	60000

14.4 Co-channel rejection

14.4.1 Co-channel rejection - TCH/FS

14.4.1.1 Definition and applicability

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.

The requirements and this test apply to MS supporting speech.

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 GSM 05.05; GSM 05.05, 6.3.

2. At reference co-channel interference the TCH/FS class Ib BER shall meet the reference interference performance of table 2 in GSM 05.05; GSM 05.05, 6.3.

3. At reference co-channel interference the TCH/FS class II BER shall meet the reference interference performance of table 2 in GSM 05.05; GSM 05.05, 6.3.

14.4.1.3 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.

14.4.1.4 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. (36.1.2.1.1.1).

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) 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 hop 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. The hopping frequencies are chosen from those defined in section 6.

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 measure-ment	Propagation condition	Test limit error rate %	Minimum No. of samples
TCH/FS	FER	TUlow/No FH	24*α	25000
TCH/FS Class Ib	RBER	TUlow/No FH	2,091/α	3300000
TCH/FS Class II	RBER	TUlow/No FH	4,3	2000000
TCH/FS	FER	TUhigh/FH	3,371*α	17800
TCH/FS class Ib	RBER	TUhigh/FH	0,215/α	2000000
TCH/FS class II	RBER	TUhigh/FH	8,333	1200000

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.

14.4.2 Co-channel rejection - TCH/HS

14.4.2.1 Definition and applicability

The requirements and this test apply to MS supporting half rate speech.

14.4.2.2 Conformance requirement

1. At reference cochannel interference, the TCH/HS FER (shall meet the reference interference performance of table 2 in GSM 05.05; GSM 05.05, 6.3.
2. At reference cochannel interference, the TCH/HS class Ib BER (BFI=0) shall meet the reference interference performance of table 2 in GSM 05.05; GSM 05.05, 6.3.
3. At reference cochannel interference, the TCH/HS class II BER (BFI=0) shall meet the reference interference performance of table 2 in GSM 05.05; GSM 05.05, 6.3.
4. At reference cochannel interference, the TCH/HS UFR shall meet the reference interference performance of table 2 in GSM 05.05; GSM 05.05, 6.3.
5. At reference cochannel interference, the TCH/HS class Ib RBER ((BFI or UFI)=0) shall meet the reference interference performance of table 2 in GSM 05.05; GSM 05.05, 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 hop 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. The hopping frequencies are chosen from those defined in section 6.

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

NOTE: 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: 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 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	10700
TCH/HS Class Ib RBER (BFI=0)	TUhigh/FH	0,325	184700
TCH/HS Class II RBER (BFI=0)	TUhigh/FH	7,961	25500
TCH/HS UFR	TUhigh/FH	6,834	8780
TCH/HS Class Ib RBER ((BFI or UFI)=0)	TUhigh/FH	0,235	255000

Table 14-17: Limits for DCS 1800 co-channel rejection

Channel/Type of measurement	Propagation condition	Test limit error rate %	Minimum No. of samples
TCH/HS FER	TUhigh/FH	5,607	10700
TCH/HS Class Ib RBER (BFI=0)	TUhigh/FH	0,325	184700
TCH/HS Class II RBER (BFI=0)	TUhigh/FH	7,961	25500
TCH/HS UFR	TUhigh/FH	6,834	8780
TCH/HS Class Ib RBER ((BFI or UFI)=0)	TUhigh/FH	0,235	255000

14.4.3 Co-channel rejection - TCH/HS (SID frames)

14.4.3.1 Definition and applicability

The requirements and this test apply to MS supporting half rate speech.

14.4.3.2 Conformance requirement

1. At reference cochannel interference, the TCH/HS ESIDR, for SID frames indicated as SID=0 shall meet the reference interference performance of table 2 in GSM 05.05; GSM 05.05, 6.3.

2. At reference cochannel interference, the TCH/HS RBER for SID frames indicated as SID=1 or SID=2, shall meet the reference interference performance of table 2 in GSM 05.05; GSM 05.05, 6.3.

3. At reference cochannel interference, the TCH/HS EVSIDR for SID frames indicated as (SID=0), or (SID=1), or ((BFI or UFI)=1), shall meet the reference interference performance of table 2 in GSM 05.05; GSM 05.05, 6.3.

4. At reference cochannel interference, the TCH/HS RBER for SID frames indicated as SID=2 and (BFI or UFI)=0, shall meet the reference interference performance of table 2 in GSM 05.05; GSM 05.05, 6.3.

14.4.3.3 Test purpose

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

4. To verify that the MS does not exceed conformance requirement 4 under propagation condition TUlow, with an allowance for the statistical significance of the test.

14.4.3.4 Method of test

14.4.3.4.1 Initial conditions

The BCCH data indicates that uplink DTX shall be disabled.

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 no the traffic channel.

14.4.3.4.2 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 function is set to TUlow.

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

NOTE: Test loop E is defined in clause 36. Frames marked with (SID=0) shall be signalled as erased on the uplink.

d) The SS transmits continuously SID frames on the downlink. The SID codeword is transmitted correctly, but the SID information contains random data.

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.

f) The SS determines the number of residual bit error events for the class 1 SID bits, which do not belong to the SID codeword, by examining sequences of at least the minimum number of samples of consecutive class 1 SID bits. Bits are taken only from those frames not signalled as erased.

g) The SS also determines the erased SID 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. Bits comprising the SID codeword are excluded.

h) The SS commands the MS to open test loop E and close test loop F.

NOTE: Test loop F is defined in clause 36. Frames marked with (SID=0), or (SID=1), or ((BFI or UFI)=1), shall be signalled as erased 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 frame erasure indication.

k) The SS determines the number of residual bit error events for the class 1 SID bits, which do not belong to the SID codeword, by examining sequences of at least the minimum number of samples of consecutive class 1 SID bits. Bits are taken only from those frames not signalled as erased.

l) The SS also determines the erased valid SID 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.

14.4.3.5 Test requirements

The error rates measured in this test shall not exceed the test limit error rate values given in table 14-18.

Table 14-18: Limits for co-channel rejection

Channel/Type of measurement	Propagation condition	Test limit error rate %	Minimum No. of samples
ESIDR	TUlow	19,152	25000
SID RBER (SID=1 or 2)	TUlow	0,560	500000
EVSIDR	TUlow	24,000	25000
SID RBER (SID=2 and (BFI or UFI)=0)	TUlow	0,022	2678000

14.4.4 Co-channel rejection - FACCH/F

14.4.4.1 Definition and applicability

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.

The requirements and this test apply to all types of MS.

14.4.4.2 Conformance requirement

At reference cochannel interference the FACCH/F FER shall meet the reference interference performance of table 2 in GSM 05.05; (GSM 05.05, 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 with an ARFCN in the mid ARFCN range. For MS supporting speech this shall be a TCH/FS. For MS not supporting speech 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 (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.

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.

14.4.4.5 Test requirements

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

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	25000

14.4.5 Co-channel rejection - FACCH/H

14.4.5.1 Definition and applicability

The requirements and this test apply to MS supporting half rate channels.

14.4.5.2 Conformance requirement

At reference cochannel interference the FACCH/H FER shall meet the reference interference performance of table 2 in GSM 05.05; (GSM 05.05, 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 speech 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 (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.

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.

14.4.5.5 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	25000

14.4.6 Co-channel rejection - TCH/EFS

14.4.6.1 Definition and applicability

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.

The requirements and this test apply to MS supporting speech.

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 GSM 05.05; GSM 05.05, 6.3.

2. At reference co-channel interference the TCH/EFS class Ib BER shall meet the reference interference performance of table 2 in GSM 05.05; GSM 05.05, 6.3.

3. At reference co-channel interference the TCH/EFS class II BER shall meet the reference interference performance of table 2 in GSM 05.05; GSM 05.05, 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. (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 hop 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. The hopping frequencies are chosen from those defined in section 6.

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 measure-ment	Propagation condition	Test limit error rate %	Minimum No. of samples
TCH/EFS	FER	TUlow/No FH	24	25000
TCH/EFS Class Ib	RBER	TUlow/No FH	0,209	3300000
TCH/EFS Class II	RBER	TUlow/No FH	3,039	2000000
TCH/EFS	FER	TUhigh/FH	3,357	17800
TCH/EFS class Ib	RBER	TUhigh/FH	0,115	2000000
TCH/EFS class II	RBER	TUhigh/FH	8,333	1200000

14.4.7 Receiver performance in the case of frequency hopping and co-channel interference on one carrier

14.4.7.1 Definition and applicability

The GSM receiver is specified to be able to handle one out of four carriers being strongly interefered with, if frequency hopping is applied. This is used in networks to increase the capacity.

The requirement and this test apply to all R97 MS (or later) supporting speech.

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%; GSM 05.05, 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	3300

14.5 Adjacent channel rejection

14.5.1 Adjacent channel rejection - speech channels

14.5.1.1 Definition and applicability

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 section.

2) Adjacent Time Slot selectivity, which is implicitly tested in test .2.1.

The requirements and this test apply to MS supporting speech.

14.5.1.2 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 GSM 05.05; GSM 05.05, 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 GSM 05.05; GSM 05.05, 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 GSM 05.05; GSM 05.05, 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 GSM 05.05 under extreme test conditions; GSM 05.05, 6.3, GSM 05.05, annex D D.2.1, 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 and GSM 900: 10,2*α %; GSM 05.05, 6.3

   DCS 1 800: 5,1*α %; GSM 05.05, 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 and GSM 900: 0,72/α %; GSM 05.05, 6.3

   DCS 1 800: 0,45/α %; GSM 05.05, 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 and GSM 900: 8,8 %; GSM 05.05, 6.3

   DCS 1 800: 8,9 %; GSM 05.05, 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 and GSM 900: 8,8 %;

   DCS 1 800: 8,9 %;.

   under extreme test conditions; GSM 05.05, 6.3, annex D D.2.1, D.2.2.

14.5.1.3 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.

14.5.1.4 Method of test

14.5.1.4.1 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).

14.5.1.4.2 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 under extreme test conditions.

14.5.1.5 Test requirements

Table 14-22: Limits for adjacent channel selectivity

			GSM 400 and GSM 900		DCS 1 800	
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	8900	3,371*α	17800
	class Ib	RBER	0,420/α	1000000	0,270/α	2000000
	class II	RBER	8,333	600000	8,333	1200000
400 kHz	TCH/FS	FER	11,461*α	8900	5,714*α	10500
	class Ib	RBER	0,756/α	1000000	0,483/α	1200000
	class II	RBER	9,167	600000	9,167	720000

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.

14.5.2 Adjacent channel rejection - control channels

14.5.2.1 Definition and applicability

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 section.

2) Adjacent Time Slot selectivity, which is implicitly tested in test 14.2.1.

The requirements and this test apply to MS not supporting speech.

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 GSM 05.05; GSM 05.05, 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 GSM 05.05 under extreme test conditions; GSM 05.05, 6.3, annex D D.2.1, 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 and GSM 900: 17,1 %; GSM 05.05, 6.3

   DCS 1 800: 6,1 %; GSM 05.05, 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 and GSM 900: 17,1 %

   DCS 1 800: 6,1 %.

   under extreme test conditions; GSM 05.05, 6.3, annex D D.2.1, D.2.2.

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 in the mid ARFCN range. Any one of the supported TCH/(F9,6, F4,8, or F2,4) 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

			GSM 400 and GSM 900		DCS 1 800	
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	5639	3,808	15756
400 kHz	FACCH/F	FER	19,152	3133	6,832	8782

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 and applicability

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.

The requirements and this test apply to MS supporting speech.

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 GSM 05.05; GSM 05.05, 5.2.

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 and GSM 900		DCS 1 800	
	Small MS	Other MS	Class 1 & 2	Class 3
WANTED SIGNAL dBµVemf( )	15	13	17	15
FIRST INTERFERER dBµVemf( )	64	74	64	68
SECOND INTERFERER dBµVemf( )	63	63	64	68

NOTE: Some of the levels in table 14-24 are different to those specified in GSM 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	8200

14.6.2 Intermodulation rejection - control channels

14.6.2.1 Definition and applicability

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.

The requirements and this test apply to MS not supporting speech.

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 GSM 05.05; GSM 05.05, 5.2.

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 and GSM 900		DCS 1 800	
	Small MS	Other MS	Class 1 & 2	Class 3
WANTED SIGNAL dBμVemf( )	15	13	17	15
FIRST INTERFERER dBμVemf( )	64	74	64	68
SECOND INTERFERER dBμVemf( )	63	63	64	68

NOTE: Some of the levels in table 14-26 are different to those specified in GSM 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 and GSM 900		DCS 1 800	
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	6696	4,368	13736

14.7 Blocking and spurious response

14.7.1 Blocking and spurious response - speech channels

14.7.1.1 Definition and applicability

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.

The requirements and this test apply to MS supporting speech.

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 GSM 05.05 section 5.1.

   The reference sensitivity performance as specified in table 1 of GSM 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 GSM 05.05 section 6.2;
   - a continuous, static sine wave signal at a level as in the table of GSM 05.05 section 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 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);

        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). GSM 05.05, 5.1.

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 GSM 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 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).

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).

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 GSM 11.10 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	-
1785 MHz to FR - 3 MHz	-	-	87
FR + 3 MHz to 1920 MHz	-	-	87
835 MHz to <915 MHz	113	113	
>980 MHz to 1000 MHz	113	113	
100 kHz to <835 MHz	90	90	
>1000 MHz to 12,75 GHz	90	90	
100 kHz to 1705 MHz	-	-	113
>1705 MHz to <1785 MHz	-	-	101
>1920 MHz to 1980 MHz	-	-	101
>1980 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 to FR – 3 MHz	90	90	-	-
FR + 3 MHz to 473,6 MHz	90	90	-	-
486 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

NOTE 1: These values differ from GSM 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 test limit error rate values given in table 14-29.

This shall apply under normal test voltage and ambient temperature, and with the interfering signal at any frequency in the range specified.

Table 14-29: Limits for blocking

Channel	Type of measurement	Test limit error rate %	Minimum number of samples
TCH/FS Class II	RBER	2,439	8200

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 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 1785 MHz to 1920 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 1920 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 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 14-29.

No failures are allowed at this lower unwanted signal level.

14.7.2 Blocking and spurious response - control channels

14.7.2.1 Definition and applicability

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.

The requirements and this test apply to MS not supporting speech.

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 GSM 05.05 section 5.1.

   The reference sensitivity performance as specified in table 1 of GSM 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 GSM 05.05 section 6.2;
   - a continuous, static sine wave signal at a level as in the table of GSM 05.05 section 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 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).

        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). GSM 05.05, 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 GSM 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 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).

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).

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 GSM 11.10 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 1920 MHz	-	-	87
835 MHz to <915 MHz	113	113	
>980 MHz to 1000 MHz	113	113	
100 kHz to <835 MHz	90	90	
>1000 MHz to 12,75 GHz	90	90	
100 kHz to 1705 MHz	-	-	113
>1705 MHz to <1785 MHz	-	-	101
>1920 MHz to 1980 MHz	-	-	101
>1980 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 to FR – 3 MHz	90	90	-	-
FR + 3 MHz to 473,6 MHz	90	90	-	-
486 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

NOTE 1: These values differ from GSM 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	
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	6696	4,368	13736

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 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).

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 and applicability

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.

The requirements and this test apply to R-GSM MS supporting speech.

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 GSM 05.05 section 5.1.

   The reference sensitivity performance as specified in table 1 of GSM 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 GSM 05.05 section 6.2;
   - a continuous, static sine wave signal at a level as in the table of GSM 05.05 section 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). GSM 05.05, 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 GSM 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 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 turnon 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 GSM 11.10 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
1785 MHz to FR - 3 MHz	-	-
FR + 3 MHz to 1920 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 1000 MHz	113	113
100 kHz to <835 MHz	90	90
>1000 MHz to 12,75 GHz	90	90

NOTE: These values differ from GSM 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	8200

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 and applicability

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.

The requirements and this test apply to R-GSM MS not supporting speech.

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 GSM 05.05 section 5.1.

   The reference sensitivity performance as specified in table 1 of GSM 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 GSM 05.05 section 6.2;
   - a continuous, static sine wave signal at a level as in the table of GSM 05.05 section 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 d BµV (emf) (i.e. -43 dBm). GSM 05.05, 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 GSM 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 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 GSM 11.10 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 1000 MHz	113	113
100 kHz to <835 MHz	90	90
>1000 MHz to 12,75 GHz	90	90

NOTE: These values differ from GSM 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	6696	4,368	13736

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 and applicability

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.

The requirements and this test apply to MS supporting speech.

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 GSM 05.05 section 5.2.
- 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 CCITT 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. GSM 05.05, 5.2.

MS type	Signal level
GSM400	-31 dBm
GSM900	-31 dBm
DCS1800	-29 / -31 * dBm

* The –31 dBm level shall apply to DCS1800 class 1 and class 2 MS meeting the –102 dBm reference sensitivity level requirement according to GSM 05.05, 6.2.

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)
GSM400	82
GSM900	82
DCS1800	82/84

* The 82 dBμVemf (ie. –31 dBm) level shall apply to DCS1800 class 1 and class 2 MS meeting the –102 dBm reference sensitivity level requirement according to GSM 05.05, 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	8200

14.8.2 AM suppression - control channels

14.8.2.1 Definition and applicability

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.

The requirements and this test apply to MS not supporting speech.

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 GSM 05.05 section 5.2.

- 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 CCITT 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. GSM 05.05, 5.2.

MS type	Signal level
GSM400	-31 dBm
GSM900	-31 dBm
DCS1800	-29 / -31 * dBm

* The –31 dBm level shall apply to DCS1800 class 1 and class 2 MS meeting the –102 dBm reference sensitivity level requirement according to GSM 05.05, 6.2.

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)
GSM400	82
GSM900	82
DCS1800	82/84

* The 82 dBµVemf (ie. –31 dBm) level shall apply to DCS1800 class 1 and class 2 MS meeting the –102 dBm reference sensitivity level requirement according to GSM 05.05, 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 900		DCS 1 800	
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	6696	4,368	13736

14.9 Paging performance at high input levels

14.9.1 Definition and applicability

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.

The requirements and this test apply to all types of MS.

14.9.2 Conformance requirement

The paging performance at high input levels requirements of GSM 05.05 section 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 and GSM900 and -23 dBm for DCS1800.

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 900: -15 dBm
DCS 1800: -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 *[Reserved for future GSM test]*

14.11 *[Reserved for future GSM test]*

14.12 *[Reserved for future GSM test]*

14.13 *[Reserved for future GSM test]*

14.14 *[Reserved for future GSM test]*

14.15 *[Reserved for future GSM test]*

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 GSM 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 to be performed at the sensitivity and interference levels defined in GSM 05.05. For circuit switched channels GSM 05.05 defines the error rates at a fixed sensitivity or interference level.

For packet switched channels GSM 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 and GSM 900				DCS 1 800			
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 channel	Propagation/ frequency conditions	Speci-fied 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

14.16.1 Minimum Input level for Reference Performance

14.16.1.1 Definition and applicability

The minimum input level is the signal level at the MS receiver input at which a certain BLER is met.

The requirements and this test apply to MS supporting packet channels.

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 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						
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 and GSM 900 small MS +2 dB

DCS 1800 class 1 or 2 MS +4 dB

DCS 1800 class 3 MS +2 dB

GSM 05.05, Table 1a; GSM 05.05, 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 and GSM 900						
USF/CS-1	dBm	< -104	-103	-104	-104	-104
USF/CS-2 to 4	dBm	< -104	-104	-104	-104	-104
DCS 1 800						
USF/CS-1	dBm	< -104	-104	-104	-104	-104
USF/CS-2 to 4	dBm	< -104	-104	-104	-104	-104

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 and GSM 900 small MS +2 dB

DCS 1800 class 1 or 2 MS +4 dB

DCS 1800 class 3 MS +2 dB

GSM 05.05, Table 1a; GSM 05.05, 6.2.

3. The BLER shall not exceed the the conformance requirements given in 1. - 2. under extreme conditions; GSM 05.05, 6.2, GSM 05.05, annex D D.2.1, 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.

   GSM 05.05, 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.

   GSM 05.05, 6.4

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 section 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 (GSM 04.60 clause 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.

14.16.1.4.2 Procedure

a) The SS transmits packets under TU50 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 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 04.60, 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 occasionaly 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 e) using CS-4 coding.

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, and 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.

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 2000 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.

14.16.2 Co-channel rejection

14.16.2.1 Co-channel rejection for packet channels

14.16.2.1.1 Definition and applicability

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.

The requirements and this test apply to MS supporting packet channels.

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 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	23	-
DCS 1 800					
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	25	-

GSM 05.05, Table 2a; GSM 05.05, 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 and GSM 900					
USF/CS-1	dB	19	12	10	10
USF/CS-2 to 4	dB	18	10	9	8
DCS 1 800					
USF/CS-1	dB	19	10	10	10
USF/CS-2 to 4	dB	18	9	9	7

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 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.

14.16.2.1.4.2 Procedure

The SS transmits packets using CS-1 coding to the MS on all allocated timeslots.

The fading characteristic of the wanted and the interfering signal is TUlow, no FH applies.

The co-channel interference level is set to 1 dB above the level 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 04.60, 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 occasionaly 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-x, the SS calculates the Block error ratio. The SS resets both counters.

f) In case of CS-1, CS-2 or CS-4 the SS repeats step c) to e) with the following three fading conditions and hopping modes: TUhigh/noFH, TUhigh/FH, and RA/noFH. In 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 establishes the normal test conditions, and 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-x, 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, under any combination of normal and extreme test voltages and ambient temperatures, shall not exceed the conformance requirement.

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 GSM 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 to be performed at the sensitivity and interference levels defined in GSM 05.05. For circuit switched channels GSM 05.05 defines the error rates at a fixed sensitivity or interference level.

For packet switched channels GSM 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

	GSM400 &GSM 900				DCS 1 800&PCS1900			
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 channel	Propagation/ frequency conditions	Specified BLER %	Minimum No of RLC blocks
Sensitivity	PDTCH/MCS-1 to 4	static	10	2000
"	PDTCH/MCS-1 to 4	TUhigh/no FH	10	6000
"	PDTCH/MCS-1 to 4	TUhigh/FH	10	6000
"	PDTCH/MCS-1 to 4	RA/no FH	10	6000
"	PDTCH/MCS-1 to 4	HT/no FH	10	6000
"	PDTCH/MCS-5 to 9	static	10	2000
"	PDTCH/MCS-5 to 9	TUhigh/no FH	10 or 30	6000 or 2000
"	PDTCH/MCS-5 to 9	TUhigh/FH	10 or 30	6000 or 2000
"	PDTCH/MCS-5 to 9	RA/noFH	10 or 30	6000 or 2000
	PDTCH/MCS-5 to 9	HT/noFH	10 or 30	6000 or 2000
"	USF/MCS-1to 4	static	1	20000
"	USF/MCS-1 to 4	TUhigh/no FH	1	60000
"	USF/MCS-1 to 4	TUhigh/FH	1	60000
"	USF/MCS-1 to 4	RA/no FH	1	60000
"	USF/MCS-1 to 4	HT/no FH	1	60000
	USF/MCS-5 to 9	static	1	20000
	USF/MCS-5 to 9	Tuhigh/noFH	1	60000
	USF/MCS-5 to 9	Tuhigh/FH	1	60000
	USF/MCS-5 to 9	RA/no FH	1	60000
	USF/MCS-5 to 9	HT/no FH	1	60000
Co-channel	PDTCH/MCS-1 to 4	TUlow/no FH	10	6000, but minimum of 500s
,,	PDTCH/MCS-1 to 4	TUhigh/no FH	10	6000
,,	PDTCHMCS-1 to 4	TUhigh/FH	10	6000
,,	PDTCH/MCS-1 to 4	RA/no FH	10	6000
,,	PDTCH/MCS-5 to 9	TUlow/no FH	10 or 30	6000 or 2000, but minimum of 500s
,,	PDTCH/MCS-5 to 9	TUhigh/no FH	10 or 30	6000 or 2000
,,	PDTCH/MCS-5 to 9	TUhigh/FH	10 or 30	6000 or 2000
,,	PDTCH/MCS-5 to 9	RA/no FH	10 or 30	6000 or 2000
"	USF/MCS-1 to 4	TUlow/no FH	1	60000
"	USF/MCS-1 to 4	TUhigh/no FH	1	60000
"	USF/MCS-1 to 4	TUhigh/FH	1	60000
"	USF/MCS-1 to 4	RA/no FH	1	60000
"	USF/MCS-5 to 9	TUlow/no FH	1	60000
"	USF/MCS-5 to 9	TUhigh/no FH	1	60000
"	USF/MCS-5 to 9	TUhigh/FH	1	60000
	USF/MCS-5 to 9	RA/no FH	1	60000
Adjacent Channel 200kHz	PDTCH/MCS-1 to 4	TUlow/No FH	10	6000
“	PDTCH/MCS-1 to 4	TUhigh/NoFH	10	6000
“	PDTCH/MSC-5 to 9	TUlow/No FH	10 or 30	6000 or

				2000
“	PDTCH/MSC-5 to 9	TUhigh/No FH	10 or 30	6000 or 2000
“	USF/MCS-1 to 4	TUlow/No FH	1	60000
“	USF/MCS-1 to 4	TUhigh/No FH	1	60000
“	USF/MCS-5 to 9	TUlow/No FH	1	60000
	USF/MCS-5 to 9	TUhigh/No FH	1	60000
Adjacent Channel 400kHz	PDTCH/MCS-1 to 4	TUhigh/No FH	10	6000
“	PDTCH/MCS-5 to 9	TUhigh/No FH	10 or 30	6000 or 2000
“	USF/MCS-1 to 4	TUhigh/No FH	1	60000
“	USF/MCS-5 to 9	TUhigh/No FH	1	60000
Intermodula -tion Rejection	PDTCH/MCS-1 to 4	static	10	2000
“	PDTCH/MCS-5 to 9	static	10	2000
“	USF/MCS-1 to 4	static	1	20000
“	USF/MCS-1 to 9	static	1	20000
Blocking & Spurious	PDTCH/MCS-1 to 4	TUhigh/No FH	10	6000
“	PDTCH/MCS-5 to 9	TUhigh/No FH	10 or 30	6000 or 2000
“	USF/MCS-1 to 4	TUhigh/No FH	1	60000
“	USF/MCS-5 to 9	TUhigh/No FH	1	60000

Notes:

1. For MCS-7,8 & 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.

2. Under fading conditions the number of RLC blocks indicated above shall be transmitted on each timeslot of the multislot configuration.

14.18.1 Minimum Input level for Reference Performance

14.18.1.1 Definition and applicability

The minimum input level is the signal level at the MS receiver input at which a certain BLER is met.

The requirements and this test apply to all types of GSM400, GSM900, DCS1800, and PCS1900 which are capable of EGPRS operation.

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 below.

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 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	*	*
DCS 1 800 and PCS 1900						
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	*	*

The input levels given in the above Table are applicable to GSM400, GSM 900 and PCS 1900 MS, and have to be corrected by the following values for the following classes of MS:

GSM 400 small MS +2 dB

GSM 900 small MS +2 dB

DCS 1800 class 1 or 2 MS +4 dB

DCS 1800 class 3 MS +2 dB

PCS 1900 class 1 or 2 MS +2 dB

Note: PDTCH/MCS-4 can not meet the reference performance for some propagation conditions (*)

GSM 05.05, Table 1a; GSM 05.05, 6.2.

Table 14.18-3b: PDTCH Sensitivity Input Level for MS for 8-PSK modulation

GSM 400 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	*	-83**
PDTCH/MCS-8	dBm	-90.5	-83**	-83**	*	*
PDTCH/MCS-9	dBm	-86	-78.5**	-78.5**	*	*
DCS 1 800 and PCS 1900						
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	*	*
PDTCH/MCS-8	dBm	-90.5	-80**	-80**	*	*
PDTCH/MCS-9	dBm	-86	*	*	*	*
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 GSM400, & GSM 900 and to Class 1 or Class 2 MS for DCS1800 & PCS 1900. For all other MS the input levels have to be corrected by the value of –2dB.

GSM 05.05, Tables 1c; GSM 05.05, 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 & 14.18-4b below.

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 and GSM 900						
USF/MCS-1 to 4	dBm	-104	-102.5	-104	-104	-102.5
DCS 1 800 and PCS1900						
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 900and PCS1900 MS, and have to be corrected by the following values for the following classes of MS:

GSM 400 small MS +2 dB

GSM 900 small MS +2 dB

DCS 1800 class 1 or 2 MS +4 dB

DCS 1800 class 3 MS +2 dB

PCS1900 class 1 or 2 MS +2 dB

GSM 05.05, Table 1a; GSM 05.05, 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 and GSM 900						
USF/MCS-5 to 9	dBm	-102	-97.5	-99	-100	-99
DCS 1 800 and PCS1900						
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 GSM400 & GSM 900 and to Class 1 or Class 2 MS for DCS1800 & PCS 1900. For all other MS the input levels have to be corrected by the value of –2dB.

GSM 05.05, Table 1c; GSM 05.05, 6.2

3. The BLER shall not exceed the conformance requirements given in 1. - 2. under extreme conditions; GSM 05.05, 6.2, GSM 05.05, annex D D.2.1, 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.

   GSM 05.05, 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.

   GSM 05.05, 6.4

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, the traffic channel may fall on any of the ARFCNs defined in section 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 (GSM 04.60 clause 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 section 40 for packet switched on an ARFCN in the Mid range. 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 TUhigh propagation 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 04.60, 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 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, and 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 j) to l) using USF/MCS2 to 4 coding.

n) The SS repeats steps i) to l) under extreme test conditions for MCS-4 coding only.

o) 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 2000 blocks.

For 8-PSK Modulation:

a) The SS transmits packets under TUhigh propagation 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 04.60, 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 occasionaly 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, and 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) using USF/MCS-6 to 9 coding.

n) The SS repeats steps j) to l) under extreme test conditions for MCS-9 coding only.

o) 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 2000 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 o) for both GMSK modulation and 8-PSK modulation the MS shall transmit no more than 25 times

14.18.2 Co-channel rejection

14.18.2.1 Definition and applicability

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.

The requirements and this test apply to all types of GSM400, GSM900, DCS1800, PCS1900 which are capable of EGPRS operation.

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 below.

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 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	*
DCS 1 800 and PCS1900					
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: PDTCH/MCS-4 can not meet the reference performance for some propagation condition (*)

GSM 05.05, Table 2a; GSM 05.05, 6.3.

Table 14.18-5b: Cochannel interference ratio for MS at reference performance for 8-PSK modulation

GSM 400 and GSM900					
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	*
PDTCH/MCS-8	dB	30.5	25.5**	25.5**	*
PDTCH/MCS-9	dB	25.5**	30.5**	30.5**	*
DCS 1800 and PCS 1900					
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	*
PDTCH/MCS-8	dB	30.5	29.5**	29**	*
PDTCH/MCS-9	dB	25.5**	*	*	*

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 (**)

GSM 05.05, Table 2c; GSM 05.05, 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 & 14.18-6b below.

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 and GSM 900					
USF/MCS-1 to 4	dB	18	11	9.5	9.5
DCS 1 800 and PCS1900					
USF/MCS-1 to 4	dB	18	9.5	9.5	9.5

GSM 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 and GSM 900					
USF/MCS-5 to 9	dB	17	11.5	9	9
DCS 1 800 and PCS1900					
USF/MCS-5 to 9	dB	17	10	9	9

GSM 05.05, Tables 2c.

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 section 40 for packet switched with an ARFCN in the mid ARFCN range, power control level set to maximum power.

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).

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 04.60, 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 occasionaly 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 the steps b) to e) for the coding schemes MCS-3 with TUhigh/noFH, MCS-2 with TUhigh/FH and MCS-1 with RA/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.

l) The SS repeats steps i) to k) for each of the coding scheme MCS-1 to 3.

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 04.60, 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 occasionaly 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 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-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.

l) The SS repeats steps i) to k) using USF/MCS-5,6,7 & 8 coding.

14.18.2.5 Test requirements

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.

14.18.3 Adjacent channel rejection

14.18.3.1 Definition and applicability

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 section.

2) Adjacent Time Slot selectivity, which is implicitly tested in test 14.18.2.

The requirements and this test apply to all types of GSM400, GSM900, DCS1800 and PCS1900 which are capable of EGPRS operation.

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%; GSM 05.05, 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 %; GSM 05.05, 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; GSM 05.05, 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 %; GSM 05.05, 6.2.

Table 14.18-7a: Adjacent channel interference ratio for MS at reference performance for 8-PSK modulation

GSM 400 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	*
PDTCH/MCS-8	dB	15.5	9**	11**	10.5**	*
PDTCH/MCS-9	dB	10**	12.5**	17**	15.5**	*
USF/MCS-5 to 9	dB	-1	-8.5	-8	-9.5	-9
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/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	*
PDTCH/MCS-8	dB	15.5	9**	16**	15.5**	*
PDTCH/MCS-9	dB	10**	12.5**	*	*	*
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(**),						

GSM 05.05, Table2g; GSM 05.05, 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; GSM 05.05, 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 %; GSM 05.05, 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 modudulation 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. GSM 05.05, 6.3.

3. The BLER shall not exceed the conformance requirements given in 1. - 2. under extreme conditions; GSM 05.05, 6.2, GSM 05.05, annex D D.2.1, D.2.2.

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 section 40 for packet switched with an ARFCN in the mid ARFCN range, power control level set to maximum power. 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.

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 as 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 04.60, 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 occasionaly 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) & d) with the unwanted signal transmitted at a nominal frequency 200kHz below the nominal frequency of the wanted signal. & its amplitude is set to achieve the adjacent interference ratio as specified in the conformance requirements.

f) The SS repeats steps c) & d) with the unwanted signal transmitted at a nominal frequency 400kHz above the nominal frequency of the wanted signal & its amplitude is set to to achieve the adjacent interference ratio as specified in the conformance requirements.

g) The SS repeats steps c) & d) with the unwanted signal transmitted at a nominal frequency 400kHz below the nominal frequency of the wanted signal & its amplitude is set to to achieve the adjacent interference ratio as 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 200kHz above the nominal frequency of the wanted signal. Its amplitude is set to to achieve the adjacent interference ratio as 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) & n) with the unwanted signal transmitted at a nominal frequency 200kHz below the nominal frequency of the wanted signal & its amplitude is set at to achieve the adjacent interference ratio as specified in the conformance requirements.

p) The SS repeats steps m) & n) with the unwanted signal transmitted at a nominal frequency 400kHz above the nominal frequency of the wanted signal & its amplitude is set to achieve the adjacent interference ratio as specified in the conformance requirements.

q) The SS repeats steps m) & n) with the unwanted signal transmitted at a nominal frequency 400kHz below the nominal frequency of the wanted signal & its amplitude is set to achieve the adjacent interference ratio as specified in the conformance requirements.

r) The SS repeats steps k) to q) for each of the coding schemes USF/MCS-2 to 4.

s) The SS repeats steps k) to q) under extreme test conditions for coding scheme USF/MCS-4 only.

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 200kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio as 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 04.60, 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 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) & d) with the unwanted signal transmitted at a nominal frequency 200kHz below the nominal frequency of the wanted signal & its amplitude is set to achieve the adjacent interference ratio as specified in the conformance requirements.

f) The SS repeats steps c) & d) with the unwanted signal transmitted at a nominal frequency 400kHz above the nominal frequency of the wanted signal & its amplitude is set to achieve the adjacent interference ratio as specified in the conformance requirements.

g) The SS repeats steps c) & d) with the unwanted signal transmitted at a nominal frequency 400kHz below the nominal frequency of the wanted signal & its amplitude is set to achieve the adjacent interference ratio as 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 200kHz above the nominal frequency of the wanted signal. Its amplitude is set to achieve the adjacent interference ratio as 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) & n) with the unwanted signal transmitted at a nominal frequency 200kHz below the nominal frequency of the wanted signal & its amplitude is set to achieve the adjacent interference ratio as specified in the conformance requirements.

p) The SS repeats steps m) & n) with the unwanted signal transmitted at a nominal frequency 400kHz above the nominal frequency of the wanted signal & its amplitude is set to achieve the adjacent interference ratio as specified in the conformance requirements.

q) q) The SS repeats steps m) & n) with the unwanted signal transmitted at a nominal frequency 400kHz below the nominal frequency of the wanted signal & its amplitude is set to achieve the adjacent interference ratio as specified in the conformance requirements.

r) The SS repeats steps k) to q) for each of the coding schemes MCS-6 to 9.

s) The SS repeats steps k) to r) under extreme test conditions for coding scheme MCS-9 only.

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.

14.18.4 Intermodulation rejection

14.18.4.1 Definition and applicability

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.

The requirements and this test apply to all types of GSM400, GSM900, DCS1800 and PCS1900 which are capable of EGPRS operation.

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; GSM 05.05, 6.2.

2. The block error rate (BLER) performance for USF/MSC-1 to 9 shall not exceed 1 %; GSM 05.05, 6.2.

3. The BLER shall not exceed the conformance requirements given in 1. - 2. under extreme conditions; GSM 05.05, 6.2, GSM 05.05, annex D D.2.1, 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 section 40 for packet switched with an ARFCN in the Mid ARFCN range, power control level set to maximum.

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 & 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, continous 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: 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) & 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) & 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 q) for each of the coding schemes MCS-1 to 3 with the receiver operating on an ARFCN in the Middle ARFCN range.

u) The SS repeats steps l) to s) under extreme test conditions for MCS-4 only.

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, continous 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: 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) & 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 & 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) & 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 q) for each of the coding schemes MCS-5,6,7 & 8 with the receiver operating on an ARFCN in the Middle ARFCN range.

u) The SS repeats steps l) to s) under extreme test conditions for MCS-9 only.

Table 14.18-8: Intermodulation intefering test signal levels

	GSM400, GSM900, PCS1900		DCS1800	
	Small MS	**Other MS**	**Class 1 & 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 GSM 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.

14.18.5 Blocking and spurious response

14.18.5.1 Definition and applicability

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.

The requirements and this test apply to all types of GSM400, GSM900, DCS1800 and PCS1900 which are capable of EGPRS operation.

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 GSM 05.05 section 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; GSM 05.05, 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 & 14.18-4b for 8-PSK modulation for USF channel with correction values as specified in GSM 05.05 section 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: inband, for a maximum of three occurences. GSM05.05, Section 5.1.

     GSM 900: in band, for a maximum of six occurrences (which if grouped shall not exceed three contiguous occurrences per group). GSM05.05, Section 5.1.

     DCS 1 800 & PCS 1900: in band, for a maximum of twelve occurrences (which if grouped shall not exceed three contiguous occurrences per group). GSM05.05, Section 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). GSM05.05, Section 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). GSM 05.05, 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 GSM 05.05, are allowed to ensure a fair test of the MS.

14.18.5.4 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 section 40 for packet switched, except the BCCH frequency list shall be empty, on an arbitrary ARFCN in the range supported by the MS. The power control level is set to amaximum power of 0dBm.

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 GMSK Modulation:

a) The SS is set to produce a TUhigh 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 GSM 05.05 section 6.2;

b) The SS transmits packets on PDTCH using MSC-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:

P-GSM 900 & GSM400: 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 & PCS 1900: 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).

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 GSM 11.10 annex 3.

e) The level of the unwanted signal is set according to table 14.18-9.

Table 14.18-9: Level of unwanted signals

	GSM450		GSM480		GSM900		DCS 1 800	PCS 1900
	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	-	-
1785 MHz to FR - 3 MHz	-	-	-	-	-	-	87	-
FR + 3 MHz to 1920 MHz	-	-	-	-	-	-	87	-
1910 MHz to FR - 3 MHz	-	-	-	-	-	-	-	87
FR + 3 MHz to 2010 MHz	-	-	-	-	-	-	-	87
100kHz to <457.6MHz	113	113	-	-	-	-	-	-
>473.6MHz to 12,750MHz	113	113	-	-	-	-	-	-
100kHz to <486MHz	-	-	113	113	-	-	-	-
>502MHz to 12,750MHz	-	-	113	113	-	-	-	-
835 MHz to <915 MHz	-	-	-	-	113	113	-	-
>980 MHz to 1000 MHz	-	-	-	-	113	113	-	-
100 kHz to <835 MHz	-	-	-	-	113	113	-	-
>1000 MHz to 12,750 MHz	-	-	-	-	113	113	-	-
100 kHz to 1705 MHz	-	-	-	-	-	-	113	-
>1705 MHz to <1785 MHz	-	-	-	-	-	-	101	-
>1920 MHz to 1980 MHz	-	-	-	-	-	-	101	-
>1980 MHz to 12,750 MHz	-	-	-	-	-	-	113	-
100kHz to <1830MHz	-	-	-	-	-	-	-	113
1830MHz to <1910MHz	-	-	-	-	-	-	-	101
>2010 to 2070MHz	-	-	-	-	-	-	-	101
>2070MHz to 12,750MHz	-	-	-	-	-	-	-	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( ). GSM05.05, Section 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( ). GSM05.05, Section 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( ). GSM05.05, Section 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( ). GSM05.05, Section 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( ). GSM05.05, Section 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 04.60, 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 occasionaly 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: 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 GSM 05.05 section 6.2;

b) The SS transmits packets on PDTCH using MSC-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: 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:

P-GSM 900 & GSM 400: 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 & PCS 1900: 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).

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 GSM 11.10 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: Due to the error rates related to the USF, the MS is likely to occasionaly 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: 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.

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 & 473.6 MHz to 12,75 GHz for GSM450 and in the combined bands 100 kHz to 486.0 MHz & 502.0 MHz to 12,75 GHz for GSM480 (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 1900: A maximum of twelve failures in the band 1910 MHz to 2010 MHz (which, if grouped, shall not exceed three 200 kHz channels per group).

A maximum of 24 in the combined bands 100 kHz to 1910 MHz and 2010 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 the maximum number of samples.

No failures are allowed at this lower unwanted signal level.