9 Reporting of Channel State Information

9.1 General

For the cases in this clause it is expected that the UE will not always detect the PDCCH, resulting in a statDTX for the uplink ACK/NACK transmission. The downlink configuration for evaluating CQI performance does not use retransmission. Therefore any BLER and Throughput calculations must exclude any packets where the UE may have attempted to combine data from more than one transmission due to missed new data indicators from lost PDCCH transmissions. Thus in all test cases in which there are not retransmission (Max number of HARQ transmissions = 1), if the number of consecutive discarded statDTX for any one process is an odd number including one, also discard the next response for that HARQ process regardless whether it is an ACK or NACK. In the calculation of Throughput the discarded ACK / NACK is considered as a statDTX.

This section includes requirements for the reporting of channel state information (CSI). For all test cases in this section, the definition of SNR is in accordance with the one given in clause 8.1.1, where $SNR = \frac{\sum \hat{I}_{or}^{(j)}}{\sum N_{oc}^{(j)}}$.

The fading of the signals and the AWGN signals applied to each receiver antenna connector shall be uncorrelated. The levels of the test signal applied to each of the antenna connectors shall be as defined in the respective test cases.

The UE performance in this section is considered to be operating band independent. Therefore, the required performance in the respective test cases can be verified in one of the operating bands supported by the UE under test. All the test points supported by the bands of the multiband UE (based on channel bandwidth, DL and UL configuration) need to be tested.

9.2 CQI Reporting under AWGN conditions

The reporting accuracy of the channel quality indicator (CQI) under frequency non-selective conditions is determined by the reporting variance and the BLER performance using the transport format indicated by the reported CQI median. The purpose is to verify that the reported CQI values are in accordance with the CQI definition given in TS 36.213 [10] clause 7.2. To account for sensitivity of the input SNR the reporting definition is considered to be verified if the reporting accuracy is met for at least one of two SNR levels separated by an offset of 1 dB.

9.2.1 CQI Reporting under AWGN conditions - PUCCH 1-0 (Cell-Specific Reference Symbols)

9.2.1.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-0

9.2.1.1.1 Test purpose

To verify the variance of the wideband CQI reports is within the limits defined and a PDSCH BLER of 10% falls between the transport format based median CQI-1 and median CQI or the transport format based median CQI and median CQI +1.

9.2.1.1.2 Test applicability

This test applies to E-UTRA FDD UE release 8 and forward.

9.2.1.1.3 Minimum conformance requirements

For the parameters specified in Table 9.2.1.1.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to Table A.4-1 shall be in the range of ±1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH

BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1

Table 9.2.1.1.3-1: PUCCH 1-0 static test

Parameter		Unit	Test 1		Test 2	
Bandwidth		MHz	10			
PDSCH transmission mode			1			
Downlink power allocation	ρ_A	dB	0			
	ρ_B	dB	0			
	σ	dB	0			
Propagation condition and antenna configuration			AWGN (1 x 2)			
SNR (Note 2)		dB	0	1	6	7
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-97	-92	-91
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-98	
Max number of HARQ transmissions			1			
Physical channel for CQI reporting			PUCCH Format 2			
PUCCH Report Type			4			
Reporting periodicity		ms	N_P = 5			
cqi-pmi-ConfigurationIndex			6			
Note 1: Reference measurement channel according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.						
Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.						

The normative reference for this requirement is TS 36.101 [2] clause 9.2.1.1.

9.2.1.1.4 Test description

9.2.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.

2. The parameter settings for the cell are set up according to Table 9.2.1.1.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.2.1.1.4.3.

9.2.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.2.1.1.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-1) according to CQI value 8 of Annex A.4 Table A.4-3 and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. Continue transmission of the PDSCH until 2000 wideband CQI reports have been gathered. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are also counted as wideband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband CQI values are in the range (Median CQI - 1) ≤ Median CQI ≤ (Median CQI + 1) then continue with step 5, otherwise go to step 8.

5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-1) according to the wideband median-CQI value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses reaches 1000.

   For the filtered ACK and NACK responses if the ratio (NACK / ACK + NACK) ≤ 0.1 then go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-1) according to the wideband median-CQI+1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered.

   If the ratio (NACK /ACK + NACK) > 0.1

   then pass the UE for this test and go to step 9, otherwise go to step 8.

7. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-1) according to the wideband median-CQI-1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered.

   If the ratio (NACK /ACK + NACK) ≤ 0.1

   then pass the UE for this test and go to step 9, otherwise go to step 8.

8. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 7) for the other SNR point as appropriate. Otherwise fail the UE.

9. If both tests have not been done, then repeat the same procedure (steps 1 to 8) with test conditions according to the table 9.2.1.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

9.2.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.2.1.1.4.3-1: PhysicalConfigDedicated-DEFAULT

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
}			

Table 9.2.1.1.4.3-2: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	Not present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic CHOICE {			
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex	0		
cqi-pmi-ConfigIndex	6	(see Table 7.2.2-1A in TS 36.213)	
cqi-FormatIndicatorPeriodic CHOICE {			
widebandCQI	NULL		
}			
ri-ConfigIndex	NULL	(see Table 7.2.2-1B in TS 36.213)	
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

9.2.1.1.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.2.1.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

9.2.1.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-0

9.2.1.2.1 Test purpose

To verify the variance of the wideband CQI reports is within the limits defined and a PDSCH BLER of 10% falls between the transport format based on wideband median CQI-1 and wideband median CQI or the transport format based on wideband median CQI and wideband median CQI +1.

9.2.1.2.2 Test applicability

This test applies to E-UTRA TDD UE release 8 and forward.

9.2.1.2.3 Minimum conformance requirements

For the parameters specified in Table 9.2.1.2.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to Table A.4-2 shall be in the range of ±1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI +1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

Table 9.2.1.2.3-1: PUCCH 1-0 static test (TDD)

Parameter		Unit	Test 1		Test 2	
Bandwidth		MHz	10			
PDSCH transmission mode			1			
Uplink downlink configuration			2			
Special subframe configuration			4			
Downlink power allocation	ρ_A	dB	0			
	ρ_B	dB	0			
	σ	dB	0			
Propagation condition and antenna configuration			AWGN (1 x 2)			
SNR (Note 2)		dB	0	1	6	7
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-97	-92	-91
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-98	
Maximum number of HARQ transmissions			1			
Physical channel for CQI reporting			PUSCH (Note 3)			
PUCCH Report Type			4			
Reporting periodicity		ms	$N_P = 5$			
cqi-pmi-ConfigurationIndex			3			
ACK/NACK feedback mode			Multiplexing			
Note 1: Reference measurement channel according to clause A.4-2 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level. Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.						

The normative reference for this requirement is TS 36.101 [2] clause 9.2.1.2.

9.2.1.2.4 Test description

9.2.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Table 9.2.1.2.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.2.1.2.4.3.

9.2.1.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.2.1.2.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-2) according to CQI value 8 of Annex A.4 Table A.4-3 and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Continue transmission of the PDSCH until 2000 wideband CQI reports have been gathered. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband CQI values are in the range (Median CQI - 1) ≤ Median CQI ≤ (Median CQI + 1) then continue with step 5, otherwise go to step 8.

5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-2) according to the wideband median-CQI value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK* The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses reaches 1000.

   For the filtered ACK and NACK responses if the ratio (NACK / ACK + NACK) ≤ 0.1 then go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-2) according to the wideband median-CQI+1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK*

   If the ratio (NACK /ACK + NACK) > 0.1

   then pass the UE for this test and go to step 9, otherwise go to step 8.

7. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-2) according to the wideband median-CQI-1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK*

   If the ratio (NACK /ACK + NACK) ≤ 0.1

   then pass the UE for this test and go to step 9, otherwise go to step 8.

8. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 7) for the other SNR point as appropriate. Otherwise fail the UE.

9. If both tests have not been done, then repeat the same procedure (steps 1 to 8) with test conditions according to the table 9.2.1.2.3-1 for the other Test as appropriate. Otherwise pass the UE.

9.2.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.2.1.2.4.3-1: PhysicalConfigDedicated-DEFAULT

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
}			

Table 9.2.1.2.4.3-2: CQI-ReportConfig-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	Not present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic CHOICE {			
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex	0		
cqi-pmi-ConfigIndex	3		
cqi-FormatIndicatorPeriodic CHOICE {			
widebandCQI	NULL		
}			
ri-ConfigIndex	NULL		
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

Table 9.2.1.2.4.3-3: TDD-Config-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
TDD-Config-DEFAULT ::= SEQUENCE {			
subframeAssignment	sa2		
specialSubframePatterns	ssp4		
}			

9.2.1.2.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.2.1.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

9.2.1.3

9.2.1.3_C FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for eICIC

9.2.1.3_C.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for eICIC (non-MBSFN ABS)

Editor's notes: This test case is incomplete. The following item is missing or incomplete:

- Connection diagram in Annex A of TS 36.508 is TBD

9.2.1.3_C.1.1 Test purpose

To verify the variance of the wideband CQI reports - in subframes overlapping with aggressor cell ABS and non-ABS subframes - is within the limits defined and a PDSCH BLER of 10% falls between the transport format based median CQI-1 and median CQI or the transport format based median CQI and median CQI +1.

9.2.1.3_C.1.2 Test applicability

This test applies to E-UTRA FDD UE - Category 2-8 - release 10 and forward. Applicability requires support for FGI bit 115.

9.2.1.3_C.1.3 Minimum conformance requirements

For the parameters specified in Table 9.2.1.3_C.1.3-1, and using the downlink physical channels specified in tables C.3.2-1 for Cell 1, C.3.3-1 for Cell 2 and C.3.2-2, the reported CQI value according to Table A.4-1 in subframes overlapping with aggressor cell ABS and non-ABS subframes shall be in the range of ±1 of the reported median more than 90% of the time. If the PDSCH BLER in non-ABS subframes using the transport format indicated by median CQI obtained by reports in CSI subframe sets $C_{CSI,1}$ is less than or equal to 0.1, the BLER in non-ABS subframes using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER in non-ABS subframes using the transport format indicated by the median CQI is greater than 0.1, the BLER in non-ABS subframes using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1. The value of the median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ minus the median CQI obtained by reports in CSI subframe sets $C_{CSI,1}$ shall be larger than or equal to 2 and less than or equal to 5 in Test 1 and shall be larger than or equal to 0 and less than or equal to 1 in Test 2.

Table 9.2.1.3_C.1.3-1: PUCCH 1-0 static test (FDD)

<table>
<tr><th colspan="2" rowspan="2">Parameter</th><th rowspan="2">Unit</th><th colspan="3">Test 1</th><th colspan="3">Test 2</th></tr>
<tr><th colspan="2">Cell 1</th><th>Cell 2</th><th colspan="2">Cell 1</th><th>Cell 2</th></tr>
<tr><td colspan="2">Bandwidth</td><td>MHz</td><td colspan="3">10</td><td colspan="3">10</td></tr>
<tr><td colspan="2">PDSCH transmission mode</td><td></td><td colspan="2">2</td><td>Note 10</td><td colspan="2">2</td><td>Note 10</td></tr>
<tr><td rowspan="3">Downlink power allocation</td><td>ρ_A</td><td>dB</td><td colspan="3">-3</td><td colspan="3">-3</td></tr>
<tr><td>ρ_B</td><td>dB</td><td colspan="3">-3</td><td colspan="3">-3</td></tr>
<tr><td>σ</td><td>dB</td><td colspan="3">0</td><td colspan="3">0</td></tr>
<tr><td colspan="2">Propagation condition and antenna configuration</td><td></td><td colspan="3">Clause B.1 (2x2)</td><td colspan="3">Clause B.1 (2x2)</td></tr>
<tr><td colspan="2">$\widehat{E}_s / N_{oc2}$ (Note 1)</td><td>dB</td><td>4</td><td>5</td><td>6</td><td>4</td><td>5</td><td>-12</td></tr>
<tr><td rowspan="3">$N_{oc}^{(j)}$ at antenna port</td><td>$N_{oc1}^{(j)}$</td><td>dBm/15kHz</td><td colspan="2">-102 (Note 7)</td><td>N/A</td><td colspan="2">-98(Note 7)</td><td>N/A</td></tr>
<tr><td>$N_{oc2}^{(j)}$</td><td>dBm/15kHz</td><td colspan="2">-98 (Note 8)</td><td>N/A</td><td colspan="2">-98(Note 8)</td><td>N/A</td></tr>
<tr><td>$N_{oc3}^{(j)}$</td><td>dBm/15kHz</td><td colspan="2">-94.8 (Note 9)</td><td>N/A</td><td colspan="2">-98(Note 9)</td><td>N/A</td></tr>
<tr><td colspan="2">$\hat{I}_{or}^{(j)}$</td><td>dB[mW/15kHz]</td><td>-94</td><td>-93</td><td>-92</td><td>-94</td><td>-93</td><td>-110</td></tr>
<tr><td colspan="2">Subframe Configuration</td><td></td><td colspan="2">Non-MBSFN</td><td>Non-MBSFN</td><td colspan="2">Non-MBSFN</td><td>Non-MBSFN</td></tr>
<tr><td colspan="2">Cell Id</td><td></td><td colspan="2">0</td><td>1</td><td colspan="2">0</td><td>1</td></tr>
<tr><td colspan="2">Time Offset between Cells</td><td>μs</td><td colspan="3">2.5 (synchronous cells)</td><td colspan="3">2.5 (synchronous cells)</td></tr>
<tr><td colspan="2">ABS pattern (Note 2)</td><td></td><td colspan="2">N/A</td><td>01010101
01010101
01010101
01010101
01010101</td><td colspan="2">N/A</td><td>01010101
01010101
01010101
01010101
01010101</td></tr>
<tr><td colspan="2">RLM/RRM Measurement Subframe Pattern (Note 4)</td><td></td><td colspan="2">00000100
00000100
00000100
00000100
00000100</td><td>N/A</td><td colspan="2">00000100
00000100
00000100
00000100
00000100</td><td>N/A</td></tr>
<tr><td rowspan="2">CSI Subframe Sets (Note 3)</td><td>$C_{CSI,0}$</td><td></td><td colspan="2">01010101
01010101
01010101
01010101
01010101</td><td>N/A</td><td colspan="2">01010101
01010101
01010101
01010101
01010101</td><td>N/A</td></tr>
<tr><td>$C_{CSI,1}$</td><td></td><td colspan="2">10101010
10101010
10101010
10101010
10101010</td><td>N/A</td><td colspan="2">10101010
10101010
10101010
10101010
10101010</td><td>N/A</td></tr>
<tr><td colspan="2">Number of control OFDM symbols</td><td></td><td colspan="3">3</td><td colspan="3">3</td></tr>
<tr><td colspan="2">Max number of HARQ transmissions</td><td></td><td colspan="3">1</td><td colspan="3">1</td></tr>
<tr><td colspan="2">Physical channel for $C_{CSI,0}$ CQI reporting</td><td></td><td colspan="3">PUCCH Format 2</td><td colspan="3">PUCCH Format 2</td></tr>
<tr><td colspan="2">Physical channel for $C_{CSI,1}$ CQI reporting</td><td></td><td colspan="3">PUSCH (Note 12)</td><td colspan="3">PUSCH (Note 12)</td></tr>
<tr><td colspan="2">PUCCH Report Type</td><td></td><td colspan="3">4</td><td colspan="3">4</td></tr>
<tr><td colspan="2">Reporting periodicity</td><td>Ms</td><td colspan="3">$N_{pd} = 5$</td><td colspan="3">$N_{pd} = 5$</td></tr>
<tr><td colspan="2">cqi-pmi-ConfigurationIndex $C_{CSI,0}$ (Note 13)</td><td rowspan="2"></td><td colspan="2">6</td><td>N/A</td><td colspan="2">6</td><td>N/A</td></tr>
<tr><td colspan="2">cqi-pmi-ConfigurationIndex2 $C_{CSI,1}$ (Note 14)</td><td colspan="2">5</td><td>N/A</td><td colspan="2">5</td><td>N/A</td></tr>
</table>

Note 1:	For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 2:	ABS pattern as defined in [14].
Note 3:	Time-domain measurement resource restriction pattern for PCell measurements as defined in [5]
Note 4:	As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [5]
Note 5:	Time-domain measurement resource restriction pattern for PCell measurements as defined in [5]
Note 6:	Cell 1 is the serving cell. Cell 2 is the aggressor cell.
Note 7:	This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 8:	This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 9:	This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
Note 10:	Downlink physical channel setup in Cell 2 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.1.5
Note 11:	Reference measurement channel in Cell 1 according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.
Note 12:	To avoid collisions between HARQ-ACK and wideband CQI it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.
Note 13:	*cqi-pmi-ConfigurationIndex* is applied for $C_{CSI,0.}$
Note 14:	*cqi-pmi-ConfigurationIndex2* is applied for $C_{CSI,1.}$

The normative reference for this requirement is TS 36.101 [2] clause 9.2.1.3.

9.2.1.3_C.1.4 Test description

9.2.1.3_C.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure [TBD].
2. The parameter settings for the cell are set up according to Table 9.2.1.3_C.1.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.2.1.3_C.1.4.3.

9.2.1.3_C.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.2.1.3_C.1.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-1) according to CQI value 8 of Annex A.4 Table A.4-3 and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. Continue transmission of the PDSCH until 2000 wideband CQI reports have been gathered. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are also counted as wideband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband CQI values are in the range (Median CQI - 1) ≤ Median CQI ≤ (Median CQI + 1) AND the value of the median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ minus the median CQI obtained by reports in CSI subframe sets $C_{CSI,1}$ is larger than or equal to 2 and less than or equal to 5 in Test 1 and is larger than or equal to 0 and less than or equal to 1 in Test 2, then continue with step 5, otherwise go to step 8.

5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-1) according to the wideband median-CQI value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses reaches 1000.

   For the filtered ACK and NACK responses if the ratio (NACK / ACK + NACK) ≤ 0.1 then go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-1) according to the wideband median-CQI+1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered.

   If the ratio (NACK /ACK + NACK) > 0.1

   then pass the UE for this test and go to step 9, otherwise go to step 8.

7. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-1) according to the wideband median-CQI-1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered.

   If the ratio (NACK /ACK + NACK) ≤ 0.1

   then pass the UE for this test and go to step 9, otherwise go to step 8.

8. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 7) for the other SNR point as appropriate. Otherwise fail the UE.

9. If both tests have not been done, then repeat the same procedure (steps 1 to 8) with test conditions according to the table 9.2.1.3_C.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

9.2.1.3_C.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.2.1.3_C.1.4.3-1: PhysicalConfigDedicated-DEFAULT

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
}			

Table 9.2.1.3_C.1.4.3-2: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	Not present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic CHOICE {			
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex	0		
cqi-pmi-ConfigIndex	6	(see Table 7.2.2-1A in TS 36.213)	
cqi-FormatIndicatorPeriodic CHOICE {			
widebandCQI	NULL		
}			
ri-ConfigIndex	NULL	(see Table 7.2.2-1B in TS 36.213)	
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

9.2.1.3_C.1.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.2.1.3_C.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

9.2.1.4

9.2.1.4_C TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for eICIC

9.2.1.4_C.1 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for eICIC (non-MBSFN ABS)

Editor's notes: This test case is incomplete. The following items are missing or incomplete:

- Minimum conformance requirements table needs to be confirmed or updated.

- Step 2, 5, 6, 7 of test procedure need to be confirmed.

- Table TDD-config-DEFAULT needs to be confirmed

9.2.1.4_C.1.1 Test purpose

To verify the variance of the wideband CQI reports is within the limits defined and a PDSCH BLER of 10% falls between the transport format based median CQI-1 and median CQI or the transport format based median CQI and median CQI +1.

9.2.1.4_C.1.2 Test applicability

This test applies to E-UTRA TDD UE release 10 and forward. Applicability requires support for FGI bit115.

9.2.1.4_C.1.3 Minimum conformance requirements

For the parameters specified in Table 9.2.1.4_C.1.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to Table A.4-1 shall be in the range of ±1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI +1) shall be greater than 0.1. If the

PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1

Table 9.2.1.4_C.1.3-1: PUCCHH 1-0 static test

Parameter		Unit	Test 1		Test 2	
			Cell 1	Cell 2	Cell 1	Cell 2
Bandwidth		MHz	10		10	
PDSCH transmission mode			2	Note 10	2	Note 10
Uplink downlink configuration			[1]		[1]	
Special subframe configuration			4		4	
Downlink power allocation	ρ_A	dB	-3		-3	
	ρ_B	dB	-3		-3	
Propagation condition and antenna configuration			Clause B.1 (2x2)		Clause B.1 (2x2)	
$\widehat{E}_s/N_{oc2}$ (Note 1)		dB	[4] [5]	[6]	[4] [5]	[-12]
$N_{oc}^{(j)}$ at antenna port	$N_{oc1}^{(j)}$	dBm/15kHz	-102(Note 7)	N/A	[-98](Note 7)	N/A
	$N_{oc2}^{(j)}$	dBm/15kHz	-98(Note 8)	N/A	[-98](Note 8)	N/A
	$N_{oc3}^{(j)}$	dBm/15kHz	-94.8(Note 9)	N/A	[-98](Note 9)	N/A
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	[-94] [-93]	[-92]	[-94] [-93]	TBD
Subframe Configuration			Non-MBSFN	Non-MBSFN	Non-MBSFN	Non-MBSFN
Cell Id			0	1	0	1
Time Offset between Cells		[μs]	2.5 (synchronous cells)		2.5 (synchronous cells)	
ABS pattern (Note 2)			N/A	[0100010001 0100010001]	N/A	[0100010001 0100010001]
RLM/RRM Measurement Subframe Pattern (Note 4)			[0000000001 0000000001]	N/A	[0000000001 0000000001]	N/A
CSI Subframe Sets (Note 3)	$C_{CSI,0}$		[0100010001 0100010001]	N/A	[0100010001 0100010001]	N.A
	$C_{CSI,1}$		[1000101000 1000101000]	N/A	[1000101000 1000101000]	N/A
Number of control OFDM symbols			3		3	
Max number of HARQ transmissions			1		1	
Physical channel for $C_{CSI,0}$ CQI reporting			PUCCH Format 2		PUCCH Format 2	
Physical channel for $C_{CSI,1}$ CQI reporting			PUSCH (Note 12)		PUSCH (Note 12)	
PUCCH Report Type			4		4	
Reporting periodicity		ms	[N_{pd} = 5]		[N_{pd} = 5]	
cqi-pmi-ConfigurationIndex	$C_{CSI,0}$		[3]	N/A	[3]	N/A
	$C_{CSI,1}$		[4]	N/A	[4]	N/A

ACK/NACK feedback mode		[Multiplexing]	[Multiplexing]
Note 1: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level. Note 2: ABS pattern as defined in [9]. Note 3: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7] Note 4: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7] Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7] Note 6: Cell 1 is the serving cell. Cell 2 is the aggressor cell. Note 7: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS. Note 8: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS Note 9: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS. Note 10: Downlink physical channel setup in Cell 2 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A5.2.5 Note 11: Reference measurement channel in Cell 1 according to Table A.4-2 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1. Note 12: To avoid collisions between HARQ-ACK and wideband CQI it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.			

The normative reference for this requirement is TS 36.101 [2] clause 9.2.1.4.

9.2.1.4_C.1.4 Test description

9.2.1.4._C.14.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Table 9.2.1.4_C.1.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.2.1.4_C.1.4.3.

9.2.1.4_C.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.2.1.4_C.1.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-2) according to CQI value 8 of Annex A.4 Table A.4-3 and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling

information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Continue transmission of the PDSCH until 2000 wideband CQI reports have been gathered. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband CQI values are in the range (Median CQI - 1) ≤ Median CQI ≤ (Median CQI + 1) then continue with step 5, otherwise go to step 8.

5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-2) according to the wideband median-CQI value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK* The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses reaches 1000.

   For the filtered ACK and NACK responses if the ratio (NACK / ACK + NACK) ≤ 0.1 then go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-2) according to the wideband median-CQI+1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK*

   If the ratio (NACK /ACK + NACK) > 0.1

   then pass the UE for this test and go to step 9, otherwise go to step 8.

7. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-2) according to the wideband median-CQI-1 value and shall not react to the UE's wideband CQI reports. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH, transmitted by the SS, record and filter the ACK, NACK and statDTX responses as in step 5 until 1000 filtered ACK+NACK responses are gathered. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK*

   If the ratio (NACK /ACK + NACK) ≤ 0.1

   then pass the UE for this test and go to step 9, otherwise go to step 8.

8. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 7) for the other SNR point as appropriate. Otherwise fail the UE.

9. If both tests have not been done, then repeat the same procedure (steps 1 to 8) with test conditions according to the table 9.2.1.4_C.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

9.2.1.4_C.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.2.1.4_C.1.4.3-1: PhysicalConfigDedicated-DEFAULT

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
}			

Table 9.2.1.4_C.1.4.3-2: CQI-ReportConfig-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	Not present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic CHOICE {			
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex	0		
cqi-pmi-ConfigIndex	3		
cqi-FormatIndicatorPeriodic CHOICE {			
widebandCQI	NULL		
}			
ri-ConfigIndex	NULL		
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

Table 9.2.1.4_C.1.4.3-3: TDD-Config-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
TDD-Config-DEFAULT ::= SEQUENCE {			
subframeAssignment	sa1		
specialSubframePatterns	ssp4		
}			

9.2.1.4_C.1.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.2.1.4_C.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

9.2.2 CQI Reporting under AWGN conditions - PUCCH 1-1 (Cell-Specific Reference Symbols)

9.2.2.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-1

9.2.2.1.1 Test purpose

To verify the variance of the wideband spatial differential CQI between codeword #0 and codeword #1 are within the limits defined and for both codeword #0 and codeword #1, the PDSCH BLER using the transport format indicated by the respective median CQI_0 – 1 and median CQI_1 – 1 shall be less than or equal to 0.1 and the PDSCH BLER using the transport format indicated by the respective median CQI_0 + 1 and median CQI_1 + 1 shall be greater than or equal to 0.1.

9.2.2.1.2 Test applicability

This test applies to E-UTRA FDD UE release 8 and forward of.

9.2.2.1.3 Minimum conformance requirements

The minimum requirements for dual codeword transmission are defined in terms of a reporting spread of the wideband CQI value for codeword #1, and their BLER performance using the transport format indicated by the reported CQI median of codeword #0 and codeword #1. The precoding used at the transmitter is a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The propagation condition assumed for the minimum performance requirement is defined in subclause B.1.

For the parameters specified in table 9.2.2.1.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported offset level of the wideband spatial differential CQI for codeword #1 (Table 7.2.2 in TS 36.213 [10]) shall be used to determine the wideband CQI index for codeword #1 as

$$\text{wideband } CQI_1 = \text{wideband } CQI_0 - \text{Codeword 1 offset level}$$

The wideband CQI_1 shall be within the set {median CQI_1 -1, median CQI_1 +1} for more than 90% of the time, where the resulting wideband values CQI_1 shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median CQI_0 – 1 and median CQI_1 – 1 shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median CQI_0 + 1 and median CQI_1 + 1 shall be greater than or equal to 0.1.

Table 9.2.2.1.3-1: PUCCH 1-1 static test (FDD)

Parameter		Unit	Test 1		Test 2	
Bandwidth		MHz	10			
PDSCH transmission mode			4			
Downlink power allocation	ρ_A	dB	-3			
	ρ_B	dB	-3			
	σ	dB	0			
Propagation condition and antenna configuration			Clause B.1 (2 x 2)			
CodeBookSubsetRestriction bitmap			010000			
SNR (Note 2)		dB	10	11	16	17
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-88	-87	-82	-81
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-98	
Max number of HARQ transmissions			1			
Physical channel for CQI/PMI reporting			PUCCH Format 2			
PUCCH Report Type for CQI/PMI			2			
PUCCH Report Type for RI			3			
Reporting periodicity		ms	$N_P = 5$			
cqi-pmi-ConfigurationIndex			6			
ri-ConfigIndex			1 (Note 3)			
Note 1: Reference measurement channel according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level. Note 3: It is intended to have UL collisions between RI reports and HARQ-ACK, since the RI reports shall not be used by the eNB in this test.						

The normative reference for this requirement is TS 36.101 [2] clause 9.2.2.1.

9.2.2.1.4 Test description

9.2.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 9.2.2.1.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.2.2.1.4.3.

9.2.2.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.2.2.1.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC (Table A.4-1) including two codewords with spatial multiplexing both using the transport format according to CQI value 8 of Annex A.4 Table A.4-3a and keep them regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. Continue transmission of the PDSCH until 2000 wideband and wideband spatial differential CQI reports have been gathered. In this process the SS collects wideband and wideband spatial differential CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are also counted as wideband and wideband spatial differential CQI reports respectively.
3. From each wideband CQI report, wideband CQI_0 is defined as Wideband CQI of codeword #0 and wideband CQI_1 is calculated according to clause 9.2.2.1.3. Codeword 1 offset level is selected from {0,1,2,3,-4,-3,-2,-1}. Set up a relative frequency distribution for the wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side) for each codewords. Wideband Median CQI_0 is based on the wideband CQI_0 and wideband median CQI_1 is based on the wideband CQI_1.
4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband CQI_1 values are in the range (Median CQI_1 - 1) ≤ Median CQI ≤ (Median CQI_1 + 1) then continue with step 5, otherwise go to step 7.
5. The SS shall transmit PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC (Table A.4-1) including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median- CQI_0– 1 and the transport format of codeword #1 is according to the wideband median CQI_1– 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

   If the ratio (NACK /ACK + NACK) ≤ 0.1 for both codeword #0 and codeword #1

   then and go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC (Table A.4-1) including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median-CQI_0 + 1 and the transport format of codeword #1 is according to the wideband median-CQI_1 + 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

   If the ratio (NACK /ACK + NACK) ≥ 0.1 for both codeword #0 and codeword #1

   then pass the UE for this test and go to step 8, otherwise go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.2.2.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

9.2.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.2.2.1.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
antennaInfo CHOICE {			
antennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm4		
}			
codebookSubsetRestriction CHOICE {			
n2TxAntenna-tm4	010000		
ue-TransmitAntennaSelection CHOICE {			
release	NULL		
}			
}			
}			

Table 9.2.2.1.4.3-2: *PDSCH-ConfigDedicated-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB-3		
}			

Table 9.2.2.1.4.3-3: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	Not present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic CHOICE {			
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex	0		
cqi-pmi-ConfigIndex	6	(see Table 7.2.2-1A in TS 36.213)	
cqi-FormatIndicatorPeriodic CHOICE {			
widebandCQI	NULL		
}			
ri-ConfigIndex	1	(see Table 7.2.2-1B in TS 36.213)	
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

9.2.2.1.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.2.2.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

9.2.2.1_D.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.2.2.1_D.4.2.

[TT TBD]

9.2.2.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-1

9.2.2.2.1 Test purpose

To verify the variance of the wideband spatial differential CQI between codeword #0 and codeword #1 are within the limits defined and for both codeword #0 and codeword #1, the PDSCH BLER using the transport format indicated by the respective wideband median $CQI_0 – 1$ and wideband median $CQI_1 – 1$ shall be less than or equal to 0.1 and the PDSCH BLER using the transport format indicated by the respective wideband median $CQI_0 + 1$ and wideband median $CQI_1 + 1$ shall be greater than or equal to 0.1.

9.2.2.2.2 Test applicability

This test applies to E-UTRA TDD UE release 8 and forward.

9.2.2.2.3 Minimum conformance requirements

For the parameters specified in table 9.2.2.2.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported offset level of the wideband spatial differential CQI for codeword #1 (Table 7.2.2 in TS 36.213 [10]) shall be used to determine the wideband CQI index for codeword #1 as:

$$\text{wideband } CQI_1 = \text{wideband } CQI_0 – \text{Codeword 1 offset level}$$

The wideband CQI_1 shall be within the set {median CQI_1 -1, median CQI_1 +1} for more than 90% of the time, where the resulting wideband values CQI_1 shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 – 1$ and median CQI_1 – 1 shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median CQI_0 + 1 and median CQI_1 + 1 shall be greater than or equal to 0.1.

Table 9.2.2.2.3-1: PUCCH 1-1 static test (TDD)

<table>
<tr><th colspan="2">Parameter</th><th>Unit</th><th colspan="2">Test 1</th><th colspan="2">Test 2</th></tr>
<tr><td colspan="2">Bandwidth</td><td>MHz</td><td colspan="4">10</td></tr>
<tr><td colspan="2">PDSCH transmission mode</td><td></td><td colspan="4">4</td></tr>
<tr><td colspan="2">Uplink downlink configuration</td><td></td><td colspan="4">2</td></tr>
<tr><td colspan="2">Special subframe configuration</td><td></td><td colspan="4">4</td></tr>
<tr><td rowspan="3">Downlink power allocation</td><td>ρ_A</td><td>dB</td><td colspan="4">-3</td></tr>
<tr><td>ρ_B</td><td>dB</td><td colspan="4">-3</td></tr>
<tr><td>σ</td><td>dB</td><td colspan="4">0</td></tr>
<tr><td colspan="2">Propagation condition and antenna configuration</td><td></td><td colspan="4">Clause B.1 (2 x 2)</td></tr>
<tr><td colspan="2">CodeBookSubsetRestriction bitmap</td><td></td><td colspan="4">010000</td></tr>
<tr><td colspan="2">SNR (Note 2)</td><td>dB</td><td>10</td><td>11</td><td>16</td><td>17</td></tr>
<tr><td colspan="2">$\hat{I}_{or}^{(j)}$</td><td>dB[mW/15kHz]</td><td>-88</td><td>-87</td><td>-82</td><td>-81</td></tr>
<tr><td colspan="2">$N_{oc}^{(j)}$</td><td>dB[mW/15kHz]</td><td colspan="2">-98</td><td colspan="2">-98</td></tr>
<tr><td colspan="2">Maximum number of HARQ transmissions</td><td></td><td colspan="4">1</td></tr>
<tr><td colspan="2">Physical channel for CQI/PMI reporting</td><td></td><td colspan="4">PUSCH (Note 3)</td></tr>
<tr><td colspan="2">PUCCH Report Type</td><td></td><td colspan="4">2</td></tr>
<tr><td colspan="2">Reporting periodicity</td><td>ms</td><td colspan="4">$N_P = 5$</td></tr>
<tr><td colspan="2">cqi-pmi-ConfigurationIndex</td><td></td><td colspan="4">3</td></tr>
<tr><td colspan="2">ri-ConfigIndex</td><td></td><td colspan="4">805 (Note 4)</td></tr>
<tr><td colspan="2">ACK/NACK feedback mode</td><td></td><td colspan="4">Multiplexing</td></tr>
<tr><td colspan="7">Note 1: Reference measurement channel according to Table A.4-2 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1
Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.
Note 4: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification.</td></tr>
</table>

The normative reference for this requirement is TS 36.101 [2] clause 9.2.2.2.

9.2.2.2.4 Test description

9.2.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.

2. The parameter settings for the cell are set up according to Table 9.2.2.2.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.2.2.2.4.3.

9.2.2.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.2.2.2.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC (Table A.4-2) including two codewords with spatial multiplexing both using the transport format according to CQI value 8 of Annex A.4 Table A.4-3a and keep them regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Continue transmission of the PDSCH until 2000 wideband and wideband spatial differential CQI reports have been gathered. In this process the SS collects wideband and wideband spatial differential CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband and wideband spatial differential CQI reports respectively.

3. From each wideband CQI report, wideband CQI_0 is defined as Wideband CQI of codeword #0 and wideband CQI_1 is calculated according to clause 9.2.2.2.3. Codeword 1 offset level is selected from {0,1,2,3,-4,-3,-2,-1}. Set up a relative frequency distribution for the wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side) for each codewords. Wideband Median CQI_0 is based on the wideband CQI_0 and wideband median CQI_1 is based on the wideband CQI_1.

4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband CQI_1 values are in the range (Median CQI_1 - 1) ≤ Median CQI ≤ (Median CQI_1 + 1) then continue with step 5, otherwise go to step 7.

5. The SS shall transmit PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC (Table A.4-2) including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median- CQI_0– 1 and the transport format of codeword #1 is according to the wideband median CQI_1– 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK* The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

   If the ratio (NACK /ACK + NACK) ≤ 0.1

   then, and go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC (Table A.4-2) including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median-CQI_0 + 1 and the transport format of codeword #1 is according to the wideband median-CQI_1 + 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the

associated ACK, NACK and statDTX responses for each codewords respectively. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK* The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

If the ratio (NACK /ACK + NACK) ≥ 0.1

then pass the UE for this test and go to step 8, otherwise go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.2.2.2.3-1 for the other Test as appropriate. Otherwise pass the UE.

9.2.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.2.2.2.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
antennaInfo CHOICE {			
antennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm4		
}			
codebookSubsetRestriction CHOICE {			
n2TxAntenna-tm4	010000		
ue-TransmitAntennaSelection CHOICE {			
release	NULL		
}			
}			
}			

Table 9.2.2.2.4.3-2: *PDSCH-ConfigDedicated-DEFAULT*

Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB-3		
}			

Table 9.2.2.2.4.3-3: CQI-ReportConfig-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	Not present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic CHOICE {			
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex	0		
cqi-pmi-ConfigIndex	3		
cqi-FormatIndicatorPeriodic CHOICE {			
widebandCQI	NULL		
}			
ri-ConfigIndex	805		
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

Table 9.2.2.2.4.3-4: TDD-Config-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
TDD-Config-DEFAULT ::= SEQUENCE {			
subframeAssignment	Sa2		
specialSubframePatterns	Ssp4		
}			

9.2.2.2.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.2.2.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

9.2.3 CQI Reporting under AWGN conditions - PUCCH 1-1 (CSI Reference Symbols)9.2.3.1_D FDD CQI Reporting under AWGN conditions – PUCCH 1-1 for eDL-MIMO

9.2.3.1_D.1 Test purpose

To verify the variance of the wideband spatial differential CQI between codeword #0 and codeword #1 are within the limits defined and for both codeword #0 and codeword #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 - 1$ and median $CQI_1 - 1$ shall be less than or equal to 0.1 and the PDSCH BLER using the transport format indicated by the respective median $CQI_0 + 1$ and median $CQI_1 + 1$ shall be greater than or equal to 0.1.

9.2.3.1_D.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward that support eDL-MIMO. Applicability requires support for FGI bit 103.

9.2.3.1_D.3 Minimum conformance requirements

The minimum requirements for dual codeword transmission are defined in terms of a reporting spread of the wideband CQI value for codeword #1, and their BLER performance using the transport format indicated by the reported CQI median of codeword #0 and codeword #1. The precoding used at the transmitter is a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The propagation condition assumed for the minimum performance requirement is defined in subclause B.1.

For the parameters specified in table 9.2.3.1_D.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported offset level of the wideband spatial differential CQI for codeword #1 (Table 7.2 -2 in TS 36.213 [10]) shall be used to determine the wideband CQI index for codeword #1 as:

$$\text{wideband CQI}_1 = \text{wideband CQI}_0 - \text{Codeword 1 offset level}$$

The wideband CQI_1 shall be within the set {median CQI_1 -1, median CQI_1 +1} for more than 90% of the time, where the resulting wideband values CQI_1 shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 - 1$ and median $CQI_1 - 1$ shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 + 1$ and median $CQI_1 + 1$ shall be greater than or equal to 0.1.

Table 9.2.3.1_D.3-1: PUCCH 1-1 static test (FDD)

Parameter		Unit	Test 1		Test 2	
Bandwidth		MHz	10			
PDSCH transmission mode			9			
Downlink power allocation	ρ_A	dB	0			
	ρ_B	dB	0			
	P_c	dB	-3			
	σ	dB	0			
Cell-specific reference signals			Antenna ports 0, 1			
CSI reference signals			Antenna ports 15,…,18			
Beamforming model			As specified in Annex B.4.3			
CSI-RS periodicity and subframe offset T_{CSI-RS} / Δ_{CSI-RS}			5/1			
CSI reference signal configuration			0			
Propagation condition and antenna configuration			Clause B.1 (4 x 2)			
CodeBookSubsetRestriction bitmap			0x0000 0000 0100 0000			
SNR (Note 2)		dB	7	8	13	14
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-91	-90	-85	-84
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-98	
Max number of HARQ transmissions			1			
Physical channel for CQI/PMI reporting			PUSCH (Note3)			
PUCCH Report Type for CQI/PMI			2			
Physical channel for RI reporting			PUCCH Format 2			
PUCCH Report Type for RI			3			
Reporting periodicity		ms	N_{pd} = 5			
CQI delay		ms	8			
cqi-pmi-ConfigurationIndex			2			
ri-ConfigIndex			1			
Note 1: Reference measurement channel according to Table A.4-1a with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1. Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level. Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#0 and #5.						

The normative reference for this requirement is TS 36.101 [2] clause 9.2.3.1.

9.2.3.1_D.4 Test description

9.2.3.1_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11.
2. The parameter settings for the cell are set up according to Table 9.2.3.1_D.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.2.3.1_D.4.3.

9.2.3.1_D.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration and the SNR according to Table 9.2.3.1_D.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC (Table A.4-1a) including two codewords with spatial multiplexing both using the transport format according to CQI value 8 of Annex A.4 Table A.4-3c and keep them regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4-1a). The UE will send ACK/NACK and periodic CQI report using PUSCH. Continue transmission of the PDSCH until 2000 wideband and wideband spatial differential CQI reports have been gathered. In this process the SS collects wideband and wideband spatial differential CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are also counted as wideband and wideband spatial differential CQI reports respectively.
3. From each wideband CQI report, wideband CQI_0 is defined as Wideband CQI of codeword #0 and wideband CQI_1 is calculated according to clause 9.2.2.1_D.3. Codeword 1 offset level is selected from {0,1,2,3,-4,-3,-2,-1}. Set up a relative frequency distribution for the wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side) for each codewords. Wideband Median CQI_0 is based on the wideband CQI_0 and wideband median CQI_1 is based on the wideband CQI_1.
4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband CQI_1 values are in the range (Median CQI_1 - 1) ≤ Median CQI ≤ (Median CQI_1 + 1) then continue with step 5, otherwise go to step 7.
5. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC (Table A.4-1a) including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median- CQI_0– 1 and the transport format of codeword #1 is according to the wideband median CQI_1– 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4-1a). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

   If the ratio (NACK /ACK + NACK) ≤ 0.1 for both codeword #0 and codeword #1

   then and go to step 6, otherwise go to step 7.
6. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC (Table A.4-1a) including two codewords with spatial multiplexing where the transport format of codeword #0 is according to

the wideband median-CQI_0 + 1 and the transport format of codeword #1 is according to the wideband median-CQI_1 + 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4-1a). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

If the ratio (NACK /ACK + NACK) ≥ 0.1 for both codeword #0 and codeword #1

then pass the UE for this test and go to step 8, otherwise go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.2.3.1_D.3-1 for the other Test as appropriate. Otherwise pass the UE.

9.2.3.1_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.2.3.1_D.4.3-1: PhysicalConfigDedicated-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE {			
physicalConfigDedicated	*CQI-ReportConfig-r10-DEFAULT* using condition RBC		
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.2.3.1_D.4.3-2: *PDSCH-ConfigDedicated-DEFAULT*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB0		
}			

Table 9.2.3.1_D.4.3-3: *AntennaInfoDedicated-r10*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated-r10 ::= SEQUENCE {			
transmissionMode-r10	tm9-v1020		
codebookSubsetRestriction-r10	0x0000 0000 0100 0000		
}			
ue-TransmitAntennaSelection CHOICE {			
release	NULL		
}			

Table 9.2.3.1_D.4.3-4: *CQI-ReportConfig-r10-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-r10 ::= SEQUENCE {			
cqi-ReportModeAperiodic-r10	Not Present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic-r10	CQI-ReportPeriodic-r10-DEFAULT		
}			

Table 9.2.3.1_D.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportPeriodic-r10 ::= CHOICE {			
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex-r10	0		
cqi-PUCCH-ResourceIndexP1-r10	Not present		
cqi-pmi-ConfigIndex	2	(see Table 7.2.2-1A in TS 36.213)	
cqi-FormatIndicatorPeriodic-r10 CHOICE {			
widebandCQI-r10 SEQUENCE {			
csi-ReportMode-r10	Not present		
}			
ri-ConfigIndex	1	(see Table 7.2.2-1B in TS 36.213)	
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

Table 9.2.3.1_D.4.3-6: *CSI-RS-Config*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-RS-Config-r10 ::= SEQUENCE {			
csi-RS-r10 CHOICE{			
release	NULL		
setup SEQUENCE {			
antennaPortsCount-r10	an4	Parameter represents the number of antenna ports used for transmission of CSI reference signals	
resourceConfig-r10	0	Parameter: CSI reference signal configuration	
subframeConfig-r10	1	$\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$	
p-C-r10	-3	Parameter: P_c which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback	
}			
}			
}			

9.2.3.1_D.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.2.3.1_D.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

9.2.3.2_D TDD CQI Reporting under AWGN conditions – PUCCH 1-1 for eDL-MIMO

Editor's note: SS vendors have not decided on the 8x2 antenna configuration due to test system complexity and cost

9.2.3.2_D.1 Test purpose

To verify the variance of the wideband spatial differential CQI between codeword #0 and codeword #1 are within the limits defined and for both codeword #0 and codeword #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 - 1$ and median $CQI_1 - 1$ shall be less than or equal to 0.1 and the PDSCH BLER using the transport format indicated by the respective median $CQI_0 + 1$ and median $CQI_1 + 1$ shall be greater than or equal to 0.1.

9.2.3.2_D.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward that support eDL-MIMO. Applicability requires support for FGI bit 104.

9.2.3.2_D.3 Minimum conformance requirements

The minimum requirements for dual codeword transmission are defined in terms of a reporting spread of the wideband CQI value for codeword #1, and their BLER performance using the transport format indicated by the reported CQI median of codeword #0 and codeword #1. The precoding used at the transmitter is a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The propagation condition assumed for the minimum performance requirement is defined in subclause B.1.

For the parameters specified in table 9.2.3.2_D.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported offset level of the wideband spatial differential CQI for codeword #1 (Table 7.2 -2 in TS 36.213 [10]) shall be used to determine the wideband CQI index for codeword #1 as

$$\text{wideband } CQI_1 = \text{wideband } CQI_0 - \text{Codeword 1 offset level}$$

The wideband CQI_1 shall be within the set {median CQI_1 -1, median CQI_1 +1} for more than 90% of the time, where the resulting wideband values CQI_1 shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 - 1$ and median $CQI_1 - 1$ shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median $CQI_0 + 1$ and median $CQI_1 + 1$ shall be greater than or equal to 0.1.

Table 9.2.3.2_D.3-1: PUCCH 1-1 static test (TDD)

Parameter		Unit	Test 1		Test 2	
Bandwidth		MHz	10			
PDSCH transmission mode			9			
Uplink downlink configuration			2			
Special subframe configuration			4			
Downlink power allocation	ρ_A	dB	0			
	ρ_B	dB	0			
	P_c	dB	-6			
	σ	dB	0			
CRS reference signals			Antenna ports 0, 1			
CSI reference signals			Antenna ports 15,…,22			
Beamforming model			As specified in Annex B.4.3			
CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$			5/3			
CSI reference signal configuration			0			
Propagation condition and antenna configuration			Clause B.1 (8 x 2)			
CodeBookSubsetRestriction bitmap			0x0000 0000 0020 0000 0000 0001 0000			
SNR (Note 2)		dB	4	5	10	11
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-94	-93	-88	-87
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-98	
Max number of HARQ transmissions			1			
Physical channel for CQI/PMI reporting			PUSCH (Note 3)			
PUCCH Report Type for CQI/second PMI			2b			
Physical channel for RI reporting			PUSCH			
PUCCH Report Type for RI/ first PMI			5			
Reporting periodicity		ms	$N_{pd} = 5$			
CQI delay		ms	10 or 11			
cqi-pmi-ConfigurationIndex			3			
ri-ConfigIndex			805 (Note 4)			
ACK/NACK feedback mode			Multiplexing			

Note 1: Reference measurement channel according to Table A.4-2a with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#7 and #2.

Note 4: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification.

The normative reference for this requirement is TS 36.101 [2] clause 9.2.3.2.

9.2.3.2_D.4 Test description

9.2.3.2_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure [TBD].
2. The parameter settings for the cell are set up according to Table 9.2.3.2_D.3-1.
3. Downlink signals are initially set up according to Annex C.0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.2.3.2_D.4.3.

9.2.3.2_D.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration and the SNR according to Table 9.2.3.2_D.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC (Table A.4-2a) including two codewords with spatial multiplexing both using the transport format according to CQI value 8 of Annex A.4 Table A.4-3d and keep them regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4-2a). The UE will send ACK/NACK and periodic CQI report using PUSCH. Continue transmission of the PDSCH until 2000 wideband and wideband spatial differential CQI reports have been gathered. In this process the SS collects wideband and wideband spatial differential CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband and wideband spatial differential CQI reports respectively.
3. From each wideband CQI report, wideband CQI_0 is defined as Wideband CQI of codeword #0 and wideband CQI_1 is calculated according to clause 9.2.3.2_D.3. Codeword 1 offset level is selected from {0,1,2,3,-4,-3,-2,-1}. Set up a relative frequency distribution for the wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side) for each codewords. Wideband Median CQI_0 is based on the wideband CQI_0 and wideband median CQI_1 is based on the wideband CQI_1.
4. If Median CQI is not equal to 1 or 15 and 1800 or more of the wideband CQI_1 values are in the range (Median CQI_1 - 1) ≤ Median CQI ≤ (Median CQI_1 + 1) then continue with step 5, otherwise go to step 7.
5. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC (Table A.4-2a) including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median- CQI_0– 1 and the transport format of codeword #1 is according to the wideband median CQI_1– 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4-2a). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK* The responses are then

filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

If the ratio (NACK /ACK + NACK) ≤ 0.1

then, and go to step 6, otherwise go to step 7.

6. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC (Table A.4-2a) including two codewords with spatial multiplexing where the transport format of codeword #0 is according to the wideband median-CQI_0 + 1 and the transport format of codeword #1 is according to the wideband median-CQI_1 + 1. The SS sends downlink MAC padding bits on the DL RMC. The SS shall not react to the any wideband CQI reports from UE and shall use a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4-2a). The UE will send ACK/NACK and periodic CQI report using PUSCH. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses for each codewords respectively. *In case statDTX can not be differentiated from NACK due to multiplexing effect, evaluate the feedback as a NACK.* The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses. Continue to gather data until the number of filtered ACK+NACK responses for each codewords reaches 1000.

   If the ratio (NACK /ACK + NACK) ≥ 0.1

   then pass the UE for this test and go to step 8, otherwise go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.2.3.2_D.3-1 for the other Test as appropriate. Otherwise pass the UE.

9.2.3.2_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.2.3.2_D.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE {			
physicalConfigDedicated	*CQI-ReportConfig-r10-DEFAULT* using condition RBC		
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.2.3.2_D.4.3-2: *PDSCH-ConfigDedicated-DEFAULT*

Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB0		
}			

Table 9.2.3.2_D.4.3-3: *AntennaInfoDedicated-r10*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated-r10 ::= SEQUENCE {			
transmissionMode-r10	tm9-v1020		
codebookSubsetRestriction-r10	0x0000 0000 0020 0000 0000 0001 0000		
}			
ue-TransmitAntennaSelection CHOICE {			
release	NULL		
}			

Table 9.2.3.2_D.4.3-4: *CQI-ReportConfig-r10-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-r10 ::= SEQUENCE {			
cqi-ReportModeAperiodic-r10	Not Present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic-r10	CQI-ReportPeriodic-r10-DEFAULT		
}			

Table 9.2.3.2_D.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportPeriodic-r10 ::= CHOICE {			
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex-r10	0		
cqi-PUCCH-ResourceIndexP1-r10	Not present		
cqi-pmi-ConfigIndex	3	(see Table 7.2.2-1A in TS 36.213)	
cqi-FormatIndicatorPeriodic-r10 CHOICE {			
widebandCQI-r10 SEQUENCE {			
csi-ReportMode-r10	Not present		
}			
ri-ConfigIndex	805	(see Table 7.2.2-1B in TS 36.213)	
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

Table 9.2.3.2_D.4.3-6: TDD-Config-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
TDD-Config-DEFAULT ::= SEQUENCE {			
subframeAssignment	sa2		
specialSubframePatterns	ssp4		
}			

Table 9.2.3.2_D.4.3-7: PUCCH-ConfigDedicated-DEFAULT

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
ackNackRepetition CHOICE {			
release	NULL		
}			
tddAckNackFeedbackMode	Multiplexing	Multiplexing is selected as default to align with RAN4's assumptions in RF tests.	TDD
}			

Table 9.2.3.2_D.4.3-8: *CSI-RS-Config*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-RS-Config-r10 ::= SEQUENCE {			
csi-RS-r10 CHOICE{			
release	NULL		
setup SEQUENCE {			
antennaPortsCount-r10	an8	Parameter represents the number of antenna ports used for transmission of CSI reference signals	
resourceConfig-r10	0	Parameter: CSI reference signal configuration	
subframeConfig-r10	3	$\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$	
p-C-r10	-6	Parameter: P_c which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback	
}			
}			
}			

9.2.3.2_D.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.2.3.2_D.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

9.3 CQI Reporting under fading conditions

9.3.1 Frequency-selective scheduling mode

The accuracy of sub-band channel quality indicator (CQI) reporting under frequency selective fading conditions is determined by a double-sided percentile of the reported differential CQI offset level 0 per sub-band, and the relative increase of the throughput obtained when transmitting on any one of the sub-bands with the highest reported differential CQI offset level the corresponding transport format compared to the case for which a fixed format is transmitted on any sub-band in set of TS 36.213 [10]. To account for sensitivity of the input SNR the sub-band CQI reporting under frequency selective fading conditions is considered to be verified if the reporting accuracy is met for at least one of two SNR levels separated by an offset of 1 dB.

9.3.1.1 CQI Reporting under fading conditions – PUSCH 3-0 (Cell-Specific Reference Symbols)

9.3.1.1.1 FDD CQI Reporting under fading conditions – PUSCH 3-0

9.3.1.1.1.1 Test purpose

To verify that preferred sub-bands can be used for frequently-selective scheduling.

9.3.1.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

9.3.1.1.1.3 Minimum conformance requirements

For the parameters specified in Table 9.3.1.1.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.1.1.1.3-2 and by the following

a) a sub-band differential CQI offset level of 0 shall be reported at least α% of the time but less than β% for each sub-band;

b) the ratio of the throughput obtained when transmitting a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set S shall be $\geq \gamma$;

c) when transmitting a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI. The transport block size TBS(wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the N_{PRB} entry in Table 7.1.7.2.1-1 of TS 36.213 [10] that corresponds to the sub-band size.

Table 9.3.1.1.1.3-1: Sub-band test for single antenna transmission (FDD)

Parameter		Unit	Test 1		Test 2	
Bandwidth		MHz	10 MHz			
Transmission mode			1 (port 0)			
Downlink power allocation	ρ_A	dB	0			
	ρ_B	dB	0			
	σ	dB	0			
SNR (Note 3)		dB	9	10	14	15
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-89	-88	-84	-83
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-98	
Propagation channel			Clause B.2.4 with $\tau_d = 0.45\,\mu$s, a = 1, $f_D = 5$ Hz			
Antenna configuration			1x2			
Reporting interval		ms	5			
CQI delay		ms	8			
Reporting mode			PUSCH 3-0			
Sub-band size		RB	6 (full size)			
Max number of HARQ transmissions			1			
Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4). Note 2: Reference measurement channel according to Table A.4-4 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2. Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.						

Table 9.3.1.1.1.3-2: Minimum requirement (FDD)

Parameter	Test 1	Test 2
α [%]	2	2
β [%]	55	55
γ	1.1	1.1
UE Category	1-8	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.3.1.1.1.

9.3.1.1.1.4 Test description

9.3.1.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.

2. The parameter settings for the cell are set up according to Table 9.3.1.1.1.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.1.1.1.4.3.

9.3.1.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.3.1.1.1.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-4) according to CQI value 8 of Annex A.4 Table A.4-3 and keep it regardless of the wideband and subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI reports for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission every 5 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. Check if "$2000*\alpha\%/100 \leq$ number of CQI reports with index 0 for each full-size subband $\leq 2000*\beta\%/100$". (2000= No of full-size subband reports, 100 because of %) If yes, continue with step5, otherwise goto step 7.

5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-4) according to the wideband median-CQI value in an each TTI randomly selected full-size subband regardless of UE wideband and full-size subband CQI report. Note that each full-size subband is selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-6. SS schedules the UL transmission every 5 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as t_{median}.

6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-4) according to the highest UE reported full-size subband CQI value in one full-size subband selected among the subbands in which UE reports the highest full-size subband CQI. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-6. SS schedules the UL transmission every 5 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput and (NACK /(ACK + NACK)) according to Annex G.5.3. Declare the throughput as $t_{subband}$. If the ratio ($t_{subband}$ / t_{median}) $\geq \gamma$ and (NACK /(ACK + NACK))$\geq$ 0.05 , pass the UE for this test and go to step 8. Otherwise, go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.3.1.1.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

9.3.1.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.3.1.1.1.4.3-1: PhysicalConfigDedicated-DEFAULT

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
}			

Table 9.3.1.1.1.4.3-2: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	rm30		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic	Not present		
}			
}			

9.3.1.1.1.5 Test requirement

Table 9.3.1.1.1.5-1: Test requirement (FDD)

Parameter	Test 1	Test 2
α [%]	2	2
β [%]	55	55
γ	1.09	1.09
BLER	0.05	0.05

To pass the test, α and β and γ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

9.3.1.1.2 TDD CQI Reporting under fading conditions – PUSCH 3-0

9.3.1.1.2.1 Test purpose

To verify that preferred sub-bands can be used for frequently-selective scheduling.

9.3.1.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

9.3.1.1.2.3 Minimum conformance requirements

For the parameters specified in Table 9.3.1.1.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.1.1.2.3-2 and by the following

a) a sub-band differential CQI offset level of 0 shall be reported at least α% of the time but less than β% for each sub-band;

b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set S shall be ≥ γ;

c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each available downlink transmission instance]. The transport block size TBS(wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the N_{PRB} entry in Table 7.1.7.2.1-1 of TS 36.213 [10] that corresponds to the sub-band size.

Table 9.3.1.1.2.3-1: Sub-band test for single antenna transmission (TDD)

<table>
<tr><th colspan="2">Parameter</th><th>Unit</th><th colspan="2">Test 1</th><th colspan="2">Test 2</th></tr>
<tr><td colspan="2">Bandwidth</td><td>MHz</td><td colspan="4">10 MHz</td></tr>
<tr><td colspan="2">Transmission mode</td><td></td><td colspan="4">1 (port 0)</td></tr>
<tr><td rowspan="3">Downlink power allocation</td><td>ρ_A</td><td>dB</td><td colspan="4">0</td></tr>
<tr><td>ρ_B</td><td>dB</td><td colspan="4">0</td></tr>
<tr><td>σ</td><td>dB</td><td colspan="4">0</td></tr>
<tr><td colspan="2">Uplink downlink configuration</td><td></td><td colspan="4">2</td></tr>
<tr><td colspan="2">Special subframe configuration</td><td></td><td colspan="4">4</td></tr>
<tr><td colspan="2">SNR</td><td>dB</td><td>9</td><td>10</td><td>14</td><td>15</td></tr>
<tr><td colspan="2">$N_{oc}^{(j)}$</td><td>dB[mW/15kHz]</td><td colspan="2">-98</td><td colspan="2">-98</td></tr>
<tr><td colspan="2">$\hat{I}_{or}^{(j)}$</td><td>dB[mW/15kHz]</td><td>-89</td><td>-88</td><td>-84</td><td>-83</td></tr>
<tr><td colspan="2">Propagation channel</td><td></td><td colspan="4">Clause B.2.4 with $\tau_d = 0.45\,\mu$s
a = 1, $f_D = 5$ Hz</td></tr>
<tr><td colspan="2">Antenna configuration</td><td></td><td colspan="4">1 x 2</td></tr>
<tr><td colspan="2">Reporting interval</td><td>ms</td><td colspan="4">5</td></tr>
<tr><td colspan="2">Minimum CQI delay</td><td>ms</td><td colspan="4">10 or 11</td></tr>
<tr><td colspan="2">Reporting mode</td><td></td><td colspan="4">PUSCH 3-0</td></tr>
<tr><td colspan="2">Sub-band size</td><td>RB</td><td colspan="4">6 (full size)</td></tr>
<tr><td colspan="2">Max number of HARQ transmissions</td><td></td><td colspan="4">1</td></tr>
<tr><td colspan="2">ACK/NACK feedback mode</td><td></td><td colspan="4">Multiplexing</td></tr>
<tr><td colspan="7">Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
Note 2: Reference measurement channel according to Table A.4-5 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.
Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.</td></tr>
</table>

Table 9.3.1.1.2.3-2: Minimum requirement (TDD)

Parameter	Test 1	Test 2
α [%]	2	2
β [%]	55	55
γ	1.1	1.1
UE Category	1-8	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.2.1.1.

9.3.1.1.2.4 Test description

9.3.1.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Table 9.3.1.1.2.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.1.1.2.4.3.

9.3.1.1.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.3.1.1.2.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-5) according to CQI value 8 of Annex A.4 Table A.4-3 and keep it regardless of the wideband and full-size subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI report for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.
3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.
4. For each subband, if subband CQI of index 0 is reported, at least α% but less than β% of 2000 full-size subband CQI report, then continue to step 5, otherwise, go to step 7.
5. The SS shall send PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-5) according to the wideband median-CQI value in an each available downlink transmission instance randomly selected full-size subband regardless of UE wideband and subband CQI report. Note that each full-size subband is selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-6. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3 Declare the throughput as t_{median}.
6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-5) according to the highest UE reported full-size subband CQI value in one full-size subband selected among the sub-bands in which UE report the highest full-size subband CQI. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex

A.4 Table A.4-6. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput and (NACK /(ACK + NACK)) according to Annex G.5.3. Declare the throughput as $t_{subband}$. If the ratio ($t_{subband}$ / t_{median}) ≥ γ and (NACK /(ACK + NACK))≥ 0.05, pass the UE and go to step 8. Otherwise, go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.3.1.1.2.3-1 for the other test as appropriate.

9.3.1.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.3.1.1.2.4.3-1: PhysicalConfigDedicated-DEFAULT

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
}			

Table 9.3.1.1.2.4.3-2: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	rm30		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic	Not present		
}			
}			

Table 9.3.1.1.2.4.3-3: TDD-Config-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
TDD-Config-DEFAULT ::= SEQUENCE {			
subframeAssignment	Sa2		
specialSubframePatterns	Ssp4		
}			

9.3.1.1.2.5 Test requirement

Table 9.3.1.1.2.5-1: Test requirement (TDD)

Parameter	Test 1	Test 2
α [%]	2	2
β [%]	55	55
γ	1.09	1.09
BLER	0.05	0.05

To pass the test, α and β and γ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

9.3.1.2 CQI Reporting under fading conditions – PUSCH 3-1 (CSI Reference Symbols)

9.3.1.2.1_D FDD CQI Reporting under fading conditions – PUSCH 3-1 for eDL MIMO

9.3.1.2.1_D.1 Test purpose

To verify that preferred sub-bands can be used for frequently-selective scheduling.

9.3.1.2.1_D.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward that supports eDL MIMO. Applicability requires support for FGI bit 103.

9.3.1.2.1_D.3 Minimum conformance requirements

For the parameters specified in Table 9.3.1.2.1_D.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.1.2.1_D.3-2 and by the following:

a) a sub-band differential CQI offset level of 0 shall be reported at least α% of the time but less than β% for each sub-band;

b) the ratio of the throughput obtained when transmitting a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set S shall be $\geq \gamma$;

c) when transmitting a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI. The transport block size TBS(wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and subband CQI are selected according to Table A.4-6a or Table A.4-6b.

Table 9.3.1.2.1_D.3-1: Sub-band test for FDD

Parameter		Unit	Test 1		Test 2	
Bandwidth		MHz	10 MHz			
Transmission mode			9			
Downlink power allocation	ρ_A	dB	0			
	ρ_B	dB	0			
	P_c	dB	0			
	σ	dB	0			
SNR (Note 3)		dB	4	5	11	12
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-94	-93	-87	86
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-98	
Propagation channel			Clause B.2.4 with $\tau_d = 0.45\,\mu$s, a = 1, $f_D = 5$ Hz			
Antenna configuration			2x2			
CRS reference signals			Antenna port 0			
CSI reference signals			Antenna ports 15, 16			
Beamforming model			Annex B.4.3			
CSI-RS periodicity and subframe offset T_{CSI-RS} / Δ_{CSI-RS}			5/ 1			
CSI-RS reference signal configuration			4			
CodeBookSubsetRestriction bitmap			000001			
Reporting interval (Note 4)		Ms	5			
CQI delay		Ms	8			
Reporting mode			PUSCH 3-1			
Sub-band size		RB	6 (full size)			
Max number of HARQ transmissions			1			
Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4) Note 2: Reference measurement channel according to Table A.4-4a with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2. Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level. Note 4: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#1 and #6 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#0 and #5.						

Table 9.3.1.2.1_D.3-2: Minimum requirement (FDD)

Parameter	Test 1	Test 2
α [%]	2	2
β [%]	40	40
γ	1.1	1.1
UE Category	1-8	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.3.1.2.1.

9.3.1.2.1_D.4 Test description

9.3.1.2.1_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.

2. The parameter settings for the cell are set up according to Table 9.3.1.2.1_D.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.1.2.1_D.4.3.

9.3.1.2.1_D.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.3.1.2.1_D.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC (Table A.4-4a) according to CQI value 8 of Annex A.4 Table A.4-3f and keep it regardless of the wideband and subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI reports for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #0 and subframe #5 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. Check if "$2000*\alpha\%/100 \leq$ number of CQI reports with index 0 for each full-size subband $\leq 2000*\beta\%/100$". (2000= No of full-size subband reports, 100 because of %) If yes, continue with step5, otherwise goto step 7.

5. The SS shall transmit PDSCH via PDCCH DCI format 2Cfor C_RNTI to transmit the DL RMC (Table A.4-4a) according to the wideband median-CQI value in an each TTI randomly selected full-size subband regardless of UE wideband and full-size subband CQI report. Note that each full-size subband is selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-6b. SS schedules the UL transmission in subframe #0 and subframe #5 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4.Measure the average throughput according to Annex G.5.3. Declare the throughput as t_{median}.

6. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC (Table A.4-4a) according to the highest UE reported full-size subband CQI value in one full-size subband selected among the subbands in which UE reports the highest full-size subband CQI. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-6b SS schedules the UL transmission in subframe #0 and subframe #5 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput and (NACK /(ACK + NACK)) according to Annex G.5.3. Declare the throughput as $t_{subband}$. If the ratio ($t_{subband}$ / t_{median}) $\geq \gamma$ and (NACK /(ACK + NACK))$\geq$ 0.05 , pass the UE for this test and go to step 8. Otherwise, go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.3.1.2.1_D.3-1 for the other Test as appropriate. Otherwise pass the UE.

9.3.1.2.1_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and TS 36.331clause 6.3.2 with the following exceptions:

Table 9.3.1.2.1_D.4.3-1: PhysicalConfigDedicated-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE {			
physicalConfigDedicated	*CQI-ReportConfig-r10-DEFAULT* using condition RBC		
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.3.1.2.1_D.4.3-2: *PDSCH-ConfigDedicated-DEFAULT*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB0		
}			

Table 9.3.1.2.1_D.4.3-3: *AntennaInfoDedicated-r10*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated-r10 ::= SEQUENCE {			
transmissionMode-r10	tm9-v1020		
codebookSubsetRestriction-r10	0x0000 0000 0000 0001		
}			
ue-TransmitAntennaSelection CHOICE {			
release	NULL		
}			

Table 9.3.1.2.1_D.4.3-4: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-r10 ::= SEQUENCE {			
cqi-ReportAperiodic-r10	rm31		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic-r10	Not present		
}			

Table 9.3.1.2.1_D.4.3-5: *CSI-RS-Config*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-RS-Config-r10 ::= SEQUENCE {			
csi-RS-r10 CHOICE{			
release	NULL		
setup SEQUENCE {			
antennaPortsCount-r10	an2	Parameter represents the number of antenna ports used for transmission of CSI reference signals	
resourceConfig-r10	4	Parameter: CSI reference signal configuration	
subframeConfig-r10	1	$\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$	
p-C-r10	0	Parameter: P_c which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback	
}			
}			
}			

9.3.1.2.1_D.5 Test requirement

Table 9.3.1.1.1.5-1: Test requirement (FDD)

Parameter	Test 1	Test 2
α [%]	2	2
β [%]	40	40
γ	1.09	1.09
UE Category	1-8	1-8

To pass the test, α and β and γ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

9.3.1.2.2_D TDD CQI Reporting under fading conditions – PUSCH 3-1 for eDL MIMO

9.3.1.2.2_D.1 Test purpose

To verify that preferred sub-bands can be used for frequently-selective scheduling.

9.3.1.2.2_D.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward that supports eDL MIMO. Applicability requires support for FGI bit 103.

9.3.1.2.2_D.3 Minimum conformance requirements

For the parameters specified in Table 9.3.1.2.2_D.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.1.2.2_D.3-2 and by the following:

a) a sub-band differential CQI offset level of 0 shall be reported at least α% of the time but less than β% for each sub-band;

b) the ratio of the throughput obtained when transmitting a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set S shall be ≥ γ;

c) when transmitting a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI. The transport block size TBS(wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and subband CQI are selected according to Table A.4-6a or Table A.4-6b.

Table 9.3.1.2.2_D.3-1: Sub-band test for TDD

Parameter		Unit	Test 1		Test 2	
Bandwidth		MHz	10 MHz			
Transmission mode			9			
Uplink downlink configuration			2			
Special subframe configuration			4			
Downlink power allocation	ρ_A	dB	0			
	ρ_B	dB	0			
	P_c	dB	0			
	σ	dB	0			
SNR (Note 3)		dB	4	5	11	12
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-94	-93	-87	-86
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-98	
Propagation channel			Clause B.2.4 with $\tau_d = 0.45\,\mu$s, a = 1, $f_D = 5$ Hz			
Antenna configuration			2x2			
CRS reference signals			Antenna port 0			
CSI reference signals			Antenna ports 15,16			
Beamforming model			Annex B.4.3			
CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$			5/ 3			
CSI-RS reference signal configuration			4			
CodeBookSubsetRestriction bitmap			000001			
Reporting interval (Note 4)		ms	5			
CQI delay		ms	10			
Reporting mode			PUSCH 3-1			
Sub-band size		RB	6 (full size)			
Max number of HARQ transmissions			1			
ACK/NACK feedback mode			Multiplexing			

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel according to Table A.4-5a with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3 and #8 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF#2 and #7.

Table 9.3.1.2.2_D.3-2: Minimum requirement (TDD)

Parameter	Test 1	Test 2
α [%]	2	2
β [%]	40	40
γ	1.1	1.1
UE Category	1-8	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.3.1.2.2.

9.3.1.2.2_D.4 Test description

9.3.1.2.2_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 9.3.1.2.2_D.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.1.2.2_D.4.3.

9.3.1.2.2_D.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration and the SNR according to Table 9.3.1.2.2_D.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC (Table A.4-5a) according to CQI value 10 of Annex A.4 Table A.4-3f and keep it regardless of the wideband and full-size subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI report for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.
3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.
4. For each subband, if subband CQI of index 0 is reported, at least α% but less than β% of 2000 full-size subband CQI report, then continue to step 5, otherwise, go to step 7.
5. The SS shall send PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC (Table A.4-5a) according to the wideband median-CQI value in an each available downlink transmission instance randomly selected full-size subband regardless of UE wideband and subband CQI report. Note that each full-size subband is selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC. The transport

format to be used is defined in Annex A.4 Table A.4-6b. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3 Declare the throughput as t_{median}.

6. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC (Table A.4-5a) according to the highest UE reported full-size subband CQI value in one full-size subband selected among the sub-bands in which UE report the highest full-size subband CQI. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-6b. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput and (NACK /(ACK + NACK)) according to Annex G.5.3. Declare the throughput as $t_{subband}$. If the ratio ($t_{subband}$ / t_{median}) ≥ γ and (NACK /(ACK + NACK))≥ 0.05, pass the UE and go to step 8. Otherwise, go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.3.1.2.2_D.3-1 for the other test as appropriate.

9.3.1.2.2_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 and TS 36.331clause 6.3.2 with the following exceptions:

Table 9.3.1.2.2_D.4.3-1: PhysicalConfigDedicated-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE {			
physicalConfigDedicated	*CQI-ReportConfig-r10-DEFAULT* using condition RBC		
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.3.1.2.2_D.4.3-2: *PDSCH-ConfigDedicated-DEFAULT*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB0		
}			

Table 9.3.1.2.2_D.4.3-3: *AntennaInfoDedicated-r10*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated-r10 ::= SEQUENCE {			
transmissionMode-r10	tm9-v1020		
codebookSubsetRestriction-r10	0x0000 0000 0000 0001		
}			
ue-TransmitAntennaSelection CHOICE {			
release	NULL		
}			

Table 9.3.1.2.2_D.4.3-4: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-r10 ::= SEQUENCE {			
cqi-ReportAperiodic-r10	rm31		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic-r10	Not present		
}			

Table 9.3.1.2.2_D.4.3-5: TDD-Config-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
TDD-Config-DEFAULT ::= SEQUENCE {			
subframeAssignment	sa2		
specialSubframePatterns	ssp4		
}			

Table 9.3.1.2.2_D.4.3-6: PUSCH-ConfigDedicated-DEFAULT

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
ackNackRepetition CHOICE {			
release	NULL		
}			
tddAckNackFeedbackMode	Multiplexing	Multiplexing is selected as default to align with RAN4's assumptions in RF tests.	TDD
}			

Table 9.3.1.2.2_D.4.3-7: *CSI-RS-Config*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-RS-Config-r10 ::= SEQUENCE {			
csi-RS-r10 CHOICE{			
release	NULL		
setup SEQUENCE {			
antennaPortsCount-r10	an2	Parameter represents the number of antenna ports used for transmission of CSI reference signals	
resourceConfig-r10	4	Parameter: CSI reference signal configuration	
subframeConfig-r10	3	$\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$	
p-C-r10	0	Parameter: P_c which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback	
}			
}			
}			

9.3.1.2.2_D.5 Test requirement

Table 9.3.1.1.1.5-1: Test requirement (TDD)

Parameter	Test 1	Test 2
α [%]	2	2
β [%]	40	40
γ	1.09	1.09
UE Category	1-8	1-8

To pass the test, α and β and γ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

9.3.2 Frequency non-selective scheduling mode

The reporting accuracy of the channel quality indicator (CQI) under frequency non-selective fading conditions is determined by the reporting variance, and the relative increase of the throughput obtained when the transport format transmitted is that indicated by the reported CQI compared to the case for which a fixed transport format configured according to the reported median CQI is transmitted. In addition, the reporting accuracy is determined by a minimum BLER using the transport formats indicated by the reported CQI. To account for sensitivity of the input SNR the CQI reporting under frequency non-selective fading conditions is considered to be verified if the reporting accuracy is met for at least one of two SNR levels separated by an offset of 1 dB.

9.3.2.1 CQI Reporting under fading conditions – PUCCH 1-0 (Cell-Specific Reference Symbols)

9.3.2.1.1 FDD CQI Reporting under fading conditions – PUCCH 1-0

9.3.2.1.1.1 Test purpose

To verify that the UE is tracking the channel variations and selecting the largest transport format possible according to the prevailing channel state for frequently non-selective scheduling

9.3.2.1.1.2 Test applicability

This test applies to E-UTRA FDD UE release 8 and forward of UE category ≥2.

9.3.2.1.1.3 Minimum conformance requirements

For the parameters specified in Table 9.3.2.1.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.2.1.1.3-2 and by the following

a) CQI index not in the set {median CQI -1, median CQI +1} shall be reported at least α% of the time;

b) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index and that obtained when transmitting a fixed transport format configured according to the wideband CQI median shall be ≥ γ;

c) when transmitting the transport format indicated by each reported wideband CQI index, the average BLER for the indicated transport formats shall be greater or equal to 0.02

The transport block sizes TBS for wideband CQI median and reported wideband CQI are selected according to Table A.4-3 (for Category 2-8) or Table A.4-9 (for Category 1).

Table 9.3.2.1.1.3-1 Fading test for single antenna (FDD)

Parameter		Unit	Test 1		Test 2	
Bandwidth		MHz	10 MHz			
Transmission mode			1 (port 0)			
Downlink power allocation	ρ_A	dB	0			
	ρ_B	dB	0			
	σ	dB	0			
SNR (Note 3)		dB	6	7	12	13
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-92	-91	-86	-85
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-98	
Propagation channel			EPA5			
Correlation and antenna configuration			High (1 x 2)			
Reporting mode			PUCCH 1-0			
Reporting periodicity		ms	N_P = 2			
CQI delay		ms	8			
Physical channel for CQI reporting			PUSCH (Note 4)			
PUCCH Report Type			4			
cqi-pmi-ConfigurationIndex			1			
Max number of HARQ transmissions			1			
Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4) Note 2: Reference measurement channel according to Table A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 and Table A.4-7 for Category 1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2. Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level. Note 4: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, #3, #7 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5, #7, #1 and #3.						

Table 9.3.2.1.1.3-2 Minimum requirement (FDD)

Parameter	Test 1	Test 2
α [%]	20	20
γ	1.05	1.05
UE Category	1-8	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.3.2.1.1.

9.3.2.1.1.4 Test description

9.3.2.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.

2. The parameter settings for the cell are set up according to Table 9.3.2.1.1.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2, and uplink signals according to Annex H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.2.1.1.4.3.

9.3.2.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.2.1.1.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-1) according to CQI value 8 of Annex A.4 Table A.4-3 and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #1,#3,#5 and subframe #7 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH Continue transmission of the PDSCH until 100000 wideband CQI reports have been gathered. In this process the SS collects wideband CQI reports every 2 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. If less than $(100-\alpha)/100*100000$ of the wideband CQI values are in the range (Median CQI - 1) $\leq$ Median CQI $\leq$ (Median CQI + 1) then continue with step 5, otherwise go to step 7.

5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-1) according to the wideband median-CQI value regardless of UE wideband CQI report. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #1,#3,#5 and subframe #7 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as t_{median}.

6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-1) according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #1,#3,#5 and subframe #7 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{wideband}$. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses.
   If the ratio ($t_{wideband}$ / t_{median}) $\geq \gamma$ and ratio (NACK /(ACK + NACK)) is greater or equal to 0.02, then pass the UE for this test and go to step 8. Otherwise go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, then repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.3.2.1.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

9.3.2.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.3.2.1.1.4.3-1: PhysicalConfigDedicated-DEFAULT

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
}			

Table 9.3.2.1.1.4.3-2: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	Not present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic CHOICE {			
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex	0		
cqi-pmi-ConfigIndex	1	(see Table 7.2.2-1A in TS 36.213)	
cqi-FormatIndicatorPeriodic CHOICE {			
widebandCQI	NULL		
}			
ri-ConfigIndex	NULL	(see Table 7.2.2-1B in TS 36.213)	
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

9.3.2.1.1.5 Test requirement

Table 9.3.2.1.1.5-1: Test requirement (FDD)

Parameter	Test 1	Test 2
α [%]	20	20
γ	1.04	1.04
BLER	0.02	0.02
UE category	2-8	2-8

To pass the test, α and γ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

9.3.2.1.1_1 FDD CQI Reporting under fading conditions - PUCCH 1-0 (Release 9 and forward)

9.3.2.1.1_1.1 Test purpose

Same test purpose as in clause 9.3.2.1.1.1.

9.3.2.1.1_1.2 Test applicability

This test applies to E-UTRA FDD UE release 9 and forward of UE category 1.

9.3.2.1.1_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 9.3.2.1.1.3.

9.3.2.1.1_1.4 Test description

9.3.2.1.1_1.4.1 Initial conditions

Same initial conditions as in clause 9.3.2.1.1.4.1.

9.3.2.1.1_1.4.2 Test procedure

Same test procedure as in clause 9.3.2.1.1.4.2 with the following exceptions:

- In steps 2, 5 and 6: Instead of table A.4-1-> use table A.4-7.
- In step 2: Instead of table A.4-3 -> use Table A.4-9.

9.3.2.1.1_1.4.3 Message contents

Same message contents as in clause 9.3.2.1.1.4.3.

9.3.2.1.1_1.5 Test requirement

Same test requirements as in clause 9.3.2.1.1.5 with the following exceptions:

Instead of table 9.3.2.1.1.5.1-> use table 9.3.2.1.1_1.5-1 below:

Table 9.3.2.1.1_1.5-1: Test requirement (FDD)

Parameter	Test 1	Test 2
α [%]	20	20
γ	1.04	1.04
BLER	0.02	0.02
UE category	1	1

9.3.2.1.2 TDD CQI Reporting under fading conditions – PUCCH 1-0

9.3.2.1.2.1 Test purpose

To verify that the UE is tracking the channel variations and selecting the transport format according to the prevailing channel state for frequently non-selective scheduling

9.3.2.1.2.2 Test applicability

This test applies to E-UTRA TDD UE release 8 and forward of UE category ≥2.

9.3.2.1.2.3 Minimum conformance requirements

For the parameters specified in Table 9.3.2.1.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.2.1.2.3-2 and by the following

a) a CQI index not in the set {median CQI -1, median CQI +1} shall be reported at least α % of the time;

b) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index and that obtained when transmitting a fixed transport format configured according to the wideband CQI median shall be ≥ γ;

c) when transmitting the transport format indicated by each reported wideband CQI index, the average BLER for the indicated transport formats shall be greater or equal to 0.02

The transport block sizes TBS for wideband CQI median and reported wideband CQI are selected according to Table A.4-3 (for Category 2-8) or Table A.4-9 (for Category 1).

Table 9.3.2.1.2.3-1: Fading test for single antenna (TDD)

Parameter		Unit	Test 1		Test 2	
Bandwidth		MHz	10 MHz			
Transmission mode			1 (port 0)			
Downlink power allocation	ρ_A	dB	0			
	ρ_B	dB	0			
	σ	dB	0			
Uplink downlink configuration			2			
Special subframe configuration			4			
SNR		dB	6	7	12	13
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-98	
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-92	-91	-86	-85
Propagation channel			EPA5			
Correlation and antenna configuration			High (1 x 2)			
Reporting mode			PUCCH 1-0			
Reporting periodicity		ms	$N_P = 5$			
CQI delay		ms	10 or 11			
Physical channel for CQI reporting			PUSCH (Note 4)			
PUCCH Report Type			4			
cqi-pmi-ConfigurationIndex			3			
Max number of HARQ transmissions			1			
ACK/NACK feedback mode			Multiplexing			

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel according to Table A.4-2 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 and Table A.4-8 for Category 1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.

Table 9.3.2.1.2.3-2: Minimum requirement (TDD)

Parameter	Test 1	Test 2
α [%]	20	20
γ	1.05	1.05
UE Category	1-8	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.3.2.1.2.

9.3.2.1.2.4 Test description

9.3.2.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Table 9.3.2.1.2.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2, and uplink signals according to Annex H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.2.1.2.4.3.

9.3.2.1.2.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.2.1.2.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-2) according to CQI value 8 of Annex A.4 Table A.4-3 and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH Continue transmission of the PDSCH until 100000 wideband CQI reports have been gathered. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI reports.
3. Set up a relative frequency distribution for the reported wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.
4. If less than (100-α)/100*100000 of the wideband CQI values are in the range (Median CQI - 1) $\leq$ Median CQI $\leq$ (Median CQI + 1) then continue with step 5, otherwise go to step 7.
5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-2) according to the wideband median-CQI value regardless of UE wideband CQI report. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Declare the throughput as t_{median}.
6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-2) according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Declare the throughput as $t_{wideband}$. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses.

If the ratio ($t_{wideband}$ / t_{median}) ≥ γ and ratio (NACK /(ACK + NACK)) is greater or equal to 0.02, then pass the UE and go to step 8. Otherwise go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.3.2.1.2.3-1 for the other test as appropriate.

9.3.2.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.3.2.1.2.4.3-1: PhysicalConfigDedicated-DEFAULT

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
}			

Table 9.3.2.1.2.4.3-2: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	Not present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic CHOICE {			
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex	0		
cqi-pmi-ConfigIndex	3	(see Table 7.2.2-1C in TS 36.213)	
cqi-FormatIndicatorPeriodic CHOICE {			
widebandCQI	NULL		
}			
ri-ConfigIndex	NULL	(see Table 7.2.2-1B in TS 36.213)	
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

Table 9.3.2.1.2.4.3-3: TDD-Config-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
TDD-Config-DEFAULT ::= SEQUENCE {			
subframeAssignment	Sa2		
specialSubframePatterns	Ssp4		
}			

9.3.2.1.2.5 Test requirement

Table 9.3.2.1.2.5-1: Test requirement (TDD)

Parameter	Test 1	Test 2
α [%]	20	20
γ	1.04	1.04
BLER	0.02	0.02
UE category	2-8	2-8

To pass the test, α and γ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

9.3.2.1.2_1 TDD CQI Reporting under fading conditions - PUCCH 1-0 (Release 9 and forward)

9.3.2.1.2_2.1 Test purpose

Same test purpose as in clause 9.3.2.1.2.1.

9.3.2.1.2_1.2 Test applicability

This test applies to E-UTRA TDD UE release 9 and forward of UE category 1.

9.3.2.1.2_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 9.3.2.1.2.3.

9.3.2.1.2_1.4 Test description

9.3.2.1.2_1.4.1 Initial conditions

Same initial conditions as in clause 9.3.2.1.2.4.1.

9.3.2.1.2_1.4.2 Test procedure

Same test procedure as in clause 9.3.2.1.2.4.2 with the following exceptions:

- In steps 2, 5 and 6: Instead of table A.4-2 -> use table A.4-8.
- In step 2: Instead of using table A.4-3 -> use Table A.4-9.

9.3.2.1.2_1.4.3 Message contents

Same message contents as in clause 9.3.2.1.2.4.3.

9.3.2.1.2_1.5 Test requirement

Same test requirements as in clause 9.3.2.1.2.5 with the following exceptions:

Instead of table 9.3.2.1.2.5-1 -> use table 9.3.2.1.2_1.5-1 below:

Table 9.3.2.1.2_1.5-1: Test requirement (TDD)

Parameter	Test 1	Test 2
α [%]	20	20
γ	1.04	1.04
BLER	0.02	0.02
UE category	1	1

9.3.2.2 CQI Reporting under fading conditions – PUCCH 1-1 (CSI Reference Symbols)

9.3.2.2.1_D FDD CQI Reporting under fading conditions – PUCCH 1-1 for eDL-MIMO

9.3.2.2.1_D.1 Test purpose

To verify that the UE is tracking the channel variations and selecting the largest transport format possible according to the prevailing channel state for frequently non-selective scheduling.

9.3.2.2.1_D.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward that support eDL-MIMO. Applicability requires support for FGI bit 103.

9.3.2.2.1_D.3 Minimum conformance requirements

For the parameters specified in Table 9.3.2.2.1_D.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.2.2.1_D.3-2 and by the following:

a) CQI index not in the set {median CQI -1, median CQI +1} shall be reported at least α% of the time;

b) The ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index and that obtained when transmitting a fixed transport format configured according to the wideband CQI median shall be $\geq \gamma$;

c) When transmitting the transport format indicated by each reported wideband CQI index, the average BLER for the indicated transport formats shall be greater or equal to 0.02.

The transport block sizes TBS for wideband CQI median and reported wideband CQI are selected according to Table A.4-3b or A.4-3c.

Table 9.3.2.2.1_D.3-1: Fading test for FDD

Parameter		Unit	Test 1		Test 2	
Bandwidth		MHz	10 MHz			
Transmission mode			9			
Downlink power allocation	ρ_A	dB	0			
	ρ_B	dB	0			
	P_c	dB	-3			
	σ	dB	-3			
SNR (Note 3)		dB	2	3	7	8
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-96	-95	-91	-90
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-98	
Propagation channel			EPA5			
Correlation and antenna configuration			ULA High (4 x 2)			
Cell-specific reference signals			Antenna ports 0,1			
CSI reference signals			Antenna ports 15,…,18			
Beamforming model			As specified in Annex B.4.3			
CSI-RS periodicity and subframe offset T_{CSI-RS} / Δ_{CSI-RS}			5/1			
CSI-RS reference signal configuration			2			
CodeBookSubsetRestriction bitmap			0x0000 0000 0000 0001			
Reporting mode			PUCCH 1-1			
Reporting periodicity		ms	N_{pd} = 5			
CQI delay		ms	8			
Physical channel for CQI/ PMI reporting			PUSCH (Note 4)			
PUCCH Report Type for CQI/PMI			2			
PUCCH channel for RI reporting			PUCCH Format 2			
PUCCH report type for RI			3			
cqi-pmi-ConfigurationIndex			2			
ri-ConfigIndex			1			
Max number of HARQ transmissions			1			

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 2: Reference measurement channel according to Table A.4-1a with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.
Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 4: To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#0 and #5.

Table 9.3.2.2.1_D.3-2: Minimum requirement (FDD)

	Test 1	Test 2
α [%]	20	20
γ	1.05	1.05
UE Category	1-8	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.3.2.2.1.

9.3.2.2.1_D.4 Test description

9.3.2.2.1_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11.
2. The parameter settings for the cell are set up according to Table 9.3.2.2.1_D.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2, and uplink signals according to Annex H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.2.2.1_D.4.3.

9.3.2.2.1_D.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.2.2.1_D.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC (Table A.4-1a) according to CQI value 8 of Annex A.4 Table A.4-3c and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4-1a). The UE will send ACK/NACK and periodic CQI report using PUSCH. The UE will send ACK/NACK and periodic CQI report using PUSCH. Continue transmission of the PDSCH until 2000 wideband CQI reports have been gathered. In this process the SS collects wideband CQI reports every 2 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI reports.
3. Set up a relative frequency distribution for the reported wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.
4. If less than (100-α)/100*2000 of the wideband CQI values are in the range (Median CQI - 1) ≤ Median CQI ≤ (Median CQI + 1) then continue with step 5, otherwise go to step 7.
5. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC (Table A. 4-1a) according to the wideband median-CQI value regardless of UE wideband CQI report. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4-1a). The UE will send ACK/NACK and periodic CQI report using PUSCH. The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as t_{median}.
6. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC (Table A.4-1a) according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and subframe #5 (Table A.4-1a). The UE will send ACK/NACK and periodic CQI report using PUSCH. The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{wideband}$. For any PDSCH transmitted by the SS, record the associated ACK, NACK and statDTX responses. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses.

   If the ratio ($t_{wideband}$ / t_{median}) ≥ γ and ratio (NACK /(ACK + NACK)) is greater or equal to 0.02, then pass the UE for this test and go to step 8. Otherwise go to step 7.
7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.3.2.2.1_D.3-1 for the other test as appropriate.

9.3.2.2.1_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.3.2.2.1_D.4.3-1: PhysicalConfigDedicated-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE {			
physicalConfigDedicated	*CQI-ReportConfig-r10-DEFAULT* using condition RBC		
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.3.2.2.1_D.4.3-2: *PDSCH-ConfigDedicated-DEFAULT*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB0		
}			

Table 9.3.2.2.1_D.4.3-3: *AntennaInfoDedicated-r10*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated-r10 ::= SEQUENCE {			
transmissionMode-r10	tm9-v1020		
codebookSubsetRestriction-r10	0x0000 0000 0000 0001		
}			
ue-TransmitAntennaSelection CHOICE {			
release	NULL		
}			

Table 9.3.2.2.1_D.4.3-4: *CQI-ReportConfig-r10-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-r10 ::= SEQUENCE {			
cqi-ReportModeAperiodic-r10	Not Present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic-r10	CQI-ReportPeriodic-r10-DEFAULT		
}			

Table 9.3.2.2.1_D.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportPeriodic-r10 ::= CHOICE {			
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex-r10	0		
cqi-PUCCH-ResourceIndexP1-r10	Not present		
cqi-pmi-ConfigIndex	2	(see Table 7.2.2-1A in TS 36.213)	
cqi-FormatIndicatorPeriodic-r10 CHOICE {			
widebandCQI-r10 SEQUENCE {			
csi-ReportMode-r10	Not present		
}			
ri-ConfigIndex	1	(see Table 7.2.2-1B in TS 36.213)	
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

Table 9.3.2.2.1_D.4.3-6: *CSI-RS-Config*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-RS-Config-r10 ::= SEQUENCE {			
csi-RS-r10 CHOICE{			
release	NULL		
setup SEQUENCE {			
antennaPortsCount-r10	an4	Parameter represents the number of antenna ports used for transmission of CSI reference signals	
resourceConfig-r10	2	Parameter: CSI reference signal configuration	
subframeConfig-r10	1	$\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$	
p-C-r10	-3	Parameter: P_c which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback	
}			
}			
}			

9.3.2.2.1_D.5 Test requirement

Table 9.3.2.2.1_D.3-2: Test requirement (FDD)

	Test 1	**Test 2**
α [%]	20	20
γ	1.04	1.04
UE Category	1-8	1-8

To pass the test, α and γ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

9.3.2.2.2_D TDD CQI Reporting under fading conditions – PUCCH 1-1 for eDL-MIMO

Editor's note: SS vendors have not decided on the 8x2 antenna configuration due to test system complexity and cost

9.3.2.2.2_D.1 Test purpose

To verify that the UE is tracking the channel variations and selecting the largest transport format possible according to the prevailing channel state for frequently non-selective scheduling.

9.3.2.2.2_D.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward that support eDL-MIMO. Applicability requires support for FGI bits 104 and 110.

9.3.2.2.2_D.3 Minimum conformance requirements

For the parameters specified in Table 9.3.2.2.2_D.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.2.2.2_D.3-2 and by the following:

a) CQI index not in the set {median CQI -1, median CQI +1} shall be reported at least α % of the time;

b) The ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index and that obtained when transmitting a fixed transport format configured according to the wideband CQI median shall be ≥ γ;

c) When transmitting the transport format indicated by each reported wideband CQI index, the average BLER for the indicated transport formats shall be greater or equal to 0.02.

The transport block sizes TBS for wideband CQI median and reported wideband CQI are selected according to Table A.4-3b or A.4-3d.

Table 9.3.2.2.2_D.3-1: Fading test for TDD

Parameter		Unit	Test 1		Test 2	
Bandwidth		MHz	10 MHz			
Transmission mode			9			
Uplink downlink configuration			2			
Special subframe configuration			4			
Downlink power allocation	ρ_A	dB	0			
	ρ_B	dB	0			
	P_C	dB	-6			
	σ	dB	-3			
SNR (Note 3)		dB	1	2	7	8
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-97	-96	-91	-90
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-98	
Propagation channel			EPA5			
Correlation and antenna configuration			XP High (8 x 2)			
CRS reference signals			Antenna ports 0, 1			
CSI reference signals			Antenna ports 15,…,22			
Beamforming model			As specified in Annex B.4.3			
CSI-RS periodicity and subframe offset T_{CSI-RS} / Δ_{CSI-RS}			5/ 3			
CSI-RS reference signal configuration			2			
CodeBookSubsetRestriction bitmap			0x0000 0000 0000 0020 0000 0000 0001			
Reporting mode			PUCCH 1-1 (Sub-mode: 2)			
Reporting periodicity		ms	N_{pd} = 5			
CQI delay		ms	10			
Physical channel for CQI/ PMI reporting			PUSCH (Note 4)			
PUCCH Report Type for CQI/ PMI			2c			
Physical channel for RI reporting			PUCCH Format 2			
PUCCH report type for RI			3			
cqi-pmi-ConfigurationIndex			3			
ri-ConfigIndex			805 (Note 5)			
Max number of HARQ transmissions			1			
ACK/NACK feedback mode			Multiplexing			

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel according to Table A.4-2a with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#2 and #7.

Note 5: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification and the reported CQI in subframe SF#7 of the previous frame is applied in downlink subframes until a new CQI (after CQI/PMI dropping) is available.

Table 9.3.2.2.2_D.3-2: Minimum requirement (TDD)

	Test 1	Test 2
α [%]	20	20
γ	1.05	1.05
UE Category	1-8	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.3.2.2.2.

9.3.2.2.2_D.4 Test description

9.3.2.2.2_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure [TBD].
2. The parameter settings for the cell are set up according to Table 9.3.2.2.2_D.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2, and uplink signals according to Annex H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.2.2.2_D.4.3.

9.3.2.2.2_D.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.2.2.2_D.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-2a) according to CQI value 8 of Annex A.4 Table A.4-3d and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH Continue transmission of the PDSCH until 2000 wideband CQI reports have been gathered. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI reports.
3. Set up a relative frequency distribution for the reported wideband CQI-values, reported. Calculate the median value (wideband Median CQI is the wideband CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.
4. If less than (100-α)/100*2000 of the wideband CQI values are in the range (Median CQI - 1) ≤ Median CQI ≤ (Median CQI + 1) then continue with step 5, otherwise go to step 7.
5. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC (Table A.4-2a) according to the wideband median-CQI value regardless of UE wideband CQI report. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Declare the throughput as t_{median}.
6. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC (Table A.4-2a) according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Declare the throughput as $t_{wideband}$. For any PDSCH transmitted

by the SS, record the associated ACK, NACK and statDTX responses. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses.

If the ratio ($t_{wideband}$ / t_{median}) ≥ γ and ratio (NACK /(ACK + NACK)) is greater or equal to 0.02, then pass the UE and go to step 8. Otherwise go to step 7.

7. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 6) for the other SNR point as appropriate. Otherwise fail the UE.

8. If both tests have not been done, repeat the same procedure (steps 1 to 7) with test conditions according to the table 9.3.2.2.2_D.3-1 for the other test as appropriate.

9.3.2.2.2_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.3.2.2.2_D.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE {			
physicalConfigDedicated	*CQI-ReportConfig-r10-DEFAULT* using condition RBC		
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.3.2.2.2_D.4.3-2: *PDSCH-ConfigDedicated-DEFAULT*

Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB0		
}			

Table 9.3.2.2.2_D.4.3-3: *AntennaInfoDedicated-r10*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated-r10 ::= SEQUENCE {			
transmissionMode-r10	tm9-v1020		
codebookSubsetRestriction-r10	0x0000 0000 0000 0020 0000 0000 0001		
}			
ue-TransmitAntennaSelection CHOICE {			
release	NULL		
}			

Table 9.3.2.2.2_D.4.3-4: *CQI-ReportConfig-r10-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-r10 ::= SEQUENCE {			
cqi-ReportModeAperiodic-r10	Not Present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic-r10	CQI-ReportPeriodic-r10-DEFAULT		
}			

Table 9.3.2.2.2_D.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportPeriodic-r10 ::= CHOICE {			
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex-r10	0		
cqi-PUCCH-ResourceIndexP1-r10	Not present		
cqi-pmi-ConfigIndex	3	(see Table 7.2.2-1A in TS 36.213)	
cqi-FormatIndicatorPeriodic-r10 CHOICE {			
widebandCQI-r10 SEQUENCE {			
csi-ReportMode-r10	Not present		
}			
ri-ConfigIndex	805	(see Table 7.2.2-1B in TS 36.213)	
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

Table 9.3.2.2.2_D.4.3-6: TDD-Config-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
TDD-Config-DEFAULT ::= SEQUENCE {			
subframeAssignment	sa2		
specialSubframePatterns	ssp4		
}			

Table 9.3.2.2.2_D.4.3-7: PUCCH-ConfigDedicated-DEFAULT

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
ackNackRepetition CHOICE {			
release	NULL		
}			
tddAckNackFeedbackMode	Multiplexing	Multiplexing is selected as default to align with RAN4's assumptions in RF tests.	TDD
}			

Table 9.3.2.2.2_D.4.3-8: *CSI-RS-Config*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-RS-Config-r10 ::= SEQUENCE {			
csi-RS-r10 CHOICE{			
release	NULL		
setup SEQUENCE {			
antennaPortsCount-r10	an8	Parameter represents the number of antenna ports used for transmission of CSI reference signals	
resourceConfig-r10	2	Parameter: CSI reference signal configuration	
subframeConfig-r10	3	$\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$	
p-C-r10	-6	Parameter: P_c which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback	
}			
}			
}			

9.3.2.2.2_D.5 Test requirement

Table 9.3.2.2.2_D.5-1: Test requirement (TDD)

	Test 1	**Test 2**
α [%]	20	20
γ	1.04	1.04
UE Category	1-8	1-8

To pass the test, α and γ and BLER must be fulfilled.

To pass the test, Test 1 and Test 2 must be passed.

To pass the test, one **or** the other SNR point within one test must be fulfilled.

9.3.3 Frequency-selective interference

The accuracy of sub-band channel quality indicator (CQI) reporting under frequency selective interference conditions is determined by a double-sided percentile of the reported differential CQI offset level +2 for a preferred sub-band, and the relative increase of the throughput obtained when transmitting on any one of the sub-bands with the highest reported differential CQI offset level the corresponding transport format compared to the case for which a fixed format is transmitted on any sub-band in set of TS 36.213 [10]. The purpose is to verify that preferred sub-bands are used for frequently-selective scheduling under frequency-selective interference conditions.

9.3.3.1 CQI Reporting under fading conditions and frequency-selective interference – PUSCH 3-0 (Cell-Specific Reference Symbols)

9.3.3.1.1 FDD CQI Reporting under fading conditions and frequency-selective interference – PUSCH 3-0

9.3.3.1.1.1 Test purpose

To verify that preferred sub-bands can be used for frequently-selective scheduling with frequency-selective interference situation.

9.3.3.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

9.3.3.1.1.3 Minimum conformance requirements

For the parameters specified in Table 9.3.3.1.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.3.1.1.3-2 and by the following:

a) a sub-band differential CQI offset level of +2 shall be reported at least α% for at least one of the sub-bands of full size at the channel edges;

b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set S shall be $\geq \gamma$;

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD. Sub-bands of a size smaller than full size are excluded from the test. The transport block size TBS(wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the N_{PRB} entry in Table 7.1.7.2.1-1 of TS 36.213 [10] that corresponds to the sub-band size.

Table 9.3.3.1.1.3-1 Sub-band test for single antenna transmission (FDD)

Parameter		Unit	Test 1	Test 2
Bandwidth		MHz	10 MHz	10 MHz
Transmission mode			1 (port 0)	1 (port 0)
Downlink power allocation	ρ_A	dB	0	0
	ρ_B	dB	0	0
	σ	dB	0	0
$I_{ot}^{(j)}$ for RB 0…5 Note 3		dB[mW/15kHz]	-102	-93
$I_{ot}^{(j)}$ for RB 6…41 Note 3		dB[mW/15kHz]	-93	-93
$I_{ot}^{(j)}$ for RB 42…49 Note 3		dB[mW/15kHz]	-93	-102
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-94	-94
Max number of HARQ transmissions			1	
Propagation channel			Clause B.2.4 with $\tau_d = 0.45\,\mu$s, *a* = 1, $f_D = 5$ Hz	
Reporting interval		ms	5	
Antenna configuration			1 x 2	
CQI delay		ms	8	
Reporting mode			PUSCH 3-0	
Sub-band size		RB	6 (full size)	
Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4) Note 2: Reference measurement channel according to Table A.4-4.with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2 Note 3: Iot shall be modelled as connecting Gaussian distributed uncorrelated interference source for each UE receive antenna port. The received power spectral density of the interfering signal as measured at the UE antenna connector is to be scaled accordingly for different RB groups.				

Table 9.3.3.1.1.3-2: Minimum requirement (FDD)

Parameter	Test 1	Test 2
α [%]	60	60
γ	1.6	1.6
UE Category	1-8	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.3.3.1.1.

9.3.3.1.1.4 Test description

9.3.3.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, interfering source and faders to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.21.

2. The parameter settings for the cell are set up according to Table 9.3.3.1.1.3-1.

3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.3.1.1.4.3.

9.3.3.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.3.1.1.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-4) according to CQI value 8 of Annex A.4 Table A.4-3 and keep it regardless of the wideband and subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI reports for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission every 5 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.

3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.

4. If for at least one of the full-size subbands at the channel edges, a subband differential CQI offset level of +2 is reported in α% or more of 2000 reports, then continue with step 5, otherwise fail the UE.

5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-4) on an each TTI randomly selected full-size subband using the transport format according to the wideband median-CQI value regardless of UE wideband or subband CQI report. Note that each full-size subband shall be selected in the equal probability The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-6. SS schedules the UL transmission every 5 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as t_{median}.

6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-4) according to the highest UE reported full-size subband CQI value in one full-size subband selected among the sub-bands in which UE reports the highest full-size subband CQI. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-6. SS schedules the UL transmission every 5 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{subband}$. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval.
   If $t_{subband}$ / $t_{median} \geq \gamma$, then pass the UE for this test and go to step 7. Otherwise fail the UE.

7. If both tests have not been done, then repeat the same procedure (steps 1 to 6) with test conditions according to the table 9.3.3.1.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

9.3.3.1.1.4.3 Message contents

Table 9.3.3.1.1.4.3-1: PhysicalConfigDedicated-DEFAULT

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
}			

Table 9.3.3.1.1.4.3-2: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	rm30		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic CHOICE {	Not present		
}			
}			

9.3.3.1.1.5 Test requirement

Table 9.3.3.1.1.5-1: Test requirement (FDD)

Parameter	Test 1	Test 2
α [%]	40	40
γ	1.50	1.50

9.3.3.1.2 TDD CQI Reporting under fading conditions and frequency-selective interference – PUSCH 3-0

9.3.3.1.2.1 Test purpose

To verify that preferred sub-bands can be used for frequently-selective scheduling with frequency-selective interference situation.

9.3.3.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

9.3.3.1.2.3 Minimum conformance requirements

For the parameters specified in Table 9.3.3.1.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.3.1.2.3-2 and by the following:

a) a sub-band differential CQI offset level of +2 shall be reported at least α% for at least one of the sub-bands of full size at the channel edges;

b) the ratio of the throughput obtained when transmitting on any one of the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set S shall be $\geq \gamma$;

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD. Sub-bands of a size smaller than full size are excluded from the test. The transport block size TBS(wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the N_{PRB} entry in Table 7.1.7.2.1-1 of TS 36.213 [10] that corresponds to the sub-band size.

Table 9.3.3.1.2.3-1: Sub-band test for single antenna transmission (TDD)

Parameter		Unit	Test 1	Test 2
Bandwidth		MHz	10 MHz	10 MHz
Transmission mode			1 (port 0)	1 (port 0)
Downlink power allocation	ρ_A	dB	0	0
	ρ_B	dB	0	0
	σ	dB	0	0
Uplink downlink configuration			2	
Special subframe configuration			4	
$I_{ot}^{(j)}$ for RB 0…[5] Note 3		dB[mW/15kHz]	-102	-93
$I_{ot}^{(j)}$ for RB 6…[41] Note 3		dB[mW/15kHz]	-93	-93
$I_{ot}^{(j)}$ for RB [42]…49 Note 3		dB[mW/15kHz]	-93	-102
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-94	-94
Max number of HARQ transmissions			1	
Propagation channel			Clause B.2.4 with $\tau_d = 0.45\,\mu$s, a = 1, $f_D = 5$ Hz	
Antenna configuration			1 x 2	
Reporting interval		ms	5	
CQI delay		ms	10 or 11	
Reporting mode			PUSCH 3-0	
Sub-band size		RB	6 (full size)	
ACK/NACK feedback mode			Multiplexing	

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
Note 2: Reference measurement channel according to table A.4-5 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.
Note 3: Iot shall be modelled as connecting Gaussian distributed uncorrelated interference source for each UE receive antenna port. The received power spectral density of the interfering signal as measured at the UE antenna connector is to be scaled accordingly for different RB groups.

Table 9.3.3.1.2.3-2: Minimum requirement (TDD)

Parameter	Test 1	Test 2
α [%]	60	60
γ	1.6	1.6
UE Category	1-8	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.3.3.1.2.

9.3.3.1.2.4 Test description

9.3.3.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and interfering source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.21.
2. The parameter settings for the cell are set up according to Table 9.3.3.1.2.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.3.1.2.4.3.

9.3.3.1.2.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.3.1.2.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-5) according to CQI value 8 of Annex A.4 Table A.4-3 and keep it regardless of the wideband and subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI reports for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.
3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.
4. If for at least one of the full-size subbands at the channel edges, a subband differential CQI offset level of +2 is reported in α% or more of 2000 reports, then continue with step 5, otherwise fail the UE.
5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-5) in an each available downlink transmission instance randomly selected full-size subband using the transport format according to the wideband median-CQI value regardless of UE wideband or subband CQI report. Note that each full-size subband shall be selected in the equal probability. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as t_{median}.
6. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-5) according to the highest UE reported full-size subband CQI value in one full-size subband selected among the sub-bands in which UE reports the highest full-size subband CQI. Subband differential CQI offset level is selected from {0, 1, 2, -1}. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same full-size subbands are reported subsequently as subbands with highest full-size subband CQI, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-6. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{subband}$.
   Count the number of NACKs, ACKs and statDTXs on the UL during the test interval.
   If $t_{subband}$ / $t_{median} \geq \gamma$, then pass the UE for this test and go to step 7. Otherwise fail the UE.

7. If both tests have not been done, then repeat the same procedure (steps 1 to 6) with test conditions according to the table 9.3.3.1.2.3-1 for the other Test as appropriate. Otherwise pass the UE.

9.3.3.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.3.3.1.2.4.3-1: PhysicalConfigDedicated-DEFAULT

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
}			

Table 9.3.3.1.2.4.3-2: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	rm30		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic CHOICE {	Not present		
}			
}			

Table 9.3.3.1.2.4.3-3: TDD-Config-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
TDD-Config-DEFAULT ::= SEQUENCE {			
subframeAssignment	Sa2		
specialSubframePatterns	Ssp4		
}			

9.3.3.1.2.5 Test requirement

Table 9.3.3.1.2.5-1: Test requirement (TDD)

Parameter	Test 1	Test 2
α [%]	40	40
γ	1.50	1.50

9.3.4 UE-selected subband CQI

The accuracy of UE-selected subband channel quality indicator (CQI) reporting under frequency-selective fading conditions is determined by the relative increase of the throughput obtained when transmitting on the UE-selected subbands with the corresponding transport format compared to the case for which a fixed format is transmitted on any subband in set *S* of TS 36.213 [10]. The purpose is to verify that correct subbands are accurately reported for frequency-selective scheduling. To account for sensitivity of the input SNR the subband CQI reporting under frequency-selective fading conditions is considered to be verified if the reporting accuracy is met for at least one of two SNR levels separated by an offset of 1 dB.

9.3.4.1 CQI Reporting under fading conditions – PUSCH 2-0 (Cell-Specific Reference Symbols)

9.3.4.1.1 FDD CQI Reporting under fading conditions – PUSCH 2-0

9.3.4.1.1.1 Test purpose

To verify that UE-selected sub-bands can be used for frequently-selective scheduling.

9.3.4.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward. Applicability requires support for FGI bit 1.

9.3.4.1.1.3 Minimum conformance requirements

For the parameters specified in Table 9.3.4.1.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.4.1.1.3-2 and by the following:

a) the ratio of the throughput obtained when transmitting on a randomly selected subband among the best M subbands reported by the UE the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected subband in set S shall be $\geq \gamma$;

The requirements only apply for subbands of full size and the random scheduling across the subbands is done by selecting a new subband in each TTI for FDD. The transport block size TBS (wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the N_{PRB} entry in Table 7.1.7.2.1-1 of TS 36.213 [10] that corresponds to the subband size.

Table 9.3.4.1.1.3-1: Subband test for single antenna transmission (FDD)

Parameter		Unit	Test 1		Test 2	
Bandwidth		MHz	10 MHz			
Transmission mode			1 (port 0)			
Downlink power allocation	ρ_A	dB	0			
	ρ_B	dB	0			
	σ	dB	0			
SNR (Note 3)		dB	9	10	14	15
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-89	-88	-84	-83
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-98	
Propagation channel			Clause B.2.4 with $\tau_d = 0.45\,\mu$s, $a = 1$, $f_D = 5$ Hz			
Reporting interval		ms	5			
CQI delay		ms	8			
Reporting mode			PUSCH 2-0			
Max number of HARQ transmissions			1			
Subband size (k)		RBs	3 (full size)			
Number of preferred subbands (M)			5			
Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4) Note 2: Reference measurement channel according to Table A.4-10 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2. Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.						

Table 9.3.4.1.1.3-2: Minimum requirement (FDD)

	Test 1	Test 2
γ	1.2	1.2
UE Category	1-8	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.3.4.1.1.

9.3.4.1.1.4 Test description

9.3.4.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS and faders to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Table 9.3.4.1.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.4.1.1.4.3.

9.3.4.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.4.1.1.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-10) according to CQI value 8 of Annex A.4 Table A.4-3 and keep it regardless of the wideband and subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI reports for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission every 5 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.
3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.
4. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-10) on a randomly selected full-size subband using the transport format according to the wideband median-CQI value regardless of UE wideband or subband CQI report. Note that each full-size subband shall be selected in the equal probability The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission every 5 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as t_{median}.
5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-10) in one full-size subband selected among the M subbands reported by the UE and with the corresponding TBS. Differential CQI offset level is selected from {1, 2, 3, 4}. Note that the SS shall send PDSCH in the same full-

size subband until next UE report is available. In case when same full-size subbands are reported subsequently, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission every 5 ms to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{subband}$. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval.

If $t_{subband}$ / $t_{median} \geq \gamma$, then pass the UE for this test and go to step 7. Otherwise go to step 6.

6. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 5) for the other SNR point as appropriate. Otherwise fail the UE.

7. If both tests have not been done, then repeat the same procedure (steps 1 to 5) with test conditions according to the table 9.3.4.1.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

9.3.4.1.1.4.3 Message contents

Table 9.3.4.1.1.4.3-1: PhysicalConfigDedicated-DEFAULT

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
}			

Table 9.3.4.1.1.4.3-2: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	rm20		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic CHOICE {	Not present		
}			
}			

9.3.4.1.1.5 Test requirement

Table 9.3.4.1.1.5-1: Test requirement (FDD)

	Test 1	Test 2
γ	1.19	1.19
UE Category	1-8	1-8

9.3.4.1.2 TDD CQI Reporting under fading conditions – PUSCH 2-0

9.3.4.1.2.1 Test purpose

To verify that UE-selected sub-bands can be used for frequently-selective scheduling.

9.3.4.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward. Applicability requires support for FGI bit 1.

9.3.4.1.2.3 Minimum conformance requirements

For the parameters specified in Table 9.3.4.1.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.4.1.2.3-2 and by the following:

a) the ratio of the throughput obtained when transmitting on a randomly selected subband among the best M subbands reported by the UE the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected subband in set S shall be $\geq \gamma$;

The requirements only apply for subbands of full size and the random scheduling across the subbands is done by selecting a new subband in each available downlink transmission instance for TDD. The transport block size TBS (wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the N_{PRB} entry in Table 7.1.7.2.1-1 of TS 36.213 [10] that corresponds to the subband size.

Table 9.3.4.1.2.3-1: Sub-band test for single antenna transmission (TDD)

Parameter		Unit	Test 1		Test 2	
Bandwidth		MHz	10 MHz			
Transmission mode			1 (port 0)			
Downlink power allocation	ρ_A	dB	0			
	ρ_B	dB	0			
	σ	dB	0			
Uplink downlink configuration			2			
Special subframe configuration			4			
SNR (Note 3)		dB	9	10	14	15
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-89	-88	-84	-83
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-98	
Propagation channel			Clause B.2.4 with $\tau_d = 0.45\,\mu$s, a = 1, $f_D = 5$ Hz			
Reporting interval		ms	5			
CQI delay		ms	10 or 11			
Reporting mode			PUSCH 2-0			
Max number of HARQ transmissions			1			
Subband size (k)		RBs	3 (full size)			
Number of preferred subbands (M)			5			
ACK/NACK feedback mode			Multiplexing			
Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4) Note 2: Reference measurement channel according to Table A.4-11 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2. Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.						

Table 9.3.4.1.2.3-2: Minimum requirement (TDD)

	Test 1	Test 2
γ	1.2	1.2
UE Category	1-8	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.3.4.1.2.

9.3.4.1.2.4 Test description

9.3.4.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Table 9.3.4.1.2.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.4.1.2.4.3.

9.3.4.1.2.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.4.1.2.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_ RNTI to transmit the DL RMC (Table A.4-11) according to CQI value 8 of Annex A.4 Table A.4-3 and keep it regardless of the wideband and subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI reports for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. In this process the SS collects wideband CQI reports every 5 ms and also cases where UE transmits nothing in its CQI timing are counted as wideband CQI and full-size subband CQI reports.
3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.
4. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-11) on a randomly selected full-size subband using the transport format according to the wideband median-CQI value regardless of UE wideband or subband CQI report. Note that each full-size subband shall be selected in the equal probability. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the throughput as t_{median}.
5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-11) in one full-size subband selected among the M subbands reported by the UE and with the corresponding TBS. Differential CQI offset level is selected from {1, 2, 3, 4}. Note that the SS shall send PDSCH in the same full-size until next UE report is available. In case when same full-size subbands are reported subsequently, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission in subframe #2 and subframe #7 to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the average throughput according to Annex G.5.3. Declare the

throughput as $t_{subband}$. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval. If $t_{subband}$ / $t_{median} \geq \gamma$, then pass the UE for this test and go to step 7. Otherwise go to step 6.

6. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 5) for the other SNR point as appropriate. Otherwise fail the UE.
7. If both tests have not been done, then repeat the same procedure (steps 1 to 6) with test conditions according to the table 9.3.4.1.2.3-1 for the other Test as appropriate. Otherwise pass the UE.

9.3.4.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.3.4.1.2.4.3-1: PhysicalConfigDedicated-DEFAULT

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
}			

Table 9.3.4.1.2.4.3-2: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	rm20		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic CHOICE {	Not present		
}			
}			

Table 9.3.4.1.2.4.3-3: TDD-Config-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
TDD-Config-DEFAULT ::= SEQUENCE {			
subframeAssignment	Sa2		
specialSubframePatterns	Ssp4		
}			

9.3.4.1.2.5 Test requirement

Table 9.3.4.1.2.5-1: Test requirement (TDD)

	Test 1	Test 2
γ	1.19	1.19
UE Category	1-8	1-8

9.3.4.2 CQI Reporting under fading conditions – PUCCH 2-0 (Cell-Specific Reference Symbols)

9.3.4.2.1 FDD CQI Reporting under fading conditions – PUCCH 2-0

9.3.4.2.1.1 Test purpose

To verify that UE-selected sub-bands can be used for frequently-selective scheduling.

9.3.4.2.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward. Applicability requires support for FGI bit 2.

9.3.4.2.1.3 Minimum conformance requirements

For the parameters specified in Table 9.3.4.2.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.4.2.1.3-2 and by the following

a) the ratio of the throughput obtained when transmitting on subbands reported by the UE the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected subband in set *S* shall be ≥ γ;

The requirements only apply for subbands of full size and the random scheduling across the subbands is done by selecting a new subband in each TTI for FDD. The transport block size TBS (wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the N_{PRB} entry in Table 7.1.7.2.1-1 of TS 36.213 [10] that corresponds to the subband size.

Table 9.3.4.2.1.3-1: Subband test for single antenna transmission (FDD)

Parameter		Unit	Test 1		Test 2	
Bandwidth		MHz	10 MHz			
Transmission mode			1 (port 0)			
Downlink power allocation	ρ_A	dB	0			
	ρ_B	dB	0			
	σ	dB	0			
SNR (Note 3)		dB	8	9	13	14
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-90	-89	-85	-84
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-98	
Propagation channel			Clause B.2.4 with $\tau_d = 0.45\,\mu$s, *a* = 1, $f_D = 5$ Hz			
Reporting periodicity		ms	$N_P = 2$			
CQI delay		ms	8			
Physical channel for CQI reporting			PUSCH (Note 4)			
PUCCH Report Type for wideband CQI			4			
PUCCH Report Type for subband CQI			1			
Max number of HARQ transmissions			1			
Subband size (*k*)		RBs	6 (full size)			
Number of bandwidth parts (*J*)			3			
K			1			
cqi-pmi-ConfigIndex			1			

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel according to Table A.4-4 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, #3, #7 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5, #7, #1 and #3.

Note 5: CQI reports for the short subband (having 2RBs in the last bandwidth part) are to be disregarded and data scheduling according to the most recent subband CQI report for bandwidth part with j=1.

Note 6: In the case where wideband CQI is reported, data is to be scheduled according to the most recently used subband CQI report.

Table 9.3.4.2.1.3-2: Minimum requirement (FDD)

	Test 1	Test 2
γ	1.15	1.15
UE Category	1-8	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.3.4.2.1.

9.3.4.2.1.4 Test description

9.3.4.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS and faders to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Table 9.3.4.2.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.4.2.1.4.3.

9.3.4.2.1.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.4.2.1.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-4) according to CQI value 8 of Annex A.4 Table A.4-3 and keep it regardless of the wideband and subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI reports for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #1, #3, #5 and subframe #7 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. In this process the SS collects wideband CQI reports and also cases where UE transmits nothing in its wideband CQI timing are counted as wideband CQI reports.
3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.
4. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-4) on a randomly selected full-size subband using the transport format according to the wideband median-CQI value regardless of UE wideband or subband CQI report. Note that each full-size subband shall be selected in the equal probability The SS sends downlink MAC padding bits on the DL RMC.. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #1, #3, #5 and subframe #7 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as t_{median}.
5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-4) in the full-size subband reported by the UE and with the corresponding TBS. When the UE reports a non-full-size SB, the SS schedules the recent reported SB for bandwidth part with j=1 and with the corresponding TBS. Note that the SS shall send PDSCH in the same full-size subband until next subband UE report is available. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #1, #3, #5 and subframe #7 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{subband}$. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval.

   If $t_{subband}$ / $t_{median} \geq \gamma$, then pass the UE for this test and go to step 7. Otherwise go to step 6.

6. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 5) for the other SNR point as appropriate. Otherwise fail the UE.
7. If both tests have not been done, then repeat the same procedure (steps 1 to 6) with test conditions according to the table 9.3.4.2.1.3-1 for the other Test as appropriate. Otherwise pass the UE.

9.3.4.1.1.4.3 Message contents

Table 9.3.4.2.1.4.3-1: PhysicalConfigDedicated-DEFAULT

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
}			

Table 9.3.4.2.1.4.3-2: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	Not present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic CHOICE {			
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex	0		
cqi-pmi-ConfigIndex	1	(see Table 7.2.2-1A in TS 36.213	
cqi-FormatIndicatorPeriodic CHOICE {			
subbandCQI	1		
}			
ri-ConfigIndex	483	(see Table 7.2.2-1B in TS 36.213	
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

9.3.4.2.1.5 Test requirement

Table 9.3.4.2.1.5-1: Test requirement (FDD)

	Test 1	**Test 2**
γ	1.14	1.14
UE Category	1-8	1-8

9.3.4.2.2 TDD CQI Reporting under fading conditions – PUCCH 2-0

9.3.4.2.2.1 Test purpose

To verify that UE-selected sub-bands can be used for frequently-selective scheduling.

9.3.4.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward. Applicability requires support for FGI bit 2.

9.3.4.2.2.3 Minimum conformance requirements

For the parameters specified in Table 9.3.4.2.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.4.2.2.3-2 and by the following:

a) the ratio of the throughput obtained when transmitting on subbands reported by the UE the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected subband in set S shall be $\geq \gamma$;

The requirements only apply for subbands of full size and the random scheduling across the subbands is done by selecting a new subband in each available downlink transmission instance for TDD. The transport block size TBS (wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the N_{PRB} entry in Table 7.1.7.2.1-1 of TS 36.213 [10] that corresponds to the subband size.

Table 9.3.4.2.2.3-1: Sub-band test for single antenna transmission (TDD)

Parameter		Unit	Test 1		Test 2	
Bandwidth		MHz	10 MHz			
Transmission mode			1 (port 0)			
Downlink power allocation	ρ_A	dB	0			
	ρ_B	dB	0			
	σ	dB	0			
Uplink downlink configuration			2			
Special subframe configuration			4			
SNR (Note 3)		dB	8	9	13	14
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-90	-89	-85	-84
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-98	
Propagation channel			Clause B.2.4 with $\tau_d = 0.45\,\mu$s, a = 1, $f_D = 5$ Hz			
Reporting periodicity		ms	N_P = 5			
CQI delay		ms	10 or 11			
Physical channel for CQI reporting			PUSCH (Note 4)			
PUCCH Report Type for wideband CQI			4			
PUCCH Report Type for subband CQI			1			
Max number of HARQ transmissions			1			
Subband size (*k*)		RBs	6 (full size)			
Number of bandwidth parts (*J*)			3			
K			1			
cqi-pmi-ConfigIndex			3			
ACK/NACK feedback mode			Multiplexing			

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel according to Table A.4-5 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.

Note 5: CQI reports for the short subband (having 2RBs in the last bandwidth part) are to be disregarded and data scheduling according to the most recent subband CQI report for bandwidth part with j=1.

Note 6: In the case where wideband CQI is reported, data is to be scheduled according to the most recently used subband CQI report.

Table 9.3.4.2.2.3-2: Minimum requirement (TDD)

	Test 1	Test 2
γ	1.15	1.15
UE Category	1-8	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.3.4.2.2.

9.3.4.2.2.4 Test description

9.3.4.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Table 9.3.4.2.2.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.4.2.2.4.3.

9.3.4.2.2.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.4.2.2.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-5) according to CQI value 8 of Annex A.4 Table A.4-3 and keep it regardless of the wideband and subband CQI value sent by the UE. Continue transmission of the PDSCH until 2000 wideband CQI reports and full-size subband CQI reports for each full-size subband have been gathered. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. In this process the SS collects wideband CQI reports and also cases where UE transmits nothing in its wideband CQI timing are counted as wideband CQI reports.
3. Set up a relative frequency distribution for the reported wideband CQI-values, Calculate the median value (wideband Median CQI is the CQI that is at or crosses 50% distribution from the lower wideband CQI side). This CQI-value is declared as wideband Median CQI value.
4. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-5) on a randomly selected full-size subband using the transport format according to the wideband median-CQI value regardless of UE wideband or subband CQI report. Note that each full-size subband shall be selected in the equal probability. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as t_{median}.
5. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-5) in the full-size subband reported by the UE and with the corresponding TBS. When the UE reports a non-full-size SB, the SS schedules the recent reported SB for bandwidth part with j=1 and with the corresponding TBS. Note that the SS shall send PDSCH in the same full-size subband until next subband UE report is available. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #2 and subframe #7 (Table A.4.1-2). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{subband}$. Count the number of NACKs, ACKs

and statDTXs on the UL during the test interval.

If $t_{subband}$ / $t_{median} \geq \gamma$, then pass the UE for this test and go to step 7. Otherwise go to step 6.

6. If both SNR points of the test have not been tested, then repeat the same procedure (steps 1 to 5) for the other SNR point as appropriate. Otherwise fail the UE.

7. If both tests have not been done, then repeat the same procedure (steps 1 to 6) with test conditions according to the table 9.3.4.2.2.3-1 for the other Test as appropriate. Otherwise pass the UE.

9.3.4.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.3.4.2.2.4.3-1: PhysicalConfigDedicated-DEFAULT

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
}			

Table 9.3.4.2.2.4.3-2: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	Not present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic CHOICE {			
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex	0		
cqi-pmi-ConfigIndex	3	(see Table 7.2.2-1A in TS 36.213)	
cqi-FormatIndicatorPeriodic CHOICE {			
subbandCQI	1		
}			
ri-ConfigIndex	484	(see Table 7.2.2-1B in TS 36.213)	
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

Table 9.3.4.2.2.4.3-3: TDD-Config-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
TDD-Config-DEFAULT ::= SEQUENCE {			
subframeAssignment	Sa2		
specialSubframePatterns	Ssp4		
}			

9.3.4.2.2.5 Test requirement

Table 9.3.4.2.2.5-1: Test requirement (TDD)

	Test 1	**Test 2**
γ	1.14	1.14
UE Category	1-8	1-8

9.3.5 Additional requirements for enhanced receiver Type A

9.3.5.1 PUCCH 1-0 (Cell-Specific Reference Symbol)

9.3.5.1.1 FDD CQI Reporting under fading conditions - PUCCH 1-0 - Enhanced Performance Requirement Type A

Editor's notes: This test case is incomplete. The following items are missing or are incomplete:

- Connection diagram in Annex A of TS 36.508 is TBD

- Test tolerances are undefined

- Corresponding test case needs to be added into TS 36.521-2.

9.3.5.1.1.1 Test purpose

The purpose of the test is to verify that the reporting of the channel quality is based on the receiver of the enhanced Type A. Performance requirements are specified in terms of the relative increase of the throughput obtained when the transport format is that indicated by the reported CQI subject to an interference model compared to the case with a white Gaussian noise model, and a requirement on the minimum BLER of the transmitted transport formats indicated by the reported CQI subject to an interference model.

9.3.5.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 11 and forward that support enhanced receiver Type A.

9.3.5.1.1.3 Minimum conformance requirements

For the parameters specified in Table 9.3.5.1.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.5.1.1.3-2 and by the following

a) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP and that obtained when transmitting the transport format indicated by each reported wideband CQI index subject to a white Gaussian noise source shall be $\geq \gamma$;

b) when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP, the average BLER for the indicated transport formats shall be greater than or equal to 2%.

The transport block sizes indicated by the reported wideband CQI are selected according to Table A.4-3 (for Category 2-8) or Table A.4-9 (for Category 1).

Table 9.3.5.1.1.3-1 Fading test for single antenna (FDD)

Parameter	Unit	Cell 1	Cell 2
Bandwidth	MHz	10 MHz	
Transmission mode		1 (port 0)	
Cyclic Prefix		Normal	Normal
Cell ID		0	1
SINR (Note 8)	dB	-2	N/A
$N_{oc}^{(j)}$	dB[mW/15kHz]	-98	N/A
Propagation channel		EPA5	Static (Note 7)
Correlation and antenna configuration		Low (1 x 2)	(1 x 2)
DIP (Note 4)	dB	N/A	-0.41
Reference measurement channel		Note 2	R.2 FDD
Reporting mode		PUCCH 1-0	N/A
Reporting periodicity	ms	$N_{pd} = 2$	N/A
CQI delay	ms	8	N/A
Physical channel for CQI reporting		PUSCH (Note 3)	N/A
PUCCH Report Type		4	N/A
cqi-pmi-ConfigurationIndex		1	N/A
Max number of HARQ transmissions		1	N/A

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel according to Table A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 and Table A.4-7 for Category 1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.

Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, #3, #7 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5, #7, #1 and #3.

Note 4: The respective received power spectral density of each interfering cell relative to N_{oc}' is defined by its associated DIP value as specified in clause B.5.1.

Note 5: Two cells are considered in which Cell 1 is the serving cell and Cell 2 is the interfering cell. The number of the CRS ports in both cells is the same. Interfering cell is fully loaded.

Note 6: Both cells are time-synchronous.

Note 7: Static channel is used for the interference model. In case for white Gaussian noise model Cell 2 is not present.

Note 8: SINR corresponds to $\hat{E}_s / N_{oc}'$ of Cell 1 as defined in clause 8.1.1.

Table 9.3.5.1.1.3-2 Minimum requirement (FDD)

γ	1.8
UE Category	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.3.5.1.1.

9.3.5.1.1.4 Test description

9.3.5.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS and faders to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure TBD.
2. The parameter settings for the cell 1 are set up according to Table 9.3.5.1.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.3.5.1.1.4.3.

9.3.5.1.1.4.2 Test procedure

1. Set the cell 1 and 2 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.5.1.1.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-1) according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #1,#3,#5 and subframe #7 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{wideband\_interference}}$. The responses are then filtered as follows: for the sequence of responses for each HARQ process, discard all the statDTX responses.
3. Deactivate i.e., stop transmitting anything from the cell 2 and set the cell 1 parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.3.5.1.1.3-1 as appropriate.
4. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-1) according to the wideband CQI value reported from UE. The SS sends downlink MAC padding bits on the DL RMC. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #1,#3,#5 and subframe #7 (Table A.4.1-1). The UE will send ACK/NACK and periodic CQI report using PUSCH. Measure the average throughput according to Annex G.5.3. Declare the throughput as $t_{\text{wideband\_gaussian\_noise}}$.
5. If the ratio ($t_{\text{wideband\_interference}}$ / $t_{\text{wideband\_gaussian\_noise}}$) $\geq \gamma$ and ratio (NACK /(ACK + NACK)) calculated in step 2 is greater or equal to 0.02, then pass the UE for this test. Otherwise fail the UE.

9.3.5.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.3.5.1.1.4.3-1: PhysicalConfigDedicated-DEFAULT

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
}			

Table 9.3.5.1.1.4.3-2: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	Not present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic CHOICE {			
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex	0		
cqi-pmi-ConfigIndex	1	(see Table 7.2.2-1A in TS 36.213)	
cqi-FormatIndicatorPeriodic CHOICE {			
widebandCQI	NULL		
}			
ri-ConfigIndex	NULL	(see Table 7.2.2-1B in TS 36.213)	
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

9.3.5.1.1.5 Test requirement

Table 9.3.5.1.1.5-1 Minimum requirement (FDD)

γ	1.8 + TT
UE Category	1-8

9.4 Reporting of Precoding Matrix Indicator (PMI)

The minimum performance requirements of PMI reporting are defined based on the precoding gain, expressed as the relative increase in throughput when the transmitter is configured according to the UE reports compared to the case when the transmitter is using random precoding. When the transmitter uses random precoding, for each PDSCH allocation a precoder is randomly generated and applied to the PDSCH. A fixed transport format (FRC) configured.

The requirements for transmission mode 6 and transmission mode 9 with 4 TX are specified in terms of the ratio

$$\gamma = \frac{t_{ue}}{t_{rnd}}$$

In the definition of γ, for PUSCH 3-1 single PMI and PUSCH 1-2 multiple PMI requirements, t_{rnd} is 60% of the maximum throughput obtained at SNR_{rnd} using random precoding, and t_{ue} the throughput measured at SNR_{rnd} with precoders configured according to the UE reports.

For the PUCCH 2-1 single PMI requirement, t_{rnd} is 60% of the maximum throughput obtained at SNR_{rnd} using random precoding on a randomly selected full-size subband in set S subbands, and t_{ue} the throughput measured at SNR_{rnd} with both the precoder and the preferred full-size subband applied according to the UE reports;

For PUSCH 2-2 multiple PMI requirements, t_{rnd} is 60% of the maximum throughput obtained at SNR_{rnd} using random precoding on a randomly selected full-size subband in set S subbands, and t_{ue} the throughput measured at SNR_{rnd} with both the subband precoder and a randomly selected full-size subband (within the preferred subbands) applied according to the UE reports.

The requirements for transmission mode 9 with 8 TX are specified in terms of the ratio

$$\gamma = \frac{t_{ue,\, follow1,\, follow2}}{t_{rnd1,\, rnd2}}$$

In the definition of γ, for PUSCH 3-1 single PMI and PUSCH 1-2 multiple PMI requirements, $t_{follow1,\, follow2}$ is 70% of the maximum throughput obtained at $SNR_{follow1,\, follow2}$ using the precoders configured according to the UE reports, and $t_{rnd1,\, rnd2}$ is the throughput measured at $SNR_{follow1,\, follow2}$ with random precoding .

9.4.1 Single PMI

9.4.1.1 PMI Reporting – PUSCH 3-1 (Single PMI) (Cell-Specific Reference Symbols)

9.4.1.1.1 FDD PMI Reporting – PUSCH 3-1 (Single PMI)

9.4.1.1.1.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

9.4.1.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

9.4.1.1.1.3 Minimum conformance requirements

For the parameters specified in Table 9.4.1.1.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.4.1.1.1.3-2.

Table 9.4.1.1.1.3-1: PMI test for single-layer (FDD)

Parameter		Unit	Test 1
Bandwidth		MHz	10
Transmission mode			6
Propagation channel			EVA5
Precoding granularity		PRB	50
Correlation and antenna configuration			Low 2 x 2
Downlink power allocation	ρ_A	dB	-3
	ρ_B	dB	-3
	σ	dB	0
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98
Reporting mode			PUSCH 3-1
Reporting interval		ms	1
PMI delay (Note 2)		ms	8
Measurement channel			R.10 FDD
OCNG Pattern			OP.1 FDD
Max number of HARQ transmissions			4
Redundancy version coding sequence			{0,1,2,3}
Note 1: For random precoder selection, the precoder shall be updated in each TTI (1 ms granularity) Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).			

Table 9.4.1.1.1.3-2: Minimum requirement (FDD)

Parameter	Test 1
γ	1.1
UE Category	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.4.1.1.1.

9.4.1.1.1.4 Test description

9.4.1.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 9.4.1.1.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.1.1.1.4.3.

9.4.1.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.4.1.1.1.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC with randomly selected precoding matrix from codebook (Table 6.3.4.2.3-1 in TS 36.211 [8]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. The SS sends downlink MAC padding bits on the DL RMC.SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish t_{rnd} and SNR_{rnd} according to annex G.5.2
3. Set SNR to SNR_{rnd}. The SS shall transmit PDSCH with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4 every subframe. Measure t_{ue} according to Annex G.5.3
4. Calculate $\gamma = \frac{t_{ue}}{t_{rnd}}$ If the ratio (throughput / t_{rnd}) ≥ γ which is specified in table 9.4.1.1.1.5-1, then the test is pass. Otherwise, the test is fail.

9.4.1.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.4.1.1.1.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.4.1.1.1.4.3-2: *AntennaInfoDedicated*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm6		
codebookSubsetRestriction CHOICE{			
n2TxAntenna-tm6	1111		
}			
ue-TransmitAntennaSelection CHOICE{			
release	NULL		
}			

Table 9.4.1.1.1.4.3-3: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	rm31		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic	Not present		
}			

9.4.1.1.1.5 Test requirement

Table 9.4.1.1.1.5-1: Test requirement (FDD)

Parameter	Test 1
γ	1.09

The ratio of throughput using precoding matrix of PMI reports from the UE to using random precoding matrix shall equal or exceed the value specified in table 9.4.1.1.1.5.

9.4.1.1.2 TDD PMI Reporting – PUSCH 3-1 (Single PMI)

9.4.1.1.2.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

9.4.1.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

9.4.1.1.2.3 Minimum conformance requirements

For the parameters specified in Table 9.4.1.1.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in 9.4.1.1.2.3-2.

Table 9.4.1.1.2.3-1: PMI test for single-layer (TDD)

Parameter		Unit	Test 1
Bandwidth		MHz	10
Transmission mode			6
Uplink downlink configuration			1
Special subframe configuration			4
Propagation channel			EVA5
Precoding granularity		PRB	50
Correlation and antenna configuration			Low 2 x 2
Downlink power allocation	ρ_A	dB	-3
	ρ_B	dB	-3
	σ	dB	0
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98
Reporting mode			PUSCH 3-1
Reporting interval		ms	1
Minimum PMIdelay (Node-2)		ms	10 or 11
Measurement channel			R.10 TDD
OCNG Pattern			OP.1 TDD
Max number of HARQ transmissions			4
Redundancy version coding sequence			{0,1,2,3}
ACK/NACK feedback mode			Multiplexing
Note 1: For random precoder selection, the precoder shall be updated in each available downlink transmission instance Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)			

Table 9.4.1.1.2.3-2: Minimum requirement (TDD)

Parameter	Test 1
γ	1.1
UE Category	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.4.1.1.2.

9.4.1.1.2.4 Test description

9.4.1.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 9.4.1.1.2.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2.Message contents are defined in clause 9.4.1.1.2.4.3.

9.4.1.1.2.4.2 Test procedure

1. Set the bandwidth, propagation condition, antenna configuration and measurement channel parameters according to Table 9.4.1.1.2.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC with randomly selected precoding matrix from codebook (Table 6.3.4.2.3-1 in TS 36.211 [8]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish t_{rnd} and SNR_{rnd} according to annex G.5.2.
3. Set SNR to SNR_{rnd}. The SS shall transmit PDSCH with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure t_{ue} according to Annex G.5.3
4. Calculate $\gamma = \frac{t_{ue}}{t_{rnd}}$

9.4.1.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.4.1.1.2.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.4.1.1.2.4.3-2: *AntennaInfoDedicated*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm6		
codebookSubsetRestriction CHOICE{			
n2TxAntenna-tm6	1111		
}			
ue-TransmitAntennaSelection CHOICE{			
release	NULL		
}			

Table 9.4.1.1.2.4.3-3: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	rm31		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic	Not present		
}			

9.4.1.1.2.5 Test requirement

Table 9.4.1.1.2.5-1: Test requirement (TDD)

Parameter	Test 1
γ	1.09

9.4.1.2 PMI Reporting – PUCCH 2-1 (Single PMI) (Cell-Specific Reference Symbols)

9.4.1.2.1 FDD PMI Reporting – PUCCH 2-1 (Single PMI)

9.4.1.2.1.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

9.4.1.2.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward. Applicability requires support for FGI bit 2.

9.4.1.2.1.3 Minimum conformance requirements

For the parameters specified in Table 9.4.1.2.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.4.1.2.1.3-2.

Table 9.4.1.2.1.3-1: PMI test for single-layer (FDD)

Parameter		Unit	Test 1
Bandwidth		MHz	10
Transmission mode			6
Propagation channel			EVA5
Correlation and antenna configuration			Low 4 x 2
Downlink power allocation	ρ_A	dB	-6
	ρ_B	dB	-6
	σ	dB	3
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98
PMI delay		ms	8 or 9
Reporting mode			PUCCH 2-1 (Note 6)
Reporting periodicity		ms	$N_P = 2$
Physical channel for CQI reporting			PUSCH (Note 3)
PUCCH Report Type for wideband CQI/PMI			2
PUCCH Report Type for subband CQI			1
Measurement channel			R.14-1 FDD
OCNG Pattern			OP.1/2 FDD
Precoding granularity		PRB	6 (full size)
Number of bandwidth parts (*J*)			3
K			1
cqi-pmi-ConfigIndex			1
Max number of HARQ transmissions			4
Redundancy version coding sequence			{0,1,2,3}

Note 1: For random precoder selection, the precoder shall be updated every two TTI (2 ms granularity)
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 3: To avoid collisions between HARQ-ACK and wideband CQI/PMI or subband CQI, it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, #3, #7 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5, #7, #1 and #3.
Note 4: Reports for the short subband (having 2RBs in the last bandwidth part) are to be disregarded and instead data is to be transmitted on the most recently used subband for bandwidth part with j=1.
Note 5: In the case where wideband PMI is reported, data is to be transmitted on the most recently used subband.
Note 6: The bit field for PMI confirmation in DCI format 1B shall be mapped to "0" and TPMI information shall indicate the codebook index used in Table 6.3.4.2.3-2 of TS36.211 [4] according to the latest PMI report on PUCCH.

Table 9.4.1.2.1.3-2: Minimum requirement (FDD)

	Test 1
γ	1.2
UE Category	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.4.1.2.1.

9.4.1.2.1.4 Test description

9.4.1.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11.
2. The parameter settings for the cell are set up according to Table 9.4.1.2.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.1.2.1.4.3.

9.4.1.2.1.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.4.1.2.1.3-1 as appropriate.
2. The SS shall transmit every subframe PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC (R.14-1 FDD) on a randomly selected full-size subband with a randomly selected precoding matrix from the codebook (Table 6.3.4.2.3-2 in TS 36.211 [8]), regardless of the SB and PMI reports from the UE. Note that each full-size subband and each precoding matrix shall be selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC. The SS shall transmit PDCCH DCI format 0 in downlink SF#1, #3, #7 and #9 to schedule UL transmission in uplink subframes #5, #7, #1 and #3 (Table A.4.1-1). The UE will send ACK/NACK and periodic CSI reports using PUSCH.
   Establish t_{rnd} and SNR_{rnd} according to annex G.5.2.
3. Set SNR to SNR_{rnd}. The SS shall transmit every subframe PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC (R.14-1 FDD) on the full-size subband and with the latest precoding matrix reported by the UE. When the UE reports a non-full-size subband, the SS schedules the recent reported subband for bandwidth part with j=1 with the latest reported precoding matrix. Note that the SS shall send PDSCH in the same full-size subband and with the latest reported precoding matrix until next UE subband report is available. The SS sends downlink MAC padding bits on the DL RMC.
   The SS shall transmit PDCCH DCI format 0 in downlink SF#1, #3, #7 and #9 to schedule UL transmission in uplink subframes #5, #7, #1 and #3 (Table A.4.1-1). The UE will send ACK/NACK and periodic CSI reports using PUSCH. Measure t_{ue} according to Annex G.5.3.
4. Calculate $\gamma = \dfrac{t_{ue}}{t_{rnd}}$ If the ratio (throughput / t_{rnd}) ≥ γ which is specified in table 9.4.1.2.2.5-1, then the test is pass. Otherwise, the test is fail.

9.4.1.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.4.1.2.1.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.4.1.2.1.4.3-2: *AntennaInfoDedicated*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm6		
codebookSubsetRestriction CHOICE{			
n4TxAntenna-tm6	1111111111111111		
}			
ue-TransmitAntennaSelection CHOICE{			
release	NULL		
}			
}			

Table 9.4.1.2.1.4.3-3: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	Not present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic CHOICE {			
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex	0		
cqi-pmi-ConfigIndex	1	(see Table 7.2.2-1A in TS 36.213)	
cqi-FormatIndicatorPeriodic CHOICE {			
subbandCQI	1		
}			
ri-ConfigIndex	483	(see Table 7.2.2-1B in TS 36.213)	
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

9.4.1.2.1.5 Test requirement

Table 9.4.1.2.1.5-1: Test requirement (FDD)

	Test 1
γ	1.19
UE Category	1-8

The ratio of throughput using precoding matrix of PMI reports from the UE to using random precoding matrix shall equal or exceed the value specified in table 9.4.1.2.1.5.

9.4.1.2.2 TDD PMI Reporting – PUCCH 2-1 (Single PMI)

9.4.1.2.2.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

9.4.1.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward. Applicability requires support for FGI bit 2.

9.4.1.2.2.3 Minimum conformance requirements

For the parameters specified in Table 9.4.1.2.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in 9.4.1.2.2.3-2.

Table 9.4.1.2.2.3-1: PMI test for single-layer (TDD)

Parameter		Unit	Test 1
Bandwidth		MHz	10
Transmission mode			6
Uplink downlink configuration			1
Special subframe configuration			4
Propagation channel			EVA5
Correlation and antenna configuration			Low 4 x 2
Downlink power allocation	ρ_A	dB	-6
	ρ_B	dB	-6
	σ	dB	3
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98
PMI delay		ms	10
Reporting mode			PUCCH 2-1 (Note 6)
Reporting periodicity		ms	$N_P = 5$
Physical channel for CQI reporting			PUSCH (Note 3)
PUCCH Report Type for wideband CQI/PMI			2
PUCCH Report Type for subband CQI			1
Measurement channel			R.14-1 TDD
OCNG Pattern			OP.1/2 TDD
Precoding granularity		PRB	6 (full size)
Number of bandwidth parts (*J*)			3
K			1
cqi-pmi-ConfigIndex			4
Max number of HARQ transmissions			4
Redundancy version coding sequence			{0,1,2,3}
ACK/NACK feedback mode			Multiplexing

Note 1: For random precoder selection, the precoder shall be updated in each available downlink transmission instance
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)
Note 3: To avoid collisions between HARQ-ACK and wideband CQI/PMI or subband CQI it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.
Note 4: Reports for the short subband (having 2RBs in the last bandwidth part) are to be disregarded and instead data is to be transmitted on the most recently used subband for bandwidth part with j=1.
Note 5: In the case where wideband PMI is reported, data is to be transmitted on the most recently used subband.
Note 6: The bit field for PMI confirmation in DCI format 1B shall be mapped to “0” and TPMI information shall indicate the codebook index used in Table 6.3.4.2.3-2 of TS36.211 [4] according to the latest PMI report on PUCCH.

Table 9.4.1.2.2.3-2: Minimum requirement (TDD)

Parameter	Test 1
γ	1.2
UE Category	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.4.1.2.2.

9.4.1.2.2.4 Test description

9.4.1.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11.
2. The parameter settings for the cell are set up according to Table 9.4.1.2.2.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2.Message contents are defined in clause 9.4.1.2.2.4.3.

9.4.1.2.2.4.2 Test procedure

1. Set the bandwidth, propagation condition, antenna configuration and measurement channel parameters according to Table 9.4.1.2.2.3-1 as appropriate.
2. The SS shall transmit every subframe PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC (R.14-1 TDD) on a randomly selected full-size subband with a randomly selected precoding matrix from the codebook (Table 6.3.4.2.3-2 in TS 36.211 [8]), regardless of the SB and PMI reports from the UE. Note that each full-size subband and each precoding matrix shall be selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC.
The SS shall transmit PDCCH DCI format 0 in downlink SF#4 and #9 to schedule UL transmission in uplink subframes #8 and #3 (Table A.4.1-2). The UE will send ACK/NACK and periodic CSI reports using PUSCH. Establish t_{rnd} and SNR_{rnd} according to annex G.5.2.
3. Set SNR to SNR_{rnd}. The SS shall transmit every subframe PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC (R.14-1 TDD) on the full-size subband and with the latest precoding matrix reported by the UE. When the UE reports a non-full-size subband, the SS schedules the recent reported subband for bandwidth part with j=1 with the latest reported precoding matrix. Note that the SS shall send PDSCH in the same full-size subband and with the latest reported precoding matrix until next UE subband report is available. The SS sends downlink MAC padding bits on the DL RMC.
The SS shall transmit PDCCH DCI format 0 in downlink SF#4 and #9 to schedule UL transmission in uplink subframes #8 and #3 (Table A.4.1-2). The UE will send ACK/NACK and periodic CSI reports using PUSCH. Measure t_{ue} according to Annex G.5.3.
4. Calculate $\gamma = \frac{t_{ue}}{t_{rnd}}$ If the ratio (throughput / t_{rnd}) ≥ γ which is specified in table 9.4.1.2.2.5-1, then the test is pass. Otherwise, the test is fail.

9.4.1.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.4.1.2.2.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.4.1.2.2.4.3-2: *AntennaInfoDedicated*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm6		
codebookSubsetRestriction CHOICE{			
n4TxAntenna-tm6	1111111111111111		
}			
ue-TransmitAntennaSelection CHOICE{			
release	NULL		
}			
}			

Table 9.4.1.2.2.4.3-3: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	Not present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic CHOICE {			
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex	0		
cqi-pmi-ConfigIndex	4	(see Table 7.2.2-1A in TS 36.213)	
cqi-FormatIndicatorPeriodic CHOICE {			
subbandCQI	1		
}			
ri-ConfigIndex	484	(see Table 7.2.2-1B in TS 36.213)	
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

9.4.1.2.2.5 Test requirement

Table 9.4.1.2.2.5-1: Test requirement (TDD)

Parameter	Test 1
γ	1.19
UE Category	1-8

9.4.1.3 PMI Reporting – PUSCH 3-1 (Single PMI) (CSI Reference Symbols)

9.4.1.3.1

9.4.1.3.1_D FDD Reporting of PMI – PUSCH 3-1 (Single PMI) for eDL MIMO

9.4.1.3.1_D.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

9.4.1.3.1_D.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward that support eDL-MIMO. Applicability requires support for FGI bit 103.

9.4.1.3.1_D.3 Minimum conformance requirements

For the parameters specified in Table 9.4.1.3.1_D.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.4.1.33.1_D.3-2.

Table 9.4.1.3.1_D.3-1: PMI test for single-layer (FDD)

Parameter		Unit	Test 1
Bandwidth		MHz	10
Transmission mode			9
Propagation channel			EPA5
Precoding granularity		PRB	50
Correlation and antenna configuration			Low ULA 4 x 2
Cell-specific reference signals			Antenna ports 0,1
CSI reference signals			Antenna ports 15,…,18
Beamforming model			Annex B.4.3
CSI-RS periodicity and subframe offset T_{CSI-RS} / Δ_{CSI-RS}			5/ 1
CSI-RS reference signal configuration			6
CodeBookSubsetRestriction bitmap			0x0000 0000 0000 FFFF
Downlink power allocation	ρ_A	dB	0
	ρ_B	dB	0
	Pc	dB	-3
	σ	dB	-3
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98
Reporting mode			PUSCH 3-1
Reporting interval		ms	5
PMI delay (Note 2)		ms	8
Measurement channel			R.44 FDD
OCNG Pattern			OP.1 FDD
Max number of HARQ transmissions			4
Redundancy version coding sequence			{0,1,2,3}
Note 1: For random precoder selection, the precoder shall be updated in each TTI (1 ms granularity). Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). Note 3: PDSCH _RA= 0 dB, PDSCH_RB= 0 dB in order to have the same PDSCH and OCNG power per subcarrier at the receiver.			

Table 9.4.1.3.1_D.3-2: Minimum requirement (FDD)

Parameter	Test 1
γ	1.2
UE Category	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.4.1.3.1.

9.4.1.3.1_D.4 Test description

9.4.1.3.1_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11.
2. The parameter settings for the cell are set up according to Table 9.4.1.3.1_D.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.1.3.1_D.4.3.

9.4.1.3.1_D.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.4.1.3.1_D.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC with randomly selected precoding matrix from codebook (Table 6.3.4.2.3-2 in TS 36.211 [8]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. The SS sends downlink MAC padding bits on the DL RMC.SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish t_{rnd} and SNR_{rnd} according to annex G.5.2
3. Set SNR to SNR_{rnd}. The SS shall transmit PDSCH with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4 every subframe. Measure t_{ue} according to Annex G.5.3
4. Calculate $\gamma = \frac{t_{ue}}{t_{rnd}}$ If the ratio (throughput / t_{rnd}) ≥ γ which is specified in table 9.4.1.3.1_D.5-1, then the test is pass. Otherwise, the test is fail.

9.4.1.3.1_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.4.1.3.1_D.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-r10-DEFAULT*		
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.4.1.3.1_D.4.3-2: *PDSCH-ConfigDedicated-DEFAULT*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB0		
}			

Table 9.4.1.3.1_D.4.3-3: *AntennaInfoDedicated-r10*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated-r10 ::= SEQUENCE {			
transmissionMode-r10	tm9-v1020		
codebookSubsetRestriction-r10	0x0000 0000 0000 FFFF		
}			
ue-TransmitAntennaSelection CHOICE{			
release	NULL		
}			
AntennaInfoDedicated-r10 ::= SEQUENCE {			

Table 9.4.1.3.1_D.4.3-4: *CQI-ReportConfig-r10-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	rm31		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic	Not present		
}			

Table 9.4.1.3.1_D.4.3-5: *CSI-RS-Config*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-RS-Config-r10 ::= SEQUENCE {			
csi-RS-r10 CHOICE{			
release	NULL		
setup SEQUENCE {			
antennaPortsCount-r10	an4	Parameter represents the number of antenna ports used for transmission of CSI reference signals	
resourceConfig-r10	6	Parameter: CSI reference signal configuration	
subframeConfig-r10	1	$\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$	
p-C-r10	-3	Parameter: P_c which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback	
}			
}			
}			

9.4.1.3.1_D.5 Test requirement

Table 9.4.1.3.1_D.5-1: Test requirement (FDD)

Parameter	Test 1
γ	1.19

The ratio of throughput using precoding matrix of PMI reports from the UE to using random precoding matrix shall equal or exceed the value specified in table 9.4.1.1.1_D.5.

9.4.1.3.2_D TDD Reporting of PMI – PUSCH 3-1 (Single PMI) for eDL-MIMO

Editor's note: SS vendors have not decided on the 8x2 antenna configuration due to test system complexity and cost

9.4.1.3.2_D.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

9.4.1.3.2_D.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward that support eDL-MIMO. Applicability requires support for FGI bit 104.

9.4.1.3.2_D.3 Minimum conformance requirements

For the parameters specified in Table 9.4.1.3.2_D.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.4.1.3.2_D.3-2.

Table 9.4.1.3.2_D.3-1: PMI test for single-layer (TDD)

Parameter		Unit	Test 1
Bandwidth		MHz	10
Transmission mode			9
Uplink downlink configuration			1
Special subframe configuration			4
Propagation channel			EVA5
Precoding granularity		PRB	50
Antenna configuration			8 x 2
Correlation modelling			High, Cross polarized
Cell-specific reference signals			Antenna ports 0,1
CSI reference signals			Antenna ports 15,…,22
Beamforming model			Annex B.4.3
CSI-RS periodicity and subframe offset T_{CSI-RS} / Δ_{CSI-RS}			5/ 4
CSI-RS reference signal configuration			0
CodeBookSubsetRestriction bitmap			0x0000 0000 001F FFE0 0000 0000 FFFF
Downlink power allocation	ρ_A	dB	0
	ρ_B	dB	0
	Pc	dB	-6
	σ	dB	-3
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98
Reporting mode			PUSCH 3-1
Reporting interval		ms	5
PMI delay (Note 2)		ms	10
Measurement channel			R.45-1 TDD for UE Category 1, R.45 TDD for UE Category 2-8
OCNG Pattern			OP.1 TDD
Max number of HARQ transmissions			4
Redundancy version coding sequence			{0,1,2,3}
ACK/NACK feedback mode			Multiplexing

Note 1: For random precoder selection, the precoder shall be updated in each TTI (1 ms granularity).

Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#4 and #9 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF#3 and #8.

Note 4: Randomization of the principle beam direction shall be used as specified in B.2.3A.4

Table 9.4.1.3.2_D.3-2: Minimum requirement (TDD)

Parameter	Test 1
γ	3
UE Category	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.4.1.3.2.

9.4.1.3.2_D.4 Test description

9.4.1.3.2_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure TBD.
2. The parameter settings for the cell are set up according to Table 9.4.1.3.2_D.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.1.3.2_D.4.3.

9.4.1.3.2_D.4.2 Test procedure

1. Set the bandwidth, propagation condition, antenna configuration and measurement channel parameters according to Table 9.4.1.3.2_D.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC with randomly selected precoding matrix from codebook (Table 6.3.4.2.3-2 in TS 36.211 [8]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish t_{rnd} and SNR_{rnd} according to annex G.5.2.
3. Set SNR to SNR_{rnd}. The SS shall transmit PDSCH with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure t_{ue} according to Annex G.5.3
4. Calculate $\gamma = \dfrac{t_{ue}}{t_{rnd}}$

9.4.1.3.2_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.4.1.3.2_D.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-r10-DEFAULT*		
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.4.1.3.2_D.4.3-2: *PDSCH-ConfigDedicated-DEFAULT*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB0		
}			

Table 9.4.1.3.2_D.4.3-3: *AntennaInfoDedicated-r10*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated-r10 ::= SEQUENCE {			
transmissionMode-r10	tm9-v1020		
codebookSubsetRestriction-r10	0x0000 0000 001F FFE0 0000 0000 FFFF		
}			
ue-TransmitAntennaSelection CHOICE{			
release	NULL		
}			
AntennaInfoDedicated-r10 ::= SEQUENCE {			

Table 9.4.1.3.2_D.4.3-4: *CQI-ReportConfig-r10-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	rm31		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic	Not present		
}			

Table 9.4.1.3.2_D.4.3-5: TDD-Config-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
TDD-Config-DEFAULT ::= SEQUENCE {			
subframeAssignment	sa2		
specialSubframePatterns	ssp4		
}			

Table 9.4.1.3.2_D.4.3-6: PUSCH-ConfigDedicated-DEFAULT

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PUSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
ackNackRepetition CHOICE {			
release	NULL		
}			
tddAckNackFeedbackMode	Multiplexing	Multiplexing is selected as default to align with RAN4's assumptions in RF tests.	TDD
}			

Table 9.4.1.3.2_D.4.3-7: *CSI-RS-Config*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-RS-Config-r10 ::= SEQUENCE {			
csi-RS-r10 CHOICE{			
release	NULL		
setup SEQUENCE {			
antennaPortsCount-r10	an8	Parameter represents the number of antenna ports used for transmission of CSI reference signals	
resourceConfig-r10	0	Parameter: CSI reference signal configuration	
subframeConfig-r10	4	$\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$	
p-C-r10	-6	Parameter: P_c which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback	
}			
}			
}			

9.4.1.3.2_D.5 Test requirement

Table 9.4.1.3.2_D.5-1: Test requirement (TDD)

Parameter	Test 1
γ	3.49

The ratio of throughput using precoding matrix of PMI reports from the UE to using random precoding matrix shall equal or exceed the value specified in table 9.4.1.3.2_D.5.

9.4.2 Multiple PMI

9.4.2.1 PMI Reporting – PUSCH 1-2 (Multiple PMI) (Cell-Specific Reference Symbols)

9.4.2.1.1 FDD PMI Reporting – PUSCH 1-2 (Multiple PMI)

9.4.2.1.1.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

9.4.2.1.1.2 Test applicability

This test applies to E-UTRA FDD UE release 8 of UE category 2-5.

9.4.2.1.1.3 Minimum conformance requirements

For the parameters specified in Table 9.4.2.1.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.4.2.1.1.3-2.

Table 9.4.2.1.1.3-1 PMI test for single-layer (FDD)

Parameter		Unit	Test 1
Bandwidth		MHz	20
Transmission mode			6
Propagation channel			EPA5
Precoding granularity (only for reporting and following PMI)		PRB	8
Correlation and antenna configuration			Low 2 x 2
Downlink power allocation	ρ_A	dB	-3
	ρ_B	dB	-3
	σ	dB	0
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98
Reporting mode			PUSCH 1-2
Reporting interval		ms	1
PMI delay		ms	8
Measurement channel			R.30 FDD
OCNG Pattern			OP.1 FDD
Max number of HARQ transmissions			4
Redundancy version coding sequence			{0,1,2,3}
Note 1: For random precoder selection, the precoders shall be updated in each TTI (1 ms granularity) Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)			

Table 9.4.2.1.1.3-2: Minimum requirement (FDD)

Parameter	Test 1
γ	1.2
UE Category	2-5

The normative reference for this requirement is TS 36.101 [2] clause 9.4.2.1.1.

9.4.2.1.1.4 Test description

9.4.2.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 20MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 9.4.2.1.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.2.1.1.4.3.

9.4.2.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.4.2.1.1.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC with randomly selected precoding matrix from codebook (Table 6.3.4.2.3-1 in TS 36.211 [8]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. The SS sends downlink MAC padding bits on the DL RMC SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish t_{rnd} and SNR_{rnd} according to annex G.5.2
3. Set SNR to SNR_{rnd}. The SS shall transmit PDSCH with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4 every subframe. Measure the average throughput.
   Measure t_{ue} according to Annex G.5.3
4. Calculate $\gamma = \dfrac{t_{ue}}{t_{rnd}}$

9.4.2.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.4.2.1.1.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.4.2.1.1.4.3-2: *AntennaInfoDedicated*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm6		
codebookSubsetRestriction CHOICE{			
n2TxAntenna-tm6	1111		
}			
ue-TransmitAntennaSelection CHOICE{			
release	NULL		
}			
}			

Table 9.4.2.1.1.4.3-3: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	rm12		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic	Not present		
}			

9.4.2.1.1.5 Test requirement

Table 9.4.2.1.1.5-1: Test requirement (FDD)

Parameter	Test 1
γ	1.19
UE Category	2-5

9.4.2.1.1_1 FDD PMI Reporting – PUSCH 1-2 (Multiple PMI) (Release 9 and forward)

9.4.2.1.1_1.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

9.4.2.1.1_1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward.

9.4.2.1.1_1.3 Minimum conformance requirements

For the parameters specified in Table 9.4.2.1.1_1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.4.2.1.1_1.3-2.

Table 9.4.2.1.1_1.3-1: PMI test for single-layer (FDD)

Parameter		Unit	Test 1
Bandwidth		MHz	10
Transmission mode			6
Propagation channel			EPA5
Precoding granularity (only for reporting and following PMI)		PRB	6
Correlation and antenna configuration			Low 2 x 2
Downlink power allocation	ρ_A	dB	-3
	ρ_B	dB	-3
	σ	dB	0
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98
Reporting mode			PUSCH 1-2
Reporting interval		ms	1
PMI delay		ms	8
Measurement channel			R.11-3 FDD for UE Category 1, R.11 FDD for UE Category 2-8
OCNG Pattern			OP.1 FDD
Max number of HARQ transmissions			4
Redundancy version coding sequence			{0,1,2,3}
Note 1: For random precoder selection, the precoders shall be updated in each TTI (1 ms granularity) Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4) Note 3: One/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2 shall be used.			

Table 9.4.2.1.1_1.3-2: Minimum requirement (FDD)

Parameter	Test 1
γ	1.2
UE Category	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.4.2.1.1.

9.4.2.1.1_1.4 Test description

9.4.2.1.1_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 9.4.2.1.1_1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.2.1.1_1.4.3.

9.4.2.1.1_1.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.4.2.1.1_1.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC (R.11-3 FDD for UE Category 1 with allocation centred within the transmission bandwidth configuration or R.11 FDD for UE Category2-8) with randomly selected precoding matrix from codebook (Table 6.3.4.2.3-1 in TS 36.211 [8]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. The SS sends downlink MAC padding bits on the DL RMC SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish t_{rnd} and SNR_{rnd} according to annex G.5.2
3. Set SNR to SNR_{rnd}. The SS shall transmit PDSCH via PDCCH DCI format 1B for C-RNTI to transmit the DL RMC (R.11-3 FDD for UE Category 1 with allocation centred within the transmission bandwidth configuration or R.11 FDD for UE Category 2-8) with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4 every subframe. Measure the average throughput.
   Measure t_{ue} according to Annex G.5.3
4. Calculate $\gamma = \frac{t_{ue}}{t_{rnd}}$

9.4.2.1.1_1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.4.2.1.1_1.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.4.2.1.1_1.4.3-2: *AntennaInfoDedicated*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm6		
codebookSubsetRestriction CHOICE{			
n2TxAntenna-tm6	1111		
}			
ue-TransmitAntennaSelection CHOICE{			
release	NULL		
}			
}			

Table 9.4.2.1.1_1.4.3-3: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	rm12		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic	Not present		
}			

9.4.2.1.1_1.5 Test requirement

Table 9.4.2.1.1_1.5-1: Test requirement (FDD)

Parameter	Test 1
γ	1.19
UE Category	1-8

9.4.2.1.2 TDD PMI Reporting – PUSCH 1-2 (Multiple PMI)

9.4.2.1.2.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

9.4.2.1.2.2 Test applicability

This test applies to E-UTRA TDD UE release 8 of UE category 2-5.

9.4.2.1.2.3 Minimum conformance requirements

For the parameters specified in Table 9.4.2.1.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.4.2.1.2.3-2.

Table 9.4.2.1.2.3-1: PMI test for single-layer (TDD)

Parameter		Unit	Test 1
Bandwidth		MHz	20
Transmission mode			6
Uplink downlink configuration			1
Special subframe configuration			4
Propagation channel			EPA5
Precoding granularity (only for reporting and following PMI)		PRB	8
Correlation and antenna configuration			Low 2 x 2
Downlink power allocation	ρ_A	dB	-3
	ρ_B	dB	-3
	σ	dB	0
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98
Reporting mode			PUSCH 1-2
Reporting interval		ms	1
Minimum PMI delay		ms	10 or 11
Measurement channel			R.30 TDD
OCNG Pattern			OP.1 TDD
Max number of HARQ transmissions			4
Redundancy version coding sequence			{0,1,2,3}
ACK/NACK feedback mode			Multiplexing
Note 1: For random precoder selection, the precoders shall be updated in each available downlink transmission instance Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)			

Table 9.4.2.1.2.3-2: Minimum requirement (TDD)

Parameter	Test 1
γ	1.2
UE Category	2-5

The normative reference for this requirement is TS 36.101 [2] clause 9.4.2.1.2.

9.4.2.1.2.4 Test description

9.4.2.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 20MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.

2. The parameter settings for the cell are set up according to Table 9.4.2.1.2.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.2.1.2.4.3.

9.4.2.1.2.4.2 Test procedure

1. Set the bandwidth, propagation condition, antenna configuration and measurement channel parameters according to Table 9.4.2.1.2.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC with randomly selected precoding matrix from codebook (Table 6.3.4.2.3-1 in TS 36.211 [8]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish t_{rnd} and SNR_{rnd} according to annex G.5.2
3. Set SNR to SNR_{rnd}. The SS shall transmit PDSCH with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure t_{ue} according to Annex G.5.3
4. Calculate $\gamma = \dfrac{t_{ue}}{t_{rnd}}$

9.4.2.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.4.2.1.2.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.4.2.1.2.4.3-2: *AntennaInfoDedicated*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm6		
codebookSubsetRestriction CHOICE{			
n2TxAntenna-tm6	1111		
}			
ue-TransmitAntennaSelection CHOICE{			
release	NULL		
}			

Table 9.4.2.1.2.4.3-3: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	rm12		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic	Not present		
}			

9.4.2.1.2.5 Test requirement

Table 9.4.2.1.2.5-1: Test requirement (TDD)

Parameter	Test 1
γ	1.19
UE Category	2-5

9.4.2.1.2_1 TDD PMI Reporting – PUSCH 1-2 (Multiple PMI) (Release 9 and forward)

9.4.2.1.2_1.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

9.4.2.1.2_1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward.

9.4.2.1.2_1.3 Minimum conformance requirements

For the parameters specified in Table 9.4.2.1.2_1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.4.2.1.2_1.3-2.

Table 9.4.2.1.2_1.3-1: PMI test for single-layer (TDD)

Parameter		Unit	Test 1
Bandwidth		MHz	10
Transmission mode			6
Uplink downlink configuration			1
Special subframe configuration			4
Propagation channel			EPA5
Precoding granularity (only for reporting and following PMI)		PRB	6
Correlation and antenna configuration			Low 2 x 2
Downlink power allocation	ρ_A	dB	-3
	ρ_B	dB	-3
	σ	dB	0
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98
Reporting mode			PUSCH 1-2
Reporting interval		ms	1
PMI delay		ms	10 or 11
Measurement channel			R.11-3 TDD for UE Category 1 R.11 TDD for UE Category 2-8
OCNG Pattern			OP.1 TDD
Max number of HARQ transmissions			4
Redundancy version coding sequence			{0,1,2,3}
ACK/NACK feedback mode			Multiplexing
Note 1: For random precoder selection, the precoders shall be updated in each available downlink transmission instance Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4) Note 3: One/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2 shall be used.			

Table 9.4.2.1.2_1.3-2: Minimum requirement (TDD)

Parameter	Test 1
γ	1.2
UE Category	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.4.2.1.2.

9.4.2.1.2_1.4 Test description

9.4.2.1.2_1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 9.4.2.1.2_1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.2.1.2_1.4.3.

9.4.2.1.2_1.4.2 Test procedure

1. Set the bandwidth, propagation condition, antenna configuration and measurement channel parameters according to Table 9.4.2.1.2_1.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC (R.11-3 TDD for UE Category 1 with allocation centred within the transmission bandwidth configuration or R.11 TDD for UE Category2-8) with randomly selected precoding matrix from codebook (Table 6.3.4.2.3-1 in TS 36.211 [8]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish t_{rnd} and SNR_{rnd} according to annex G.5.2
3. Set SNR to SNR_{rnd}. The SS shall transmit PDSCH via PDCCH DCI format 1B for C-RNTI to transmit the DL RMC (R.11-3 TDD for UE Category 1 with allocation centred within the transmission bandwidth configuration or R.11 TDD for UE Category 2-8) with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure t_{ue} according to Annex G.5.3
4. Calculate $\gamma = \frac{t_{ue}}{t_{rnd}}$

9.4.2.1.2_1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.4.2.1.2_1.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.4.2.1.2_1.4.3-2: *AntennaInfoDedicated*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm6		
codebookSubsetRestriction CHOICE{			
n2TxAntenna-tm6	1111		
}			
ue-TransmitAntennaSelection CHOICE{			
release	NULL		
}			
}			

Table 9.4.2.1.2_1.4.3-3: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	rm12		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic	Not present		
}			

9.4.2.1.2_1.5 Test requirement

Table 9.4.2.1.2_1.5-1: Test requirement (TDD)

Parameter	Test 1
γ	1.19
UE Category	1-8

9.4.2.2 PMI Reporting – PUSCH 2-2 (Multiple PMI) (Cell-Specific Reference Symbols)

9.4.2.2.1 FDD PMI Reporting – PUSCH 2-2 (Multiple PMI)

9.4.2.2.1.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

9.4.2.2.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward. Applicability requires support of FGI bit 1.

9.4.2.2.1.3 Minimum conformance requirements

For the parameters specified in Table 9.4.2.2.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.4.2.2.1.3-2.

Table 9.4.2.2.1.3-1: PMI test for single-layer (FDD)

Parameter		Unit	Test 1
Bandwidth		MHz	10
Transmission mode			6
Propagation channel			EVA5
Correlation and antenna configuration			Low 4 x 2
Downlink power allocation	ρ_A	dB	-6
	ρ_B	dB	-6
	σ	dB	3
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98
PMI delay		ms	8
Reporting mode			PUSCH 2-2
Reporting interval		ms	1
Measurement channel			R.14-2 FDD
OCNG Pattern			OP.1/2 FDD
Subband size (*k*)		RBs	3 (full size)
Number of preferred subbands (*M*)			5
Max number of HARQ transmissions			4
Redundancy version coding sequence			{0,1,2,3}
Note 1: For random precoder selection, the precoder shall be updated in each TTI (1 ms granularity) Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)			

Table 9.4.2.2.1.3-2: Minimum requirement (FDD)

	Test 1
γ	1.2
UE Category	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.4.2.2.1.

9.4.2.2.1.4 Test description

9.4.2.2.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11.
2. The parameter settings for the cell are set up according to Table 9.4.2.2.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.2.2.1.4.3.

9.4.2.2.1.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.4.2.2.1.3-1 as appropriate.

2. The SS shall transmit every subframe PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC (R.14-2 FDD) on a randomly selected full-size subband with a randomly selected precoding matrix from the codebook (Table 6.3.4.2.3-2 in TS 36.211 [8]), regardless of the SB and PMI reports from the UE. Note that each full-size subband and each precoding matrix shall be selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC.
   The SS shall transmit PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. The UE will send aperiodic CSI report on PUSCH.
   Establish t_{rnd} and SNR_{rnd} according to annex G.5.2.

3. Set SNR to SNR_{rnd}. The SS shall transmit every subframe PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC (R.14-2 FDD) on one full-size subband selected among the M preferred subbands and the corresponding subband precoding matrix reported by the UE. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same M preferred subbands are reported subsequently, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC.
   The SS shall transmit PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. The UE will send aperiodic CSI report on PUSCH.
   Measure t_{ue} according to Annex G.5.3.

4. Calculate $\gamma = \dfrac{t_{ue}}{t_{rnd}}$

9.4.2.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.4.2.2.1.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.4.2.2.1.4.3-2: *AntennaInfoDedicated*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm6		
codebookSubsetRestriction CHOICE{			
n4TxAntenna-tm6	1111111111111111		
}			
ue-TransmitAntennaSelection CHOICE{			
release	NULL		
}			
}			

Table 9.4.2.2.1.4.3-3: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	rm22		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic	Not present		
}			

9.4.2.2.1.5 Test requirement

Table 9.4.2.2.1.5-1: Test requirement (FDD)

	Test 1
γ	1.19
UE Category	1-8

9.4.2.2.2 TDD PMI Reporting – PUSCH 2-2 (Multiple PMI)

9.4.2.2.2.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

9.4.2.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward. Applicability requires support of FGI bit 1.

9.4.2.2.2.3 Minimum conformance requirements

For the parameters specified in Table 9.4.2.2.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.4.2.2.2.3-2.

Table 9.4.2.2.2.3-1: PMI test for single-layer (TDD)

Parameter		Unit	Test 1
Bandwidth		MHz	10
Transmission mode			6
Uplink downlink configuration			1
Special subframe configuration			4
Propagation channel			EVA5
Correlation and antenna configuration			Low 4 x 2
Downlink power allocation	ρ_A	dB	-6
	ρ_B	dB	-6
	σ	dB	3
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98
PMI delay		ms	10
Reporting mode			PUSCH 2-2
Reporting interval		ms	1
Measurement channel			R.14-2 TDD
OCNG Pattern			OP.1/2 FDD
Subband size (*k*)		RBs	3 (full size)
Number of preferred subbands (*M*)			5
Max number of HARQ transmissions			4
Redundancy version coding sequence			{0,1,2,3}
ACK/NACK feedback mode			Multiplexing
Note 1: For random precoder selection, the precoders shall be updated in each available downlink transmission instance Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)			

Table 9.4.2.2.2.3-2: Minimum requirement (TDD)

	Test 1
γ	1.15
UE Category	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.4.2.2.2.

9.4.2.2.2.4 Test description

9.4.2.2.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11.

2. The parameter settings for the cell are set up according to Table 9.4.2.2.2.3-1.

3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B clause B.0

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.2.2.2.4.3.

9.4.2.2.2.4.2 Test procedure

1. Set the bandwidth, propagation condition, antenna configuration and measurement channel parameters according to Table 9.4.2.2.2.3-1 as appropriate.

2. The SS shall transmit every subframe PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC (R.14-2 TDD) on a randomly selected full-size subband with a randomly selected precoding matrix from the codebook (Table 6.3.4.2.3-2 in TS 36.211 [8]), regardless of the SB and PMI reports from the UE. Note that each full-size subband and each precoding matrix shall be selected in equal probability. The SS sends downlink MAC padding bits on the DL RMC.
The SS shall transmit PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. The UE will send aperiodic CSI report on PUSCH.
Establish t_{rnd} and SNR_{rnd} according to annex G.5.2.

3. Set SNR to SNR_{rnd}. The SS shall transmit every subframe PDSCH via PDCCH DCI format 1B for C_RNTI to transmit the DL RMC (R.14-2 TDD) on one full-size subband selected among the M preferred subbands and the corresponding subband precoding matrix reported by the UE. Note that the SS shall send PDSCH in the same full-size subband until next UE report is available. In case when same M preferred subbands are reported subsequently, the SS shall select for transmission a different subband with respect to the last selection. The SS sends downlink MAC padding bits on the DL RMC.
The SS shall transmit PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. The UE will send aperiodic CSI report on PUSCH.
Measure t_{ue} according to Annex G.5.3.

4. Calculate $\gamma = \frac{t_{ue}}{t_{rnd}}$

9.4.2.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.4.2.2.2.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.4.2.2.2.4.3-2: *AntennaInfoDedicated*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm6		
codebookSubsetRestriction CHOICE{			
n4TxAntenna-tm6	1111111111111111		
}			
ue-TransmitAntennaSelection CHOICE{			
release	NULL		
}			
}			

Table 9.4.2.2.2.4.3-3: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	rm22		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic	Not present		
}			

9.4.2.2.2.5 Test requirement

Table 9.4.2.2.2.5-1: Test requirement (TDD)

	Test 1
γ	1.14
UE Category	1-8

9.4.2.3 PMI Reporting – PUSCH 1-2 (Multiple PMI) (CSI Reference Symbols)

9.4.2.3.1

9.4.2.3.1_D FDD PMI Reporting - PUSCH 1-2 (Multiple PMI) for eDL-MIMO

9.4.2.3.1_D.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

9.4.2.3.1_D.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward that support eDL-MIMO. Applicability requires support for FGI bit 103.

9.4.2.3.1_D.3 Minimum conformance requirements

For the parameters specified in Table 9.4.2.3.1_D.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.4.2.3.1_D.3-2.

Table 9.4.2.3.1_D.3-1: PMI test for single-layer (FDD) for eDL-MIMO

Parameter		Unit	Test 1
Bandwidth		MHz	10
Transmission mode			9
Propagation channel			EVA5
Precoding granularity (only for reporting and following PMI)		PRB	6
Correlation and antenna configuration			Low ULA 4 x 2
Cell-specific reference signals			Antenna ports 0,1
CSI reference signals			Antenna ports 15,…,18
Beamforming model			Annex B.4.3
CSI-RS periodicity and subframe offset T_{CSI-RS} / Δ_{CSI-RS}			5/ 1
CSI-RS reference signal configuration			8
CodeBookSubsetRestriction bitmap			0x0000 0000 0000 FFFF
Downlink power allocation	ρ_A	dB	0
	ρ_B	dB	0
	Pc	dB	-3
	σ	dB	-3
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98
Reporting mode			PUSCH 1-2
Reporting interval		ms	5
PMI delay		ms	8
Measurement channel			R.45-1 FDD for UE Category 1, R.45 FDD for UE Category 2-8
OCNG Pattern			OP.1 FDD
Max number of HARQ transmissions			4
Redundancy version coding sequence			{0,1,2,3}
Note 1: For random precoder selection, the precoders shall be updated in each TTI (1 ms granularity). Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). Note 3: One/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2 shall be used. Note 4: PDSCH _RA= 0 dB, PDSCH_RB= 0 dB in order to have the same PDSCH and OCNG power per subcarrier at the receiver.			

Table 9.4.2.3.1_D.3-2: Minimum requirement (FDD) for eDL-MIMO

Parameter	Test 1
γ	1.3
UE Category	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.4.2.3.1.

9.4.2.3.1_D.4 Test description

9.4.2.3.1_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.11.
2. The parameter settings for the cell are set up according to Table 9.4.2.3.1_D.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.2.3.1_D.4.3.

9.4.2.3.1_D.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.4.2.3.1_D.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC with randomly selected precoding matrix from codebook (Table 6.3.4.2.3-2 in TS 36.211 [8]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. The SS sends downlink MAC padding bits on the DL RMC SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish t_{rnd} and SNR_{rnd} according to annex G.5.2
3. Set SNR to SNR_{rnd}. The SS shall transmit PDSCH with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4 every subframe. Measure the average throughput.
   Measure t_{ue} according to Annex G.5.3
4. Calculate $\gamma = \dfrac{t_{ue}}{t_{rnd}}$

9.4.2.3.1_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.4.2.3.1_D.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-r10-DEFAULT*		
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.4.2.3.1_D.4.3-2: *PDSCH-ConfigDedicated-DEFAULT*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB0		
}			

Table 9.4.2.3.1_D.4.3-3: *AntennaInfoDedicated-r10*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated-r10 ::= SEQUENCE {			
transmissionMode-r10	tm9-v1020		
codebookSubsetRestriction-r10	0x0000 0000 0000 FFFF		
}			
ue-TransmitAntennaSelection CHOICE{			
release	NULL		
}			

Table 9.4.2.3.1_D.4.3-4: *CQI-ReportConfig-r10-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-r10 ::= SEQUENCE {			
cqi-ReportModeAperiodic-r10	rm12		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic-r10	Not present		
}			

Table 9.4.2.3.1_D.4.3-5: *CSI-RS-Config*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-RS-Config-r10 ::= SEQUENCE {			
csi-RS-r10 CHOICE{			
release	NULL		
setup SEQUENCE {			
antennaPortsCount-r10	an4	Parameter represents the number of antenna ports used for transmission of CSI reference signals	
resourceConfig-r10	8	Parameter: CSI reference signal configuration	
subframeConfig-r10	1	$\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$	
p-C-r10	-3	Parameter: P_c which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback	
}			
}			
}			

9.4.2.3.1_D.5 Test requirement

Table 9.4.2.3.1_D.5-1: Test requirement (FDD) for eDL-MIMO

Parameter	Test 1
γ	1.29
UE Category	1-8

9.4.2.3.2_D TDD PMI Reporting - PUSCH 1-2 (Multiple PMI) for eDL-MIMO

Editor's note: SS vendors have not decided on the 8x2 antenna configuration due to test system complexity and cost

9.4.2.3.2_D.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

9.4.2.3.2_D.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward that support eDL-MIMO. Applicability requires support for FGI bit 104.

9.4.2.3.2_D.3 Minimum conformance requirements

For the parameters specified in Table 9.4.2.3.2_D.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.4.2.3.2_D.3-2.

Table 9.4.2.3.2_D.3-1: PMI test for single-layer (TDD) for eDL-MIMO

<table>
<tr><th colspan="2">Parameter</th><th>Unit</th><th>Test 1</th></tr>
<tr><td colspan="2">Bandwidth</td><td>MHz</td><td>10</td></tr>
<tr><td colspan="2">Transmission mode</td><td></td><td>9</td></tr>
<tr><td colspan="2">Uplink downlink configuration</td><td></td><td>1</td></tr>
<tr><td colspan="2">Special subframe configuration</td><td></td><td>4</td></tr>
<tr><td colspan="2">Propagation channel</td><td></td><td>EVA5</td></tr>
<tr><td colspan="2">Precoding granularity (only for reporting and following PMI)</td><td>PRB</td><td>6</td></tr>
<tr><td colspan="2">Antenna configuration</td><td></td><td>8 x 2</td></tr>
<tr><td colspan="2">Correlation modelling</td><td></td><td>High, Cross polarized</td></tr>
<tr><td colspan="2">Cell-specific reference signals</td><td></td><td>Antenna ports 0,1</td></tr>
<tr><td colspan="2">CSI reference signals</td><td></td><td>Antenna ports 15,…,22</td></tr>
<tr><td colspan="2">Beamforming model</td><td></td><td>Annex B.4.3</td></tr>
<tr><td colspan="2">CSI-RS periodicity and subframe offset T_{CSI-RS} / Δ_{CSI-RS}</td><td></td><td>5/ 4</td></tr>
<tr><td colspan="2">CSI-RS reference signal configuration</td><td></td><td>4</td></tr>
<tr><td colspan="2">CodeBookSubsetRestriction bitmap</td><td></td><td>0x0000 0000 001F FFE0 0000 0000 FFFF</td></tr>
<tr><td rowspan="4">Downlink power allocation</td><td>ρ_A</td><td>dB</td><td>0</td></tr>
<tr><td>ρ_B</td><td>dB</td><td>0</td></tr>
<tr><td>Pc</td><td>dB</td><td>-6</td></tr>
<tr><td>σ</td><td>dB</td><td>-3</td></tr>
<tr><td colspan="2">$N_{oc}^{(j)}$</td><td>dB[mW/15kHz]</td><td>-98</td></tr>
<tr><td colspan="2">Reporting mode</td><td></td><td>PUSCH 1-2</td></tr>
<tr><td colspan="2">Reporting interval</td><td>ms</td><td>5 (Note 4)</td></tr>
<tr><td colspan="2">PMI delay</td><td>ms</td><td>8</td></tr>
<tr><td colspan="2">Measurement channel</td><td></td><td>R.45-1 TDD for UE Category 1, R.45 TDD for UE Category 2-8</td></tr>
<tr><td colspan="2">OCNG Pattern</td><td></td><td>OP.1 TDD</td></tr>
<tr><td colspan="2">Max number of HARQ transmissions</td><td></td><td>4</td></tr>
<tr><td colspan="2">Redundancy version coding sequence</td><td></td><td>{0,1,2,3}</td></tr>
<tr><td colspan="2">ACK/NACK feedback mode</td><td></td><td>Multiplexing</td></tr>
<tr><td colspan="4">Note 1: For random precoder selection, the precoders shall be updated in each TTI (1 ms granularity) .
Note 2: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI. estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4) .
Note 3: One/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2 shall be used.
Note 4: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#4 and #9 to allow aperiodic CQI/PMI/RI to be transmitted</td></tr>
</table>

	on uplink SF#3 and #8.
Note 5:	Randomization of the principle beam direction shall be used as specified in B.2.3A.4

Table 9.4.2.3.2_D.3-2: Minimum requirement (TDD) for eDL-MIMO

Parameter	Test 1
γ	3.5
UE Category	1-8

The normative reference for this requirement is TS 36.101 [2] clause 9.4.2.3.2.

9.4.2.3.2_D.4 Test description

9.4.2.3.2_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure [TBD].
2. The parameter settings for the cell are set up according to Table 9.4.2.3.2_D.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.4.2.3.2_D.4.3.

9.4.2.3.2_D.4.2 Test procedure

1. Set the bandwidth, propagation condition, antenna configuration and measurement channel parameters according to Table 9.4.2.3.2_D.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC with randomly selected precoding matrix from codebook (Table 7.2.4-1 in TS 36.213 [10]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Establish t_{rnd} and SNR_{rnd} according to annex G.5.2
3. Set SNR to SNR_{rnd}. The SS shall transmit PDSCH with precoding matrix according to PMI report from the UE. The SS sends downlink MAC padding bits on the DL RMC. SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure t_{ue} according to Annex G.5.3
4. Calculate $\gamma = \dfrac{t_{ue}}{t_{rnd}}$

9.4.2.3.2_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.4.2.3.2_D.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-r10-DEFAULT*		
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.4.2.3.2_D.4.3-2: *PDSCH-ConfigDedicated-DEFAULT*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB0		
}			

Table 9.4.2.3.2_D.4.3-3: *AntennaInfoDedicated-r10*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated-r10 ::= SEQUENCE {			
transmissionMode-r10	tm9-v1020		
codebookSubsetRestriction-r10	0x0000 0000 001F FFE0 0000 0000 FFFF		
}			
ue-TransmitAntennaSelection CHOICE{			
Release	NULL		
}			

Table 9.4.2.3.2_D.4.3-4: *CQI-ReportConfig-r10-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-r10 ::= SEQUENCE {			
cqi-ReportModeAperiodic-r10	rm12		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic-r10	Not present		
}			

Table 9.4.2.3.2_D.4.3-5: PUCCH-ConfigDedicated-DEFAULT

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
ackNackRepetition CHOICE {			
Release	NULL		
}			
tddAckNackFeedbackMode	Multiplexing	Multiplexing is selected as default to align with RAN4's assumptions in RF tests.	TDD
}			

Table 9.4.2.3.2_D.4.3-6: TDD-Config-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
TDD-Config-DEFAULT ::= SEQUENCE {			
subframeAssignment	sa1		
specialSubframePatterns	ssp4		
}			

Table 9.4.2.3.2_D.4.3-7: *CSI-RS-Config*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-RS-Config-r10 ::= SEQUENCE {			
csi-RS-r10 CHOICE{			
Release	NULL		
setup SEQUENCE {			
antennaPortsCount-r10	an8	Parameter represents the number of antenna ports used for transmission of CSI reference signals	
resourceConfig-r10	4	Parameter: CSI reference signal configuration	
subframeConfig-r10	4	$\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$	
p-C-r10	-6	Parameter: P_c which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback	
}			
}			
}			

9.4.2.3.2_D.5 Test requirement

Table 9.4.2.3.2_D.5-1: Test requirement (TDD) for eDL-MIMO

Parameter	Test 1
γ	3.49
UE Category	1-8

9.5 Reporting of Rank Indicator (RI)

The purpose of this test is to verify that the reported rank indicator accurately represents the channel rank. The accuracy of RI (CQI) reporting is determined by the relative increase of the throughput obtained when transmitting based on the reported rank compared to the case for which a fixed rank is used for transmission. Transmission mode 4 is used with the specified CodebookSubSetRestriction.

For fixed rank 1 transmission, the RI and PMI reporting is restricted to two single-layer precoders, For fixed rank 2 transmission, the RI and PMI reporting is restricted to one two-layer precoder, For follow RI transmission, the RI and PMI reporting is restricted to select the union of these precoders. Channels with low and high correlation are used to ensure that RI reporting reflects the channel condition.

9.5.1 RI Reporting (Cell-Specific Reference Symbols)

9.5.1.1 FDD RI Reporting– PUCCH 1-1

9.5.1.1.1 Test purpose

To verify that the reported rank indicator accurately represents the channel rank.

9.5.1.1.2 Test applicability

This test applies to E-UTRA FDD UE release 8 and 9 of UE category ≥2.

9.5.1.1.3 Minimum conformance requirements

The minimum performance requirement in Table 9.5.1.1.3-2 is defined as

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$;

b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

TBS selection is based on the UE wideband CQI feedback. The transport block size TBS for wideband CQI is selected according to Table A.4-3a.

For the parameters specified in Table 9.5.1.1.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.5.1.1.3-2.

Table 9.5.1.1.3-1: RI Test (FDD)

Parameter		Unit	Test 1	Test 2	Test 3
Bandwidth		MHz	10		
PDSCH transmission mode			4		
Downlink power allocation	ρ_A	dB	-3		
	ρ_B	dB	-3		
	σ	dB	0		
CodeBookSubsetRestriction bitmap			000011 for fixed RI = 1 010000 for fixed RI = 2 010011 for UE reported RI		
Propagation condition and antenna configuration			2 x 2 EPA5		
Antenna correlation			Low	Low	High
RI configuration			Fixed RI=2 and follow RI	Fixed RI=1 and follow RI	Fixed RI=2 and follow RI
SNR		dB	0	20	20
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	-98
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-78	-78
Maximum number of HARQ transmissions			1		
Reporting mode			PUCCH 1-1 (Note 4)		
Physical channel for CQI/PMI reporting			PUCCH Format 2		
PUCCH Report Type for CQI/PMI			2		
Physical channel for RI reporting			PUSCH (Note 3)		
PUCCH Report Type for RI			3		
Reporting periodicity		ms	$N_P = 5$		
PMI and CQI delay		ms	8		
cqi-pmi-ConfigurationIndex			6		
ri-ConfigurationInd			1 (Note 5)		

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4).

Note 2: Reference measurement channel according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Note 3: To avoid collisions between RI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic RI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.

Note 4: The bit field for precoding information in DCI format 2 shall be mapped as:
- For reported RI = 1 and PMI = 0 >> precoding information bit field index = 1
- For reported RI = 1 and PMI = 1 >> precoding information bit field index = 2
- For reported RI = 2 and PMI = 0 >> precoding information bit field index = 0

Note 5: To avoid the ambiguity of SS behaviour when applying CQI and PMI during rank switching, RI reports are to be applied at the SS with one subframe delay in addition to Note 1 to align with CQI and PMI reports.

Table 9.5.1.1.3-2: Minimum requirement (FDD)

Parameter	Test 1	Test 2	Test 3
γ_1	N/A	1.05	N/A
γ_2	1	N/A	1.1
UE Category	2-8	2-8	2-8

The normative reference for this requirement is TS 36.101 [2] clause 9.5.1.1.

9.5.1.1.4 Test description

9.5.1.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 9.5.1.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.5.1.1.4.3.

9.5.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction for fixed Rank and the SNR according to Table 9.5.1.1.3-1 as appropriate.
2. The SS shall send PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to the UE reported CQI, PMI and RI. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-3a. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #3 and #8 according to Annex A.4-10. Measure the t_{fix} according to annex G.5.3.
3. Propagation conditions are set according to Annex B.1.
4. The SS sends uplink scheduling information via PDCCH DCI format 0 to schedule UL RMC in every subframe according to Annex A.4-10.
5. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.5.1.1.3-1.
6. The UE shall transmit RRC Connection Reconfiguration Complete message.
7. Propagation conditions are set according to Table 9.5.1.1.3-1.
8. The SS shall send PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to the UE reported CQI, PMI and RI. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-3a. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #3 and #8 according to Annex A.4-10. Measure $t_{reported}$ according to Annex G.5.3

   If the ratio ($t_{reported}$ / t_{fix}) satisfies the requirement in Table 9.5.1. 1.5-1, then pass the UE for this test and go to step 9. Otherwise, fail the UE.
9. If all tests have not been done, then repeat the same procedure (steps 1 to 8) with test conditions according to the Table 9.5.1.1.3-2 for the other Tests as appropriate. Otherwise pass the UE.

9.5.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.5.1.1.4.3-1: PhysicalConfigDedicated-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE {			
physicalConfigDedicated	PhysicalConfigDedicated - DEFAULT using condition RBC		
}			

Table 9.5.1.1.4.3-2: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		RBC
antennaInfo CHOICE {			
antennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm4		
}			
codebookSubsetRestriction CHOICE {			
N2TxAntenna-tm4	According to each test		
ue-TransmitAntennaSelection CHOICE {			
release	NULL		
}			
}			
}			

Table 9.5.1.1.4.3-3: *PDSCH-ConfigDedicated-DEFAULT*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB-3		
}			

Table 9.5.1.1.4.3-4: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	Not present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic CHOICE {			
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex	0		
cqi-pmi-ConfigIndex	6	(see Table 7.2.2-1A in TS 36.213)	
cqi-FormatIndicatorPeriodic CHOICE {			
widebandCQI	NULL		
}			
ri-ConfigIndex	1	(see Table 7.2.2-1B in TS 36.213)	
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

9.5.1.1.5 Test requirement

Table 9.5.1.1.5-1: Test requirement (FDD)

Parameter	Test 1	Test 2	Test 3
γ_1	N/A	1.04	N/A
γ_2	0.99	N/A	1.09
UE Category	2-8	2-8	2-8

9.5.1.1_1 FDD RI Reporting– PUCCH 1-1 (Release 10)

9.5.1.1_1.1 Test purpose

Same test purpose as in clause 9.5.1.1.1.

9.5.1.1_1.2 Test applicability

This test applies to E-UTRA FDD UE release 10 of UE category ≥2.

9.5.1.1_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 9.5.1.1.3 with the following exceptions:

- Instead of Table 9.5.1.1.3-1 → use Table 9.5.1.1_1.3-1.
- Instead of Table 9.5.1.1.3-2 → use Table 9.5.1.1_1.3-2.

Table 9.5.1.1_1.3-1: RI Test (FDD)

Parameter		Unit	Test 1	Test 2	Test 3	
Bandwidth		MHz	10			
PDSCH transmission mode			4			
Downlink power allocation	ρ_A	dB	-3			
	ρ_B	dB	-3			
	σ	dB	0			
CodeBookSubsetRestriction bitmap			000011 for fixed RI = 1 010000 for fixed RI = 2 010011 for UE reported RI			
Propagation condition and antenna configuration			2 x 2 EPA5			
Antenna correlation			Low	Low	High	
RI configuration			Fixed RI=2 and follow RI	Fixed RI=1 and follow RI	Fixed RI=1 and follow RI	Fixed RI=2 and follow RI
SNR		dB	0	20	20	20
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	-98	-98
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-78	-78	-78
Maximum number of HARQ transmissions			1			
Reporting mode			PUCCH 1-1 (Note 4)			
Physical channel for CQI/PMI reporting			PUCCH Format 2			
PUCCH Report Type for CQI/PMI			2			
Physical channel for RI reporting			PUSCH (Note 3)			
PUCCH Report Type for RI			3			
Reporting periodicity		ms	$N_P = 5$			
PMI and CQI delay		ms	8			
cqi-pmi-ConfigurationIndex			6			
ri-ConfigurationInd			1 (Note 5)			

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4).

Note 2: Reference measurement channel according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Note 3: To avoid collisions between RI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic RI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.

Note 4: The bit field for precoding information in DCI format 2 shall be mapped as:
- For reported RI = 1 and PMI = 0 >> precoding information bit field index = 1
- For reported RI = 1 and PMI = 1 >> precoding information bit field index = 2
- For reported RI = 2 and PMI = 0 >> precoding information bit field index = 0

Note 5: To avoid the ambiguity of SS behaviour when applying CQI and PMI during rank switching, RI reports are to be applied at the SS with one subframe delay in addition to Note 1 to align with CQI and PMI reports.

Table 9.5.1.1_1.3-2: Minimum requirement (FDD)

Parameter	Test 1	Test 2	Test 3
γ_1	N/A	1.05	0.9 (Note 1)
γ_2	1	N/A	1.1 (Note 1)
UE Category	2-8	2-8	2-8

Note 1: For Test 3, the minimum requirements shall be fulfilled for at least one of γ_1 or γ_2 .

9.5.1.1_1.4 Test description

Same test description as in clause 9.5.1.1.4 with the following exceptions:

- Instead of Table 9.5.1.1.3-1 → use Table 9.5.1.1_1.3-1.
- Instead of Table 9.5.1.1.3-2 → use Table 9.5.1.1_1.3-2.
- Instead of Table 9.5.1.1.5-1 → use Table 9.5.1.1_1.5-1.

9.5.1.1_1.4.1 Initial conditions

Same initial conditions as in clause 9.5.1.1.4.1.

9.5.1.1_1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction for fixed Rank and the SNR according to Table 9.5.1.1_1.3-1 as appropriate.
2. The SS shall send PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to the UE reported CQI, PMI and RI. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-3a. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #3 and #8 according to Annex A.4-10. Measure the t_{fix} according to annex G.5.3.
3. Propagation conditions are set according to Annex B.1.
4. For Test 3 the SS repeats steps 1 to 3 to get two values for t_{fix}, one value for fixed Rank 1 case and the other value for fixed Rank 2 case.
5. The SS sends uplink scheduling information via PDCCH DCI format 0 to schedule UL RMC in every subframe according to Annex A.4-10.
6. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.5.1.1_1.3-1.
7. The UE shall transmit RRC Connection Reconfiguration Complete message.
8. Propagation conditions are set according to Table 9.5.1.1_1.3-1.
9. The SS shall send PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to the UE reported CQI, PMI and RI. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-3a. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #3 and #8 according to Annex A.4-10. Measure $t_{reported}$ according to Annex G.5.3
10. For Test 1 and Test 2 if the ratio ($t_{reported}$ / t_{fix}) satisfies the requirement in Table 9.5.1.1_1.5-1, then pass the UE for Test 1 and Test 2.
11. For Test 3 if the ratio ($t_{reported}$ / t_{fix}) satisfies at least one of the γ_1 or γ_2 requirements in Table 9.5.1.1_1.5-1, then pass the UE for Test 3.
12. For a complete test case to pass the UE has to pass all test cases 1, 2 and 3. Otherwise, fail the UE.
13. If all tests have not been done, then repeat the same procedure (steps 1 to 12) with test conditions according to the Table 9.5.1.1_1.3-2 for the other Tests as appropriate.

9.5.1.1_1.4.3 Message contents

Same message contents as in clause 9.5.1.1.4.3.

9.5.1.1_1.5 Test requirement

Same test requirements as in clause 9.5.1.1.5 with the following exceptions:

- Instead of Table 9.5.1.1.5-1 → use Table 9.5.1.1_1.5-1

Table 9.5.1.1_1.5-1: Test requirement (FDD)

Parameter	Test 1	Test 2	Test 3
γ_1	N/A	1.04	0.89 (Note 1)
γ_2	0.99	N/A	1.09 (Note 1)
UE Category	2-8	2-8	2-8
Note 1: For Test 3, the minimum requirements shall be fulfilled for at least one of γ_1 or γ_2 .			

9.5.1.1_2 FDD RI Reporting– PUCCH 1-1 (Release 11)

9.5.1.1_2.1 Test purpose

Same test purpose as in clause 9.5.1.1.1.

9.5.1.1_2.2 Test applicability

This test applies to E-UTRA FDD UE release 11 and forward of UE category ≥2.

9.5.1.1_2.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 9.5.1.1.3 with the following exceptions:

- Instead of Table 9.5.1.1.3-1 → use Table 9.5.1.1_2.3-1.
- Instead of Table 9.5.1.1.3-2 → use Table 9.5.1.1_2.3-2.

Table 9.5.1.1_2.3-1: RI Test (FDD)

Parameter		Unit	Test 1	Test 2	Test 3
Bandwidth		MHz	10		
PDSCH transmission mode			4		
Downlink power allocation	ρ_A	dB	-3		
	ρ_B	dB	-3		
	σ	dB	0		
Propagation condition and antenna configuration			2 x 2 EPA5		
CodeBookSubsetRestriction bitmap			000011 for fixed RI = 1 010000 for fixed RI = 2 010011 for UE reported RI		
Antenna correlation			Low	Low	High
RI configuration			Fixed RI=2 and follow RI	Fixed RI=1 and follow RI	Fixed RI=1 and follow RI
SNR		dB	0	20	20
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	-98
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-78	-78
Maximum number of HARQ transmissions			1		
Reporting mode			PUCCH 1-1 (Note 4)		
Physical channel for CQI/PMI reporting			PUCCH Format 2		
PUCCH Report Type for CQI/PMI			2		
Physical channel for RI reporting			PUSCH (Note 3)		
PUCCH Report Type for RI			3		
Reporting periodicity		ms	N_{pd} = 5		
PMI and CQI delay		ms	8		
cqi-pmi-ConfigurationIndex			6		
ri-ConfigurationInd			1 (Note 5)		

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 2: Reference measurement channel according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.
Note 3: To avoid collisions between RI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic RI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.
Note 4: The bit field for precoding information in DCI format 2 shall be mapped as:
- For reported RI = 1 and PMI = 0 >> precoding information bit field index = 1
- For reported RI = 1 and PMI = 1 >> precoding information bit field index = 2
- For reported RI = 2 and PMI = 0 >> precoding information bit field index = 0

Note 5: To avoid the ambiguity of TE behaviour when applying CQI and PMI during rank switching, RI reports are to be applied at the TE with one subframe delay in addition to Note 1 to align with CQI and PMI reports.

Table 9.5.1.1_2.3-2: Minimum requirement (FDD)

Parameter	Test 1	Test 2	Test 3
γ_1	N/A	1.05	0.9
γ_2	1	N/A	N/A
UE Category	2-8	2-8	2-8

9.5.1.1_2.4 Test description

Same test description as in clause 9.5.1.1.4 with the following exceptions:

- Instead of Table 9.5.1.1.3-1 → use Table 9.5.1.1_2.3-1.
- Instead of Table 9.5.1.1.3-2 → use Table 9.5.1.1_2.3-2.
- Instead of Table 9.5.1.1.5-1 → use Table 9.5.1.1_2.5-1.

9.5.1.1_2.5 Test requirement

Same test requirements as in clause 9.5.1.1.5 with the following exceptions:

- Instead of Table 9.5.1.1.5-1 → use Table 9.5.1.1_2.5-1

Table 9.5.1.1_2.5-1: Test requirement (FDD)

Parameter	Test 1	Test 2	Test 3
γ_1	N/A	1.04	0.89
γ_2	0.99	N/A	N/A
UE Category	2-8	2-8	2-8

9.5.1.2 TDD RI Reporting – PUSCH 3-1

9.5.1.2.1 Test purpose

To verify that the reported rank indicator accurately represents the channel rank.

9.5.1.2.2 Test applicability

This test applies to E-UTRA TDD UE release 8 and 9, which support UE Category ≥2.

9.5.1.2.3 Minimum conformance requirements

The minimum performance requirement in Table 9.5.1.2.3-2 is defined as

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be ≥ γ_1;

b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be ≥ γ_2;

TBS selection is based on the UE wideband CQI feedback. The transport block size TBS is that resulting from the code rate which is closest to that indicated by M = wideband CQI and the N_{PRB} entry in Table 7.1.7.2.1-1 of TS36.213 [10] that corresponds to the transmission bandwidth configuration in Table 5.6-1 of TS36.101 [2].

For the parameters specified in Table 9.5.1.2.3-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.5.1.2.3-2.

Table 9.5.1.2.3-1: RI Test (TDD)

Parameter		Unit	Test 1	Test 2	Test 3
Bandwidth		MHz	10		
PDSCH transmission mode			4		
Downlink power allocation	ρ_A	dB	-3		
	ρ_B	dB	-3		
	σ	dB	0		
Uplink downlink configuration			2		
Special subframe configuration			4		
Propagation condition and antenna configuration			2 x 2 EPA5		
CodeBookSubsetRestriction bitmap			000011 for fixed RI = 1 010000 for fixed RI = 2 010011 for UE reported RI		
Antenna correlation			Low	Low	High
RI configuration			Fixed RI=2 and follow RI	Fixed RI=1 and follow RI	Fixed RI=2 and follow RI
SNR		dB	0	20	20
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	-98
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-78	-78
Maximum number of HARQ transmissions			1		
Reporting mode			PUSCH 3-1 (Note 3)		
Reporting interval		ms	5		
PMI and CQI delay		ms	10 or 11		
ACK/NACK feedback mode			Bundling		
Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4). Note 2: Reference measurement channel according to Table A.4-2 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1. Note 3: Reported wideband CQI and PMI are used and sub-band CQI is discarded.					

Table 9.5.1.2.3-2: Minimum requirement (TDD)

Parameter	Test 1	Test 2	Test 3
γ_1	N/A	1.05	N/A
γ_2	1	N/A	1.1
UE Category	2-8	2-8	2-8

The normative reference for this requirement is TS 36.101 [2] clause 9.5.1.2.

9.5.1.2.4 Test description

9.5.1.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.

2. The parameter settings for the cell are set up according to Table 9.5.1.2.3-1.

3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.5.1.2.4.3.

9.5.1.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction for fixed Rank and the SNR according to Table 9.5.1.2.3-1 as appropriate.

2. The SS shall send PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and RI. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-3a. The SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the t_{fix} according to annex G.5.3

3. Propagation conditions are set according to Annex B.1.

4. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit to 0 to schedule UL RMC in subframe#2 and #7 according to Annex A.4-11.

5. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.5.1.2.3-1.

6. The UE shall transmit RRC Connection Reconfiguration Complete message.

7. Propagation conditions are set according to Table 9.5.1.2.3-1.

8. The SS shall send PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and RI. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-3a. The SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure $t_{reported}$ according to Annex G.5.3

   If the ratio ($t_{reported}$ / t_{fix}) satisfies the requirement in Table 9.5.1.2.5-1, then pass the UE for this test and go to step 9. Otherwise, fail the UE.

9. If all tests have not been done, then repeat the same procedure (steps 1 to 8) with test conditions according to the Table 9.5.1.2.3-2 for the other Tests as appropriate. Otherwise pass the UE.

9.5.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.5.1.2.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.508 clause 5.5.1.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
cqi-ReportConfig	*CQI-ReportConfig-DEFAULT*		
antennaInfo CHOICE {			
antennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm4		
}			
codebookSubsetRestriction CHOICE {			
N2TxAntenna-tm4	According to each test		
ue-TransmitAntennaSelection CHOICE {			
release	NULL		
}			
}			
}			

Table 9.5.1.2.4.3-2: *PDSCH-ConfigDedicated-DEFAULT*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB-3		
}			

Table 9.5.1.2.4.3-3: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	rm31		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic CHOICE {	Not Present		
}			
}			

Table 9.5.1.2.4.3-4: PUCCH-ConfigDedicated-DEFAULT

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
ackNackRepetition CHOICE {			
release	NULL		
}			
tddAckNackFeedbackMode	Bundling	Multiplexing is selected as default to align with RAN4's assumptions in RF tests.	TDD
}			

9.5.1.2.5 Test requirement

Table 9.5.1.2.5-1: Test requirement (TDD)

Parameter	Test 1	Test 2	Test 3
γ_1	N/A	1.04	N/A
γ_2	0.99	N/A	1.09
UE Category	2-8	2-8	2-8

9.5.1.2_1 TDD RI Reporting – PUSCH 3-1 (Release 10)

9.5.1.2_1.1 Test purpose

Same test purpose as in clause 9.5.1.2.1.

9.5.1.2_1.2 Test applicability

This test applies to E-UTRA TDD UE release 10, which supports UE Category ≥2.

9.5.1.2_1.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 9.5.1.2.3 with the following exceptions:

- Instead of Table 9.5.1.2.3-1 → use Table 9.5.1.2_1.3-1.
- Instead of Table 9.5.1.2.3-2 → use Table 9.5.1.2_1.3-2.

Table 9.5.1.2_1.3-1: RI Test (TDD)

Parameter		Unit	Test 1	Test 2	Test 3	
Bandwidth		MHz	10			
PDSCH transmission mode			4			
Downlink power allocation	ρ_A	dB	-3			
	ρ_B	dB	-3			
	σ	dB	0			
Uplink downlink configuration			2			
Special subframe configuration			4			
Propagation condition and antenna configuration			2 x 2 EPA5			
CodeBookSubsetRestriction bitmap			000011 for fixed RI = 1 010000 for fixed RI = 2 010011 for UE reported RI			
Antenna correlation			Low	Low	High	High
RI configuration			Fixed RI=2 and follow RI	Fixed RI=1 and follow RI	Fixed RI=1 and follow RI	Fixed RI=2 and follow RI
SNR		dB	0	20	20	20
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	-98	-98
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-78	-78	-78
Maximum number of HARQ transmissions			1			
Reporting mode			PUSCH 3-1 (Note 3)			
Reporting interval		ms	5			
PMI and CQI delay		ms	10 or 11			
ACK/NACK feedback mode			Bundling			
Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4). Note 2: Reference measurement channel according to Table A.4-2 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1. Note 3: Reported wideband CQI and PMI are used and sub-band CQI is discarded.						

Table 9.5.1.2_1.3-2: Minimum requirement (TDD)

Parameter	Test 1	Test 2	Test 3
γ_1	N/A	1.05	0.9 (Note 1)
γ_2	1	N/A	1.1 (Note 1)
UE Category	2-8	2-8	2-8
Note 1: For Test 3, the minimum requirements shall be fulfilled for at least one of γ_1 or γ_2 .			

9.5.1.2_1.4 Test description

9.5.1.2_1.4.1 Initial conditions

Same initial conditions as in clause 9.5.1.2.4.1.

9.5.1.2_1.4.2 Test procedure

1. Set the parameters of bandwidth, reference Channel, the propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction for fixed Rank and the SNR according to Table 9.5.1.2_1.3-1 as appropriate.

2. The SS shall send PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and RI. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-3a. The SS schedules the UL transmission to

carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure the t_{fix} according to annex G.5.3

3. Propagation conditions are set according to Annex B.1.
4. For Test 3 the SS repeats steps 1 to 3 to get two values for t_{fix}, one value for fixed Rank 1 case and the other value for fixed Rank 2 case.
5. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit to 0 to schedule UL RMC in subframe#2 and #7 according to Annex A.4-11.
6. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.5.1.2_1.3-1.
6. The UE shall transmit RRC Connection Reconfiguration Complete message.
7. Propagation conditions are set according to Table 9.5.1.2_1.3-1.
8. The SS shall send PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and RI. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-3a. The SS schedules the UL transmission to carry the PUSCH CQI feedback via PDCCH DCI format 0 with CQI request bit set to 1 and I_MCS=29 and N_PRB allocated to be less or equal to 4. Measure $t_{reported}$ according to Annex G.5.3
10. For Test 1 and Test 2 if the ratio ($t_{reported}$ / t_{fix}) satisfies the requirement in Table 9.5.1.2_1.5-1, then pass the UE for Test 1 and Test 2.
11. For Test 3 if the ratio ($t_{reported}$ / t_{fix}) satisfies at least one of the γ_1 or γ_2 requirements in Table 9.5.1.2_1.5-1, then pass the UE for Test 3.
12. For a complete test case to pass the UE has to pass all test cases 1, 2 and 3. Otherwise, fail the UE
13. If all tests have not been done, then repeat the same procedure (steps 1 to 12) with test conditions according to the Table 9.5.1.2_1.3-2 for the other Tests as appropriate.

9.5.1.2_1.4.3 Message contents

Same message contents as in clause 9.5.1.2.4.3.

9.5.1.2_1.5 Test requirement

Same test requirements as in clause 9.5.1.2.5 with the following exceptions:

- Instead of Table 9.5.1.2.5-1 → use Table 9.5.1.2_1.5-1

Table 9.5.1.2_1.5-1: Test requirement (TDD)

Parameter	Test 1	Test 2	Test 3
γ_1	N/A	1.04	0.89 (Note 1)
γ_2	0.99	N/A	1.09 (Note 1)
UE Category	2-8	2-8	2-8
Note 1: For Test 3, the minimum requirements shall be fulfilled for at least one of γ_1 or γ_2 .			

9.5.1.2_2 TDD RI Reporting – PUSCH 3-1 (Release 11)

9.5.1.2_2.1 Test purpose

Same test purpose as in clause 9.5.1.2.1.

9.5.1.2_2.2 Test applicability

This test applies to E-UTRA TDD UE release 11 and forward, which supports UE Category ≥2.

9.5.1.2_2.3 Minimum conformance requirements

Same minimum conformance requirements as in clause 9.5.1.2.3 with the following exceptions:

- Instead of Table 9.5.1.2.3-1 → use Table 9.5.1.2_2.3-1.
- Instead of Table 9.5.1.2.3-2 → use Table 9.5.1.2_2.3-2.

Table 9.5.1.2_2.3-1: RI Test (TDD)

Parameter		Unit	Test 1	Test 2	Test 3
Bandwidth		MHz	10		
PDSCH transmission mode			4		
Downlink power allocation	ρ_A	dB	-3		
	ρ_B	dB	-3		
	σ	dB	0		
Uplink downlink configuration			2		
Special subframe configuration			4		
Propagation condition and antenna configuration			2 x 2 EPA5		
CodeBookSubsetRestriction bitmap			000011 for fixed RI = 1 010000 for fixed RI = 2 010011 for UE reported RI		
Antenna correlation			Low	Low	High
RI configuration			Fixed RI=2 and follow RI	Fixed RI=1 and follow RI	Fixed RI=1 and follow RI
SNR		dB	0	20	20
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	-98
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-78	-78
Maximum number of HARQ transmissions			1		
Reporting mode			PUSCH 3-1 (Note 3)		
Reporting interval		ms	5		
PMI and CQI delay		ms	10 or 11		
ACK/NACK feedback mode			Bundling		
Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4). Note 2: Reference measurement channel according to Table A.4-2 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1. Note 3: Reported wideband CQI and PMI are used and sub-band CQI is discarded.					

Table 9.5.1.2_2.3-2: Minimum requirement (TDD)

Parameter	Test 1	Test 2	Test 3
γ_1	N/A	1.05	0.9
γ_2	1	N/A	N/A
UE Category	2-8	2-8	2-8

9.5.1.2_2.4 Test description

Same test description as in clause 9.5.1.2.4 with the following exceptions:

- Instead of Table 9.5.1.2.3-1 → use Table 9.5.1.2_2.3-1.

- Instead of Table 9.5.1.2.3-2 → use Table 9.5.1.2_2.3-2.
- Instead of Table 9.5.1.2.5-1 → use Table 9.5.1.2_2.5-1.

9.5.1.2_2.5 Test requirement

Same test requirements as in clause 9.5.1.2.5 with the following exceptions:

- Instead of Table 9.5.1.2.5-1 → use Table 9.5.1.2_2.5-1

Table 9.5.1.2_2.5-1: Test requirement (TDD)

Parameter	Test 1	Test 2	Test 3
γ_1	N/A	1.04	0.89
γ_2	0.99	N/A	N/A
UE Category	2-8	2-8	2-8

9.5.2 RI Reporting (CSI Reference Symbols)

9.5.2.1

9.5.2.1_D FDD RI Reporting- PUCCH 1-1 for eDL-MIMO

9.5.2.1_D.1 Test purpose

To verify that the reported rank indicator accurately represents the channel rank.

9.5.2.1_D.2 Test applicability

This test applies to E-UTRA FDD UE release 10 and forward that support eDL-MIMO. Applicability requires support for FGI bit 103.

9.5.2.1_D.3 Minimum conformance requirements

The minimum performance requirement in Table 9.5.2.1_D.3-2 is defined as

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$;

b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

TBS selection is based on the UE wideband CQI feedback. The transport block size TBS for wideband CQI is selected according to Table A.4-3e or Table A.4-3f.

For the parameters specified in Table 9.5.2.1_D.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.5.2.1_D.3-2.

Table 9.5.2.1_D.3-1: RI Test (FDD) for eDL-MIMO

Parameter		Unit	Test 1	Test 2	Test 3
Bandwidth		MHz	10		
PDSCH transmission mode			9		
Downlink power allocation	ρ_A	dB	0		
	ρ_B	dB	0		
	Pc	dB	0		
	σ	dB	0		
Propagation condition and antenna configuration			2 x 2 EPA5		
Cell-specific reference signals			Antenna ports 0		
CSI reference signals			Antenna ports 15, 16		
Beamforming model			As specified in Annex B.4.3		
CSI-RS periodicity and subframe offset T_{CSI-RS} / Δ_{CSI-RS}			5/1		
CSI reference signal configuration			6		
CodeBookSubsetRestriction bitmap			000011 for fixed RI = 1 010000 for fixed RI = 2 010011 for UE reported RI		
Antenna correlation			Low	Low	High
RI configuration			Fixed RI=2 and follow RI	Fixed RI=1 and follow RI	Fixed RI=2 and follow RI
SNR		dB	0	20	20
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	-98
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-78	-78
Maximum number of HARQ transmissions			1		
Reporting mode			PUCCH 1-1		
Physical channel for CQI/PMI reporting			PUSCH (Note 3)		
PUCCH Report Type for CQI/PMI			2		
Physical channel for RI reporting			PUCCH Format 2		
PUCCH Report Type for RI			3		
Reporting periodicity		ms	N_{pd} = 5		
PMI and CQI delay		ms	8		
cqi-pmi-ConfigurationIndex			6		
ri-ConfigurationInd			1 (Note 4)		

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4).

Note 2: Reference measurement channel according to Table A.4-1b with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Note 3: To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#0 and #5.

Note 4: To avoid the ambiguity of TE behaviour when applying CQI and PMI during rank switching, RI reports are to be applied at the TE with one subframe delay in addition to Note 1 to align with CQI and PMI reports.

Table 9.5.2.1_D.3-2: Minimum requirement (FDD) for eDL-MIMO

Parameter	Test 1	Test 2	Test 3
γ_1	N/A	1.05	0.9
γ_2	1	N/A	N/A
UE Category	2-8	2-8	2-8

The normative reference for this requirement is TS 36.101 [2] clause 9.5.2.1.

9.5.2.1_D.4 Test description

9.5.2.1_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 9.5.2.1_D.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.5.2.1_D.4.3.

9.5.2.1_D.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction for fixed Rank and the SNR according to Table 9.5.2.1_D.3-1 as appropriate.
2. The SS shall send PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the UE reported CQI, PMI and RI. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-3f. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and #5 (Table A.4-1b). Measure the t_{fix} according to annex G.5.3.
3. Propagation conditions are set according to Annex B.1.
4. The SS sends uplink scheduling information via PDCCH DCI format 0 to schedule UL RMC in every subframe according to Table A.4-1b.
5. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.5.2.1_D.3-1.
6. The UE shall transmit RRC Connection Reconfiguration Complete message.
7. Propagation conditions are set according to Table 9.5.2.1_D.3-1.
8. The SS shall send PDSCH via PDCCH DCI format 2 for C_RNTI to transmit the DL RMC according to the UE reported CQI, PMI and RI. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-3f. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #0 and #5 (Table A.4-1b). Measure $t_{reported}$ according to Annex G.5.3

   If the ratio ($t_{reported}$ / t_{fix}) satisfies the requirement in Table 9.5.2. 1_D.5-1, then pass the UE for this test and go to step 9. Otherwise, fail the UE.

9. If all tests have not been done, then repeat the same procedure (steps 1 to 8) with test conditions according to the Table 9.5.2.1_D.3-2 for the other Tests as appropriate. Otherwise pass the UE.

9.5.2.1_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.5.2.1_D.4.3-1: PhysicalConfigDedicated-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE {			
physicalConfigDedicated	*CQI-ReportConfig-r10-DEFAULT* using condition RBC		
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.5.2.1_D.4.3-2: *PDSCH-ConfigDedicated-DEFAULT*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB0		
}			

Table 9.5.2.1_D.4.3-3: *AntennaInfoDedicated-r10*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated-r10 ::= SEQUENCE {			
transmissionMode-r10	tm9-v1020		
codebookSubsetRestriction-r10	According to each test	000011 for fixed RI = 1 010000 for fixed RI = 2 010011 for UE reported RI	
}			
ue-TransmitAntennaSelection CHOICE {			
release	NULL		
}			

Table 9.5.2.1_D.4.3-4: *CQI-ReportConfig-r10-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-r10 ::= SEQUENCE {			
cqi-ReportModeAperiodic-r10	Not Present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic-r10	CQI-ReportPeriodic-r10-DEFAULT		
}			

Table 9.5.2.1_D.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportPeriodic-r10 ::= CHOICE {			
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex-r10	0		
cqi-PUCCH-ResourceIndexP1-r10	Not present		
cqi-pmi-ConfigIndex	6	(see Table 7.2.2-1A in TS 36.213)	
cqi-FormatIndicatorPeriodic-r10 CHOICE {			
widebandCQI-r10 SEQUENCE {			
csi-ReportMode-r10	Not present		
}			
ri-ConfigIndex	1	(see Table 7.2.2-1B in TS 36.213)	
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

Table 9.5.2.1_D.4.3-6: *CSI-RS-Config*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-RS-Config-r10 ::= SEQUENCE {			
csi-RS-r10 CHOICE{			
release	NULL		
setup SEQUENCE {			
antennaPortsCount-r10	an2	Parameter represents the number of antenna ports used for transmission of CSI reference signals	
resourceConfig-r10	6	Parameter: CSI reference signal configuration	
subframeConfig-r10	1	$\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$	
p-C-r10	0	Parameter: P_c which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback	
}			
}			
}			

9.5.2.1_D.5 Test requirement

Table 9.5.2.1_D.5-1: Test requirement (FDD) for eDL-MIMO

Parameter	Test 1	Test 2	Test 3
γ_1	N/A	1.04	0.89
γ_2	0.99	N/A	N/A
UE Category	2-8	2-8	2-8

9.5.2.2_D TDD RI Reporting- PUCCH 1-1 for eDL-MIMO

9.5.2.2_D.1 Test purpose

To verify that the reported rank indicator accurately represents the channel rank.

9.5.2.2_D.2 Test applicability

This test applies to E-UTRA TDD UE Release 10 and forward that support eDL-MIMO. Applicability requires support for FGI bit 103.

9.5.2.2_D.3 Minimum conformance requirements

The minimum performance requirement in Table 9.5.2.2_D.3-2 is defined as:

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$;

b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

TBS selection is based on the UE wideband CQI feedback. The transport block size TBS for wideband CQI is selected according to Table A.4-3e or Table A.4-3f.

For the parameters specified in Table 9.5.2.2_D.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.5.2.2_D.3-2.

Table 9.5.2.2_D.3-1: RI Test (TDD) for eDL-MIMO

Parameter		Unit	Test 1	Test 2	Test 3
Bandwidth		MHz	10		
PDSCH transmission mode			9		
Downlink power allocation	ρ_A	dB	0		
	ρ_B	dB	0		
	Pc	dB	0		
	σ	dB	0		
Uplink downlink configuration			1		
Special subframe configuration			4		
Propagation condition and antenna configuration			2 x 2 EPA5		
Cell-specific reference signals			Antenna ports 0		
CSI reference signals			Antenna ports 15, 16		
CSI reference signal configuration			4		
Beamforming model			As specified in Annex B.4.3		
CSI-RS periodicity and subframe offset T_{CSI-RS} / Δ_{CSI-RS}			5/4		
CodeBookSubsetRestriction bitmap			000011 for fixed RI = 1 010000 for fixed RI = 2 010011 for UE reported RI		
Antenna correlation			Low	Low	High
RI configuration			Fixed RI=2 and follow RI	Fixed RI=1 and follow RI	Fixed RI=2 and follow RI
SNR		dB	0	20	20
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	-98
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-78	-78
Maximum number of HARQ transmissions			1		
Reporting mode			PUCCH 1-1		
Physical channel for CQI/ PMI reporting			PUSCH (Note 3)		
PUCCH report type for CQI/ PMI			2		
Physical channel for RI reporting			PUCCH Format 2		
Reporting periodicity		ms	$N_{pd} = 5$		
PMI and CQI delay		ms	10		
ACK/NACK feedback mode			Bundling		
cqi-pmi-ConfigurationIndex			4		
ri-ConfigurationInd			1		

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 2: Reference measurement channel according to Table A.4-2b with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.
Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#3 and #8.

Table 9.5.2.2_D.3-2: Minimum requirement (TDD) for eDL-MIMO

Parameter	Test 1	Test 2	Test 3
γ_1	N/A	1.05	0.9
γ_2	1	N/A	N/A
UE Category	2-8	2-8	2-8

The normative reference for this requirement is TS 36.101 [2] clause 9.5.2.2.

9.5.2.2_D.4 Test description

9.5.2.2_D.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 9.5.2.2_D.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.5.2.2_D.4.3.

9.5.1.2_D.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction for fixed Rank and the SNR according to Table 9.5.2.2_D.3-1 as appropriate.
2. The SS shall send PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and RI. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-3f. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #3 and #8 (Table A.4-2b). Measure the t_{fix} according to annex G.5.3
3. Propagation conditions are set according to Annex B.1.
4. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit to 0 to schedule UL RMC in subframe#3 and #8 according to Table A.4-2b.
5. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.5.2.2_D.3-1.
6. The UE shall transmit RRC Connection Reconfiguration Complete message.
7. Propagation conditions are set according to Table 9.5.2.2_D.3-1.
8. The SS shall send PDSCH via PDCCH DCI format 2C for C_RNTI to transmit the DL RMC according to the UE reported CQI (wideband CQI), PMI and RI. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-3f. The SS sends uplink scheduling information via PDCCH DCI format 0 with CQI request bit set to 0 to schedule UL RMC in subframe #3 and subframe #8 (Table A.4-2b). Measure $t_{reported}$ according to Annex G.5.3

   If the ratio ($t_{reported}$ / t_{fix}) satisfies the requirement in Table 9.5.2.2_D.5-1, then pass the UE for this test and go to step 9. Otherwise, fail the UE.

9. If all tests have not been done, then repeat the same procedure (steps 1 to 8) with test conditions according to the Table 9.5.2.2_D.3-2 for the other Tests as appropriate. Otherwise pass the UE.

9.5.2.2_D.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.5.2.2_D.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
RadioResourceConfigDedicated-SRB2-DRB(n, m) ::= SEQUENCE {			
physicalConfigDedicated	*CQI-ReportConfig-r10-DEFAULT* using condition RBC		
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.5.2.2_D.4.3-2: *PDSCH-ConfigDedicated-DEFAULT*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB0		
}			

Table 9.5.2.2_D.4.3-3: *AntennaInfoDedicated-r10*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated-r10 ::= SEQUENCE {			
transmissionMode-r10	tm9-v1020		
codebookSubsetRestriction-r10	According to each test	000011 for fixed RI = 1 010000 for fixed RI = 2 010011 for UE reported RI	
}			
ue-TransmitAntennaSelection CHOICE {			
release	NULL		
}			

Table 9.5.2.2_D.4.3-4: *CQI-ReportConfig-r10-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-r10 ::= SEQUENCE {			
cqi-ReportModeAperiodic-r10	Not Present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic-r10	CQI-ReportPeriodic-r10-DEFAULT		
}			

Table 9.5.2.2_D.4.3-5: *CQI-ReportPeriodic-r10-DEFAULT*

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportPeriodic-r10 ::= CHOICE {			
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex-r10	0		
cqi-PUCCH-ResourceIndexP1-r10	Not present		
cqi-pmi-ConfigIndex	4	(see Table 7.2.2-1A in TS 36.213)	
cqi-FormatIndicatorPeriodic-r10 CHOICE {			
widebandCQI-r10 SEQUENCE {			
csi-ReportMode-r10	Not present		
}			
ri-ConfigIndex	1	(see Table 7.2.2-1B in TS 36.213)	
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

Table 9.5.2.2_D.4.3-6: PUCCH-ConfigDedicated-DEFAULT

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PUCCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
ackNackRepetition CHOICE {			
release	NULL		
}			
tddAckNackFeedbackMode	Bundling	Multiplexing is selected as default to align with RAN4's assumptions in RF tests.	TDD
}			

Table 9.5.2.2_D.4.3-7: TDD-Config-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
TDD-Config-DEFAULT ::= SEQUENCE {			
subframeAssignment	sa1		
specialSubframePatterns	ssp4		
}			

Table 9.5.2.2_D.4.3-8: *CSI-RS-Config*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
CSI-RS-Config-r10 ::= SEQUENCE {			
csi-RS-r10 CHOICE{			
release	NULL		
setup SEQUENCE {			
antennaPortsCount-r10	an2	Parameter represents the number of antenna ports used for transmission of CSI reference signals	
resourceConfig-r10	4	Parameter: CSI reference signal configuration	
subframeConfig-r10	4	$\Delta_{\text{CSI-RS}} = I_{\text{CSI-RS}}$ when CSI-RS SubframeConfig is from 0-4; Parameter: $I_{\text{CSI-RS}}$	
p-C-r10	0	Parameter: P_c which is the assumed ratio of PDSCH EPRE to CSI-RS EPRE when UE derives CSI feedback	
}			
}			
}			

9.5.2.2_D.5 Test requirement

Table 9.5.2.2_D.5-1: Test requirement (TDD) for eDL-MIMO

Parameter	Test 1	Test 2	Test 3
γ_1	N/A	1.04	0.89
γ_2	0.99	N/A	N/A
UE Category	2-8	2-8	2-8

9.5.3 RI Reporting (Cell-Specific Reference Symbols)

9.5.3.1_C FDD RI Reporting – PUCCH 1-0 for eICIC

9.5.3.1_C.1 FDD RI Reporting – PUCCH 1-0 for eICIC (non-MBSFN ABS)

Editor's notes: This test case is incomplete. The following item is missing or incomplete:

- Some test parameters are still in square brackets.
- Message contents are FFS.
- Test tolerances are TBD.

9.5.3.1_C.1.1 Test purpose

To verify that the reported rank indicator accurately represents the channel rank under time domain resource restriction i.e. in case two CSI subframe sets are configured.

9.5.3.1_C.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward. Applicability requires support for FGI bit 115.

9.5.3.1_C.1.3 Minimum conformance requirements

The minimum performance requirement in Table 9.5.3.1_C.1.3-2 is defined as

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be ≥ γ_1

TBS selection is based on the UE wideband CQI feedback. The transport block size TBS for wideband is selected according to Table A.4.3-a.

For the parameters specified in Table 9.5.3.1_C.1.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.5.3.1_C.1.3-2.

Table 9.5.3.1_C.1.3-1: RI Test (FDD)

Parameter		Unit	Test 1		Test 2	
			Cell 1	Cell 2	Cell 1	Cell 2
Bandwidth		MHz	10		10	
PDSCH transmission mode			3	Note 10	3	Note 10
Downlink power allocation	ρ_A	dB	-3		-3	
	ρ_B	dB	-3		-3	
	σ	dB	0		0	
Propagation condition and antenna configuration			2 x 2 EPA5		2 x 2 EPA5	
CodeBookSubsetRestriction bitmap			01 for fixed RI = 1 10 for fixed RI = 2 11 for UE reported RI	N/A	01 for fixed RI = 1 10 for fixed RI = 2 11 for UE reported RI	N/A
Antenna correlation			Low		Low	
RI configuration			Fixed RI=1 and follow RI	N/A	Fixed RI=1 and follow RI	N/A
$\widehat{E}_s/N_{oc2}$		dB	0	-12	20	6
$N_{oc}^{(j)}$	$N_{oc1}^{(j)}$	dBmW/15kHz	[-98] (Note 3)	N/A	-102 (Note 3)	N/A
	$N_{oc2}^{(j)}$		[-98] (Note 4)	N/A	-98 (Note 4)	N/A
	$N_{oc3}^{(j)}$		[-98] (Note 5)	N/A	-94.8 (Note 5)	N/A
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-110	-78	-92
Subframe Configuration			Non-MBSFN	Non-MBSFN	Non-MBSFN	Non-MBSFN
Cell Id			0	1	0	1
Time Offset between Cells		μs	2.5 (synchronous cells)		2.5 (synchronous cells)	
ABS Pattern (Note 6)			N/A	10000000 10000000 10000000 10000000 10000000	N/A	10000000 10000000 10000000 10000000 10000000
RLM/RRM Measurement Subframe Pattern (Note 7)			10000000 10000000 10000000 10000000 10000000	N/A	10000000 10000000 10000000 10000000 10000000	N/A
CSI Subframe Sets (Note 8)	$C_{CSI,0}$		10000000 10000000 10000000 10000000 10000000	N/A	10000000 10000000 10000000 10000000 10000000	N/A
	$C_{CSI,1}$		01111111 01111111 01111111 01111111 01111111		01111111 01111111 01111111 01111111 01111111	
Number of control OFDM Symbols			3	3	3	3
Maximum number of HARQ transmissions			1		1	
Reporting mode			PUCCH 1-0		PUCCH 1-0	
Physical channel for CQI reporting			PUCCH Format 2		PUCCH Format 2	
PUCCH Report Type for CQI			4		4	

Physical channel for RI reporting		PUCCH Format 2		PUCCH Format 2	
PUCCH Report Type for RI		3		3	
Reporting periodicity	ms	N_{pd}= 10		N_{pd}= 10	
cqi-pmi-ConfigurationIndex		11		11	
ri-ConfigurationInd		5		5	
cqi-pmi-ConfigurationIndex2		10		10	
ri-ConfigurationInd2		2		2	
Cyclic prefix		Normal	Normal	Normal	Normal

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 2: Reference measurement channel in Cell 1 according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.
Note 3: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 4: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 5: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
Note 6: ABS pattern as defined in TS 36.423 [14].
Note 7: Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5].
Note 8: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in TS 36.331 [5].
Note 9: Cell 1 is the serving cell. Cell 2 is the aggressor cell.
Note 10: Downlink physical channel setup in Cell 2 in accordance with Annex C.3.3 applying OCNG pattern OP.5 FDD as defined in Annex A.5.1.5.

Table 9.5.3.1_C.1.3-2: Minimum requirement (FDD)

	Test 1	Test 2
γ_1	0.9	1.05
UE Category	2-8	2-8

The normative reference for this requirement is TS 36.101 [2] clause 9.5.3.1.

9.5.3.1_C.1.4 Test description

9.5.3.1_C.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure [TBD].

2. The parameter settings for the cell are set up according to Table 9.5.3.1_C.1.3-1.

3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF (in Cell 1) according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.5.3.1_C.1.4.3.

9.5.3.1_C.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction for fixed Rank and the SNR according to Table 9.5.3.1_C.1.3-1 as appropriate.
2. Set the Cell2 –aggressor cell- as defined in Table 9.5.3.1_C.1.3-1 and according to Annex C3.3.
3. The SS shall send PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to the UE reported CQI and RI. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-3a.
4. Measure the t_{fix} according to annex G.5.3.
5. Propagation conditions are set according to Annex B.1.
6. The SS sends uplink scheduling information via PDCCH DCI format 0 to schedule UL RMC in every subframe according to Table A.4.1-1.
7. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.5.3.1_C.1.3-1.
8. The UE shall transmit RRC Connection Reconfiguration Complete message.
9. Propagation conditions are set according to Table 9.5.3.1_C.1.3-1.
10. The SS shall send PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to the UE reported CQI and RI. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-3a.
11. Measure $t_{reported}$ according to Annex G.5.3

    If the ratio ($t_{reported}$ / t_{fix}) satisfies the requirement in Table 9.5.3.1_C.1.5-1, then pass the UE for this test and go to step 12. Otherwise, fail the UE.
12. If all tests have not been done, then repeat the same procedure (steps 1 to 11) with test conditions according to the Table 9.5.3.1_C.1.3-1 for the other Tests as appropriate. Otherwise pass the UE.

9.5.3.1_C.1.4.3 Message contents

[FFS]

9.5.3.1_C.1.5 Test requirement

Table 9.5.3.1_C.1.5-1: Minimum requirement (FDD)

	Test 1	Test 2
γ_1	0.9+TT	1.05+TT
UE Category	2-8	2-8

9.5.3.2_C TDD RI Reporting – PUCCH 1-0 for eICIC

9.5.3.2_C.1 TDD RI Reporting – PUCCH 1-0 for eICIC (non-MBSFN ABS)

Editor's notes: This test case is incomplete. The following item is missing or incomplete:

- Some test parameters are still in square brackets.
- Message contents are FFS.

- Test tolerances are TBD.

9.5.3.2_C.1.1 Test purpose

To verify that the reported rank indicator accurately represents the channel rank under time domain resource restriction i.e. in case two CSI subframe sets are configured.

9.5.3.2_C.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward. Applicability requires support for FGI bit 115.

9.5.3.2_C.1.3 Minimum conformance requirements

The minimum performance requirement in Table 9.5.3.2_C.1.3-2 is defined as:

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$.

TBS selection is based on the UE wideband CQI feedback. The transport block size TBS for wideband is selected according to Table A.4.3-a.

For the parameters specified in Table 9.5.3.2_C.1.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.5.3.2_C.1.3-2.

Table 9.5.3.2_C.1.3-1: RI Test (TDD)

Parameter		Unit	Test1		Test2	
			Cell 1	Cell 2	Cell 1	Cell 2
Bandwidth		MHz	10		10	
PDSCH transmission mode			3	Note 11	3	Note 11
Uplink downlink configuration					1	
Special subframe configuration			[4]		4	
Downlink power allocation	ρ_A	dB	[-3]		-3	
	ρ_B	dB	[-3]		-3	
	σ	dB	0		0	
Propagation condition and antenna configuration			[2 x 2 EPA5]		2 x 2 EPA5	
CodeBookSubsetRestriction bitmap			01 for fixed RI = 1 10 for fixed RI = 2 11 for UE reported RI	N/A	01 for fixed RI = 1 10 for fixed RI = 2 11 for UE reported RI	N/A
Antenna correlation			Low		Low	
RI configuration			Fixed RI=1 and follow RI	N/A	Fixed RI=1 and follow RI	N/A
$\widehat{E}_s/N_{oc2}$		dB	[0]	-12	20	6
$N_{oc}^{(j)}$	$N_{oc1}^{(j)}$	dB[mW/15kHz]	-98 (Note 4)	N/A	-102 (Note 4)	N/A
	$N_{oc2}^{(j)}$		-98 (Note 5)	N/A	-98 (Note 5)	N/A
	$N_{oc3}^{(j)}$		-98 (Note 6)	N/A	-94.8 (Note 6)	N/A
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-110	-78	-92
Subframe Configuration			Non-MBSFN	Non-MBSFN	Non-MBSFN	Non-MBSFN
Cell Id			0	1	0	1
Time Offset between Cells		μs	2.5 (synchronous cells)		2.5 (synchronous cells)	
ABS Pattern (Note 7)			N/A	0000000001 0000000001	N/A	0000000001 0000000001
RLM/RRM Measurement Subframe Pattern (Note 8)			0000000001 0000000001	N/A	0000000001 0000000001	N/A
CSI Subframe Sets (Note 9)	$C_{CSI,0}$		0000000001 0000000001	N/A	0000000001 0000000001	N/A
	$C_{CSI,1}$		1100111000 1100111000		1100111000 1100111000	
Number of control OFDM Symbols			3	3	3	3
Maximum number of HARQ transmissions			1		1	
Reporting mode			PUCCH 1-0		PUCCH 1-0	
Physical channel for $C_{CSI,0}$ CQI and RI reporting			PUCCH Format 2		PUCCH Format 2	
PUCCH Report Type for CQI			4		4	

Physical channel for $C_{CSI,1}$ CQI and RI reporting		PUSCH (Note 3)		PUSCH (Note 3)	
PUCCH Report Type for RI		3		3	
Reporting periodicity	ms	N_{pd}= 10		N_{pd}= 10	
ACK/NACK feedback mode		Multiplexing		Multiplexing	
cqi-pmi-ConfigurationIndex		8		8	
ri-ConfigurationInd		5		5	
cqi-pmi-ConfigurationIndex2		9		9	
ri-ConfigurationInd2		0		0	
Cyclic prefix		Normal	Normal	Normal	Normal
Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4). Note 2: Reference measurement channel in Cell 1 according to Table A.4-2 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1. Note 3: To avoid collisions between RI/CQI reports and HARQ-ACK it is necessary to report them on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic RI/CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3. Note 4: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS Note 5: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS. Note 6: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS. Note 7: ABS pattern as defined in TS 36.423 [14]. Note 8: Time-domain measurement resource restriction pattern for PCell measurements as defined in TS 36.331 [5]. Note 9: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in TS 36.331 [5]. Note 10: Cell 1 is the serving cell. Cell 2 is the aggressor cell. Note 11: Downlink physical channel setup in Cell 2 in accordance with Annex C.3.3 applying OCNG pattern OP.5 TDD as defined in Annex A.5.2.5.					

Table 9.5.3.2_C.1.3-2: Minimum requirement (TDD)

	Test 1	Test 2
γ_1	0.9	1.05
UE Category	2-8	2-8

The normative reference for this requirement is TS 36.101 [2] clause 9.5.3.2.

9.5.3.2_C.1.4 Test description

9.5.3.2_C.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure [TBD].
2. The parameter settings for the cell are set up according to Table 9.5.3.1_C.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.5.3.1_C.1.4.3.

9.5.3.2_C.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration, antenna correlation, CodeBookSubsetRestriction for fixed Rank and the SNR according to Table 9.5.3.2_C.1.3-1 as appropriate.

2. Set the Cell2 –aggressor cell- as defined in Tables 9.5.3.2_C.1.3-1 and according to Annex C3.3

3. The SS shall send PDSCH in via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to the UE reported CQI and RI. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-3a.
The SS sends uplink scheduling information via PDCCH DCI format 0 in subframe # 4 and #9 with CQI request bit set to 0 to schedule UL RMC in subframe #8 and #3 according to Annex A.4.1 Table A.4.1-2.

4. Measure the t_{fix} according to annex G.5.3.

5. Propagation conditions are set according to Annex B.1.

6. The SS sends uplink scheduling information via PDCCH DCI format 0 to schedule UL RMC in subframe #3 and #8 according to Annex A.4.1 Table A.4.1-2.

7. The SS shall transmit an RRC Connection Reconfiguration message to set codebookSubsetRestriction as for UE reported RI according to Table 9.5.3.2_C.1.3-1.

8. The UE shall transmit RRC Connection Reconfiguration Complete message.

9. Propagation conditions are set according to Table 9.5.3.2_C.1.3-1.

10. The SS shall send PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to the UE reported CQI and RI. In case of CQI reports for two codewords (codeword #0 and #1), the CQI offset level for codeword #1 is selected from {0,1,2,3,-4,-3,-2,-1}. The SS sends downlink MAC padding bits on the DL RMC. The transport format to be used is defined in Annex A.4 Table A.4-3a.
The SS sends uplink scheduling information via PDCCH DCI format 0 in subframe # 4 and #9 with CQI request bit set to 0 to schedule UL RMC in subframe #8 and #3 according to Annex A.4.1 Table A.4.1-2.

11. Measure $t_{reported}$ according to Annex G.5.3
If the ratio ($t_{reported}$ / t_{fix}) satisfies the requirement in Table 9.5.3.2_C.1.5-1, then pass the UE for this test and go to step 12. Otherwise, fail the UE.

12. If all tests have not been done, then repeat the same procedure (steps 1 to 11) with test conditions according to the Table 9.5.3.2_C.1.3-1 for the other Tests as appropriate. Otherwise pass the UE.

9.5.3.2_C.1.4.3 Message contents

[FFS]

9.5.3.2_C.1.5 Test requirement

Table 9.5.3.2_C.1.5-1: Minimum requirement (TDD)

	Test 1	Test 2
γ_1	0.9+TT	1.05+TT
UE Category	2-8	2-8

9.6 Additional requirements for carrier aggregation

This clause includes requirements for the reporting of channel state information (CSI) with the UE configured for carrier aggregation. The purpose is to verify that the channel state for each cell is correctly reported with multiple cells configured for periodic reporting.

9.6.1 Periodic reporting on multiple cells (Cell-Specific Reference Symbols)

9.6.1.1_A FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA

9.6.1.1_A.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA (intra band contiguous DL CA)

FFS

9.6.1.1_A.2 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA (inter band DL CA)

Editor's notes: This test case is incomplete. The following item is missing or incomplete:

- Some test parameters are still in square brackets.
- Message contents are FFS.

9.6.1.1_A.2.1 Test purpose

9.6.1.1_A.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward that support inter-band DL CA.

9.6.1.1_A.2.3 Minimum conformance requirements

The following requirements apply to UE Category 3-8. For the parameters specified in Table 9.6.1.1_A.2.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of Pcell and Scell reported according to Table A.4-3 shall be such that

$$\text{wideband } CQI_{Pcell} - \text{wideband } CQI_{Scell} \geq 2$$

for more than 90% of the time.

Table 9.6.1.1_A.2.3-1: PUCCH 1-0 static test on multiple cells (FDD)

Parameter		Unit	Pcell	Scell
Bandwidth		MHz	[10 MHz for both cells]	
PDSCH transmission mode			1	
Downlink power allocation	ρ_A	dB	0	
	ρ_B	dB	0	
Propagation condition and antenna configuration			AWGN (1 x 2)	
SNR		dB	[10]	[4]
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	[-88]	[-94]
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98
Physical channel for CQI reporting			PUCCH	
PUCCH Report Type			PUCCH Format 2	
Reporting periodicity		ms	N_{pd} = 10	
cqi-pmi-ConfigurationIndex			11	16 [shift of 5 ms relative to Pcell]
Note 1: Reference measurement channel according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.				

The normative reference for this requirement is TS 36.101 [2] clause 9.6.1.1.

9.6.1.1_A.2.4 Test description

9.6.1.1_A.2.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: 10MHz for both carriers, as defined in TS 36.508 [7] clause 4.3.1

1. Connect the SS and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure group [TBD] as appropriate.
2. The parameter settings for the cell are set up according to Table 9.6.1.1_A.2.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.6.1.1_A.2.4.3.

9.6.1.1_A.2.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration and the SNR according to Table 9.6.1.1_A.2.3-1 as appropriate.
2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-1) according to CQI value 8 of Annex A.4 Table A.4-3 in both P-Cell and S-Cell and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC.

3. Continue transmission of the PDSCH until [2000] wideband CQI reports have been gathered for each P-Cell and S-Cell. For each CSI report calculate the respective difference $CQI_{P\text{-}S}$ = wideband CQI_{Pcell} – wideband CQI_{Scell}.

4. If more than [1800] values of $CQI_{P\text{-}S}$ are ≥ 2 pass the UE. Otherwise fail the UE.

9.6.1.1_A.2.4.3 Message contents

FFS

9.6.1.1_A.2.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.6.1.1_A.2.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

9.6.1.2_A TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA

9.6.1.2_A.1 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA (intra band contiguous DL CA)

Editor's notes: This test case is incomplete. The following item is missing or incomplete:

- Some test parameters are still in square brackets.
- Message contents are FFS.

9.6.1.2_A.1.1 Test purpose

9.6.1.2_A.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward that support intra-band contiguous DL CA.

9.6.1.2_A.1.3 Minimum conformance requirements

The following requirements apply to UE Category 3-8. For the parameters specified in Table 9.6.1.2_A.1.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of Pcell and Scell reported according to Table A.4-3 shall be such that

$$\text{wideband } CQI_{Pcell} - \text{wideband } CQI_{Scell} \geq 2$$

for more than 90% of the time.

Table 9.6.1.2_A.1.3-1: PUCCH 1-0 static test on multiple cells (TDD)

Parameter		Unit	Pcell	Scell
Bandwidth		MHz	[20 MHz for both cells]	
PDSCH transmission mode			1	
Uplink downlink configuration			2	
Special subframe configuration			4	
Downlink power allocation	ρ_A	dB	0	
	ρ_B	dB	0	
Propagation condition and antenna configuration			AWGN (1 x 2)	
SNR		dB	[10]	[4]
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	[-88]	[-94]
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98
Physical channel for CQI reporting			PUCCH	
PUCCH Report Type			4	
Reporting periodicity		ms	N_{pd} = 10	
cqi-pmi-ConfigurationIndex			8	13 [shift of 5 ms relative to Pcell]
Note 1: Reference measurement channel according to Table A.4-2 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.				

The normative reference for this requirement is TS 36.101 [2] clause 9.6.1.2.

9.6.1.2_A.1.4 Test description

9.6.1.2_A.1.4.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: 10MHz for both carriers, as defined in TS 36.508 [7] clause 4.3.1

1. Connect the SS and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure group [TBD] as appropriate.
2. The parameter settings for the cell are set up according to Table 9.6.1.2_A.2.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3A-RF according to TS 36.508 [7] clause 5.2A.2. Message contents are defined in clause 9.6.1.2_A.2.4.3.

9.6.1.2_A.1.4.2 Test procedure

1. Set the parameters of bandwidth, reference channel, propagation condition, antenna configuration and the SNR according to Table 9.6.1.2_A.2.3-1 as appropriate.

2. The SS shall transmit PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC (Table A.4-1) according to CQI value 8 of Annex A.4 Table A.4-3 in both P-Cell and S-Cell and keep it regardless of the wideband CQI value sent by the UE. The SS sends downlink MAC padding bits on the DL RMC.

3. Continue transmission of the PDSCH until [2000] wideband CQI reports have been gathered for each P-Cell and S-Cell. For each CSI report calculate the respective difference CQI_{P-S} = wideband CQI_{Pcell} – wideband CQI_{Scell}.

4. If more than [1800] values of CQI_{P-S} are ≥ 2 pass the UE. Otherwise fail the UE.

9.6.1.2_A.1.4.3 Message contents

FFS

9.6.1.2_A.1.5 Test requirement

The pass fail decision is as specified in the test procedure in clause 9.6.1.2_A.1.4.2.

There are no parameters in the test setup or measurement process whose variation impacts the results so there are no applicable test tolerances for this test.

9.6.1.2_A.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for CA (inter band DL CA)

FFS

10 MBMS Performance

10.1 FDD MBMS performance (Fixed Reference Channel)

10.1.1 Test purpose

This test verifies the performance of FDD MBMS with a given SNR for which the average BLER remains below a given reference value.

10.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE supporting MBMS release 9 and forward.

10.1.3 Minimum conformance requirements

The parameters specified in Table 10.1.3-1 are valid for all FDD tests unless otherwise stated. For the requirements defined in this section, the difference between CRS EPRE and the MBSFN RS EPRE should be set to 0 dB as the UE demodulation performance might be different when this condition is not met (e.g. in scenarios where power offsets are present, such as scenarios when reserved cells are present).

Table 10.1.3-1: Common Test Parameters (FDD)

Parameter	Unit	Value
Number of HARQ processes	Processes	None
Subcarrier spacing	kHz	15 kHz
Allocated subframes per Radio Frame (Note 1)		6 subframes
Number of OFDM symbols for PDCCH (Note 2)		2 symbols in the case of 3 PHICH symbols or 4 RS Ports; 1 or 2 symbols for other scenarios.
Cyclic Prefix		Extended
Note1: For FDD mode, up to 6 subframes (#1/2/3/6/7/8) are available for MBMS, in line with TS 36.331. Note2: 2 OFDM symbols are reserved for PDCCH in this subclause.		

The receive characteristic of MBMS is determined by the BLER. The requirement is valid for all RRC states for which the UE has capabilities for MBMS.

For the parameters specified in Table 10.1.3-1 and Table 10.1.3-2 and Annex A.3.8.1, the average downlink SNR shall be below the specified value for the BLER shown in Table 10.1.3-3.

Table 10.1.3-2: Test Parameters for Testing

Parameter		Unit	Test 1-4
Downlink power allocation	ρ_A	dB	0
	ρ_B	dB	0 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
Note 1: $P_B = 0$			

Table 10.1.3-3: Minimum performance

Test number	Bandwidth	Reference Channel	OCNG Pattern	Propagation condition	Correlation Matrix and antenna	Reference value		MBMS UE Category
						BLER (%)	SNR(dB)	
1	10 MHz	R.37 FDD	OP.4 FDD	MBSFN channel model (Table B.2.6-1)	1x2 low	1	4.1	1-5
2	10 MHz	R.38 FDD	OP.4 FDD				11.0	1-5
3	10 MHz	R.39 FDD	OP.4 FDD				20.1	2-5
	5.0MHz	R.39-1 FDD	OP.4 FDD				20.5	1
4	1.4 MHz	R.40 FDD	OP.4 FDD				6.6	1-5

The normative reference for this requirement is TS 36.101 [2] clause 10.1.

10.1.4 Test description

10.1.4.1 Initial conditions

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: As specified per test number in Table 10.1.3-3 as defined in TS 36.508 [7] clause 4.3.1.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Table 10.1.3-1.
3. The downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0.
5. Ensure the UE is in State 2A according to TS 36.508 [7] clause 4.5.2A. Message contents are defined in clause 10.1.4.3.
6. SS transmits *MBSFNAreaConfiguration* message. Message content is defined in clause 10.1.4.3.
7. Wait for a period equal to the MCCH modification period to make sure the UE has received the *MBSFNAreaConfiguration* message.
8. SS continues with the generic procedures described in TS 36.508 [7] clause 4.5.3A.3 and 4.5.4.3 and ensures the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and the UE test loop Mode C is activated. Message contents are defined in clause 10.1.4.3.
9. SS is configured to include 10 MBMS packets in one TB.

10.1.4.2 Test procedure

1. Initialise the variables M_{tot} and M_{ok} as 0. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration and the SNR according to Table 10.1.5-1 as appropriate.
2. SS shall send MBMS Packets on the MTCH radio bearer for the test time specified in Table G.6.4-1 . SS stores the number of the transmitted MBMS Packets on the MTCH in the current test iteration in the variable M_{tot}.
3. SS shall send a "UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST" message and wait for the UE to respond with a "UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE" reporting the received MBMS Packet counter value. Message contents are defined in clause 10.1.4.3. SS calculates the variable M_{ok} as (current counter value - counter value at last test iteration).
4. SS shall compute the BLER as the following:

   The BLER = $(M_{tot} – M_{ok}) / M_{tot}$
5. Repeat steps from 1 to 4 for each subtest in Table 10.1.5-1 as appropriate.

10.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 4.6 and 4.7A with following exceptions:

Table 10.1.4.3-1: SystemInformationBlockType2: Additional FDD MBMS performance (Fixed Reference Channel)

Derivation Path: 36.508 table 4.4.3.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType2 ::= SEQUENCE {			
mbsfn-SubframeConfig SEQUENCE {			
radioframeAllocationPeriod	n1		
radioframeAllocationOffset	0		
subframeAllocation CHOICE{			
oneFrame	'111111'		
}			
}			
}			

Table 10.1.4.3-2: MBSFNAreaConfiguration message: Additional FDD MBMS performance (Fixed Reference Channel)

Derivation Path: 36.508, Table 4.6.1-4A			
Information Element	**Value/remark**	**Comment**	**Condition**
MBSFNAreaConfiguration-r9 ::= SEQUENCE {			
commonSF-Alloc-r9 SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF SEQUENCE {			
radioframeAllocationPeriod	n1		
radioframeAllocationOffset	0		
subframeAllocation CHOICE {			
oneFrame	'111111'		
}			
}			
commonSF-AllocPeriod-r9	rf8		
pmch-InfoList-r9 SEQUENCE (SIZE (0..maxPMCH-PerMBSFN)) OF SEQUENCE {			
pmch-Config-r9 SEQUENCE {			
sf-AllocEnd-r9	47	48 active subframes in 8 Radio-frames	
dataMCS-r9	4	Test number 1 and 4	R.37 FDD R.40 FDD
	12	Test number 2	R.38 FDD
	20	Test number 3	R.39 FDD R.39-1 FDD
mch-SchedulingPeriod-r9	rf8		
}			
…			
}			

Table 10.1.4.3-3: ACTIVATE TEST MODE: Additional FDD MBMS performance (Fixed Reference Channel)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE C

Table 10.1.4.3-4: CLOSE UE TEST LOOP: Additional FDD MBMS performance (Fixed Reference Channel)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE C

Table 10.1.4.3-5: SystemInformationBlockType13: Additional FDD MBMS performance (Fixed Reference Channel)

Derivation Path: 36.508 table 4.4.3.3-13			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType13 ::= SEQUENCE {			
MBSFN-AreaInfo-r9 SEQUENCE (SIZE(1..maxMBSFN-Area)) OF SEQUENCE {			
mcch-Config-r9 SEQUENCE {			
signallingMCS-r9	n7	Test number 1 and 4	QPSK
	n13	Test number 2	16QAM
	n19	Test number 3	64QAM
}			
}			
}			

10.1.5 Test requirement

For the parameters specified in Table 10.1.3-1, Table 10.1.3-2, Annex A.3.8.1, and SNR in Table 10.1.5-1, the value for the BLER in step 4 shall be below the test limit in Annex G.6.3 for all subtests shown in Table 10.1.5-1.

Table 10.1.5-1: Test requirement

Test number	Bandwidth	Reference Channel	OCNG Pattern	Propagation condition	Correlation Matrix and antenna	Reference value BLER (%)	Reference value SNR(dB)	MBMS UE Category
1	10 MHz	R.37 FDD	OP.4 FDD	MBSFN channel model (Table B.2.6-1)	1x2 low	1	5	1-5
2	10 MHz	R.38 FDD	OP.4 FDD				11.9	1-5
3	10 MHz	R.39 FDD	OP.4 FDD				21.0	2-5
	5.0MHz	R.39-1 FDD	OP.4 FDD				21.4	1
4	1.4 MHz	R.40 FDD	OP.4 FDD				7.5	1-5

10.2 TDD MBMS performance (Fixed Reference Channel)

10.2.1 Test purpose

This test verifies the performance of TDD MBMS with a given SNR for which the average BLER remains below a given reference value.

10.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE supporting MBMS release 9 and forward.

10.2.3 Minimum conformance requirements

The parameters specified in Table 10.2.3-1 are valid for all TDD tests unless otherwise stated. For the requirements defined in this section, the difference between CRS EPRE and the MBSFN RS EPRE should be set to 0 dB as the UE demodulation performance might be different when this condition is not met (e.g. in scenarios where power offsets are present, such as scenarios when reserved cells are present).

Table 10.2.3-1: Common Test Parameters (TDD)

Parameter	Unit	Value
Number of HARQ processes	Processes	None
Subcarrier spacing	kHz	15 kHz
Allocated subframes per Radio Frame (Note 1)		5 subframes
Number of OFDM symbols for PDCCH (Note 2)		2 symbols in the case of 3 PHICH symbols or 4 RS Ports; 1 or 2 symbols for other scenarios.
Cyclic Prefix		Extended
Note1: For TDD mode, in line with TS 36.331, Uplink-Downlink Configuration 5 is proposed, up to 5 subframes (#3/4/7/8/9) are available for MBMS. Note2: 2 OFDM symbols are reserved for PDCCH in this subclause.		

The receive characteristic of MBMS is determined by the BLER. The requirement is valid for all RRC states for which the UE has capabilities for MBMS.

For the parameters specified in Table 10.2.3-1 and Table 10.2.3-2 and Annex A.3.8.2, the average downlink SNR shall be below the specified value for the BLER shown in Table 10.2.3-3.

Table 10.2.3-2: Test Parameters for Testing

Parameter		Unit	Test 1-4
Downlink power allocation	ρ_A	dB	0
	ρ_B	dB	0 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
Note 1: $P_B = 0$			

Table 10.2.3-3: Minimum performance

Test number	Bandwidth	Reference Channel	OCNG Pattern	Propagation condition	Correlation Matrix and antenna	Reference value BLER (%)	Reference value SNR(dB)	MBMS UE Category
1	10 MHz	R.37 TDD	OP.4 TDD	MBSFN channel model (Table B.2.6-1)	1x2 low	1	3.4	1-5
2	10 MHz	R.38 TDD	OP.4 TDD				11.1	1-5
3	10 MHz	R.39 TDD	OP.4 TDD				20.1	2-5
	5MHz	R.39-1 TDD	OP.4 TDD				20.5	1
4	1.4 MHz	R.40 TDD	OP.4 TDD				5.8	1-5

The normative reference for this requirement is TS 36.101 [2] clause 10.2.

10.2.4 Test description

10.2.4.1 Initial conditions

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.

Channel Bandwidths to be tested: As specified per test number in Table 10.2.3-3 as defined in TS 36.508 [7] clause 4.3.1.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Table 10.2.3-1.
3. The downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0.
5. Ensure the UE is in State 2A according to TS 36.508 [7] clause 4.5.2A. Message contents are defined in clause 10.1.4.3.
6. SS transmits *MBSFNAreaConfiguration* message. Message content is defined in clause 10.2.4.3.
7. Wait for a period equal to the MCCH modification period to make sure the UE has received the *MBSFNAreaConfiguration* message.
8. SS continues with the generic procedures described in TS 36.508 [7] clause 4.5.3A.3 and 4.5.4.3 and ensures the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and the UE test loop Mode C is activated. Message contents are defined in clause 10.2.4.3.

9. SS is configured to include 10 MBMS packets in one TB.

10.2.4.2 Test procedure

1. Initialise the variables M_{tot} and M_{ok} as 0. Set the parameters of bandwidth, reference channel, the propagation condition, antenna configuration and the SNR according to Table 10.2.5-1 as appropriate.

2. SS shall send MBMS Packets on the MTCH radio bearer for the test time specified in Table G.6.4-1. SS stores the number of the transmitted MBMS Packets on the MTCH in the current test iteration in the variable M_{tot}.

3. SS shall send a “UE TEST LOOP MODE C MBMS PACKET COUNTER REQUEST” message and wait for the UE to respond with a “UE TEST LOOP MODE C MBMS PACKET COUNTER RESPONSE” reporting the received MBMS Packet counter value. Message contents are defined in clause 10.2.4.3. SS calculates the variable M_{ok} as (current counter value - counter value at last test iteration).

4. SS shall compute the BLER as the following:

   The BLER = $(M_{tot} – M_{ok}) / M_{tot}$

5. Repeat steps from 1 to 4 for each subtest in Table 10.2.5-1 as appropriate.

10.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clauses 4.6 and 4.7A with following exceptions:

Table 10.2.4.3-1: SystemInformationBlockType2: Additional TDD MBMS performance (Fixed Reference Channel)

Derivation Path: 36.508 table 4.4.3.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType2 ::= SEQUENCE {			
mbsfn-SubframeConfig SEQUENCE {			
radioframeAllocationPeriod	n1		
radioframeAllocationOffset	0		
subframeAllocation CHOICE{			
oneFrame	'111110'	The last bit is not used	
}			
}			
}			

Table 10.2.4.3-2: MBSFNAreaConfiguration message: Additional TDD MBMS performance (Fixed Reference Channel)

Derivation Path: 36.508, Table 4.6.1-4A			
Information Element	**Value/remark**	**Comment**	**Condition**
MBSFNAreaConfiguration-r9 ::= SEQUENCE {			
commonSF-Alloc-r9 SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF SEQUENCE {			
radioframeAllocationPeriod	n1		
radioframeAllocationOffset	0		
subframeAllocation CHOICE {			
oneFrame	'111110'	The last bit is not used	
}			
}			
commonSF-AllocPeriod-r9	rf8		
pmch-InfoList-r9 SEQUENCE (SIZE (0..maxPMCH-PerMBSFN)) OF SEQUENCE {			
pmch-Config-r9 SEQUENCE {			
sf-AllocEnd-r9	39	40 active subframes in 8 Radio-frames	
dataMCS-r9	4	Test number 1 and 4	R.37 TDD R.40 TDD
	12	Test number 2	R.38 TDD
	20	Test number 3	R.39 TDD R.39-1 TDD
mch-SchedulingPeriod-r9	rf8		
}			
…			
}			

Table 10.2.4.3-3: ACTIVATE TEST MODE: Additional TDD MBMS performance (Fixed Reference Channel)

Derivation Path: 36.508, Table 4.7A-1, condition UE TEST LOOP MODE C

Table 10.2.4.3-4: CLOSE UE TEST LOOP: Additional TDD MBMS performance (Fixed Reference Channel)

Derivation Path: 36.508, Table 4.7A-3, condition UE TEST LOOP MODE C

Table 10.2.4.3-5: SystemInformationBlockType13: Additional TDD MBMS performance (Fixed Reference Channel)

Derivation Path: 36.508 table 4.4.3.3-13			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType13 ::= SEQUENCE {			
MBSFN-AreaInfo-r9 SEQUENCE (SIZE(1..maxMBSFN-Area)) OF SEQUENCE {			
mcch-Config-r9 SEQUENCE {			
signallingMCS-r9	n7	Test number 1 and 4	QPSK
	n13	Test number 2	16QAM
	n19	Test number 3	64QAM
}			
}			
}			

10.2.5 Test requirement

For the parameters specified in Table 10.2.3-1, Table 10.2.3-2, Annex A.3.8. 2, and SNR in Table 10.2.5-1, the value for the BLER in step 4 shall be below the test limit in Annex G.6.3 for all subtests shown in Table 10.2.5-1.

Table 10.2.5-1: Test

Test number	Bandwidth	Reference Channel	OCNG Pattern	Propagation condition	Correlation Matrix and antenna	Reference value		MBMS UE Category
						BLER (%)	SNR(dB)	
1	10 MHz	R.37 TDD	OP.4 TDD	MBSFN channel model (Table B.2.6-1)	1x2 low	1	4.3	1-5
2	10 MHz	R.38 TDD	OP.4 TDD				12	1-5
3	10 MHz	R.39 TDD	OP.4 TDD				21.0	2-5
	5MHz	R.39-1 TDD	OP.4 TDD				21.4	1
4	1.4 MHz	R.40 TDD	OP.4 TDD				6.7	1-5

Annex A (normative): Measurement Channels

A.1 General

A schematic overview of the encoding process for the reference measurement channels is provided in Figure A-1.

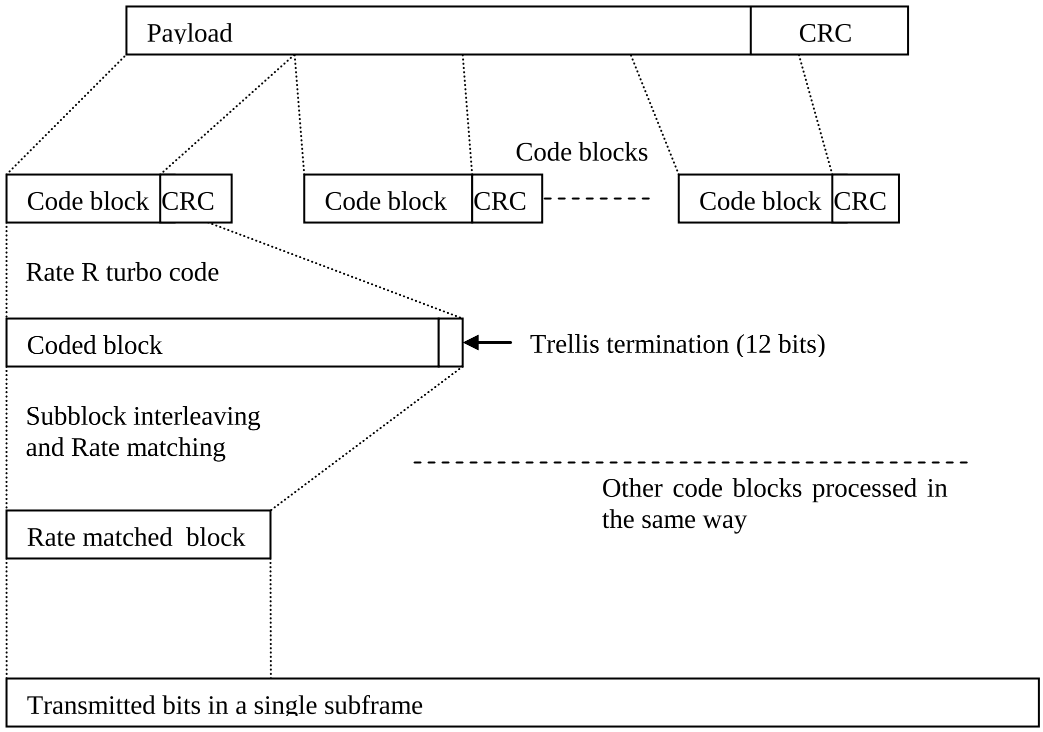


Figure A-1: Schematic overview of the encoding process

The throughput values defined in the measurement channels specified in Annex A, are calculated and are valid per data stream (codeword). For multi-stream (more than one codeword) transmissions, the throughput referenced in the minimum requirements is the sum of throughputs of all data streams (codewords).

The UE category entry in the definition of the reference measurement channels in Annex A is only informative and reveals the UE categories, which can support the corresponding measurement channel. Whether the measurement channel is used for testing a certain UE category or not is specified in the individual test cases.

Rate matching process in Figure A-1 is dependent on the parameter "Total number of Soft Channel bits" which has been defined for each UE category in TS 36.306 [15] clause 4.1. The SS shall use the Soft Channel bits size according to the UE category.

A.2 UL reference measurement channels

A.2.1 General

A.2.1.1 Applicability and common parameters

The following sections define the UL signal applicable to the Transmitter Characteristics (clause 6) and for the Receiver Characteristics (clause 7) where the UL signal is relevant.

The Reference channels in this section assume transmission of PUSCH and Demodulation Reference signal only. The following conditions apply:

- 1 HARQ transmission
- Cyclic Prefix normal
- PUSCH hopping off
- Link adaptation off
- Demodulation Reference signal as per TS 36.211 [8] clause 5.5.2.1.2.

Where ACK/NACK is transmitted, it is assumed to be multiplexed on PUSCH as per TS 36.212 [9] subclause 5.2.2.6.

- ACK/NACK 1 bit
- ACK/NACK mapping adjacent to Demodulation Reference symbol
- ACK/NACK resources punctured into data
- Max number of resources for ACK/NACK: 4 SC-FDMA symbols per subframe
- No CQI transmitted, no RI transmitted

A.2.1.2 Determination of payload size

The algorithm for determining the payload size A is as follows; given a desired coding rate R and radio block allocation N_{RB}:

1. Calculate the number of channel bits N_{ch} that can be transmitted during the first transmission of a given sub-frame.
2. Find A such that the resulting coding rate is as close to R as possible, that is,

   $$\min\left|R-(A+24)/N_{ch}\right|,$$

   subject to

   a) A is a valid TB size according to clause 7.1.7 of TS 36.213 [10] assuming an allocation of N_{RB} resource blocks.

   b) Segmentation is not included in this formula, but should be considered in the TBS calculation.

   c) For RMC-s, which at the nominal target coding rate do not cover all the possible UE categories for the given modulation, reduce the target coding rate gradually (within the same modulation), until the maximal possible number of UE categories is covered.
3. If there is more than one A that minimises the equation above, then the larger value is chosen per default.

A.2.1.3 Overview of UL reference measurement channels

In Table A.2.1.3-1 are listed the UL reference measurement channels specified in annexes A.2.2 and A.2.3 of this release of TS 36.521-1. This table is informative and serves only to a better overview. The reference for the concrete reference measurement channels and corresponding implementation's parameters as to be used for testing are annexes A.2.2 and A.2.3 as appropriate.

Table A.2.1.3-1: Overview of UL reference measurement channels

Duplex	Table	Name	BW	Mod	TCR	RB	RB Offset	UE Categ	Notes
FDD, Full RB allocation, QPSK									
FDD	Table A.2.2.1.1-1		1.4	QPSK	1/3	6		≥ 1	
FDD	Table A.2.2.1.1-1		3	QPSK	1/3	15		≥ 1	
FDD	Table A.2.2.1.1-1		5	QPSK	1/3	25		≥ 1	
FDD	Table A.2.2.1.1-1		10	QPSK	1/3	50		≥ 1	
FDD	Table A.2.2.1.1-1		15	QPSK	1/5	75		≥ 1	
FDD	Table A.2.2.1.1-1		20	QPSK	1/6	100		≥ 1	
FDD, Full RB allocation, 16-QAM									
FDD	Table A.2.2.1.2-1		1.4	16QAM	3/4	6		≥ 1	
FDD	Table A.2.2.1.2-1		3	16QAM	1/2	15		≥ 1	
FDD	Table A.2.2.1.2-1		5	16QAM	1/3	25		≥ 1	
FDD	Table A.2.2.1.2-1		10	16QAM	3/4	50		≥ 2	
FDD	Table A.2.2.1.2-1		15	16QAM	1/2	75		≥ 2	
FDD	Table A.2.2.1.2-1		20	16QAM	1/3	100		≥ 2	
FDD, Partial RB allocation, QPSK, 1.4 MHz									
FDD	Table A.2.2.2.1-1		1.4	QPSK	1/3	1		≥ 1	
FDD	Table A.2.2.2.1-1		1.4	QPSK	1/3	2		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-1		1.4	QPSK	1/3	3		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-1		1.4	QPSK	1/3	4		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-1		1.4	QPSK	1/3	5		≥ 1	
FDD, Partial RB allocation, QPSK, 3 MHz									
FDD	Table A.2.2.2.1-2		3	QPSK	1/3	1		≥ 1	
FDD	Table A.2.2.2.1-2		3	QPSK	1/3	2		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-2		3	QPSK	1/3	3		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-2		3	QPSK	1/3	4		≥ 1	
FDD	Table A.2.2.2.1-2		3	QPSK	1/3	5		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-2		3	QPSK	1/3	6		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-2		3	QPSK	1/3	10		≥ 1	Not yet used in tests
FDD, Partial RB allocation, QPSK, 5 MHz									
FDD	Table A.2.2.2.1-3		5	QPSK	1/3	1		≥ 1	
FDD	Table A.2.2.2.1-3		5	QPSK	1/3	2		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-3		5	QPSK	1/3	5		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-3		5	QPSK	1/3	6		≥ 1	
FDD	Table A.2.2.2.1-3		5	QPSK	1/3	8		≥ 1	
FDD	Table A.2.2.2.1-3a		5	QPSK	1/3	10		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-3a		5	QPSK	1/3	15		≥ 1	
FDD	Table A.2.2.2.1-3a		5	QPSK	1/3	18		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-3a		5	QPSK	1/3	20		≥ 1	
FDD	Table A.2.2.2.1-3a		5	QPSK	1/3	24		≥ 1	Not yet used in tests
FDD, Partial RB allocation, QPSK, 10 MHz									
FDD	Table A.2.2.2.1-4		10	QPSK	1/3	1		≥ 1	
FDD	Table A.2.2.2.1-4		10	QPSK	1/3	2		≥ 1	
FDD	Table A.2.2.2.1-4		10	QPSK	1/3	5		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-4		10	QPSK	1/3	6		≥ 1	
FDD	Table A.2.2.2.1-4		10	QPSK	1/3	8		≥ 1	

FDD	Table A.2.2.2.1-4		10	QPSK	1/3	10		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-4a		10	QPSK	1/3	12		≥ 1	
FDD	Table A.2.2.2.1-4a		10	QPSK	1/3	15		≥ 1	
FDD	Table A.2.2.2.1-4a		10	QPSK	1/3	16		≥ 1	
FDD	Table A.2.2.2.1-4a		10	QPSK	1/3	18		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-4a		10	QPSK	1/3	20		≥ 1	
FDD	Table A.2.2.2.1-4a		10	QPSK	1/3	24		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-4a		10	QPSK	1/3	25		≥ 1	
FDD	Table A.2.2.2.1-4b		10	QPSK	1/3	27		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-4b		10	QPSK	1/3	30		≥ 1	
FDD	Table A.2.2.2.1-4b		10	QPSK	1/3	32		≥ 1	
FDD	Table A.2.2.2.1-4b		10	QPSK	1/3	36		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-4b		10	QPSK	1/3	40		≥ 1	
FDD	Table A.2.2.2.1-4b		10	QPSK	1/3	45		≥ 1	

FDD	Table A.2.2.2.1-4b		10	QPSK	1/3	48		≥ 1	
FDD, Partial RB allocation, QPSK, 15 MHz									
FDD	Table A.2.2.2.1-5		15	QPSK	1/3	1		≥ 1	
FDD	Table A.2.2.2.1-5		15	QPSK	1/3	2		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-5		15	QPSK	1/3	5		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-5		15	QPSK	1/3	6		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-5		15	QPSK	1/3	8		≥ 1	
FDD	Table A.2.2.2.1-5		15	QPSK	1/3	9		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-5a		15	QPSK	1/3	10		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-5a		15	QPSK	1/3	16		≥ 1	
FDD	Table A.2.2.2.1-5a		15	QPSK	1/3	18		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-5a		15	QPSK	1/3	20		≥ 1	
FDD	Table A.2.2.2.1-5a		15	QPSK	1/3	24		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-5a		15	QPSK	1/3	25		≥ 1	
FDD	Table A.2.2.2.1-5b		15	QPSK	1/3	27		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-5b		15	QPSK	1/3	36		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-5b		15	QPSK	1/3	40		≥ 1	
FDD	Table A.2.2.2.1-5b		15	QPSK	1/3	48		≥ 1	
FDD	Table A.2.2.2.1-5b		15	QPSK	1/3	50		≥ 1	
FDD	Table A.2.2.2.1-5b		15	QPSK	1/3	54		≥ 1	
FDD	Table A.2.2.2.1-5b		15	QPSK	1/3	60		≥ 1	
FDD, Partial RB allocation, QPSK, 20 MHz									
FDD	Table A.2.2.2.1-6		20	QPSK	1/3	1		≥ 1	
FDD	Table A.2.2.2.1-6		20	QPSK	1/3	2		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-6		20	QPSK	1/3	5		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-6		20	QPSK	1/3	6		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-6		20	QPSK	1/3	8		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-6		20	QPSK	1/3	10		≥ 1	
FDD	Table A.2.2.2.1-6a		20	QPSK	1/3	16		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-6a		20	QPSK	1/3	18		≥ 1	
FDD	Table A.2.2.2.1-6a		20	QPSK	1/3	20		≥ 1	
FDD	Table A.2.2.2.1-6a		20	QPSK	1/3	24		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.1-6a		20	QPSK	1/3	25		≥ 1	
FDD	Table A.2.2.2.1-6a		20	QPSK	1/3	48		≥ 1	
FDD	Table A.2.2.2.1-6b		20	QPSK	1/3	50		≥ 1	
FDD	Table A.2.2.2.1-6b		20	QPSK	1/3	54		≥ 1	
FDD	Table A.2.2.2.1-6b		20	QPSK	1/5	75		≥ 1	
FDD, Partial RB allocation, 16-QAM, 1.4 MHz									
FDD	Table A.2.2.2.2-1		1.4	16QAM	3/4	1		≥ 1	
FDD	Table A.2.2.2.2-1		1.4	16QAM	3/4	5		≥ 1	
FDD, Partial RB allocation, 16-QAM, 3 MHz									
FDD	Table A.2.2.2.2-2		3	16QAM	3/4	1		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.2-2		3	16QAM	3/4	4		≥ 1	
FDD	Table A.2.2.2.2-2		3	16QAM	3/4	6		≥ 1	
FDD, Partial RB allocation, 16-QAM, 5 MHz									
FDD	Table A.2.2.2.2-3		5	16QAM	3/4	1		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.2-3		5	16QAM	3/4	8		≥ 1	
FDD, Partial RB allocation, 16-QAM, 10 MHz									

FDD	Table A.2.2.2.2-4		10	16QAM	3/4	1		≥ 1	
FDD	Table A.2.2.2.2-4		10	16QAM	3/4	12		≥ 1	
FDD	Table A.2.2.2.2-4		10	16QAM	1/2	16		≥ 1	
FDD	Table A.2.2.2.2-4		10	16QAM	3/4	30		≥ 2	
FDD	Table A.2.2.2.2-4		10	16QAM	3/4	36		≥ 2	
FDD, Partial RB allocation, 16-QAM, 15 MHz									
FDD	Table A.2.2.2.2-5		15	16QAM	3/4	1		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.2-5		15	16QAM	3/4	6		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.2-5		15	16QAM	3/4	8		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.2-5		15	16QAM	3/4	9		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.2-5		15	16QAM	1/2	16		≥ 1	
FDD	Table A.2.2.2.2-5		15	16QAM	1/2	18		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.2-5a		15	16QAM	1/3	20		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.2-5a		15	16QAM	1/3	24		≥ 1	Not yet used in tests
FDD, Partial RB allocation, 16-QAM, 20 MHz									
FDD	Table A.2.2.2.2-6		20	16QAM	3/4	1		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.2-6		20	16QAM	3/4	2		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.2-6		20	16QAM	1/2	16		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.2-6		20	16QAM	1/2	18		≥ 1	
FDD	Table A.2.2.2.2-6		20	16QAM	1/3	20		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.2-6		20	16QAM	1/3	24		≥ 1	Not yet used in tests
FDD	Table A.2.2.2.2-6		20	16QAM	1/2	75		≥ 2	Not yet used in tests
FDD, Sustained data rate									
FDD	Table A.2.2.3-1	R.1-1 FDD	10	QPSK	0.31	40		≥ 1	
FDD	Table A.2.2.3-1	R.1-2 FDD	10	QPSK	0.31	40		≥ 1	
FDD	Table A.2.2.3-1	R.1-3 FDD	20	QPSK	0.31	90		≥ 2	
FDD	Table A.2.2.3-1	R.1-3A FDD	10	QPSK	0.31	40		≥ 1	
FDD	Table A.2.2.3-1	R.1-4 FDD	20	QPSK	0.31	40		≥ 2	
TDD, Full RB allocation, QPSK									
TDD	Table A.2.3.1.1-1		1.4	QPSK	1/3	6		≥ 1	
TDD	Table A.2.3.1.1-1		3	QPSK	1/3	15		≥ 1	
TDD	Table A.2.3.1.1-1		5	QPSK	1/3	25		≥ 1	
TDD	Table A.2.3.1.1-1		10	QPSK	1/3	50		≥ 1	
TDD	Table A.2.3.1.1-1		15	QPSK	1/5	75		≥ 1	
TDD	Table A.2.3.1.1-1		20	QPSK	1/6	100		≥ 1	
TDD, Full RB allocation, 16-QAM									
TDD	Table A.2.3.1.2-1		1.4	16QAM	3/4	6		≥ 1	
TDD	Table A.2.3.1.2-1		3	16QAM	1/2	15		≥ 1	
TDD	Table A.2.3.1.2-1		5	16QAM	1/3	25		≥ 1	
TDD	Table A.2.3.1.2-1		10	16QAM	3/4	50		≥ 2	
TDD	Table A.2.3.1.2-1		15	16QAM	1/2	75		≥ 2	
TDD	Table A.2.3.1.2-1		20	16QAM	1/3	100		≥ 2	
TDD, Partial RB allocation, QPSK, 1.4 MHz									
TDD	Table A.2.3.2.1-1		1.4	QPSK	1/3	1		≥ 1	
TDD	Table A.2.3.2.1-1		1.4	QPSK	1/3	2		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-1		1.4	QPSK	1/3	3		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-1		1.4	QPSK	1/3	4		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-1		1.4	QPSK	1/3	5		≥ 1	

TDD, Partial RB allocation, QPSK, 3 MHz									
TDD	Table A.2.3.2.1-2		3	QPSK	1/3	1		≥ 1	
TDD	Table A.2.3.2.1-2		3	QPSK	1/3	2		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-2		3	QPSK	1/3	3		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-2		3	QPSK	1/3	4		≥ 1	
TDD	Table A.2.3.2.1-2		3	QPSK	1/3	5		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-2		3	QPSK	1/3	6		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-2		3	QPSK	1/3	10		≥ 1	Not yet used in tests
TDD, Partial RB allocation, QPSK, 5 MHz									
TDD	Table A.2.3.2.1-3		5	QPSK	1/3	1		≥ 1	
TDD	Table A.2.3.2.1-3		5	QPSK	1/3	2		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-3		5	QPSK	1/3	5		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-3		5	QPSK	1/3	6		≥ 1	
TDD	Table A.2.3.2.1-3		5	QPSK	1/3	8		≥ 1	
TDD	Table A.2.3.2.1-3a		5	QPSK	1/3	10		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-3a		5	QPSK	1/3	15		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-3a		5	QPSK	1/3	18		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-3a		5	QPSK	1/3	20		≥ 1	
TDD	Table A.2.3.2.1-3a		5	QPSK	1/3	24		≥ 1	Not yet used in tests
TDD, Partial RB allocation, QPSK, 10 MHz									
TDD	Table A.2.3.2.1-4		10	QPSK	1/3	1		≥ 1	
TDD	Table A.2.3.2.1-4		10	QPSK	1/3	2		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-4		10	QPSK	1/3	5		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-4		10	QPSK	1/3	6		≥ 1	
TDD	Table A.2.3.2.1-4		10	QPSK	1/3	8		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-4		10	QPSK	1/3	10		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-4a		10	QPSK	1/3	12		≥ 1	
TDD	Table A.2.3.2.1-4a		10	QPSK	1/3	16		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-4a		10	QPSK	1/3	18		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-4a		10	QPSK	1/3	20		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-4a		10	QPSK	1/3	24		≥ 1	
TDD	Table A.2.3.2.1-4a		10	QPSK	1/3	25		≥ 1	
TDD	Table A.2.3.2.1-4b		10	QPSK	1/3	27		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-4b		10	QPSK	1/3	30		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-4b		10	QPSK	1/3	36		≥ 1	
TDD	Table A.2.3.2.1-4b		10	QPSK	1/3	40		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-4b		10	QPSK	1/3	48		≥ 1	
TDD, Partial RB allocation, QPSK, 15 MHz									
TDD	Table A.2.3.2.1-5		15	QPSK	1/3	1		≥ 1	
TDD	Table A.2.3.2.1-5		15	QPSK	1/3	2		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-5		15	QPSK	1/3	5		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-5		15	QPSK	1/3	6		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-5		15	QPSK	1/3	8		≥ 1	
TDD	Table A.2.3.2.1-5		15	QPSK	1/3	10		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-5a		15	QPSK	1/3	16		≥ 1	
TDD	Table A.2.3.2.1-5a		15	QPSK	1/3	18		≥ 1	
TDD	Table A.2.3.2.1-5a		15	QPSK	1/3	20		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-5a		15	QPSK	1/3	24		≥ 1	Not yet used in tests

TDD	Table A.2.3.2.1-5a		15	QPSK	1/3	25		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-5a		15	QPSK	1/3	27		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-5b		15	QPSK	1/3	36		≥ 1	
TDD	Table A.2.3.2.1-5b		15	QPSK	1/3	40		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-5b		15	QPSK	1/3	48		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-5b		15	QPSK	1/3	50		≥ 1	
TDD	Table A.2.3.2.1-5b		15	QPSK	1/3	54		≥ 1	
TDD, Partial RB allocation, QPSK, 20 MHz									
TDD	Table A.2.3.2.1-6		20	QPSK	1/3	1		≥ 1	
TDD	Table A.2.3.2.1-6		20	QPSK	1/3	2		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-6		20	QPSK	1/3	5		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-6		20	QPSK	1/3	6		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-6		20	QPSK	1/3	8		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-6		20	QPSK	1/5	10		≥ 1	
TDD	Table A.2.3.2.1-6a		20	QPSK	1/5	18		≥ 1	
TDD	Table A.2.3.2.1-6a		20	QPSK	1/3	20		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-6a		20	QPSK	1/3	24		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-6a		20	QPSK	1/3	25		≥ 1	
TDD	Table A.2.3.2.1-6a		20	QPSK	1/3	48		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.1-6a		20	QPSK	1/3	50		≥ 1	
TDD	Table A.2.3.2.1-6b		20	QPSK	1/3	54		≥ 1	
TDD	Table A.2.3.2.1-6b		20	QPSK	1/5	75		≥ 1	
TDD, Partial RB allocation, 16-QAM, 1.4 MHz									
TDD	Table A.2.3.2.2-1		1.4	16QAM	3/4	1		≥ 1	
TDD	Table A.2.3.2.2-1		1.4	16QAM	3/4	5		≥ 1	
TDD, Partial RB allocation, 16-QAM, 3 MHz									
TDD	Table A.2.3.2.2-2		3	16QAM	3/4	1		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.2-2		3	16QAM	3/4	4		≥ 1	
TDD, Partial RB allocation, 16-QAM, 5 MHz									
TDD	Table A.2.3.2.2-3		5	16QAM	3/4	1		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.2-3		5	16QAM	3/4	8		≥ 1	
TDD, Partial RB allocation, 16-QAM, 10 MHz									
TDD	Table A.2.3.2.2-4		10	16QAM	3/4	1		≥ 1	
TDD	Table A.2.3.2.2-4		10	16QAM	3/4	12		≥ 1	
TDD	Table A.2.3.2.2-4		10	16QAM	1/2	16		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.2-4		10	16QAM	1/3	24		≥ 1	
TDD	Table A.2.3.2.2-4		10	16QAM	3/4	30		≥ 2	Not yet used in tests
TDD	Table A.2.3.2.2-4		10	16QAM	3/4	36		≥ 2	Not yet used in tests
TDD, Partial RB allocation, 16-QAM, 15 MHz									
TDD	Table A.2.3.2.2-5		15	16QAM	3/4	1		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.2-5		15	16QAM	1/2	16		≥ 1	
TDD	Table A.2.3.2.2-5		15	16QAM	3/4	36		≥ 2	
TDD, Partial RB allocation, 16-QAM, 20 MHz									
TDD	Table A.2.3.2.2-6		20	16QAM	3/4	1		≥ 1	Not yet used in tests
TDD	Table A.2.3.2.2-6		20	16QAM	1/2	18		≥ 1	
TDD	Table A.2.3.2.2-6		20	16QAM	3/4	50		≥ 2	
TDD	Table A.2.3.2.2-6		20	16QAM	1/2	75		≥ 2	Not yet used in tests
TDD, Sustained data rate									

TDD	Table A.2.3.3-1	R.1-1 TDD	10	QPSK	0.43	40		≥ 1	
TDD	Table A.2.3.3-1	R.1-2 TDD	10	QPSK	0.61	40		≥ 2	
TDD	Table A.2.3.3-1	R.1-3 TDD	20	QPSK	0.49	90		≥ 2	
TDD	Table A.2.3.3-1	R.1-3B TDD	15	QPSK	0.42	60		≥ 2	
TDD	Table A.2.3.3-1	R.1-4 TDD	20	QPSK	0.49	90		≥ 2	

A.2.2 Reference measurement channels for FDD

A.2.2.1 Full RB allocation

A.2.2.1.1 QPSK

Table A.2.2.1.1-1: Reference Channels for QPSK with full RB allocation

Parameter	Unit	Value					
Channel bandwidth	**MHz**	**1.4**	**3**	**5**	**10**	**15**	**20**
Allocated resource blocks		6	15	25	50	75	100
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/5	1/6
Payload size	Bits	600	1544	2216	5160	4392	4584
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1	1
Total number of bits per Sub-Frame (Note 1)	Bits	1728	4320	7200	14400	21600	28800
Total symbols per Sub-Frame		864	2160	3600	7200	10800	14400
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

A.2.2.1.2 16-QAM

Table A.2.2.1.2-1: Reference Channels for 16-QAM with full RB allocation

Parameter	Unit	Value					
Channel bandwidth	**MHz**	**1.4**	**3**	**5**	**10**	**15**	**20**
Allocated resource blocks		6	15	25	50	75	100
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		16QAM	16QAM	16QAM	16QAM	16QAM	16QAM
Target Coding rate		3/4	1/2	1/3	3/4	1/2	1/3
Payload size	Bits	2600	4264	4968	21384	21384	19848
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	4	4	4
Total number of bits per Sub-Frame	Bits	3456	8640	14400	28800	43200	57600
Total symbols per Sub-Frame		864	2160	3600	7200	10800	14400
UE Category		≥ 1	≥ 1	≥ 1	≥ 2	≥ 2	≥ 2
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

A.2.2.2 Partial RB allocation

For each channel bandwidth, various partial RB allocations are specified. The number of allocated RBs is chosen according to values specified in the Tx and Rx requirements. The single allocated RB case is included.

The allocated RBs are contiguous and start from one end of the channel bandwidth. A single allocated RB is at one end of the channel bandwidth.

A.2.2.2.1 QPSK

Table A.2.2.2.1-1: Reference Channels for 1.4MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value
Channel bandwidth	**MHz**	**1.4**	**1.4**	**1.4**	**1.4**	**1.4**
Allocated resource blocks		1	2	3	4	5
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3
Payload size	Bits	72	176	256	392	424
Transport block CRC	Bits	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1
Total number of bits per Sub-Frame	Bits	288	576	864	1152	1440
Total symbols per Sub-Frame		144	288	432	576	720
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)						

Table A.2.2.2.1-2: Reference Channels for 3MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value	Value	Value
Channel bandwidth	**MHz**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
Allocated resource blocks		1	2	3	4	5	6	10
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3	1/3	1/3
Payload size	Bits	72	176	256	392	424	600	872
Transport block CRC	Bits	24	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1	1	1
Total number of bits per Sub-Frame	Bits	288	576	864	1152	1440	1728	2880
Total symbols per Sub-Frame		144	288	432	576	720	864	1440
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)								

Table A.2.2.2.1-3: Reference Channels for 5MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value
Channel bandwidth	**MHz**	**5**	**5**	**5**	**5**	**5**
Allocated resource blocks		1	2	5	6	8
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3
Payload size	Bits	72	176	424	600	808
Transport block CRC	Bits	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1
Total number of bits per Sub-Frame	Bits	288	576	1440	1728	2304
Total symbols per Sub-Frame		144	288	720	864	1152
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)						

Table A.2.2.2.1-3a: Reference Channels for 5MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value
Channel bandwidth	**MHz**	**5**	**5**	**5**	**5**	**5**
Allocated resource blocks		10	15	18	20	24
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3
Payload size	Bits	872	1320	1864	1736	2472
Transport block CRC	Bits	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1
Total number of bits per Sub-Frame	Bits	2880	4320	5184	5760	6912
Total symbols per Sub-Frame		1440	2160	2592	2880	3456
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)						

Table A.2.2.2.1-4: Reference Channels for 10MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value	Value
Channel bandwidth	**MHz**	**10**	**10**	**10**	**10**	**10**	**10**
Allocated resource blocks		1	2	5	6	8	10
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3	1/3
Payload size	Bits	72	176	424	600	808	872
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1	1
Total number of bits per Sub-Frame	Bits	288	576	1440	1728	2304	2880
Total symbols per Sub-Frame		144	288	720	864	1152	1440
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.2.2.2.1-4a: Reference Channels for 10MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value	Value	Value
Channel bandwidth	**MHz**	**10**	**10**	**10**	**10**	**10**	**10**	**10**
Allocated resource blocks		12	15	16	18	20	24	25
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3	1/3	1/3
Payload size	Bits	1224	1320	1384	1864	1736	2472	2216
Transport block CRC	Bits	24	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1	1	1
Total number of bits per Sub-Frame	Bits	3456	4320	4608	5184	5760	6912	7200
Total symbols per Sub-Frame		1728	2160	2304	2592	2880	3456	3600
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)								

Table A.2.2.2.1-4b: Reference Channels for 10MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value	Value	Value
Channel bandwidth	**MHz**	**10**	**10**	**10**	**10**	**10**	**10**	**10**
Allocated resource blocks		27	30	32	36	40	45	48
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3	1/3	1/3
Payload size	Bits	2792	2664	2792	3752	4136	4008	4264
Transport block CRC	Bits	24	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1	1	1
Total number of bits per Sub-Frame	Bits	7776	8640	9216	10368	11520	12960	13824
Total symbols per Sub-Frame		3888	4320	4608	5184	5760	6480	6912
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)								

Table A.2.2.2.1-5: Reference Channels for 15MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value	Value
Channel bandwidth	**MHz**	**15**	**15**	**15**	**15**	**15**	**15**
Allocated resource blocks		1	2	5	6	8	9
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3	1/3
Payload size	Bits	72	176	424	600	808	776
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1	1
Total number of bits per Sub-Frame	Bits	288	576	1440	1728	2304	2592
Total symbols per Sub-Frame		144	288	720	864	1152	1296
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.2.2.2.1-5a: Reference Channels for 15MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value	Value
Channel bandwidth	**MHz**	**15**	**15**	**15**	**15**	**15**	**15**
Allocated resource blocks		10	16	18	20	24	25
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3	1/3
Payload size	Bits	872	1384	1864	1736	2472	2216
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1	1
Total number of bits per Sub-Frame	Bits	2880	4608	5184	5760	6912	7200
Total symbols per Sub-Frame		1440	2304	2592	2880	3456	3600
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.2.2.2.1-5b: Reference Channels for 15MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value	Value	Value
Channel bandwidth	**MHz**	**15**	**15**	**15**	**15**	**15**	**15**	**15**
Allocated resource blocks		27	36	40	48	50	54	60
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3	1/3	1/3
Payload size	Bits	2792	3752	4136	4264	5160	4776	4264
Transport block CRC	Bits	24	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1	1	1
Total number of bits per Sub-Frame	Bits	7776	10368	11520	13824	14400	15552	17280
Total symbols per Sub-Frame		3888	5184	5760	6912	7200	7776	8640
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)								

Table A.2.2.2.1-6: Reference Channels for 20MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value	Value
Channel bandwidth	**MHz**	**20**	**20**	**20**	**20**	**20**	**20**
Allocated resource blocks		1	2	5	6	8	10
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3	1/3
Payload size	Bits	72	176	424	600	808	872
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1	1
Total number of bits per Sub-Frame	Bits	288	576	1440	1728	2304	2880
Total symbols per Sub-Frame		144	288	720	864	1152	1440
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.2.2.2.1-6a: Reference Channels for 20MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value	Value
Channel bandwidth	**MHz**	**20**	**20**	**20**	**20**	**20**	**20**
Allocated resource blocks		16	18	20	24	25	48
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3	1/3
Payload size	Bits	1384	1864	1736	2472	2216	4264
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1	1
Total number of bits per Sub-Frame	Bits	4608	5184	5760	6912	7200	13824
Total symbols per Sub-Frame		2304	2592	2880	3456	3600	6912
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.2.2.2.1-6b: Reference Channels for 20MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value
Channel bandwidth	**MHz**	**20**	**20**	**20**
Allocated resource blocks		50	54	75
DFT-OFDM Symbols per Sub-Frame		12	12	12
Modulation		QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/5
Payload size	Bits	5160	4776	4392
Transport block CRC	Bits	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1
Total number of bits per Sub-Frame	Bits	14400	15552	21600
Total symbols per Sub-Frame		7200	7776	10800
UE Category		≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)				

A.2.2.2.2 16-QAM

Table A.2.2.2.2-1: Reference Channels for 1.4MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	**MHz**	**1.4**	**1.4**
Allocated resource blocks		1	5
DFT-OFDM Symbols per Sub-Frame		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	3/4
Payload size	Bits	408	2152
Transport block CRC	Bits	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1
Total number of bits per Sub-Frame	Bits	576	2880
Total symbols per Sub-Frame		144	720
UE Category		≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)			

Table A.2.2.2.2-2: Reference Channels for 3MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value	Value
Channel bandwidth	**MHz**	**3**	**3**	**3**
Allocated resource blocks		1	4	6
DFT-OFDM Symbols per Sub-Frame		12	12	12
Modulation		16QAM	16QAM	16QAM
Target Coding rate		3/4	3/4	3/4
Payload size	Bits	408	1736	2600
Transport block CRC	Bits	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1
Total number of bits per Sub-Frame	Bits	576	2304	3456
Total symbols per Sub-Frame		144	576	864
UE Category		≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)				

Table A.2.2.2.2-3: Reference Channels for 5MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	**MHz**	**5**	**5**
Allocated resource blocks		1	8
DFT-OFDM Symbols per Sub-Frame		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	3/4
Payload size	Bits	408	3496
Transport block CRC	Bits	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1
Total number of bits per Sub-Frame	Bits	576	4608
Total symbols per Sub-Frame		144	1152
UE Category		≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)			

Table A.2.2.2.2-4: Reference Channels for 10MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value
Channel bandwidth	**MHz**	**10**	**10**	**10**	**10**	**10**
Allocated resource blocks		1	12	16	30	36
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12
Modulation		16QAM	16QAM	16QAM	16QAM	16QAM
Target Coding rate		3/4	3/4	1/2	3/4	3/4
Payload size	Bits	408	5160	4584	12960	15264
Transport block CRC	Bits	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	3	3
Total number of bits per Sub-Frame	Bits	576	6912	9216	17280	20736
Total symbols per Sub-Frame		144	1728	2304	4320	5184
UE Category		≥ 1	≥ 1	≥ 1	≥ 2	≥ 2
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)						

Table A.2.2.2.2-5: Reference Channels for 15MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value	Value
Channel bandwidth	**MHz**	**15**	**15**	**15**	**15**	**15**	**15**
Allocated resource blocks		1	6	8	9	16	18
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		16QAM	16QAM	16QAM	16QAM	16QAM	16QAM
Target Coding rate		3/4	3/4	3/4	3/4	1/2	1/2
Payload size	Bits	408	2600	3496	3880	4584	5160
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1	1
Total number of bits per Sub-Frame	Bits	576	3456	4608	5184	9216	10368
Total symbols per Sub-Frame		144	864	1152	1296	2304	2592
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.2.2.2.2-5a: Reference Channels for 15MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	**MHz**	**15**	**15**
Allocated resource blocks		20	24
DFT-OFDM Symbols per Sub-Frame		12	12
Modulation		16QAM	16QAM
Target Coding rate		1/3	1/3
Payload size	Bits	4008	4776
Transport block CRC	Bits	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1
Total number of bits per Sub-Frame	Bits	11520	13824
Total symbols per Sub-Frame		2880	3456
UE Category		≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)			

Table A.2.2.2.2-6: Reference Channels for 20MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value	Value	Value
Channel bandwidth	**MHz**	**20**	**20**	**20**	**20**	**20**	**20**	**20**
Allocated resource blocks		1	2	16	18	20	24	75
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12	12
Modulation		16QAM	16QAM	16QAM	16QAM	16QAM	16QAM	16QAM
Target Coding rate		3/4	3/4	1/2	1/2	1/3	1/3	1/2
Payload size	Bits	408	840	4584	5160	4008	4776	21384
Transport block CRC	Bits	24	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1	1	4
Total number of bits per Sub-Frame	Bits	576	1152	9216	10368	11520	13824	43200
Total symbols per Sub-Frame		144	288	2304	2592	2880	3456	10800
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 2
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)								

A.2.2.3 Reference measurement channels for sustained downlink data rate provided by lower layers

Table A.2.2.3-1: Uplink Reference Channels for sustained data-rate test (FDD)

Parameter	Unit	Value					
Reference Channel		R.1-1 FDD	R.1-2 FDD	R.1-3 FDD	R.1-3A FDD	R.1-4 FDD	FFS
Channel Bandwidth	MHz	10	10	20	10	20	
Allocated Resource Blocks		40 (Note 2)	40 (Note 2)	90 (Note 3)	40(Note 2)	90 (Note 3)	
Allocated Sub-Frames per Radio-Frame		10	10	10	10	10	
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	
Coding Rate		0.31	0.31	0.31	0.31	0.31	
Information Bit Payload per Sub-Frame	Bits	3496	3496	7992	3496	7992	
Number of Code Blocks per Sub-Frame (Note 1)		1	1	2	1	2	
Modulation Symbols per Sub-Frame		5760	5760	12960	5760	12960	
Binary Channel Bits per Sub-Frame		11520	11520	25920	11520	25920	
Max Throughput over 1 Radio-Frame	Mbps	3.496	3.496	7.992	3.496	7.992	
UE Category		≥ 1	≥ 1	≥ 2	≥ 1	≥ 2	
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 2: RB-s 5-44 allocated with PUSCH. Note 3: RB-s 5-94 allocated with PUSCH.							

A.2.3 Reference measurement channels for TDD

For TDD the measurement channel is based on DL/UL configuration ratio of 2DL:2UL.

A.2.3.1 Full RB allocation

A.2.3.1.1 QPSK

Table A.2.3.1.1-1: Reference Channels for QPSK with full RB allocation

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Uplink-Downlink Configuration (Note 2)		1	1	1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/5	1/6
Payload size							
For Sub-Frame 2,3,7,8	Bits	600	1544	2216	5160	4392	4584
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1	1
Total number of bits per Sub-Frame							
For Sub-Frame 2,3,7,8	Bits	1728	4320	7200	14400	21600	28800
Total symbols per Sub-Frame							
For Sub-Frame 2,3,7,8		864	2160	3600	7200	10800	14400
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 2: As per Table 4.2-2 in TS 36.211 [8]							

A.2.3.1.2 16-QAM

Table A.2.3.1.2-1: Reference Channels for 16-QAM with full RB allocation

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Uplink-Downlink Configuration (Note 2)		1	1	1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		16QAM	16QAM	16QAM	16QAM	16QAM	16QAM
Target Coding rate		3/4	1/2	1/3	3/4	1/2	1/3
Payload size							
For Sub-Frame 2,3,7,8	Bits	2600	4264	4968	21384	21384	19848
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks - C		1	1	1	4	4	4
Total number of bits per Sub-Frame							
For Sub-Frame 2,3,7,8	Bits	3456	8640	14400	28800	43200	57600
Total symbols per Sub-Frame							
For Sub-Frame 2,3,7,8		864	2160	3600	7200	10800	14400
UE Category		≥ 1	≥ 1	≥ 1	≥ 2	≥ 2	≥ 2
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 2: As per Table 4.2-2 in TS 36.211 [8]							

A.2.3.2 Partial RB allocation

For each channel bandwidth, various partial RB allocations are specified. The number of allocated RBs is chosen according to values specified in the Tx and Rx requirements. The single allocated RB case is included.

The allocated RBs are contiguous and start from one end of the channel bandwidth. A single allocated RB is at one end of the channel bandwidth.

A.2.3.2.1 QPSK

Table A.2.3.2.1-1: Reference Channels for 1.4MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value
Channel bandwidth	MHz	1.4	1.4	1.4	1.4	1.4
Allocated resource blocks		1	2	3	4	5
Uplink-Downlink Configuration (Note 2)		1	1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3
Payload size						
For Sub-Frame 2,3,7,8	Bits	72	176	256	392	424
Transport block CRC	Bits	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1
Total number of bits per Sub-Frame						
For Sub-Frame 2,3,7,8	Bits	288	576	864	1152	1440
Total symbols per Sub-Frame						
For Sub-Frame 2,3,7,8		144	288	432	576	720
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 2: As per Table 4.2-2 in TS 36.211 [8]						

Table A.2.3.2.1-2: Reference Channels for 3MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value	Value	Value
Channel bandwidth	MHz	3	3	3	3	3	3	3
Allocated resource blocks		1	2	3	4	5	6	10
Uplink-Downlink Configuration (Note 2)		1	1	1	1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3	1/3	1/3
Payload size								
For Sub-Frame 2,3,7,8	Bits	72	176	256	392	424	600	872
Transport block CRC	Bits	24	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1	1	1
Total number of bits per Sub-Frame								
For Sub-Frame 2,3,7,8	Bits	288	576	864	1152	1440	1728	2880
Total symbols per Sub-Frame								
For Sub-Frame 2,3,7,8		144	288	432	576	720	864	1440
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 2: As per Table 4.2-2 in TS 36.211 [8]								

Table A.2.3.2.1-3: Reference Channels for 5MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value
Channel bandwidth	MHz	5	5	5	5	5
Allocated resource blocks		1	2	5	6	8
Uplink-Downlink Configuration (Note 2)		1	1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3
Payload size						
For Sub-Frame 2,3,7,8	Bits	72	176	424	600	808
Transport block CRC	Bits	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1
Total number of bits per Sub-Frame	Bits					
For Sub-Frame 2,3,7,8		288	576	1440	1728	2304
Total symbols per Sub-Frame						
For Sub-Frame 2,3,7,8		144	288	720	864	1152
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 2: As per Table 4.2-2 in TS 36.211 [8]						

Table A.2.3.2.1-3a: Reference Channels for 5MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value
Channel bandwidth	MHz	5	5	5	5	5
Allocated resource blocks		10	15	18	20	24
Uplink-Downlink Configuration (Note 2)		1	1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3
Payload size						
For Sub-Frame 2,3,7,8	Bits	872	1320	1864	1736	2472
Transport block CRC	Bits	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1
Total number of bits per Sub-Frame	Bits					
For Sub-Frame 2,3,7,8		2880	4320	5184	5760	6912
Total symbols per Sub-Frame						
For Sub-Frame 2,3,7,8		1440	2160	2592	2880	3456
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 2: As per Table 4.2-2 in TS 36.211 [8]						

Table A.2.3.2.1-4: Reference Channels for 10MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value	Value
Channel bandwidth	MHz	10	10	10	10	10	10
Allocated resource blocks		1	2	5	6	8	10
Uplink-Downlink Configuration		1	1	1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3	1/3
Payload size							
For Sub-Frame 2,3,7,8	Bits	72	176	424	600	808	872
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1	1
Total number of bits per Sub-Frame							
For Sub-Frame 2,3,7,8	Bits	288	576	1440	1728	2304	2880
Total symbols per Sub-Frame							
For Sub-Frame 2,3,7,8		144	288	720	864	1152	1440
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 2: As per Table 4.2-2 in TS 36.211 [8]							

Table A.2.3.2.1-4a: Reference Channels for 10MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value	Value
Channel bandwidth	MHz	10	10	10	10	10	10
Allocated resource blocks		12	16	18	20	24	25
Uplink-Downlink Configuration		1	1	1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3	1/3
Payload size							
For Sub-Frame 2,3,7,8	Bits	1224	1384	1864	1736	2472	2216
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1	1
Total number of bits per Sub-Frame							
For Sub-Frame 2,3,7,8	Bits	3456	4608	5184	5760	6912	7200
Total symbols per Sub-Frame							
For Sub-Frame 2,3,7,8		1728	2304	2592	2880	3456	3600
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 2: As per Table 4.2-2 in TS 36.211 [8]							

Table A.2.3.2.1-4b: Reference Channels for 10MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value
Channel bandwidth	MHz	10	10	10	10	10
Allocated resource blocks		27	30	36	40	48
Uplink-Downlink Configuration		1	1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3
Payload size						
For Sub-Frame 2,3,7,8	Bits	2792	2664	3752	4136	4264
Transport block CRC	Bits	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1
Total number of bits per Sub-Frame						
For Sub-Frame 2,3,7,8	Bits	7776	8640	10368	11520	13824
Total symbols per Sub-Frame						
For Sub-Frame 2,3,7,8		3888	4320	5184	5760	6912
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 2: As per Table 4.2-2 in TS 36.211 [8]						

Table A.2.3.2.1-5: Reference Channels for 15MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value	Value
Channel bandwidth	MHz	15	15	15	15	15	15
Allocated resource blocks		1	2	5	6	8	10
Uplink-Downlink Configuration		1	1	1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3	1/3
Payload size							
For Sub-Frame 2,3,7,8	Bits	72	176	424	600	808	872
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1	1
Total number of bits per Sub-Frame							
For Sub-Frame 2,3,7,8	Bits	288	576	1440	1728	2304	2880
Total symbols per Sub-Frame							
For Sub-Frame 2,3,7,8		144	288	720	864	1152	1440
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 2: As per Table 4.2-2 in TS 36.211 [8]							

Table A.2.3.2.1-5a: Reference Channels for 15MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value	Value
Channel bandwidth	MHz	15	15	15	15	15	15
Allocated resource blocks		16	18	20	24	25	27
Uplink-Downlink Configuration		1	1	1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3	1/3
Payload size							
For Sub-Frame 2,3,7,8	Bits	1384	1864	1736	2472	2216	2792
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1	1
Total number of bits per Sub-Frame							
For Sub-Frame 2,3,7,8	Bits	4608	5184	5760	6912	7200	7776
Total symbols per Sub-Frame							
For Sub-Frame 2,3,7,8		2304	2592	2880	3456	3600	3888
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 2: As per Table 4.2-2 in TS 36.211 [8]							

Table A.2.3.2.1-5b: Reference Channels for 15MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value
Channel bandwidth	MHz	15	15	15	15	15
Allocated resource blocks		36	40	48	50	54
Uplink-Downlink Configuration		1	1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3
Payload size						
For Sub-Frame 2,3,7,8	Bits	3752	4136	4264	5160	4776
Transport block CRC	Bits	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1
Total number of bits per Sub-Frame						
For Sub-Frame 2,3,7,8	Bits	10368	11520	13824	14400	15552
Total symbols per Sub-Frame						
For Sub-Frame 2,3,7,8		5184	5760	6912	7200	7776
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 2: As per Table 4.2-2 in TS 36.211 [8]						

Table A.2.3.2.1-6: Reference Channels for 20MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value	Value
Channel bandwidth	MHz	20	20	20	20	20	20
Allocated resource blocks		1	2	5	6	8	10
Uplink-Downlink Configuration (Note 2)		1	1	1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3	1/3
Payload size							
For Sub-Frame 2,3,7,8	Bits	72	176	424	600	808	872
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1	1
Total number of bits per Sub-Frame							
For Sub-Frame 2,3,7,8	Bits	288	576	1440	1728	2304	2880
Total symbols per Sub-Frame							
For Sub-Frame 2,3,7,8		144	288	720	864	1152	1440
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 2: As per Table 4.2-2 in TS 36.211 [8]							

Table A.2.3.2.1-6a: Reference Channels for 20MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value	Value
Channel bandwidth	MHz	20	20	20	20	20	20
Allocated resource blocks		18	20	24	25	48	50
Uplink-Downlink Configuration (Note 2)		1	1	1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/3	1/3
Payload size							
For Sub-Frame 2,3,7,8	Bits	1864	1736	2472	2216	4264	5160
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1	1
Total number of bits per Sub-Frame							
For Sub-Frame 2,3,7,8	Bits	5184	5760	6912	7200	13824	14400
Total symbols per Sub-Frame							
For Sub-Frame 2,3,7,8		2592	2880	3456	3600	6912	7200
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 2: As per Table 4.2-2 in TS 36.211 [8]							

Table A.2.3.2.1-6b: Reference Channels for 20MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	20	20
Allocated resource blocks		54	75
Uplink-Downlink Configuration (Note 2)		1	1
DFT-OFDM Symbols per Sub-Frame		12	12
Modulation		QPSK	QPSK
Target Coding rate		1/3	1/5
Payload size			
For Sub-Frame 2,3,7,8	Bits	4776	4392
Transport block CRC	Bits	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1
Total number of bits per Sub-Frame			
For Sub-Frame 2,3,7,8	Bits	15552	21600
Total symbols per Sub-Frame			
For Sub-Frame 2,3,7,8		7776	10800
UE Category		≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 2: As per Table 4.2-2 in TS 36.211 [8]			

A.2.3.2.2 16-QAM

Table A.2.3.2.2-1: Reference Channels for 1.4MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	1.4	1.4
Allocated resource blocks		1	5
Uplink-Downlink Configuration (Note 2)		1	1
DFT-OFDM Symbols per Sub-Frame		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	3/4
Payload size			
For Sub-Frame 2,3,7,8	Bits	408	2152
Transport block CRC	Bits	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1
Total number of bits per Sub-Frame			
For Sub-Frame 2,3,7,8	Bits	576	2880
Total symbols per Sub-Frame			
For Sub-Frame 2,3,7,8		144	720
UE Category		≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 2: As per Table 4.2-2 in TS 36.211 [8]			

Table A.2.3.2.2-2: Reference Channels for 3MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	3	3
Allocated resource blocks		1	4
Uplink-Downlink Configuration (Note 2)		1	1
DFT-OFDM Symbols per Sub-Frame		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	3/4
Payload size			
For Sub-Frame 2,3,7,8	Bits	408	1736
Transport block CRC	Bits	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1
Total number of bits per Sub-Frame			
For Sub-Frame 2,3,7,8	Bits	576	2304
Total symbols per Sub-Frame			
For Sub-Frame 2,3,7,8		144	576
UE Category		≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 2: As per Table 4.2-2 in TS 36.211 [8]			

Table A.2.3.2.2-3: Reference Channels for 5MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	5	5
Allocated resource blocks		1	8
Uplink-Downlink Configuration (Note 2)		1	1
DFT-OFDM Symbols per Sub-Frame		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	3/4
Payload size			
For Sub-Frame 2,3,7,8	Bits	408	3496
Transport block CRC	Bits	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1
Total number of bits per Sub-Frame			
For Sub-Frame 2,3,7,8	Bits	576	4608
Total symbols per Sub-Frame			
For Sub-Frame 2,3,7,8		144	1152
UE Category		≥ 1	≥ 1
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 2: As per Table 4.2-2 in TS 36.211 [8]			

Table A.2.3.2.2-4: Reference Channels for 10MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value	Value
Channel bandwidth	MHz	10	10	10	10	10	10
Allocated resource blocks		1	12	16	24	30	36
Uplink-Downlink Configuration (Note 2)		1	1	1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		16QAM	16QAM	16QAM	16QAM	16QAM	16QAM
Target Coding rate		3/4	3/4	1/2	1/3	3/4	3/4
Payload size							
For Sub-Frame 2,3,7,8	Bits	408	5160	4584	4776	12960	15264
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	3	3
Total number of bits per Sub-Frame							
For Sub-Frame 2,3,7,8	Bits	576	6912	9216	13824	17280	20736
Total symbols per Sub-Frame							
For Sub-Frame 2,3,7,8		144	1728	2304	3456	4320	5184
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 2	≥ 2
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 2: As per Table 4.2-2 in TS 36.211 [8]							

Table A.2.3.2.2-5: Reference Channels for 15MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value	Value
Channel bandwidth	MHz	15	15	15
Allocated resource blocks		1	16	36
Uplink-Downlink Configuration(Note 2)		1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12
Modulation		16QAM	16QAM	16QAM
Target Coding rate		3/4	1/2	3/4
Payload size				
For Sub-Frame 2,3,7,8	Bits	408	4584	15264
Transport block CRC	Bits	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	3
Total number of bits per Sub-Frame				
For Sub-Frame 2,3,7,8	Bits	576	9216	20736
Total symbols per Sub-Frame				
For Sub-Frame 2,3,7,8		144	2304	5184
UE Category		≥ 1	≥ 1	≥ 2
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 2: As per Table 4.2-2 in TS 36.211 [8]				

Table A.2.3.2.2-6: Reference Channels for 20MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value	Value	Value
Channel bandwidth	MHz	20	20	20	20
Allocated resource blocks		1	18	50	75
Uplink-Downlink Configuration (Note 2)		1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12
Modulation		16QAM	16QAM	16QAM	16QAM
Target Coding rate		3/4	1/2	3/4	1/2
Payload size					
For Sub-Frame 2,3,7,8	Bits	408	5160	21384	21384
Transport block CRC	Bits	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	4	4
Total number of bits per Sub-Frame					
For Sub-Frame 2,3,7,8	Bits	576	10368	28800	43200
Total symbols per Sub-Frame					
For Sub-Frame 2,3,7,8		144	2592	7200	10800
UE Category		≥ 1	≥ 1	≥ 2	≥ 2
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 2: As per Table 4.2-2 in TS 36.211 [8]					

A.2.3.3 Reference measurement channels for sustained downlink data rate provided by lower layers

Table A.2.3.3-1: Uplink Reference Channels for sustained data-rate test (TDD)

Parameter	Unit	Value				
Reference Channel		R.1-1 TDD	R.1-2 TDD	R.1-3 TDD	R.1-3B TDD	R.1-4 TDD
Channel Bandwidth	MHz	10	10	20	15	20
Uplink-Downlink Configuration (Note 2)		5	5	5	1	1
Allocated Resource Blocks		40 (Note 3)	40 (Note 3)	90 (Note 5)	60 (Note 4)	90 (Note 5)
Allocated Sub-Frames per Radio-Frame		1	1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK
Coding Rate						
For Sub-Frame 2		0.43	0.61	0.49	0.42	0.49
For Sub-Frame 3,7,8		n/a	n/a	n/a	0.42	0.49
Information Bit Payload per Sub-Frame	Bits					
For Sub-Frame 2		4968	6968	12576	7224	12576
For Sub-Frame 3,7,8		0	0	0	7224	12576
Number of Code Blocks per Sub-Frame (Note 1)						
For Sub-Frame 2		1	2	3	2	3
For Sub-Frame 3,7,8		0	0	0	2	3
Modulation Symbols per Sub-Frame						
For Sub-Frame 2		5760	5760	12960	8640	10240
For Sub-Frame 3,7,8		0	0	0	8640	10240
Binary Channel Bits per Sub-Frame						
For Sub-Frame 2		11520	11520	25920	17280	25920
For Sub-Frame 3,7,8		n/a	n/a	n/a	17280	25920
Max Throughput over 1 Radio-Frame	Mbps	0.4968	0.6968	1.2576	2.8896	5.0304
UE Category		≥ 1	≥ 2	≥ 2	≥ 2	≥ 2

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
Note 2: As per Table 4.2-2 in TS 36.211 [8]
Note 3: RB-s 5-44 allocated with PUSCH.
Note 4: RB-s 7-66 allocated with PUSCH.
Note 5: RB-s 5-94 allocated with PUSCH.

A.3 DL reference measurement channels

A.3.1 General

The number of available channel bits varies across the sub-frames due to PBCH and PSS/SSS overhead. The payload size per sub-frame is varied in order to keep the code rate constant throughout a frame.

No user data is scheduled on subframes #5 in order to facilitate the transmission of system information blocks (SIB).

The algorithm for determining the payload size A is as follows; given a desired coding rate R and radio block allocation N_{RB}

1. Calculate the number of channel bits N_{ch} that can be transmitted during the first transmission of a given sub-frame.

2. Find A such that the resulting coding rate is as close to R as possible, that is,

$$\min \left| R - (A + 24) / N_{ch} \right|,$$

subject to

a) A is a valid TB size (according to TS 36.213 [10] clause 7.1.7) assuming an allocation of N_{RB} resource blocks

b) Segmentation is not included in this formula, but should be considered in the TBS calculation

3. If there is more than one A that minimizes the equation above, then the larger value is chosen per default.
4. For TDD, the measurement channel is based on DL/UL configuration ratio of 2DL+DwPTS (12 OFDM symbol): 2UL.

A.3.1.1 Overview of DL reference measurement channels

In Table A.3.1.1-1 are listed the DL reference measurement channels specified in annexes A.3.2 to A.3.9 of this release of TS 36.521-1. This table is informative and serves only to a better overview. The reference for the concrete reference measurement channels and corresponding implementation's parameters as to be used for testing are annexes A.3.2 to A.3.9 as appropriate.

Table A.3.1.1-1: Overview of DL reference measurement channels

Duplex	Table	Name	BW	Mod	TCR	RB	RB Offset	UE Categ	Notes
FDD, Receiver requirements									
FDD	Table A.3.2-1		1.4	QPSK	1/3	6		≥ 1	
FDD	Table A.3.2-1		3	QPSK	1/3	15		≥ 1	
FDD	Table A.3.2-1		5	QPSK	1/3	25		≥ 1	
FDD	Table A.3.2-1		10	QPSK	1/3	50		≥ 1	
FDD	Table A.3.2-1		15	QPSK	1/3	75		≥ 1	
FDD	Table A.3.2-1		20	QPSK	1/3	100		≥ 1	
TDD, Receiver requirements									
TDD	Table A.3.2-2		1.4	QPSK	1/3	6		≥ 1	
TDD	Table A.3.2-2		3	QPSK	1/3	15		≥ 1	
TDD	Table A.3.2-2		5	QPSK	1/3	25		≥ 1	
TDD	Table A.3.2-2		10	QPSK	1/3	50		≥ 1	
TDD	Table A.3.2-2		15	QPSK	1/3	75		≥ 1	
TDD	Table A.3.2-2		20	QPSK	1/3	100		≥ 1	
FDD, Receiver requirements, Maximum input level for UE Categories 3-5									
FDD	Table A.3.2-3		1.4	64QAM	3/4	6		-	
FDD	Table A.3.2-3		3	64QAM	3/4	15		-	
FDD	Table A.3.2-3		5	64QAM	3/4	25		-	
FDD	Table A.3.2-3		10	64QAM	3/4	50		-	
FDD	Table A.3.2-3		15	64QAM	3/4	75		-	
FDD	Table A.3.2-3		20	64QAM	3/4	100		-	
FDD, Receiver requirements, Maximum input level for UE Categories 1									
FDD	Table A.3.2-3a		1.4	64QAM	3/4	6		-	
FDD	Table A.3.2-3a		3	64QAM	3/4	15		-	
FDD	Table A.3.2-3a		5	64QAM	3/4	18		-	
FDD	Table A.3.2-3a		10	64QAM	3/4	17		-	
FDD	Table A.3.2-3a		15	64QAM	3/4	17		-	
FDD	Table A.3.2-3a		20	64QAM	3/4	17		-	
FDD, Receiver requirements, Maximum input level for UE Categories 2									
FDD	Table A.3.2-3b		1.4	64QAM	3/4	6		-	
FDD	Table A.3.2-3b		3	64QAM	3/4	15		-	
FDD	Table A.3.2-3b		5	64QAM	3/4	25		-	
FDD	Table A.3.2-3b		10	64QAM	3/4	50		-	
FDD	Table A.3.2-3b		15	64QAM	3/4	75		-	
FDD	Table A.3.2-3b		20	64QAM	3/4	83		-	
TDD, Receiver requirements, Maximum input level for UE Categories 3-5									
TDD	Table A.3.2-4		1.4	64QAM	3/4	6		-	
TDD	Table A.3.2-4		3	64QAM	3/4	15		-	
TDD	Table A.3.2-4		5	64QAM	3/4	25		-	
TDD	Table A.3.2-4		10	64QAM	3/4	50		-	
TDD	Table A.3.2-4		15	64QAM	3/4	75		-	
TDD	Table A.3.2-4		20	64QAM	3/4	100		-	
TDD, Receiver requirements, Maximum input level for UE Categories 1									
TDD	Table A.3.2-4a		1.4	64QAM	3/4	6		-	
TDD	Table A.3.2-4a		3	64QAM	3/4	15		-	

TDD	Table A.3.2-4a		5	64QAM	3/4	18		-	
TDD	Table A.3.2-4a		10	64QAM	3/4	17		-	
TDD	Table A.3.2-4a		15	64QAM	3/4	17		-	
TDD	Table A.3.2-4a		20	64QAM	3/4	17		-	
TDD, Receiver requirements, Maximum input level for UE Categories 2									
TDD	Table A.3.2-4b		1.4	64QAM	3/4	6		-	
TDD	Table A.3.2-4b		3	64QAM	3/4	15		-	
TDD	Table A.3.2-4b		5	64QAM	3/4	25		-	
TDD	Table A.3.2-4b		10	64QAM	3/4	50		-	
TDD	Table A.3.2-4b		15	64QAM	3/4	75		-	
TDD	Table A.3.2-4b		20	64QAM	3/4	83		-	
FDD, Transmitter requirements									
FDD	Table A.3.2A-1		1.4	QPSK	1/8-1/3	3		≥ 1	
FDD	Table A.3.2A-1		3	QPSK	1/3	4		≥ 1	
FDD	Table A.3.2A-1		5	QPSK	1/3	8		≥ 1	
FDD	Table A.3.2A-1		10	QPSK	1/3	16		≥ 1	
FDD	Table A.3.2A-1		15	QPSK	1/3	25		≥ 1	
FDD	Table A.3.2A-1		20	QPSK	1/3	30		≥ 1	
TDD, Transmitter requirements									
TDD	Table A.3.2A-2		1.4	QPSK	1/8-1/3	3		≥ 1	
TDD	Table A.3.2A-2		3	QPSK	1/3	4		≥ 1	
TDD	Table A.3.2A-2		5	QPSK	1/3	8		≥ 1	
TDD	Table A.3.2A-2		10	QPSK	1/3	16		≥ 1	
TDD	Table A.3.2A-2		15	QPSK	1/3	25		≥ 1	
TDD	Table A.3.2A-2		20	QPSK	1/3	30		≥ 1	
FDD, PDSCH Performance, Single-antenna transmission (CRS)									
FDD	Table A.3.3.1-1	R.4 FDD	1.4	QPSK	1/3	6		≥ 1	
FDD	Table A.3.3.1-1	R.42 FDD	20	QPSK	1/3	100		≥ 1	
FDD	Table A.3.3.1-1	R.2 FDD	10	QPSK	1/3	50		≥ 1	
FDD	Table A.3.3.1-2	R.3-1 FDD	5	16QAM	1/2	25		≥ 1	
FDD	Table A.3.3.1-2	R.3 FDD	10	16QAM	1/2	50		≥ 2	
FDD	Table A.3.3.1-3	R.5 FDD	3	64QAM	3/4	15		≥ 1	
FDD	Table A.3.3.1-3	R.6 FDD	5	64QAM	3/4	25		≥ 2	
FDD	Table A.3.3.1-3	R.7 FDD	10	64QAM	3/4	50		≥ 2	
FDD	Table A.3.3.1-3	R.8 FDD	15	64QAM	3/4	75		≥ 2	
FDD	Table A.3.3.1-3	R.9 FDD	20	64QAM	3/4	100		≥ 3	
FDD	Table A.3.3.1-3a	R.6-1 FDD	5	64QAM	3/4	18		≥ 1	
FDD	Table A.3.3.1-3a	R.7-1 FDD	10	64QAM	3/4	17		≥ 1	
FDD	Table A.3.3.1-3a	R.8-1 FDD	15	64QAM	3/4	17		≥ 1	
FDD	Table A.3.3.1-3a	R.9-1 FDD	20	64QAM	3/4	17		≥ 1	
FDD	Table A.3.3.1-3a	R.9-2 FDD	20	64QAM	3/4	83		≥ 2	
FDD, PDSCH Performance, Single-antenna transmission (CRS), Single PRB (Channel edge)									
FDD	Table A.3.3.1-4	R.0 FDD	3	16QAM	1/2	1		≥ 1	
FDD	Table A.3.3.1-4	R.1 FDD	10 / 20	16QAM	1/2	1		≥ 1	
FDD, PDSCH Performance, Single-antenna transmission (CRS), Single PRB (MBSFN Configuration)									
FDD	Table A.3.3.1-5	R.29 FDD	10	16QAM	1/2	1		≥ 1	
FDD, PDSCH Performance, Multi-antenna transmission (CRS), Two antenna ports									

FDD	Table A.3.3.2.1-1	R.10 FDD	10	QPSK	1/3	50		≥ 1	
FDD	Table A.3.3.2.1-1	R.11 FDD	10	16QAM	1/2	50		≥ 2	
FDD	Table A.3.3.2.1-1	R.11-2 FDD	5	16QAM	1/2	25		≥ 1	
FDD	Table A.3.3.2.1-1	R.11-3 FDD	10	16QAM	1/2	40		≥ 1	
FDD	Table A.3.3.2.1-1	R.11-4 FDD	10	QPSK	1/2	50		≥ 1	
FDD	Table A.3.3.2.1-1	R.30 FDD	20	16QAM	1/2	100		≥ 2	
FDD	Table A.3.3.2.1-1	R.35 FDD	10	64QAM	1/2	50		≥ 2	
FDD	Table A.3.3.2.1-2	R.46 FDD	10	QPSK		50		≥ 1	
FDD	Table A.3.3.2.1-2	R.47 FDD	10	16QAM		50		≥ 1	
FDD, PDSCH Performance, Multi-antenna transmission (CRS), Four antenna ports									
FDD	Table A.3.3.2.2-1	R.12 FDD	1.4	QPSK	1/3	6		≥ 1	
FDD	Table A.3.3.2.2-1	R.13 FDD	10	QPSK	1/3	50		≥ 1	
FDD	Table A.3.3.2.2-1	R.14 FDD	10	16QAM	1/2	50		≥ 2	
FDD	Table A.3.3.2.2-1	R.14-1 FDD	10	16QAM	1/2	6		≥ 1	
FDD	Table A.3.3.2.2-1	R.14-2 FDD	10	16QAM	1/2	3		≥ 1	
FDD	Table A.3.3.2.2-1	R.14-3 FDD	20	16QAM	1/2	100		≥ 1	
FDD	Table A.3.3.2.2-1	R.36 FDD	10	64QAM	1/2	50		≥ 2	
FDD, PDSCH Performance (UE specific RS) Two antenna ports (CSI-RS)									
FDD	Table A.3.3.3.1-1	R.51 FDD	10	16QAM	1/2	50		≥ 2	
FDD, PDSCH Performance (UE specific RS) Four antenna ports (CSI-RS)									
FDD	Table A.3.3.3.2-1	R.43 FDD	10	QPSK	1/3	50		≥ 1	
FDD	Table A.3.3.3.2-1	R.50 FDD	10	64QAM	1/2	50		≥ 2	
FDD	Table A.3.3.3.2-2	R.44 FDD	10	QPSK	1/3	50		≥ 1	
FDD	Table A.3.3.3.2-2	R.45 FDD	10	16QAM	1/2	50		≥ 2	
FDD	Table A.3.3.3.2-2	R.45-1 FDD	10	16QAM	1/2	39		≥ 1	
FDD	Table A.3.3.3.2-1	R.48 FDD	10	QPSK		50		≥ 1	
TDD, PDSCH Performance, Single-antenna transmission (CRS)									
TDD	Table A.3.4.1-1	R.4 TDD	1.4	QPSK	1/3	6		≥ 1	
TDD	Table A.3.4.1-1	R.42 TDD	20	QPSK	1/3	100		≥ 1	
TDD	Table A.3.4.1-1	R.2 TDD	10	QPSK	1/3	50		≥ 1	
TDD	Table A.3.4.1-2	R.3-1 TDD	5	16QAM	1/2	25		≥ 1	
TDD	Table A.3.4.1-2	R.3 TDD	10	16QAM	1/2	50		≥ 2	
TDD	Table A.3.4.1-3	R.5 TDD	3	64QAM	3/4	15		≥ 1	
TDD	Table A.3.4.1-3	R.6 TDD	5	64QAM	3/4	25		≥ 2	
TDD	Table A.3.4.1-3	R.7 TDD	10	64QAM	3/4	50		≥ 2	
TDD	Table A.3.4.1-3	R.8 TDD	15	64QAM	3/4	75		≥ 2	
TDD	Table A.3.4.1-3	R.9 TDD	20	64QAM	3/4	100		≥ 3	
TDD	Table A.3.4.1-3a	R.6-1 TDD	5	64QAM	3/4	18		≥ 1	
TDD	Table A.3.4.1-3a	R.7-1 TDD	10	64QAM	3/4	17		≥ 1	
TDD	Table A.3.4.1-3a	R.8-1 TDD	15	64QAM	3/4	17		≥ 1	
TDD	Table A.3.4.1-3a	R.9-1 TDD	20	64QAM	3/4	17		≥ 1	
TDD	Table A.3.4.1-3a	R.9-2 TDD	20	64QAM	3/4	83		≥ 2	
TDD, PDSCH Performance, Single-antenna transmission (CRS), Single PRB (Channel edge)									
TDD	Table A.3.4.1-4	R.0 TDD	3	16QAM	1/2	1		≥ 1	
TDD	Table A.3.4.1-4	R.1 TDD	10 / 20	16QAM	1/2	1		≥ 1	
TDD, PDSCH Performance, Single-antenna transmission (CRS), Single PRB (MBSFN Configuration)									
TDD	Table A.3.4.1-5	R.29 TDD	10	16QAM	1/2	1		≥ 1	

TDD, PDSCH Performance, Multi-antenna transmission (CRS), Two antenna ports									
TDD	Table A.3.4.2.1-1	R.10 TDD	10	QPSK	1/3	50		≥ 1	
TDD	Table A.3.4.2.1-1	R.11 TDD	10	16QAM	1/2	50		≥ 2	
TDD	Table A.3.4.2.1-1	R.11-1 TDD	10	16QAM	1/2	50		≥ 2	
TDD	Table A.3.4.2.1-1	R.11-2 TDD	5	16QAM	1/2	25		≥ 1	
TDD	Table A.3.4.2.1-1	R.11-3 TDD	10	16QAM	1/2	40		≥ 1	
TDD	Table A.3.4.2.1-1	R.11-4 TDD	10	QPSK	1/2	20		≥ 1	
TDD	Table A.3.4.2.1-1	R.30 TDD	20	16QAM	1/2	100		≥ 2	
TDD	Table A.3.4.2.1-1	R.30-1 TDD	20	16QAM	1/2	100		≥ 2	
TDD	Table A.3.4.2.1-1	R.30-2 TDD	20	16QAM	1/2	100		≥ 2	
TDD	Table A.3.4.2.1-1	R.35 TDD	10	64QAM	1/2	50		≥ 2	
TDD	Table A.3.4.2.1-2	R.46 TDD	10	QPSK		50		≥ 1	
TDD	Table A.3.4.2.1-2	R.47 TDD	10	16QAM		50		≥ 1	
TDD	Table A.3.4.2.1-1	R.35-1 TDD	20	64QAM	0.39	100		≥ 2	
TDD, PDSCH Performance, Multi-antenna transmission (CRS), Four antenna ports									
TDD	Table A.3.4.2.2-1	R.12 TDD	1.4	QPSK	1/3	6		≥ 1	
TDD	Table A.3.4.2.2-1	R.13 TDD	10	QPSK	1/3	50		≥ 1	
TDD	Table A.3.4.2.2-1	R.14 TDD	10	16QAM	1/2	50		≥ 2	
TDD	Table A.3.4.2.2-1	R.14-1 TDD	10	16QAM	1/2	6		≥ 1	
TDD	Table A.3.4.2.2-1	R.14-2 TDD	10	16QAM	1/2	3		≥ 1	
TDD	Table A.3.4.2.2-1	R.43 TDD	20	16QAM	1/2	100		≥ 2	
TDD	Table A.3.4.2.2-1	R.36 TDD	10	64QAM	1/2	50		≥ 2	
TDD, PDSCH Performance, Single antenna port (DRS)									
TDD	Table A.3.4.3.1-1	R.25 TDD	10	QPSK	1/3	50		≥ 1	
TDD	Table A.3.4.3.1-1	R.26 TDD	10	16QAM	1/2	50		≥ 2	
TDD	Table A.3.4.3.1-1	R.26-1 TDD	5	16QAM	1/2	25		≥ 1	
TDD	Table A.3.4.3.1-1	R.27 TDD	10	64QAM	3/4	50		≥ 2	
TDD	Table A.3.4.3.1-1	R.27-1 TDD	10	64QAM	3/4	18		≥ 1	
TDD	Table A.3.4.3.1-1	R.28 TDD	10	16QAM	1/2	1		≥ 1	
TDD, PDSCH Performance, Two antenna ports (DRS)									
TDD	Table A.3.4.3.2-1	R.31 TDD	10	QPSK	1/3	50		≥ 1	
TDD	Table A.3.4.3.2-1	R.32 TDD	10	16QAM	1/2	50		≥ 2	
TDD	Table A.3.4.3.2-1	R.32-1 TDD	5	16QAM	1/2	[25]		≥ 1	
TDD	Table A.3.4.3.2-1	R.33 TDD	10	64QAM	3/4	50		≥ 2	
TDD	Table A.3.4.3.2-1	R.33-1 TDD	10	64QAM	3/4	[18]		≥ 1	
TDD	Table A.3.4.3.2-1	R.34 TDD	10	64QAM	1/2	50		≥ 2	
TDD, PDSCH Performance (UE specific RS) Two antenna ports (CSI-RS)									
TDD	Table A.3.4.3.3-1	R.51 TDD	10	16QAM	1/2	50		≥ 2	
TDD, PDSCH Performance (UE specific RS) Four antenna ports (CSI-RS)									
TDD	Table A.3.4.3.4-1	R.44 TDD	10	64QAM	1/2	50		≥ 2	
TDD	Table A.3.4.3.4-1	R.48 TDD	10	QPSK		50		≥ 1	
TDD, PDSCH Performance (UE specific RS) Eight antenna ports (CSI-RS)									
TDD	Table A.3.4.3.5-1	R.51 TDD	10	QPSK	1/3	50		≥ 1	
TDD	Table A.3.4.3.5-2	R.45 TDD	10	16QAM	1/2	50		≥ 2	
TDD	Table A.3.4.3.5-2	R.45-1 TDD	10	16QAM	1/2	39		≥ 1	
FDD, PDCCH / PCFICH Performance									
FDD	Table A.3.5.1-1	R.15 FDD	10	PDCCH					
FDD	Table A.3.5.1-1	R.15-1 FDD	10	PDCCH					

FDD	Table A.3.5.1-1	R.15-2 FDD	10	PDCCH					
FDD	Table A.3.5.1-1	R.15-2 FDD	10	PDCCH					
FDD	Table A.3.5.1-1	R.16 FDD	1.4	PDCCH					
FDD	Table A.3.5.1-1	R.17 FDD	10	PDCCH					
FDD	Table A.3.5.1-1A	R.16_1 FDD	10	PDCCH					
FDD	Table A.3.5.1-1A	R.17_1 FDD	5	PDCCH					
FDD	Table A.3.5.1-2		10	QPSK	1/3	50		≥ 1	
FDD	Table A.3.5.1-2		1.4	QPSK	1/3	6		≥ 1	
FDD	Table A.3.5.1-2		10	QPSK	1/3	50		≥ 1	
FDD	Table A.3.5.1-2		10	QPSK	1/3	50		≥ 1	
FDD	Table A.3.5.1-2		5	QPSK	1/3	25		≥ 1	
TDD, PDCCH / PCFICH Performance									
TDD	Table A.3.5.2-1	R.15 TDD	10	PDCCH					
TDD	Table A.3.5.2-1	R.15-1 TDD	10	PDCCH					
TDD	Table A.3.5.2-1	R.15-2 TDD	10	PDCCH					
TDD	Table A.3.5.2-1	R.15-2 TDD	10	PDCCH					
TDD	Table A.3.5.2-1	R.16 TDD	1.4	PDCCH					
TDD	Table A.3.5.2-1	R.17 TDD	10	PDCCH					
TDD	Table A.3.5.2-1A	R.16_1 TDD	10	PDCCH					
TDD	Table A.3.5.2-1A	R.17_1 TDD	5	PDCCH					
TDD	Table A.3.5.2-2		10	QPSK	1/3	50		≥ 1	
TDD	Table A.3.5.2-2		1.4	QPSK	1/3	6		≥ 1	
TDD	Table A.3.5.2-2		10	QPSK	1/3	50		≥ 1	
TDD	Table A.3.5.2-2		10	QPSK	1/3	50		≥ 1	
TDD	Table A.3.5.2-2		5	QPSK	1/3	25		≥ 1	
FDD / TDD, PHICH Performance									
FDD / TDD	Table A.3.6-1	R.18	10	PHICH					
FDD / TDD	Table A.3.6-1	R.19	1.4	PHICH					
FDD / TDD	Table A.3.6-1	R.20	10	PHICH					
FDD / TDD	Table A.3.6-1	R.24	10	PHICH					
FDD / TDD	Table A.3.6-1A	R.19_1	10	PHICH					
FDD / TDD	Table A.3.6-1A	R.20_1	5	PHICH					
FDD, PMCH Performance									
FDD	Table A.3.8.1-1	R.40 FDD	1.4	QPSK	1/3	6		≥ 1	
FDD	Table A.3.8.1-1	R.37 FDD	10	QPSK	1/3	50		≥ 1	
FDD	Table A.3.8.1-2	R.38 FDD	10	16QAM	1/2	50		≥ 1	
FDD	Table A.3.8.1-3	R.39-1 FDD	5	64QAM	2/3	25		≥ 1	
FDD	Table A.3.8.1-3	R.39 FDD	10	64QAM	2/3	50		≥ 2	
TDD, PMCH Performance									
TDD	Table A.3.8.2-1	R.40 TDD	1.4	QPSK	1/3	6		≥ 1	
TDD	Table A.3.8.2-1	R.37 TDD	10	QPSK	1/3	50		≥ 1	
TDD	Table A.3.8.2-2	R.38 TDD	10	16QAM	1/2	50		≥ 1	
TDD	Table A.3.8.2-3	R.39-1 TDD	5	64QAM	2/3	25		≥ 1	
TDD	Table A.3.8.2-3	R.39 TDD	10	64QAM	2/3	50		≥ 2	
FDD, Sustained data rate (CRS)									
FDD	Table A.3.9.1-1	R.31-1 FDD	10	64QAM	0.40			≥ 1	

FDD	Table A.3.9.1-1	R.31-2 FDD	10	64QAM	0.59-0.64			≥ 2	
FDD	Table A.3.9.1-1	R.31-3 FDD	20	64QAM	0.59-0.62			≥ 2	
FDD	Table A.3.9.1-1	R.31-3A FDD	10	64QAM	0.85-0.90			≥ 2	
FDD	Table A.3.9.1-1	R.31-4 FDD	20	64QAM	0.87-0.90			≥ 3	
TDD, Sustained data rate (CRS)									
TDD	Table A.3.9.2-1	R.31-1 TDD	10	64QAM	0.40			≥ 1	
TDD	Table A.3.9.2-1	R.31-2 TDD	10	64QAM	0.59-0.64			≥ 2	
TDD	Table A.3.9.2-1	R.31-3 TDD	20	64QAM	0.59-0.62			≥ 2	
TDD	Table A.3.9.2-1	R.31-3B TDD	15	64QAM	0.87-0.90			≥ 2	
TDD	Table A.3.9.2-1	R.31-4 TDD	20	64QAM	0.87-0.90			≥ 3	

A.3.2 Reference measurement channel for receiver characteristics

Tables A.3.2-1 and A.3.2-2 are applicable for measurements on the Receiver Characteristics (clause 7) with the exception of sub-clause 7.4 (Maximum input level).

Tables A.3.2-3, A.3.2-3a, A.3.2-3b, A3.2-4, A3.2-4a and A.3.2-4b are applicable for sub-clause 7.4 (Maximum input level).

Tables A.3.2-1 and A.3.2-2 also apply for the modulated interferer used in Clauses 7.5, 7.6 and 7.8 with test specific bandwidths.

Table A.3.2-1: Fixed Reference Channel for Receiver Requirements (FDD)

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		9	9	9	9	9	9
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding Rate		1/3	1/3	1/3	1/3	1/3	1/3
Number of HARQ Processes	Processes	8	8	8	8	8	8
Maximum number of HARQ transmissions		1	1	1	1	1	1
Information Bit Payload per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	408	1320	2216	4392	6712	8760
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	152	872	1800	4392	6712	8760
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (Note 3)							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1	1	1	1	2	2
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	1	1	1	1	2	2
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1368	3780	6300	13800	20700	27600
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	528	2940	5460	12960	19860	26760
Max. Throughput averaged over 1 frame	kbps	341.6	1143.2	1952.8	3952.8	6040.8	7884
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8] Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.3.2-2: Fixed Reference Channel for Receiver Requirements (TDD)

Parameter	Unit	Value					
Channel Bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Uplink-Downlink Configuration (Note 6)		1	1	1	1	1	1
Allocated subframes per Radio Frame (D+S)		3	3+2	3+2	3+2	3+2	3+2
Number of HARQ Processes	Processes	7	7	7	7	7	7
Maximum number of HARQ transmission		1	1	1	1	1	1
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target coding rate		1/3	1/3	1/3	1/3	1/3	1/3
Information Bit Payload per Sub-Frame	Bits						
For Sub-Frame 4, 9		408	1320	2216	4392	6712	8760
For Sub-Frame 1, 6		n/a	968	1544	3240	4968	6712
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		208	1064	1800	4392	6712	8760
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (Note 4)							
For Sub-Frame 4, 9		1	1	1	1	2	2
For Sub-Frame 1, 6		n/a	1	1	1	1	2
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		1	1	1	1	2	2
Binary Channel Bits Per Sub-Frame	Bits						
For Sub-Frame 4, 9		1368	3780	6300	13800	20700	27600
For Sub-Frame 1, 6		n/a	3276	5556	11256	16956	22656
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		672	3084	5604	13104	20004	26904
Max. Throughput averaged over 1 frame	kbps	102.4	564	932	1965.6	3007.2	3970.4
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1

Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
Note 2: For 1.4MHz, no data shall be scheduled on special subframes (1&6) to avoid problems with insufficient PDCCH performance
Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: As per Table 4.2-2 in TS 36.211 [8]

Table A.3.2-3: Fixed Reference Channel for Maximum input level for UE Categories 3-5 (FDD)

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		8	9	9	9	9	9
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4
Number of HARQ Processes	Processes	8	8	8	8	8	8
Maximum number of HARQ transmissions		1	1	1	1	1	1
Information Bit Payload per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	2984	8504	14112	30576	46888	61664
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	6456	12576	28336	45352	61664
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (Note 3)							
For Sub-Frames 1,2,3,4,6,7,8,9		1	2	3	5	8	11
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		n/a	2	3	5	8	11
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	4104	11340	18900	41400	62100	82800
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	8820	16380	38880	59580	80280
Max. Throughput averaged over 1 frame	kbps	2387.2	7448.8	12547	27294	42046	55498
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8] Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.3.2-3a: Fixed Reference Channel for Maximum input level for UE Category 1 (FDD)

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	18	17	17	17
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		8	9	9	9	9	9
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4
Number of HARQ Processes	Processes	8	8	8	8	8	8
Maximum number of HARQ transmissions		1	1	1	1	1	1
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	2984	8504	10296	10296	10296	10296
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	6456	8248	10296	10296	10296
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (Note 3)							
For Sub-Frames 1,2,3,4,6,7,8,9		1	2	2	2	2	2
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		n/a	2	2	2	2	2
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	4104	11340	13608	14076	14076	14076
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	8820	11088	14076	14076	14076
Max. Throughput averaged over 1 frame	kbps	2387.2	7448.8	9079.6	9266.4	9266.4	9266.4
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8] Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.3.2-3b: Fixed Reference Channel for Maximum input level for UE Category 2 (FDD)

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	83
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		8	9	9	9	9	9
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4
Number of HARQ Processes	Processes	8	8	8	8	8	8
Maximum number of HARQ transmissions		1	1	1	1	1	1
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	2984	8504	14112	30576	46888	51024
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	6456	12576	28336	45352	51024
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (Note 3)							
For Sub-Frames 1,2,3,4,6,7,8,9		1	2	3	5	8	9
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		n/a	2	3	5	8	9
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	4104	11340	18900	41400	62100	68724
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	8820	16380	38880	59580	66204
Max. Throughput averaged over 1 frame	kbps	2387.2	7448.8	12547	27294	42046	45922

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz

Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Table A.3.2-4: Fixed Reference Channel for Maximum input level for UE Categories 3-5 (TDD)

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Subcarriers per resource block		12	12	12	12	12	12
Uplink-Downlink Configuration (Note 6)		1	1	1	1	1	1
Allocated subframes per Radio Frame		2	3+2	3+2	3+2	3+2	3+2
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4
Number of HARQ Processes	Processes	7	7	7	7	7	7
Maximum number of HARQ transmissions		1	1	1	1	1	1
Information Bit Payload per Sub-Frame							
For Sub-Frames 4,9	Bits	2984	8504	14112	30576	46888	61664
For Sub-Frames 1,6	Bits	n/a	6968	11448	23688	35160	46888
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	6968	12576	30576	45352	61664
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (Note 4)							
For Sub-Frames 4,9		1	2	3	5	8	11
For Sub-Frames 1,6		n/a	2	2	4	6	8
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		n/a	2	3	5	8	11
Binary Channel Bits per Sub-Frame							
For Sub-Frames 4,9	Bits	4104	11340	18900	41400	62100	82800
For Sub-Frames 1,6		n/a	9828	16668	33768	50868	67968
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	9252	16812	39312	60012	80712
Max. Throughput averaged over 1 frame	kbps	596.8	3791.2	6369.6	13910	20945	27877

Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance
Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: As per Table 4.2-2 in TS 36.211 [8]

Table A.3.2-4a: Fixed Reference Channel for Maximum input level for UE Category 1 (TDD)

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	18	17	17	17
Subcarriers per resource block		12	12	12	12	12	12
Uplink-Downlink Configuration (Note 5)		1	1	1	1	1	1
Allocated subframes per Radio Frame		2	3+2	3+2	3+2	3+2	3+2
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4
Number of HARQ Processes	Processes	7	7	7	7	7	7
Maximum number of HARQ transmissions		1	1	1	1	1	1
Information Bit Payload per Sub-Frame							
For Sub-Frames 4,9	Bits	2984	8504	10296	10296	10296	10296
For Sub-Frames 1,6	Bits	n/a	6968	8248	7480	7480	7480
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	6968	8248	10296	10296	10296
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (Note 4)							
For Sub-Frames 4,9		1	2	2	2	2	2
For Sub-Frames 1,6		n/a	2	2	2	2	2
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		n/a	2	2	2	2	2
Binary Channel Bits per Sub-Frame							
For Sub-Frames 4,9	Bits	4104	11340	13608	14076	14076	14076
For Sub-Frames 1,6		n/a	9828	11880	11628	11628	11628
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	9252	11520	14076	14076	14076
Max. Throughput averaged over 1 frame	kbps	596.8	3791.2	4533.6	4584.8	4584.8	4584.8

Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance
Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
Note 5: As per Table 4.2-2 in TS 36.211 [8]

Table A.3.2-4b: Fixed Reference Channel for Maximum input level for UE Category 2 (TDD)

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	83
Subcarriers per resource block		12	12	12	12	12	12
Uplink-Downlink Configuration (Note 5)		1	1	1	1	1	1
Allocated subframes per Radio Frame		2	3+2	3+2	3+2	3+2	3+2
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4
Number of HARQ Processes	Processes	7	7	7	7	7	7
Maximum number of HARQ transmissions		1	1	1	1	1	1
Information Bit Payload per Sub-Frame							
For Sub-Frames 4,9	Bits	2984	8504	14112	30576	46888	51024
For Sub-Frames 1,6	Bits	n/a	6968	11448	23688	35160	39232
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	6968	12576	30576	45352	51024
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (Note 4)							
For Sub-Frames 4,9		1	2	3	5	8	9
For Sub-Frames 1,6		n/a	2	3	5	7	7
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		n/a	2	3	5	8	9
Binary Channel Bits per Sub-Frame							
For Sub-Frames 4,9	Bits	4104	11340	18900	41400	62100	68724
For Sub-Frames 1,6		n/a	9828	16668	33768	50868	56340
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	9252	16380	39312	60012	66636
Max. Throughput averaged over 1 frame	kbps	596.8	3791.2	6369.6	13910	20945	23154

Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance
Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
Note 5: As per Table 4.2-2 in TS 36.211 [8]

A.3.2A Downlink Reference measurement channel for TX characteristics

Tables A.3.2A-1 and A.3.2A-2 describes the reference measurement channels to be used on the downlink during Transmitter Characteristics (clause 6) for FDD and TDD respectively. The number of allocated resource blocks have been defined (partial allocation) to allow the transmission of PBCH, PSS/SSS and system information mapped on PDSCH.

Table A.3.2A-1: Fixed DL PDSCH Dedicated Reference Channel for TX Requirements (FDD)

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		3	4	8	16	25	30
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		10	10	10	10	10	10
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding Rate		(Note 4)	1/3	1/3	1/3	1/3	1/3
Number of HARQ Processes	Processes	8	8	8	8	8	8
Maximum number of HARQ transmissions		1	1	1	1	1	1
Information Bit Payload							
For Sub-Frames 0, 1, 2, 3, 4, 5, 6, 7, 8, 9	Bits	88	328	680	1384	2216	2664
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame		1	1	1	1	1	1
Code block CRC size	Bits	0	0	0	0	0	0
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1, 2, 3, 4, 6, 7, 8, 9	Bits	684	1008	2016	4416	6900	8280
For Sub-Frames 5		540	1008	2016	4416	6900	8280
For Sub-Frames 0		264	1008	2016	4416	6900	8280
Max. Throughput averaged over 1 frame	kbps	88	328	680	1384	2216	2664
UE-Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz
Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: The PDSCH shall be assigned to the UE under test with a set of allocated localized virtual resource blocks starting from one end of the channel.
Note 4: To ensure constant transport block size in 1.4MHz, the code rate for subframes varies approx. within {1/8-1/3}

Table A.3.2A-2: Fixed DL PDSCH Dedicated Reference Channel for TX Requirements (TDD)

Parameter	Unit	Value					
Channel Bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		3	4	8	16	25	30
Uplink-Downlink Configuration (Note 6)		1	1	1	1	1	1
Allocated subframes per Radio Frame (D+S)		4	4	4	4	4	4
Number of HARQ Processes	Processes	7	7	7	7	7	7
Maximum number of HARQ transmission		1	1	1	1	1	1
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target coding rate		(Note 5)	1/3	1/3	1/3	1/3	1/3
Information Bit Payload per Sub-Frame	Bits						
For Sub-Frame 1, 6		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0, 4, 5, 9		88	328	680	1384	2216	2664
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks		1	1	1	1	1	1
Code block CRC size		0	0	0	0	0	0
Binary Channel Bits Per Sub-Frame	Bits						
For Sub-Frame 1, 6		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 4, 9		684	1008	2016	4416	6900	8280
For Sub-Frame 0		336	1008	2016	4416	6900	8280
For Sub-Frame 5		612	1008	2016	4416	6900	8280
Max. Throughput averaged over one frame	kbps	35.2	131.2	272	553.6	886.4	1065.6
UE-Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1

Note 1: For normal subframes (0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
Note 2: For simplicity, no data shall be scheduled on special subframes (1&6).
Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 4: The PDSCH shall be assigned to the UE under test with a set of allocated localized virtual resource blocks starting from one end of the channel.
Note 5: To ensure constant transport block size in 1.4MHz, the code rate for subframes varies approx. within {1/8 -1/3}.
Note 6: As per Table 4.2-2 in TS 36.211 [8]

A.3.3 Reference measurement channel for PDSCH performance requirements (FDD)

A.3.3.1 Single-antenna transmission (Common Reference Symbols)

Table A.3.3.1-1: Fixed Reference Channel QPSK R=1/3

Parameter	Unit	Value					
Reference channel		R.4 FDD	R.42 FDD		R.2 FDD		
Channel bandwidth	MHz	1.4	20	5	10	15	20
Allocated resource blocks (Note 4)		6	100		50		
Allocated subframes per Radio Frame		9	9		9		
Modulation		QPSK	QPSK		QPSK		
Target Coding Rate		1/3	1/3		1/3		
Information Bit Payload (Note 4)							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	408	8760		4392		
For Sub-Frame 5	Bits	n/a	n/a		n/a		
For Sub-Frame 0	Bits	152	8760		4392		
Number of Code Blocks (Notes 3 and 4)							
For Sub-Frames 1,2,3,4,6,7,8,9		1	2		1		
For Sub-Frame 5		n/a	n/a		n/a		
For Sub-Frame 0		1	2		1		
Binary Channel Bits (Note 4)							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1368	27600		13800		
For Sub-Frame 5	Bits	n/a	n/a		n/a		
For Sub-Frame 0	Bits	528	26760		12960		
Max. Throughput averaged over 1 frame (Note 4)	Mbps	0.342	7.884		3.953		
UE Category		≥ 1	≥ 1		≥ 1		

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
Note 4: Given per component carrier per codeword

Table A.3.3.1-2: Fixed Reference Channel 16QAM R=1/2

Parameter	Unit	Value					
Reference channel				R.3-1 FDD	R.3 FDD		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks				25	50		
Allocated subframes per Radio Frame				9	9		
Modulation				16QAM	16QAM		
Target Coding Rate				1/2	1/2		
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits			6456	14112		
For Sub-Frame 5	Bits			n/a	n/a		
For Sub-Frame 0	Bits			5736	12960		
Number of Code Blocks per Sub-Frame (see Note 3)							
For Sub-Frames 1,2,3,4,6,7,8,9				2	3		
For Sub-Frame 5				n/a	n/a		
For Sub-Frame 0				1	3		
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits			12600	27600		
For Sub-Frame 5	Bits			n/a	n/a		
For Sub-Frame 0	Bits			10920	25920		
Max. Throughput averaged over 1 frame	Mbps			5.738	12.586		
UE Category				≥ 1	≥ 2		

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Table A.3.3.1-3: Fixed Reference Channel 64QAM R=3/4

Parameter	Unit	Value					
Reference channel			R.5 FDD	R.6 FDD	R.7 FDD	R.8 FDD	R.9 FDD
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks			15	25	50	75	100
Allocated subframes per Radio Frame			9	9	9	9	9
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		8504	14112	30576	46888	61664
For Sub-Frame 5	Bits		n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits		6456	12576	28336	45352	61664
Number of Code Blocks per Sub-Frame (see Note 3)			2	3	5	8	11
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		11340	18900	41400	62100	82800
For Sub-Frame 5	Bits		n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits		8820	16380	38880	59580	80280
Max. Throughput averaged over 1 frame	Mbps		7.449	12.547	27.294	42.046	55.498
UE Category			≥ 1	≥ 2	≥ 2	≥ 2	≥ 3

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Table A.3.3.1-3a: Fixed Reference Channel 64QAM R=3/4

Parameter	Unit	Value					
Reference channel			R.6-1 FDD	R.7-1 FDD	R.8-1 FDD	R.9-1 FDD	R.9-2 FDD
Channel bandwidth	MHz		5	10	15	20	20
Allocated resource blocks (Note 3)			18	17	17	17	83
Allocated subframes per Radio Frame			9	9	9	9	9
Modulation			64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate			3/4	3/4	3/4	3/4	3/4
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		10296	10296	10296	10296	51024
For Sub-Frame 5	Bits		n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits		8248	10296	10296	10296	51024
Number of Code Blocks per Sub-Frame (Note 4)							
For Sub-Frames 1,2,3,4,6,7,8,9			2	2	2	2	9
For Sub-Frame 5			n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0			2	2	2	2	9
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		13608	14076	14076	14076	68724
For Sub-Frame 5	Bits		n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits		11088	14076	14076	14076	66204
Max. Throughput averaged over 1 frame	Mbps			9.266	9.266	9.266	45.922
UE Category			≥ 1	≥ 1	≥ 1	≥ 1	≥ 2

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: Localized allocation started from RB #0 is applied.
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Table A.3.3.1-4: Fixed Reference Channel Single PRB (Channel Edge)

Parameter	Unit	Value					
Reference channel			R.0 FDD		R.1 FDD		
Channel bandwidth	MHz	1.4	3	5	10/20	15	20
Allocated resource blocks			1		1		
Allocated subframes per Radio Frame			9		9		
Modulation			16QAM		16QAM		
Target Coding Rate			1/2		1/2		
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		224		256		
For Sub-Frame 5	Bits		n/a		n/a		
For Sub-Frame 0	Bits		224		256		
Number of Code Blocks per Sub-Frame (see Note 3)			1		1		
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		504		552		
For Sub-Frame 5	Bits		n/a		n/a		
For Sub-Frame 0	Bits		504		552		
Max. Throughput averaged over 1 frame	Mbps		0.202		0.230		
UE Category			≥ 1		≥ 1		

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Table A.3.3.1-5: Fixed Reference Channel Single PRB (MBSFN Configuration)

Parameter	Unit	Value
Reference channel		R.29 FDD (MBSFN)
Channel bandwidth	MHz	10
Allocated resource blocks		1
MBSFN Configuration		TBD
Allocated subframes per Radio Frame		3
Modulation		16QAM
Target Coding Rate		1/2
Information Bit Payload		
For Sub-Frames 4,9	Bits	256
For Sub-Frame 5	Bits	n/a
For Sub-Frame 0	Bits	256
For Sub-Frame 1,2,3,6,7,8	Bits	0 (MBSFN)
Number of Code Blocks per Sub-Frame (see Note 3)		1
For Sub-Frames 4,9		1
For Sub-Frame 5		n/a
For Sub-Frame 0		1
For Sub-Frame 1,2,3,6,7,8		0 (MBSFN)
Binary Channel Bits Per Sub-Frame		
For Sub-Frames 4,9	Bits	552
For Sub-Frame 5	Bits	n/a
For Sub-Frame 0	Bits	552
For Sub-Frame 1,2,3,6,7,8	Bits	0 (MBSFN)
Max. Throughput averaged over 1 frame	kbps	76.8
UE Category		≥ 1
Note 1: 2 symbols allocated to PDCCH Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8] Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit		

A.3.3.2 Multi-antenna transmission (Common Reference Symbols)

A.3.3.2.1 Two antenna ports

Table A.3.3.2.1-1: Fixed Reference Channel two antenna ports

Parameter	Unit	Value						
Reference channel		R.10 FDD	R.11 FDD	R.11-2 FDD	R.11-3 FDD (Note 5)	R.11-4 FDD	R.30 FDD	R.35 FDD
Channel bandwidth	MHz	10	10	5	10	10	20	10
Allocated resource blocks		50	50	25	40	50	100	50
Allocated subframes per Radio Frame		9	9	9	9	9	9	9
Modulation		QPSK	16QAM	16QAM	16QAM	QPSK	16QAM	64QAM
Target Coding Rate		1/3	1/2	1/2	1/2	1/2	1/2	1/2
Information Bit Payload								
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	4392	12960	5736	10296	6968	25456	19848
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	N/A	n/a	n/a
For Sub-Frame 0	Bits	4392	12960	4968	10296	6968	25456	18336
Number of Code Blocks per Sub-Frame (Note 3)								
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1	3	1	2	2	5	4
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	N/A	n/a	n/a
For Sub-Frame 0	Bits	1	3	1	2	2	5	3
Binary Channel Bits Per Sub-Frame								
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	13200	26400	12000	21120	13200	52800	39600
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	N/A	n/a	n/a
For Sub-Frame 0	Bits	12384	24768	10368	19488	12384	51168	37152
Max. Throughput averaged over 1 frame	Mbps	3.953	11.664	5.086	9.266	6.271	22.910	17.712
UE Category		≥ 1	≥ 2	≥ 1	≥ 1	≥ 1	≥ 2	≥ 2

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 4: Given per component carrier per codeword.
Note 5: For R.11-3 resource blocks of RB6–RB45 are allocated.

Table A.3.3.2.1-2: Fixed Reference Channel two antenna ports

Parameter	Unit	Value							
Reference channel		R.46 FDD	R.47 FDD						
Channel bandwidth	MHz	10	10						
Allocated resource blocks (Note 4)		50	50						
Allocated subframes per Radio Frame		9	9						
Modulation		QPSK	16QAM						
Target Coding Rate									
Information Bit Payload (Note 4)									
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	5160	8760						
For Sub-Frame 5	Bits	n/a	n/a						
For Sub-Frame 0	Bits	5160	8760						
Number of Code Blocks (Notes 3 and 4)									
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1	2						
For Sub-Frame 5	Bits	n/a	n/a						
For Sub-Frame 0	Bits	1	2						
Binary Channel Bits (Note 4)									
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	13200	26400						
For Sub-Frame 5	Bits	n/a	n/a						
For Sub-Frame 0	Bits	12384	24768						
Max. Throughput averaged over 1 frame (Note 4)	Mbps	4.644	7.884						
UE Category		≥ 1	≥ 1						

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
Note 4: Given per component carrier per codeword.

A.3.3.2.2 Four antenna ports

Table A.3.3.2.2-1: Fixed Reference Channel four antenna ports

Parameter	Unit	Value						
Reference channel		R.12 FDD	R.13 FDD	R.14 FDD	R.14-1 FDD	R.14-2 FDD	R.14-3 FDD	R.36 FDD
Channel bandwidth	MHz	1.4	10	10	10	10	20	10
Allocated resource blocks		6	50	50	6	3	100	50
Allocated subframes per Radio Frame		9	9	9	8	8	9	9
Modulation		QPSK	QPSK	16QAM	16QAM	16QAM	16QAM	64QAM
Target Coding Rate		1/3	1/3	1/2	1/2	1/2	1/2	1/2
Information Bit Payload								
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	408	4392	12960	1544	744	[25456]	18336
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	152	3624	11448	n/a	n/a	[22920]	18336
Number of Code Blocks per Sub-Frame (see Note 3)								
For Sub-Frames 1,2,3,4,6,7,8,9		1	1	3	1	1	5	3
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		1	1	2	n/a	n/a	4	3
Binary Channel Bits Per Sub-Frame								
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1248	12800	25600	3072	1536	51200	38400
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	480	12032	24064	n/a	n/a	49664	36096
Max. Throughput averaged over 1 frame	Mbps	0.342	3.876	11.513	1.235	0.595	[22.656]	16.502
UE Category		≥ 1	≥ 1	≥ 2	≥ 1	≥ 1	≥ 2	≥ 2
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8] Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)								

A.3.3.3 Reference Measurement Channel for UE-Specific Reference Symbols

A.3.3.3.1 Two antenna port (CSI-RS)

The reference measurement channels in Table A.3.3.3.1-1 apply for verifying demodulation performance for UE-specific reference symbols with two cell-specific antenna ports and two CSI-RS antenna ports.

Table A.3.3.3.1-1: Fixed Reference Channel for CDM-multiplexed DM RS with two CSI-RS antenna ports

Parameter	Unit	Value
Reference channel		R.51 FDD
Channel bandwidth	MHz	10
Allocated resource blocks		50 (Note 3)
Allocated subframes per Radio Frame		9
Modulation		16QAM
Target Coding Rate		1/2
Information Bit Payload		
For Sub-Frames 1,4,6,9	Bits	11448
For Sub-Frames 2,3,7,8	Bits	11448
For Sub-Frame 5	Bits	n/a
For Sub-Frame 0	Bits	9528
Number of Code Blocks (Note 4)		
For Sub-Frames 1,4,6,9	Code blocks	2
For Sub-Frames 2,3,7,8	Code blocks	2
For Sub-Frame 5	Bits	n/a
For Sub-Frame 0	Bits	2
Binary Channel Bits		
For Sub-Frames 1,4,6,9	Bits	24000
For Sub-Frames 2,7		23600
For Sub-Frames 3,8		23200
For Sub-Frame 5	Bits	n/a
For Sub-Frame 0	Bits	19680
Max. Throughput averaged over 1 frame	Mbps	10.1112
UE Category		≥ 2
Note 1: 2 symbols allocated to PDCCH. Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]. Note 3: 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0. Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).		

A.3.3.3.2 Four antenna ports (CSI-RS)

The reference measurement channels in Table A.3.3.3.2-1 apply for verifying demodulation performance for UE-specific reference symbols with two cell-specific antenna ports and four CSI-RS antenna ports.

Table A.3.3.3.2-1: Fixed Reference Channel for CDM-multiplexed DM RS with four CSI-RS antenna ports

Parameter	Unit	Value		
Reference channel		R.43 FDD	R.48 FDD	R.50 FDD
Channel bandwidth	MHz	10	10	10
Allocated resource blocks		50 (Note 3)	50 (Note 3)	50 (Note 3)
Allocated subframes per Radio Frame		9	9	9
Modulation		QPSK	QPSK	64QAM
Target Coding Rate		1/3		1/2
Information Bit Payload				
For Sub-Frames 1,4,6,9	Bits	3624	6200	18336
For Sub-Frames 2,3,7,8	Bits	3624	6200	16416
For Sub-Frame 5	Bits	n/a	n/a	n/a
For Sub-Frame 0	Bits	2984	4968	14688
Number of Code Blocks (Note 4)				
For Sub-Frames 1,4,6,9	Code blocks	1	2	3
For Sub-Frames 2,3,7,8	Code blocks	1	2	3
For Sub-Frame 5	Bits	n/a	n/a	n/a
For Sub-Frame 0	Bits	1	1	3
Binary Channel Bits				
For Sub-Frames 1,4,6,9	Bits	12000	12000	36000
For Sub-Frames 2,7		11600	11600	34800
For Sub-Frames 3,8		11600	12000	34800
For Sub-Frame 5	Bits	n/a	n/a	n/a
For Sub-Frame 0	Bits	9840	9840	29520
Max. Throughput averaged over 1 frame	Mbps	3.1976	5.4568	15.3696
UE Category		≥ 1	≥ 1	≥ 2
Note 1: 2 symbols allocated to PDCCH. Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]. Note 3: 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0. Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).				

The reference measurement channels in Table A.3.3.3.2-2 apply for verifying FDD PMI accuracy measurement with two CRS antenna ports and four CSI-RS antenna ports.

Table A.3.3.3.2-2: Fixed Reference Channel for four antenna ports (CSI-RS)

Parameter	Unit	Value		
Reference channel		R.44 FDD	R.45 FDD	R.45-1 FDD
Channel bandwidth	MHz	10	10	10
Allocated resource blocks		50[3]	50[3]	39
Allocated subframes per Radio Frame		10	10	10
Modulation		QPSK	16QAM	16QAM
Target Coding Rate		1/3	1/2	1/2
Information Bit Payload				
For Sub-Frames (Non CSI-RS subframe)	Bits	3624	11448	8760
For Sub-Frames (CSI-RS subframe)	Bits	3624	11448	8760
For Sub-Frames (ZeroPowerCSI-RS subframe)	Bits	n/a	n/a	n/a
For Sub-Frame 5	Bits	n/a	n/a	n/a
For Sub-Frame 0	Bits	2984	9528	8760
Number of Code Blocks per Sub-Frame (Note 4)				
For Sub-Frames (Non CSI-RS subframe)		1	2	2
For Sub-Frames (CSI-RS subframe)		1	2	2
For Sub-Frames (ZeroPowerCSI-RS subframe)	Bits	n/a	n/a	n/a
For Sub-Frame 5		n/a	n/a	n/a
For Sub-Frame 0		1	2	2
Binary Channel Bits Per Sub-Frame				
For Sub-Frames (Non CSI-RS subframe)	Bits	12000	24000	18720
For Sub-Frames (CSI-RS subframe)	Bits	11600	23200	18096
For Sub-Frames (ZeroPowerCSI-RS subframe)	Bits	n/a	n/a	n/a
For Sub-Frame 5	Bits	n/a	n/a	n/a
For Sub-Frame 0	Bits	9840	19680	18720
Max. Throughput averaged over 1 frame	Mbps	3.1976	10.1112	7.884
UE Category		≥ 1	≥ 2	≥ 1

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: For R.44 and R.45, 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks (RB0-RB20 and RB30-RB49) are allocated in sub-frame 0.
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

A.3.4 Reference measurement channel for PDSCH performance requirements (TDD)

A.3.4.1 Single-antenna transmission (Common Reference Symbols)

Table A.3.4.1-1: Fixed Reference Channel QPSK R=1/3

Parameter	Unit	Value					
Reference channel		R.4 TDD	R.42 TDD		R.2 TDD		
Channel bandwidth	MHz	1.4	20		10		
Allocated resource blocks (Note 6)		6	100		50		
Uplink-Downlink Configuration (Note 4)		1	1		1		
Allocated subframes per Radio Frame (D+S)		3	3+2		3+2		
Modulation		QPSK	QPSK		QPSK		
Target Coding Rate		1/3	1/3		1/3		
Information Bit Payload (Note 6)							
For Sub-Frames 4,9	Bits	408	8760		4392		
For Sub-Frames 1,6	Bits	n/a	7736		3240		
For Sub-Frame 5	Bits	n/a	n/a		n/a		
For Sub-Frame 0	Bits	208	8760		4392		
Number of Code Blocks per Sub-Frame (Note 5 and 6)							
For Sub-Frames 4,9		1	2		1		
For Sub-Frames 1,6		n/a	2		1		
For Sub-Frame 5		n/a	n/a		n/a		
For Sub-Frame 0		1	2		1		
Binary Channel Bits Per Sub-Frame (Note 6)							
For Sub-Frames 4,9	Bits	1368	27600		13800		
For Sub-Frames 1,6	Bits	n/a	22656		11256		
For Sub-Frame 5	Bits	n/a	n/a		n/a		
For Sub-Frame 0	Bits	672	26904		13104		
Max. Throughput averaged over 1 frame (Note 6)	Mbps	0.102	4.175		1.966		
UE Category		≥ 1	≥ 1		≥ 1		

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: For BW=1.4 MHz, the information bit payloads of special subframes are set to zero (no scheduling) to avoid problems with insufficient PDCCH performance at the test point.
Note 3: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 4: As per Table 4.2-2 in TS 36.211 [8]
Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
Note 6: Given per component carrier per codeword

Table A.3.4.1-2: Fixed Reference Channel 16QAM R=1/2

Parameter	Unit	Value					
Reference channel				R.3-1 TDD	R.3 TDD		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks				25	50		
Uplink-Downlink Configuration (Note 3)				1	1		
Allocated subframes per Radio Frame (D+S)				3+2	3+2		
Modulation				16QAM	16QAM		
Target Coding Rate				1/2	1/2		
Information Bit Payload							
For Sub-Frames 4,9	Bits			6456	14112		
For Sub-Frames 1,6	Bits			5160	11448		
For Sub-Frame 5	Bits			n/a	n/a		
For Sub-Frame 0	Bits			5736	12960		
Number of Code Blocks per Sub-Frame (see Note 4)							
For Sub-Frames 4,9				2	3		
For Sub-Frames 1,6				1	2		
For Sub-Frame 5				n/a	n/a		
For Sub-Frame 0				1	3		
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 4,9	Bits			12600	27600		
For Sub-Frames 1,6	Bits			11112	22512		
For Sub-Frame 5	Bits			n/a	n/a		
For Sub-Frame 0	Bits			11208	26208		
Max. Throughput averaged over 1 frame	Mbps			2.897	6.408		
UE Category				≥ 1	≥ 2		

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]

Note 3: As per Table 4.2-2 in TS 36.211 [8]

Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Table A.3.4.1-3: Fixed Reference Channel 64QAM R=3/4

Parameter	Unit	Value					
Reference channel			R.5 TDD	R.6 TDD	R.7 TDD	R.8 TDD	R.9 TDD
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks			15	25	50	75	100
Uplink-Downlink Configuration (Note 3)			1	1	1	1	1
Allocated subframes per Radio Frame (D+S)			3+2	3+2	3+2	3+2	3+2
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate			3/4	3/4	3/4	3/4	3/4
Information Bit Payload							
For Sub-Frames 4,9	Bits		8504	14112	30576	46888	61664
For Sub-Frames 1,6	Bits		6968	11448	23688	35160	46888
For Sub-Frame 5	Bits		n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits		6968	12576	30576	45352	61664
Number of Code Blocks per Sub-Frame (see Note 4)							
For Sub-Frames 4,9			2	3	5	8	11
For Sub-Frames 1,6			2	2	4	6	8
For Sub-Frame 5			n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0			2	3	5	8	11
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 4,9	Bits		11340	18900	41400	62100	82800
For Sub-Frames 1,6	Bits		9828	16668	33768	50868	67968
For Sub-Frame 5	Bits		n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits		9252	16812	39312	60012	80712
Max. Throughput averaged over 1 frame	Mbps		3.791	6.370	13.910	20.945	27.877
UE Category			≥ 1	≥ 2	≥ 2	≥ 2	≥ 3

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: As per Table 4.2-2 TS 36.211 [8]
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Table A.3.4.1-3a: Fixed Reference Channel 64QAM R=3/4

Parameter	Unit	Value					
Reference channel			R.6-1 TDD	R.7-1 TDD	R.8-1 TDD	R.9-1 TDD	R.9-2 TDD
Channel bandwidth	MHz		5	10	15	20	20
Allocated resource blocks (Note 3)			18	17	17	17	83
Uplink-Downlink Configuration (Note 4)			1	1	1	1	1
Allocated subframes per Radio Frame (D+S)			3+2	3+2	3+2	3+2	3+2
Modulation			64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate			3/4	3/4	3/4	3/4	3/4
Information Bit Payload							
For Sub-Frames 4,9	Bits		10296	10296	10296	10296	51024
For Sub-Frames 1,6	Bits		8248	7480	7480	7480	39232
For Sub-Frame 5	Bits		n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits		8248	10296	10296	10296	51024
Number of Code Blocks per Sub-Frame (Note 5)							
For Sub-Frames 4,9			2	2	2	2	9
For Sub-Frames 1,6			2	2	2	2	7
For Sub-Frame 5			n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0			2	2	2	2	9
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 4,9	Bits		13608	14076	14076	14076	68724
For Sub-Frames 1,6	Bits		11880	11628	11628	11628	56340
For Sub-Frame 5	Bits		n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits		11520	14076	14076	14076	66636
Max. Throughput averaged over 1 frame	Mbps		4.534	4.585	4.585	4.585	23.154
UE Category			≥ 1	≥ 1	≥ 1	≥ 1	≥ 2

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: Localized allocation started from RB #0 is applied.
Note 4: As per Table 4.2-2 TS 36.211 [8]
Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Table A.3.4.1-4: Fixed Reference Channel Single PRB

Parameter	Unit	Value					
Reference channel			R.0 TDD		R.1 TDD		
Channel bandwidth	MHz	1.4	3	5	10/20	15	20
Allocated resource blocks			1		1		
Uplink-Downlink Configuration (Note 3)			1		1		
Allocated subframes per Radio Frame (D+S)			3+2		3+2		
Modulation			16QAM		16QAM		
Target Coding Rate			1/2		1/2		
Information Bit Payload							
For Sub-Frames 4,9	Bits		224		256		
For Sub-Frames 1,6	Bits		208		208		
For Sub-Frame 5	Bits		n/a		n/a		
For Sub-Frame 0	Bits		224		256		
Number of Code Blocks per Sub-Frame (Note 4)							
For Sub-Frames 4,9			1		1		
For Sub-Frames 1,6			1		1		
For Sub-Frame 5			n/a		n/a		
For Sub-Frame 0			1		1		
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 4,9	Bits		504		552		
For Sub-Frames 1,6	Bits		456		456		
For Sub-Frame 5	Bits		n/a		n/a		
For Sub-Frame 0	Bits		504		552		
Max. Throughput averaged over 1 frame	Mbps		0.109		0.118		
UE Category			≥ 1		≥ 1		

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: As per Table 4.2-2 in TS 36.211 [8]
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Table A.3.4.1-5: Fixed Reference Channel Single PRB (MBSFN Configuration)

Parameter	Unit	Value
Reference channel		R.29 TDD (MBSFN)
Channel bandwidth	MHz	10
Allocated resource blocks		1
MBSFN Configuration		[TBD]
Uplink-Downlink Configuration (Note 3)		1
Allocated subframes per Radio Frame (D+S)		1+2
Modulation		16QAM
Target Coding Rate		1/2
Information Bit Payload		
For Sub-Frames 4,9	Bits	0 (MBSFN)
For Sub-Frames 1,6	Bits	208
For Sub-Frame 5	Bits	n/a
For Sub-Frame 0	Bits	256
Number of Code Blocks per Sub-Frame (Note 4)		
For Sub-Frames 4,9	Bits	0 (MBSFN)
For Sub-Frames 1,6	Bits	1
For Sub-Frame 5	Bits	n/a
Binary Channel Bits Per Sub-Frame		
For Sub-Frames 4,9	Bits	0 (MBSFN)
For Sub-Frames 1,6	Bits	456
For Sub-Frame 5	Bits	n/a
For Sub-Frame 0	Bits	552
Max. Throughput averaged over 1 frame	kbps	67.2
UE Category		≥ 1
Note 1: 2 symbols allocated to PDCCH Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8] Note 3: as per Table 4.2-2 in TS 36.211 [8] Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)		

A.3.4.2 Multi-antenna transmission (Common Reference Symbols)

A.3.4.2.1 Two antenna ports

Table A.3.4.2.1-1: Fixed Reference Channel two antenna ports

Parameter	Unit	Value										
Reference channel		R.10 TDD	R.11 TDD	R.11-1 TDD	R.11-2 TDD	R.11-3 TDD (Note 6)	R.11-4 TDD	R.30 TDD	R.30-1 TDD	R.30-2 TDD	R.35 TDD	R.35-1 TDD
Channel bandwidth	MHz	10	10	10	5	10	10	20	20	20	10	20
Allocated resource blocks		50	50	50	25	40	50	100	100	100	50	100
Uplink-Downlink Configuration (Note 3)		1	1	1	1	1	1	1	1	1	1	1
Allocated subframes per Radio Frame (D+S)		3+2	3+2	2+2	3+2	3+2	2	3+2	+2	2	2+2	2
Modulation		QPSK	16QAM	16QAM	16QAM	16QAM	QPSK	16QAM	16QAM	16QAM	64QAM	64QAM
Target Coding Rate		1/3	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	0.39
Information Bit Payload (Note 5)												
For Sub-Frames 4,9	Bits	4392	12960	12960	5736	10296	6968	25456	25456	25456	19848	30576
For Sub-Frames 1,6		3240	9528	9528	5160	9144	n/a	22920	21384	n/a	15840	n/a
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	4392	12960	n/a	4968	10296	n/a	25456	n/a	n/a	n/a	n/a
Number of Code Blocks per Sub-Frame (Note 4 and 5)												
For Sub-Frames 4,9		1	3	3	1	2	2	5	5	5	4	5
For Sub-Frames 1,6		1	2	2	1	2	n/a	4	4	n/a	3	n/a
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		1	3	n/a	1	2	n/a	5	n/a	n/a	n/a	n/a
Binary Channel Bits Per Sub-Frame(Note 5)												
For Sub-Frames 4,9	Bits	13200	26400	26400	12000	21120	13200	52800	52800	52800	39600	79200
For Sub-Frames 1,6		10656	21312	21312	10512	16992	10656	42912	42912	n/a	31968	n/a
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	12528	25056	n/a	10656	19776	12528	51456	n/a	n/a	n/a	n/a
Max. Throughput averaged over 1 frame (Note 5)	Mbps	1.966	5.794	4.498	2.676	4.918	1.39	12.221	9.368	5.091	7.138	6.115
UE Category		≥ 1	≥ 2	≥ 2	≥ 1	≥ 1	≥ 1	≥ 2	≥ 2	≥ 2	≥ 2	≥ 2

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: As per Table 4.2-2 in TS 36.211 [8].
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: Given per component carrier per codeword.
Note 6: For R.11-3 resource blocks of RB6–RB45 are allocated.

Table A.3.4.2.1-2: Fixed Reference Channel two antenna ports

Parameter	Unit	Value					
Reference channel		R.46 TDD	R.47 TDD				
Channel bandwidth	MHz	10	10				
Allocated resource blocks (Note 5)		50	50				
Uplink-Downlink Configuration (Note 3)		1	1				
Allocated subframes per Radio Frame (D+S)		3+2	3+2				
Modulation		QPSK	16QAM				
Target Coding Rate							
Information Bit Payload (Note 5)							
For Sub-Frames 4,9	Bits	5160	8760				
For Sub-Frames 1,6		3880	7480				
For Sub-Frame 5	Bits	n/a	n/a				
For Sub-Frame 0	Bits	5160	8760				
Number of Code Blocks (Notes 4 and 5)							
For Sub-Frames 4,9		1	2				
For Sub-Frames 1,6		1	2				
For Sub-Frame 5		n/a	n/a				
For Sub-Frame 0		1	2				
Binary Channel Bits (Note 5)							
For Sub-Frames 4,9	Bits	13200	26400				
For Sub-Frames 1,6		10656	21312				
For Sub-Frame 5	Bits	n/a	n/a				
For Sub-Frame 0	Bits	12528	25056				
Max. Throughput averaged over 1 frame (Note 5)	Mbps	2.324	4.124				
UE Category		≥ 1	≥ 1				

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].
Note 3: As per Table 4.2-2 in TS 36.211 [4].
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 5: Given per component carrier per codeword

A.3.4.2.2 Four antenna ports

Table A.3.4.2.2-1: Fixed Reference Channel four antenna ports

Parameter	Unit	Value						
Reference channel		R.12 TDD	R.13 TDD	R.14 TDD	R.14-1 TDD	R.14-2 TDD	R.43 TDD	R.36 TDD
Channel bandwidth	MHz	1.4	10	10	10	10	20	10
Allocated resource blocks		6	50	50	6	3	100	50
Uplink-Downlink Configuration (Note 4)		1	1	1	1	1	1	1
Allocated subframes per Radio Frame (D+S)		3	3+2	2+2	2	2	2+2	2+2
Modulation		QPSK	QPSK	16QAM	16QAM	16QAM	16QAM	64QAM
Target Coding Rate		1/3	1/3	1/2	1/2	1/2	1/2	1/2
Information Bit Payload								
For Sub-Frames 4,9	Bits	408	4392	12960	1544	744	25456	18336
For Sub-Frames 1,6	Bits	n/a	3240	9528	n/a	n/a	21384	15840
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	208	4392	n/a	n/a	n/a	n/a	n/a
Number of Code Blocks per Sub-Frame (Note 5)								
For Sub-Frames 4,9		1	1	3	1	1	5	3
For Sub-Frames 1,6		n/a	1	2	n/a	n/a	4	3
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		1	1	n/a	n/a	n/a	n/a	n/a
Binary Channel Bits Per Sub-Frame								
For Sub-Frames 4,9	Bits	1248	12800	25600	3072	1536	51200	38400
For Sub-Frames 1,6		n/a	10256	20512	n/a	n/a	41312	30768
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	624	12176	n/a	n/a	n/a	n/a	n/a
Max. Throughput averaged over 1 frame	Mbps	0.102	1.966	4.498	0.309	0.149	9.368	6.835
UE Category		≥ 1	≥ 1	≥ 2	≥ 1	≥ 1	≥ 2	≥ 2

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: For BW=1.4 MHz, the information bit payloads of special subframes are set to zero (no scheduling) to avoid problems with insufficient PDCCH performance at the test point.
Note 3: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 4: As per Table 4.2-2 in TS 36.211 [8]
Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 6: Given per component carrier per codeword.

A.3.4.3 Reference Measurement Channels for UE-Specific Reference Symbols

A.3.4.3.1 Single antenna port (Cell Specific)

The reference measurement channels in Table A.3.4.3.1-1 apply for verifying demodulation performance for UE-specific reference symbols with one cell-specific antenna port.

Table A.3.4.3.1-1: Fixed Reference Channel for DRS

Parameter	Unit	Value					
Reference channel		R.25 TDD	R.26 TDD	R.26-1 TDD	R.27 TDD	R.27-1 TDD	R.28 TDD
Channel bandwidth	MHz	10	10	5	10	10	10
Allocated resource blocks		50 [4]	50 [4]	25 [4]	50 [4]	18 [6]	1
Uplink-Downlink Configuration (Note 3)		1	1	1	1	1	1
Allocated subframes per Radio Frame (D+S)		3+2	3+2	3+2	3+2	3+2	3+2
Modulation		QPSK	16QAM	16QAM	64QAM	64QAM	16QAM
Target Coding Rate		1/3	1/2	1/2	3/4	3/4	1/2
Information Bit Payload							
For Sub-Frames 4,9	Bits	4392	12960	5736	28336	10296	224
For Sub-Frames 1,6	Bits	3240	9528	4584	22920	8248	176
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	2984	9528	3880	22152	10296	224
Number of Code Blocks per Sub-Frame (see Note 5)							
For Sub-Frames 4,9		1	3	1	5	2	1
For Sub-Frames 1,6		1	2	1	4	2	1
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		1	2	1	4	2	1
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 4,9	Bits	12600	25200	11400	37800	13608	504
For Sub-Frames 1,6	Bits	10356	20712	10212	31068	11340	420
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	10332	20664	7752	30996	13608	504
Max. Throughput averaged over 1 frame	Mbps	1.825	5.450	2.452	12.466	4.738	0.102
UE Category		≥ 1	≥ 2	≥ 1	≥ 2	≥ 1	≥ 1

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: as per Table 4.2-2 in TS 36.211 [8].
Note 4: For R.25, R.26 and R.27, 50 resource blocks are allocated in sub-frames 1, 4, 6, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0. For R.26-1, 25 resource blocks are allocated in sub-frames 1, 4, 6, 9 and 17 resource blocks (RB0–RB7 and RB16–RB24) are allocated in sub-frame 0.
Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 6: Localized allocation started from RB #0 is applied.

A.3.4.3.2 Two antenna ports (Cell Specific)

The reference measurement channels in Table A.3.4.3.2-1 apply for verifying demodulation performance for CDM-multiplexed UE specific reference symbols with two cell-specific antenna ports.

Table A.3.4.3.2-1: Fixed Reference Channel for CDM-multiplexed DM RS

Parameter	Unit	Value					
Reference channel		R.31 TDD	R.32 TDD	R.32-1 TDD	R.33 TDD	R.33-1 TDD	R.34 TDD
Channel bandwidth	MHz	10	10	5	10	10	10
Allocated resource blocks		50[4]	50[4]	25[4]	50[4]	18[6]	50[4]
Uplink-Downlink Configuration (Note 3)		1	1	1	1	1	1
Allocated subframes per Radio Frame (D+S)		3+2	3+2	3+2	3+2	3+2	3+2
Modulation		QPSK	16QAM	16QAM	64QAM	64QAM	64QAM
Target Coding Rate		1/3	1/2	1/2	3/4	3/4	1/2
Information Bit Payload							
For Sub-Frames 4,9	Bits	3624	11448	5736	27376	9528	18336
For Sub-Frames 1,6		2664	7736	3112	16992	7480	11832
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	2984	9528	3496	22152	9528	14688
Number of Code Blocks per Sub-Frame (Note 5)							
For Sub-Frames 4,9		1	2	1	5	2	3
For Sub-Frames 1,6		1	2	1	3	2	2
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		1	2	1	4	2	3
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 4,9	Bits	12000	24000	10800	36000	12960	36000
For Sub-Frames 1,6		7872	15744	6528	23616	10368	23616
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	9840	19680	7344	29520	12960	29520
Max. Throughput averaged over 1 frame	Mbps	1.556	4.79	2.119	11.089	4.354	7.502
UE Category		≥ 1	≥ 2	≥ 1	≥ 2	≥ 1	≥ 2

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: as per Table 4.2-2 in TS 36.211 [8].
Note 4: For R.31, R.32, R.33 and R.34, 50 resource blocks are allocated in sub-frames 4, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1, 6. For R.32-1, 25 resource blocks are allocated in sub-frames 4, 9 and 17 resource blocks (RB0–RB7 and RB16–RB24) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1, 6.
Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 6: Localized allocation started from RB#0 is applied.

A.3.4.3.3 Two antenna ports (CSI-RS)

The reference measurement channels in Table A.3.4.3.3-1 apply for verifying demodulation performance for CDM-multiplexed UE specific reference symbols with two cell-specific antenna ports and two CSI-RS antenna ports.

Table A.3.4.3.3-1: Fixed Reference Channel for CDM-multiplexed DM RS with two CSI-RS antenna ports

Parameter	Unit	Value
Reference channel		R.51 TDD
Channel bandwidth	MHz	10
Allocated resource blocks		50 (Note 5)
Uplink-Downlink Configuration (Note 3)		1
Allocated subframes per Radio Frame (D+S)		3+2
Modulation		16QAM
Target Coding Rate		1/2
Information Bit Payload		
For Sub-Frames 4,9 (non CSI-RS subframe)	Bits	11448
For Sub-Frame 4,9	Bits	11448
For Sub-Frames 1,6	Bits	7736
For Sub-Frame 5	Bits	n/a
For Sub-Frame 0	Bits	9528
Number of Code Blocks (Note 4)		
For Sub-Frames 4, 9 (non CSI-RS subframe)	Code blocks	2
For Sub-Frames 4,9	Code blocks	2
For Sub-Frames 1,6	Code blocks	2
For Sub-Frame 5		n/a
For Sub-Frame 0	Code blocks	2
Binary Channel Bits		
For Sub-Frames 4, 9 (non CSI-RS subframe)	Bits	24000
For Sub-Frames 4,9		22800
For Sub-Frames 1,6		15744
For Sub-Frame 5	Bits	n/a
For Sub-Frame 0	Bits	19680
Max. Throughput averaged over 1 frame	Mbps	4.7896
UE Category		≥ 2
Note 1: 2 symbols allocated to PDCCH. Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]. Note 3: as per Table 4.2-2 in TS 36.211 [8]. Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). Note 5: 50 resource blocks are allocated in sub-frames 4, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1, 6.		

A.3.4.3.4 Four antenna ports (CSI-RS)

The reference measurement channels in Table A.3.4.3.4-1 apply for verifying demodulation performance for CDM-multiplexed UE specific reference symbols with two cell-specific antenna ports and four CSI-RS antenna ports.

Table A.3.4.3.4-1: Fixed Reference Channel for CDM-multiplexed DM RS with four CSI-RS antenna ports

Parameter	Unit	Value	
Reference channel		R.44 TDD	R.48 TDD
Channel bandwidth	MHz	10	10
Allocated resource blocks		50 (Note 4)	50 (Note 4)
Uplink-Downlink Configuration (Note 3)		1	1
Allocated subframes per Radio Frame (D+S)		3+2	3+2
Modulation		64QAM	QPSK
Target Coding Rate		1/2	
Information Bit Payload			
For Sub-Frames 4,9 (non CSI-RS subframe)	Bits	18336	n/a
For Sub-Frames 4,9 (CSI-RS subframe)	Bits	16416	6200
For Sub-Frames 1,6		11832	4264
For Sub-Frame 5	Bits	n/a	n/a
For Sub-Frame 0	Bits	14688	4968
Number of Code Blocks per Sub-Frame (Note 5)			
For Sub-Frames 4,9 (non CSI-RS subframe)		3	2
For Sub-Frames 4,9 (CSI-RS subframe)		3	2
For Sub-Frames 1,6		2	1
For Sub-Frame 5		n/a	n/a
For Sub-Frame 0		3	1
Binary Channel Bits Per Sub-Frame			
For Sub-Frames 4,9 (non CSI-RS subframe)	Bits	36000	12000
For Sub-Frames 4,9 (CSI-RS subframe)	Bits	33600	11600
For Sub-Frames 1,6		23616	7872
For Sub-Frame 5	Bits	n/a	n/a
For Sub-Frame 0	Bits	29520	9840
Max. Throughput averaged over 1 frame	Mbps	7.1184	2.5896
UE Category		≥ 2	≥ 1

Note 1: 2 symbols allocated to PDCCH
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: as per Table 4.2-2 in TS 36.211 [8].
Note 4: 50 resource blocks are allocated in sub-frames 4, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1, 6.
Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

A.3.4.3.5 Eight antenna ports (CSI-RS)

The reference measurement channels in Table A.3.4.3.5-1 apply for verifying demodulation performance for CDM-multiplexed UE specific reference symbols with two cell-specific antenna ports and eight CSI-RS antenna ports.

Table A.3.4.3.5-1: Fixed Reference Channel for CDM-multiplexed DM RS with eight CSI-RS antenna ports

Parameter	Unit	Value
Reference channel		R.50 TDD
Channel bandwidth	MHz	10
Allocated resource blocks		50 (Note 4)
Uplink-Downlink Configuration (Note 3)		1
Allocated subframes per Radio Frame (D+S)		3+2
Modulation		QPSK
Target Coding Rate		1/3
Information Bit Payload		
For Sub-Frames 4,9 (non CSI-RS subframe)	Bits	3624
For Sub-Frames 4,9 (CSI-RS subframe)	Bits	3624
For Sub-Frames 1,6		2664
For Sub-Frame 5	Bits	n/a
For Sub-Frame 0	Bits	2984
Number of Code Blocks per Sub-Frame (Note 5)		
For Sub-Frames 4,9 (non CSI-RS subframe)		1
For Sub-Frames 4,9 (CSI-RS subframe)		1
For Sub-Frames 1,6		1
For Sub-Frame 5		n/a
For Sub-Frame 0		1
Binary Channel Bits Per Sub-Frame		
For Sub-Frames 4,9 (non CSI-RS subframe)	Bits	12000
For Sub-Frames 4,9 (CSI-RS subframe)	Bits	10400
For Sub-Frames 1,6		7872
For Sub-Frame 5	Bits	n/a
For Sub-Frame 0	Bits	9840
Max. Throughput averaged over 1 frame	Mbps	1.556
UE Category		≥ 1
Note 1: 2 symbols allocated to PDCCH. Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]. Note 3: as per Table 4.2-2 in TS 36.211 [8]. Note 4: 50 resource blocks are allocated in sub-frames 4, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1, 6. Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).		

The reference measurement channels in Table A.3.4.3.5-2 apply for verifying TDD PMI accuracy measurement with two CRS antenna ports and eight CSI-RS antenna ports.

Table A.3.4.3.5-2: Fixed Reference Channel for eight antenna ports (CSI-RS)

Parameter	Unit	Value	
Reference channel		R.45 TDD	R.45-1 TDD
Channel bandwidth	MHz	10	10
Allocated resource blocks		50[4]	39
Uplink-Downlink Configuration (Note 3)		1	1
Allocated subframes per Radio Frame (D+S)		4+2	4+2
Allocated subframes per Radio Frame		10	10
Modulation		16QAM	16QAM
Target Coding Rate		1/2	1/2
Information Bit Payload			
For Sub-Frames 4 and 9 (Non CSI-RS subframe)	Bits	n/a	n/a
For Sub-Frames 4 and 9 (CSI-RS subframe)	Bits	11448	8760
For Sub-Frames 1,6	Bits	7736	7480
For Sub-Frame 5	Bits	n/a	n/a
For Sub-Frame 0	Bits	9528	8760
Number of Code Blocks per Sub-Frame (Note 5)			
For Sub-Frames 4 and 9 (Non CSI-RS subframe)		n/a	n/a
For Sub-Frames 4 and 9 (CSI-RS subframe)		2	2
For Sub-Frames 1,6		2	2
For Sub-Frame 5		n/a	n/a
For Sub-Frame 0		2	2
Binary Channel Bits Per Sub-Frame			
For Sub-Frames 4 and 9 (Non CSI-RS subframe)	Bits	n/a	n/a
For Sub-Frames 4 and 9 (CSI-RS subframe)	Bits	22400	17472
For Sub-Frames 1,6	Bits	15744	14976
For Sub-Frame 5	Bits	n/a	n/a
For Sub-Frame 0	Bits	19680	18720
Max. Throughput averaged over 1 frame	Mbps	4.7896	4.1240
UE Category		≥ 2	≥ 1

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8].
Note 3: As per Table 4.2-2 in TS 36.211 [8].
Note 4: For R.45, 50 resource blocks are allocated in sub-frames 4, 9 and 41 resource blocks (RB0-RB20 and RB30-RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1, 6.
Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 6: Localized allocation started from RB #0 is applied.

A.3.5 Reference measurement channels for PDCCH/PCFICH performance requirements

A.3.5.1 FDD

Table A.3.5.1-1: Reference Channel FDD

Parameter	Unit	Value				
Reference channel		R.15 FDD	R.15-1 FDD	R.15-2 FDD	R.16 FDD	R.17 FDD
Number of transmitter antennas		1	2	2	2	4
Channel bandwidth	MHz	10	10	10	1.4	10
Number of OFDM symbols for PDCCH	symbols	2	3	2	2	2
Aggregation level	CCE	8	8	8	2	4
DCI Format		Format 1	Format 1	Format 1	Format 2	Format 2
Cell ID		0	0	0	0	0
Payload (without CRC)	Bits	31	31	31	31	46

Table A.3.5.1-1A: Reference Channel FDD

Parameter	Unit	Value	
Reference channel		R.16_1 FDD	R.17_1 FDD
Number of transmitter antennas		2	4
Channel bandwidth	MHz	10	5
Number of OFDM symbols for PDCCH	symbols	2	2
Aggregation level	CCE	4	2
DCI Format		Format 2	Format 2
Cell ID		0	0
Payload (without CRC)	Bits	43	42

Table A.3.5.1-2: Additional PDSCH Reference Channel FDD

Parameter	Unit	Value				
Number of transmitter antennas		1	2	2	4	4
Channel bandwidth	MHz	10	1.4	10	10	5
Allocated Resource Blocks		50	6	50	50	25
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding Rate		1/3	1/3	1/3	1/3	1/3
Information Bit Payload						
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	4392	504	4392	4392	2216
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a
For Sub-Frame0	Bits	4392	256	4392	3624	1800
Number of Code Blocks per Sub-Frame						
For Sub-Frames 1,2,3,4,6,7,8,9		1	1	1	1	1
For Sub-Frame 5		n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		1	1	1	1	1
Binary Channel Bits Per Sub-Frame						
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	13800	1584	13200	12800	6400
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		12960	768	12384	12032	5632
Max. Throughput averaged over 1 frame	Mbps	3.953	0.429	3.953	3.876	1.953
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: 2 symbols allocated to PDCCH for all BW.						

A.3.5.2 TDD

Table A.3.5.2-1: Reference Channel TDD

Parameter	Unit	Value				
Reference channel		R.15 TDD	R.15-1 TDD	R.15-2 TDD	R.16 TDD	R.17 TDD
Number of transmitter antennas		1	2	2	2	4
Channel bandwidth	MHz	10	10	10	1.4	10
Number of OFDM symbols for PDCCH	symbols	2	3	2	2	2
Aggregation level	CCE	8	8	8	2	4
DCI Format		Format 1	Format 1	Format 1	Format 2	Format 2
Cell ID		0	0	0	0	0
Payload (without CRC)	Bits	34	34	34	34	49

Table A.3.5.2-1A: Reference Channel TDD

Parameter	Unit	Value	
Reference channel		R.16_1 TDD	R.17_1 TDD
Number if transmitter antennas		2	4
Channel bandwidth	MHz	10	5
Number of OFDM symbols for PDCCH	symbols	2	2
Aggregation level	CCE	4	2
DCI Format		Format 2	Format 2
Cell ID		0	0
Payload (without CRC)	Bits	46	45

Table A.3.5.2-2: Additional PDSCH Reference Channel TDD

Parameter	Unit	Value				
Number of transmitter antennas		1	2	2	4	4
Channel bandwidth	MHz	10	1.4	10	10	5
Uplink-Downlink Configuration (Note 2)		0	0	0	0	0
Allocated Resource Blocks		50	6	50	50	25
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding Rate		1/3	1/3	1/3	1/3	1/3
Information Bit Payload						
For Sub-Frame 1,6	Bits	3240	328	3240	3240	1544
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	4392	256	4392	4392	1800
Number of Code Blocks per Sub-Frame						
For Sub-Frame 1,6		1	1	1	1	1
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0		1	1	1	1	1
Binary Channel Bits Per Sub-Frame						
For Sub-Frame 1,6	Bits	11256	1152	10656	10256	5056
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	13104	936	12528	12176	5776
Max. Throughput averaged over 1 frame	Mbps	1.087	0.091	1.087	1.164	0.489
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1
Note 1: 2 symbols allocated to PDCCH for all BW. Note 2: As per Table 4.2-2 in TS 36.211 [8].						

A.3.6 Reference measurement channels for PHICH performance requirements

Table A.3.6-1: Reference Channel FDD/TDD

Parameter	Unit	Value			
Reference channel		R.18	R.19	R.20	R.24
Number of transmitter antennas		1	2	4	1
Channel bandwidth	MHz	10	1.4	10	10
User roles (Note 1)		[W I1 I2]	[W I1 I2]	[W I1 I2]	[W I1]
Resource allocation (Note 2)		[(0,0) (0,1) (0,4)]	[(0,0) (0,1) (0,4)]	[(0,0) (0,1) (0,4)]	[(0,0) (0,1)]
Power offsets (Note 3)	dB	[-4 0 -3]	[-4 0 -3]	[-4 0 -3]	[+3 0]
Payload (Note 4)		[A R R]	[A R R]	[A R R]	[A R]
Note 1: W=wanted user, I1=interfering user 1, I2=interfering user 2. Note 2: The resource allocation per user is given as (N_group_PHICH, N_seq_PHICH). Note 3: The power offsets (per user) represent the difference of the power of BPSK modulated symbol per PHICH relative to the first interfering user. Note 4: A=fixed ACK, R=random ACK/NACK.					

Table A.3.6-1A: Reference Channel FDD/TDD

Parameter	Unit	Value	
Reference channel		R.19_1	R.20_1
Number of transmitter antennas		2	4
Channel bandwidth	MHz	10	5
User roles (Note 1)		[W I1 I2]	[W I1 I2]
Resource allocation (Note 2)		[(0,0) (0,1) (0,4)]	[(0,0) (0,1) (0,4)]
Power offsets (Note 3)	dB	[-4 0 -3]	[-4 0 -3]
Payload (Note 4)		[A R R]	[A R R]
Note 1: W=wanted user, I1=interfering user 1, I2=interfering user 2. Note 2: The resource allocation per user is given as (N_group_PHICH, N_seq_PHICH). Note 3: The power offsets (per user) represent the difference of the power of BPSK modulated symbol per PHICH relative to the first interfering user. Note 4: A=fixed ACK, R=random ACK/NACK.			

A.3.7 [FFS]

A.3.8 Reference measurement channels for MBMS performance requirements

A.3.8.1 FDD

Table A.3.8.1-1: Fixed Reference Channel QPSK R=1/3

Parameter	PMCH						
	Unit	Value					
Reference channel		R.40 FDD			R.37 FDD		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6			50		
Allocated subframes per Radio Frame (Note 1)		6			6		
Modulation		QPSK			QPSK		
Target Coding Rate		1/3			1/3		
Information Bit Payload (Note 2)							
For Sub-Frames 1,2,3,6,7,8	Bits	408			3624		
For Sub-Frames 0,4,5,9	Bits	n/a			n/a		
Number of Code Blocks per Subframe (Note 3)		1			1		
Binary Channel Bits Per Subframe							
For Sub-Frames 1,2,3,6,7,8	Bits	1224			10200		
For Sub-Frames 0,4,5,9	Bits	n/a			n/a		
MBMS UE Category		≥ 1			≥ 1		

Note 1: For FDD mode, up to 6 subframes (#1/2/3/6/7/8) are available for MBMS, in line with TS 36.331.
Note 2: 2 OFDM symbols are reserved for PDCCH; and reference signal allocated as per TS 36.211.
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Table A.3.8.1-2: Fixed Reference Channel 16QAM R=1/2

Parameter	PMCH						
	Unit	Value					
Reference channel					R.38 FDD		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks					50		
Allocated subframes per Radio Frame (Note 1)					6		
Modulation					16QAM		
Target Coding Rate					1/2		
Information Bit Payload (Note 2)							
For Sub-Frames 1,2,3,6,7,8	Bits				9912		
For Sub-Frames 0,4,5,9	Bits				n/a		
Number of Code Blocks per Subframe (Note 3)					2		
Binary Channel Bits Per Subframe							
For Sub-Frames 1,2,3,6,7,8	Bits				20400		
For Sub-Frames 0,4,5,9	Bits				n/a		
MBMS UE Category					≥ 1		

Note 1: For FDD mode, up to 6 subframes (#1/2/3/6/7/8) are available for MBMS, in line with TS 36.331.
Note 2: 2 OFDM symbols are reserved for PDCCH; and reference signal allocated as per TS 36.211.
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Table A.3.8.1-3: Fixed Reference Channel 64QAM R=2/3

Parameter	PMCH						
	Unit	Value					
Reference channel				R.39-1 FDD	R.39 FDD		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks				25	50		
Allocated subframes per Radio Frame(Note1)				6	6		
Modulation				64QAM	64QAM		
Target Coding Rate				2/3	2/3		
Information Bit Payload (Note 2)							
For Sub-Frames 1,2,3,6,7,8	Bits			9912	19848		
For Sub-Frames 0,4,5,9	Bits			n/a	n/a		
Number of Code Blocks per Sub-Frame (Note 3)				2	4		
Binary Channel Bits Per Subframe							
For Sub-Frames 1,2,3,6,7,8	Bits			15300	30600		
For Sub-Frames 0,4,5,9	Bits			n/a	n/a		
MBMS UE Category				≥ 1	≥ 2		

Note 1: For FDD mode, up to 6 subframes (#1/2/3/6/7/8) are available for MBMS, in line with TS 36.331.
Note 2: 2 OFDM symbols are reserved for PDCCH; and reference signal allocated as per TS 36.211.
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

A.3.8.2 TDD

Table A.3.8.2-1: Fixed Reference Channel QPSK R=1/3

Parameter	PMCH						
	Unit	Value					
Reference channel		R.40 TDD			R.37 TDD		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6			50		
Uplink-Downlink Configuration(Note 1)		5			5		
Allocated subframes per Radio Frame		5			5		
Modulation		QPSK			QPSK		
Target Coding Rate		1/3			1/3		
Information Bit Payload (Note 2)							
For Sub-Frames 3,4,7,8,9	Bits	408			3624		
For Sub-Frames 0,1,2,5,6	Bits	n/a			n/a		
Number of Code Blocks per Subframe (Note 3)		1			1		
Binary Channel Bits Per Subframe							
For Sub-Frames 3,4,7,8,9	Bits	1224			10200		
For Sub-Frames 0,1,2,5,6	Bits	n/a			n/a		
MBMS UE Category		≥ 1			≥ 1		

Note 1: For TDD mode, in line with TS 36.331, Uplink-Downlink Configuration 5 is proposed, up to 5 subframes (#3/4/7/8/9) are available for MBMS.
Note 2: 2 OFDM symbols are reserved for PDCCH; reference signal allocated as per TS 36.211.
Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Table A.3.8.2-2: Fixed Reference Channel 16QAM R=1/2

Parameter	PMCH						
	Unit	Value					
Reference channel					R.38 TDD		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks					50		
Uplink-Downlink Configuration(Note 1)					5		
Allocated subframes per Radio Frame					5		
Modulation					16QAM		
Target Coding Rate					1/2		
Information Bit Payload (Note 2)							
For Sub-Frames 3,4,7,8,9	Bits				9912		
For Sub-Frames 0,1,2,5,6	Bits				n/a		
Number of Code Blocks per Subframe (Note 3)					2		
Binary Channel Bits Per Subframe							
For Sub-Frames 3,4,7,8,9	Bits				20400		
For Sub-Frames 0,1,2,5,6	Bits				n/a		
MBMS UE Category					≥ 1		
Note 1: For TDD mode, in line with TS 36.331, Uplink-Downlink Configuration 5 is proposed, up to 5 subframes (#3/4/7/8/9) are available for MBMS. Note 2: 2 OFDM symbols are reserved for PDCCH; reference signal allocated as per TS 36.211. Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).							

Table A.3.8.2-3: Fixed Reference Channel 64QAM R=2/3

Parameter	PMCH						
	Unit	Value					
Reference channel				R.39-1 TDD	R.39 TDD		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks				25	50		
Uplink-Downlink Configuration(Note 1)				5	5		
Allocated subframes per Radio Frame				5	5		
Modulation				64QAM	64QAM		
Target Coding Rate				2/3	2/3		
Information Bit Payload (Note 2)							
For Sub-Frames 3,4,7,8,9	Bits			9912	19848		
For Sub-Frames 0,1,2,5,6	Bits			n/a	n/a		
Number of Code Blocks per Sub-Frame (Note 3)				2	4		
Binary Channel Bits Per Subframe							
For Sub-Frames 3,4,7,8,9	Bits			15300	30600		
For Sub-Frames 0,1,2,5,6	Bits			n/a	n/a		
MBMS UE Category				≥ 1	≥ 2		
Note 1: For TDD mode, in line with TS 36.331, Uplink-Downlink Configuration 5 is proposed, up to 5 subframes (#3/4/7/8/9) are available for MBMS. Note 2: 2 OFDM symbols are reserved for PDCCH; reference signal allocated as per TS 36.211. Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).							

A.3.9 Reference measurement channels for sustained downlink data rate provided by lower layers

A.3.9.1 FDD

Table A.3.9.1-1: Fixed Reference Channel for sustained data-rate test (FDD)

Parameter	Unit	Value				
Reference channel		R.31-1 FDD	R.31-2 FDD	R.31-3 FDD	R.31-3A FDD	R.31-4 FDD
Channel bandwidth	MHz	10	10	20	10	20
Allocated resource blocks		Note 5	Note 6	Note 7	Note 6	Note 7
Allocated subframes per Radio Frame		10	10	10	10	10
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM
Coding Rate						
For Sub-Frame 1,2,3,4,6,7,8,9,		0.40	0.59	0.59	0.85	0.88
For Sub-Frame 5		0.40	0.64	0.62	0.89	0.87
For Sub-Frame 0		0.40	0.63	0.61	0.90	0.90
Information Bit Payload						
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	10296	25456	51024	36696	75376
For Sub-Frame 5	Bits	10296	25456	51024	35160	71112
For Sub-Frame 0	Bits	10296	25456	51024	36696	75376
Number of Code Blocks per Sub-Frame (Note 3)						
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	2	5	9	6	13
For Sub-Frame 5		2	5	9	6	12
For Sub-Frame 0	Bits	2	5	9	6	13
Binary Channel Bits Per Sub-Frame						
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	26100	43200	86400	43200	86400
For Sub-Frame 5		26100	39744	82080	39744	82080
For Sub-Frame 0	Bits	26100	40752	83952	40752	83952
Number of layers		1	2	2	2	2
Max. Throughput averaged over 1 frame	Mbps	10.296	25.456	51.024	36.542	74.950
UE Category		≥ 1	≥ 2	≥ 2	≥ 2	≥ 3

Note 1: 1 symbol allocated to PDCCH for all tests

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Note 4: Resource blocks n_{PRB} = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths

Note 5: Resource blocks n_{PRB} = 6..14,30..49 are allocated for the user data in all sub-frames

Note 6: Resource blocks n_{PRB} = 3..49 are allocated for the user data in sub-frame 5, and resource blocks n_{PRB} = 0..49 in sub-frames 0,1,2,3,4,6,7,8,9

Note 7: Resource blocks n_{PRB} = 4..99 are allocated for the user data in sub-frame 5, and resource blocks n_{PRB} = 0..99 in sub-frames 0,1,2,3,4,6,7,8,9

A.3.9.2 TDD

Table A.3.9.2-1: Fixed Reference Channel for sustained data-rate test (TDD)

Parameter	Unit	Value				
Reference channel		R.31-1 TDD	R.31-2 TDD	R.31-3 TDD	R.31-3B TDD	R.31-4 TDD
Channel bandwidth	MHz	10	10	20	15	20
Allocated resource blocks		Note 6	Note 7	Note 8	Note 9	Note 8
Uplink-Downlink Configuration (Note 3)		5	5	5	1	1
Number of HARQ Processes per component carrier	Processes	15	15	15	7	7
Allocated subframes per Radio Frame (D+S)		8+1	8+1	8+1	4+2	4+2
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM
Coding Rate						
For Sub-Frames 4,9		0.40	0.59	0.59	0.87	0.88
For Sub-Frames 3,7,8		0.40	0.59	0.59	n/a	n/a
For Sub-Frame 1		n/a	n/a	n/a	n/a	n/a
For Sub-Frame 5		0.40	0.64	0.62	0.88	0.87
For Sub-Frame 6		0.40	0.60	0.60	n/a	n/a
For Sub-Frame 0		0.40	0.62	0.61	0.90	0.90
Information Bit Payload						
For Sub-Frames 4,9	Bits	10296	25456	51024	51024	75376
For Sub-Frames 3,7,8	Bits	10296	25456	51024	0	0
For Sub-Frame 1	Bits	0	0	0	0	0
For Sub-Frame 5	Bits	10296	25456	51024	51024	71112
For Sub-Frame 6	Bits	10296	25456	51024	0	0
For Sub-Frame 0	Bits	10296	25456	51024	51024	75376
Number of Code Blocks per Sub-Frame (Note 4)						
For Sub-Frames 4,9		2	5	9	9	13
For Sub-Frames 3,7,8		2	5	9	n/a	n/a
For Sub-Frame 1		n/a	n/a	n/a	n/a	n/a
For Sub-Frame 5		2	5	9	9	12
For Sub-Frame 6		2	5	9	n/a	n/a
For Sub-Frame 0		2	5	9	9	13
Binary Channel Bits Per Sub-Frame						
For Sub-Frames 4,9	Bits	26100	43200	86400	58752	86400
For Sub-Frames 3,7,8	Bits	26100	43200	86400	n/a	n/a
For Sub-Frame 1	Bits	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 5	Bits	26100	40176	82512	58320	82512
For Sub-Frame 6	Bits	26100	42768	85968	n/a	n/a
For Sub-Frame 0	Bits	26100	41184	84384	56736	84384
Number of layers		1	2	2	2	2
Max. Throughput averaged over 1 frame	Mbps	8.237	20.365	40.819	20.409	29.724
UE Category		≥ 1	≥ 2	≥ 2	≥ 2	≥ 3

Note 1: 1 symbol allocated to PDCCH for all tests
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: As per Table 4.2-2 in TS 36.211 [8]
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
Note 5: Resource blocks n_{PRB} = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths
Note 6: Resource blocks n_{PRB} = 6..14,30..49 are allocated for the user data in all subframes
Note 7: Resource blocks n_{PRB} = 3..49 are allocated for the user data in sub-frame 5, and resource blocks n_{PRB} = 0..49 in sub-frames 0,3,4,6,7,8,9
Note 8: Resource blocks n_{PRB} = 4..99 are allocated for the user data in sub-frame 5, and resource blocks n_{PRB} = 0..99 in sub-frames 0,3,4,6,7,8,9
Note 9: Resource blocks n_{PRB} = 4..71 are allocated for the user data in all sub-frames

A.4 CQI reference measurement channels

This section defines the DL signal applicable to the reporting of channel quality information (Clause 9.2 and 9.3).

In Table A.4-0 are listed the UL/DL reference measurement channels specified in annex A.4 of this release of TS 36.521-1. This table is informative and serves only to a better overview. The reference for the concrete reference measurement channels and corresponding implementation's parameters as to be used for testing are the other tables of this annex as appropriate.

Table A.4-0: Overview of CSI reference measurement channels

Duplex	Table	Name	BW	Mod	TCR	RB	RB Off set	UE Cat eg	Notes
CSI Performance, PDSCH, Full allocation (CRS)									
FDD	Table A.4-1		10	CQI	CQI	50			
TDD	Table A.4-2		10	CQI	CQI	50			
CSI Performance, PDSCH, Full allocation (CSI-RS): 2 CRS ports									
FDD	Table A.4-1a		10	CQI	CQI	50			
TDD	Table A.4-2a		10	CQI	CQI	50			
CSI Performance, PDSCH, Full allocation (CSI-RS): 1 CRS port									
FDD	Table A.4-1b		10	CQI	CQI	50			
TDD	Table A.4-2b		10	CQI	CQI	50			
CSI Performance, PDSCH, Partial allocation (CRS) (6 RB-s)									
FDD	Table A.4-4		10	CQI	CQI	6			
TDD	Table A.4-5		10	CQI	CQI	6			
CSI Performance, PDSCH, Partial allocation (CSI-RS) (6 RB-s)									
FDD	Table A.4-4a		10	CQI	CQI	6			
TDD	Table A.4-5a		10	CQI	CQI	6			
CSI Performance, PDSCH, Partial allocation (CRS) (15 RB-s)									
FDD	Table A.4-7		10	CQI	CQI	15			
TDD	Table A.4-8		10	CQI	CQI	15			
CSI Performance, PDSCH, Partial allocation (CRS) (3 RB-s)									
FDD	Table A.4-10		10	CQI	CQI	3			
TDD	Table A.4-11		10	CQI	CQI	3			
CSI Performance, PUSCH for PUCCH reporting mode									
FDD	Table A.4.1-1		10	QPSK	1/3	6		≥ 1	Allocated Sub-Frames 1, 3, 5, 7
FDD	Table A.4.1-1		10	QPSK	1/3	6		≥ 1	Allocated Sub-Frames 3, 8
FDD	Table A.4.1-1		10	QPSK	1/3	6		≥ 1	Allocated Sub-Frames 0 - 9
TDD	Table A.4.1-2		10	QPSK	1/3	6		≥ 1	Allocated Sub-Frames 2, 7
TDD	Table A.4.1-2		10	QPSK	1/3	6		≥ 1	Allocated Sub-Frames 3, 8

The reference channels in Table A.4-1, A.4-2, A.4-4 and A.4-5 comply with the CQI definition specified in Sec. 7.2.3 of TS 36.213 [10]. Table A.4-3 and A.4-6 specify the transport format corresponding to each CQI for single antenna transmission. Table A.4-3a specifies the transport format corresponding to each CQI for dual antenna transmission.

Table A.4-1: Reference channel for CQI requirements (FDD) full PRB allocation

Parameter	Unit	Value						
Channel bandwidth	MHz	1.4	3	5	10		15	20
Allocated resource blocks		6	15	25	50		75	100
Subcarriers per resource block		12	12	12	12		12	12
Allocated subframes per Radio Frame		8	8	8	8		8	8
Modulation					Table A.4-3	Table A.4-3a		
Target coding rate					Table A.4-3	Table A.4-3a		
Number of HARQ Processes	Processes	8	8	8	8		8	8
Maximum number of HARQ transmissions		1	1	1	1		1	1
Note 1: 3 symbols allocated to PDCCH Note 2: Only subframes 1,2,3,4,6,7,8, and 9 are allocated to avoid PBCH and synchronization signal overhead								

Table A.4-1a: Reference channel for CQI requirements (FDD) full PRB allocation (CSI-RS): 2 CRS ports

Parameter	Unit	Value						
Channel bandwidth	MHz	1.4	3	5	10		15	20
Allocated resource blocks		6	15	25	50		75	100
Subcarriers per resource block		12	12	12	12		12	12
Allocated subframes per Radio Frame		8	8	8	8		8	8
Modulation					Table A.4-3b	Table A.4-3c		
Target coding rate					Table A.4-3b	Table A.4-3c		
Number of HARQ Processes	Processes	8	8	8	8		8	8
Maximum number of HARQ transmissions		1	1	1	1		1	1
Note 1: 3 symbols allocated to PDCCH Note 2: Only subframes 1,2,3,4,6,7,8, and 9 are allocated to avoid PBCH and synchronization signal overhead								

Table A.4-1b: Reference channel for CQI requirements (FDD) full PRB allocation (CSI-RS): 1 CRS port

Parameter	Unit	Value						
Channel bandwidth	MHz	1.4	3	5	10		15	20
Allocated resource blocks		6	15	25	50		75	100
Subcarriers per resource block		12	12	12	12		12	12
Allocated subframes per Radio Frame		8	8	8	8		8	8
Modulation					Table A.4-3e	Table A.4-3f		
Target coding rate					Table A.4-3e	Table A.4-3f		
Number of HARQ Processes	Processes	8	8	8	8		8	8
Maximum number of HARQ transmissions		1	1	1	1		1	1
Note 1: 3 symbols allocated to PDCCH Note 2: Only subframes 1,2,3,4,6,7,8, and 9 are allocated to avoid PBCH and synchronization signal overhead								

Table A.4-2: Reference channel for CQI requirements (TDD) full PRB allocation

Parameter	Unit	Value						
Channel bandwidth	MHz	1.4	3	5	10		15	20
Allocated resource blocks		6	15	25	50		75	100
Subcarriers per resource block		12	12	12	12		12	12
Allocated subframes per Radio Frame		4	4	4	4		4	4
Modulation					Table A.4-3	Table A.4-3a		
Target coding rate					Table A.4-3	Table A.4-3a		
Number of HARQ Processes	Processes	10	10	10	10		10	10
Maximum number of HARQ transmissions		1	1	1	1		1	1
Note 1: 3 symbols allocated to PDCCH Note 2: UL-DL configuration 2 is used and only subframes 3, 4, 8, and 9 are allocated to avoid PBCH and synchronization signal overhead								

Table A.4-2a: Reference channel for CQI requirements (TDD) full PRB allocation (CSI-RS): 2 CRS ports

Parameter	Unit	Value						
Channel bandwidth	MHz	1.4	3	5	10		15	20
Allocated resource blocks		6	15	25	50		75	100
Subcarriers per resource block		12	12	12	12		12	12
Allocated subframes per Radio Frame		4	4	4	4		4	4
Modulation					Table A.4-3b	Table A.4-3d		
Target coding rate					Table A.4-3b	Table A.4-3d		
Number of HARQ Processes	Processes	10	10	10	10		10	10
Maximum number of HARQ transmissions		1	1	1	1		1	1
Note 1: 3 symbols allocated to PDCCH Note 2: UL-DL configuration 2 is used and only subframes 3, 4, 8, and 9 are allocated to avoid PBCH and synchronization signal overhead								

Table A.4-2b: Reference channel for CQI requirements (TDD) full PRB allocation (CSI-RS): 1 CRS port

Parameter	Unit	Value						
Channel bandwidth	MHz	1.4	3	5	10		15	20
Allocated resource blocks		6	15	25	50		75	100
Subcarriers per resource block		12	12	12	12		12	12
Allocated subframes per Radio Frame		2	2	2	2		2	2
Modulation					Table A.4-3e	Table A.4-3f		
Target coding rate					Table A.4-3e	Table A.4-3f		
Number of HARQ Processes	Processes	10	10	10	10		10	10
Maximum number of HARQ transmissions		1	1	1	1		1	1
Note 1: 3 symbols allocated to PDCCH Note 2: UL-DL configuration 2 is used and only subframes 4 and 9 are allocated to avoid PBCH and synchronization signal overhead								

Table A.4-3: Transport format corresponding to each CQI index for 50 PRB allocation single antenna transmission

CQI index	Modulation	Target code rate	Imcs	Information Bit Payload (Subframes 1,2,3,4,6,7,8,9)	Binary Channel Bits Per Sub-Frame (Subframes 1,2,3,4,6,7,8,9)	Actual Code rate
0	out of range	out of range	DTX	-	-	-
1	QPSK	0.0762	0	1384	12600	0.1117
2	QPSK	0.1172	0	1384	12600	0.1117
3	QPSK	0.1885	2	2216	12600	0.1778
4	QPSK	0.3008	4	3624	12600	0.2895
5	QPSK	0.4385	6	5160	12600	0.4114
6	QPSK	0.5879	8	6968	12600	0.5549
7	16QAM	0.3691	11	8760	25200	0.3486
8	16QAM	0.4785	13	11448	25200	0.4552
9	16QAM	0.6016	16	15264	25200	0.6067
10	64QAM	0.4551	18	16416	37800	0.4349
11	64QAM	0.5537	21	21384	37800	0.5663
12	64QAM	0.6504	23	25456	37800	0.6741
13	64QAM	0.7539	25	28336	37800	0.7503
14	64QAM	0.8525	27	31704	37800	0.8394
15	64QAM	0.9258	27	31704	37800	0.8394
Note1: Sub-frame#0 and #5 are not used for the corresponding requirement.						

Table A.4-3a: Transport format corresponding to each CQI index for 50 PRB allocation dual antenna transmission

CQI index	Modulation	Target code rate	Imcs	Information Bit Payload (Subframes 1,2,3,4,6,7,8,9)	Binary Channel Bits Per Sub-Frame (Subframes 1,2,3,4,6,7,8,9)	Actual Code rate
0	out of range	out of range	DTX	-	-	-
1	QPSK	0.0762	0	1384	12000	0.1173
2	QPSK	0.1172	0	1384	12000	0.1173
3	QPSK	0.1885	2	2216	12000	0.1867
4	QPSK	0.3008	4	3624	12000	0.3040
5	QPSK	0.4385	6	5160	12000	0.4320
6	QPSK	0.5879	8	6968	12000	0.5827
7	16QAM	0.3691	11	8760	24000	0.3660
8	16QAM	0.4785	13	11448	24000	0.4780
9	16QAM	0.6016	15	14112	24000	0.5890
10	64QAM	0.4551	18	16416	36000	0.4567
11	64QAM	0.5537	20	19848	36000	0.5520
12	64QAM	0.6504	22	22920	36000	0.6373
13	64QAM	0.7539	24	27376	36000	0.7611
14	64QAM	0.8525	26	30576	36000	0.8500
15	64QAM	0.9258	27	31704	36000	0.8813
Note1: Sub-frame#0 and #5 are not used for the corresponding requirement. The next subframe (i.e. sub-frame#1 or #6) shall be used for the retransmission.						

Table A.4-3b: Transport format corresponding to each CQI index for 50 PRB allocation (CSI-RS): 2 CRS ports, Non CSI-RS subframe

CQI index	Modulation	Target code rate	Imcs	Information Bit Payload	Binary Channel Bits Per Sub-Frame
0	out of range	out of range	DTX	-	-
1	QPSK	0.0762	0	1384	10800
2	QPSK	0.1172	0	1384	10800
3	QPSK	0.1885	2	2216	10800
4	QPSK	0.3008	[]	[3624]	10800
5	QPSK	0.4385	5	4392	10800
6	QPSK	0.5879	7	6200	10800
7	16QAM	0.3691	10	7992	21600
8	16QAM	0.4785	12	9912	21600
9	16QAM	0.6016	14	12960	21600
10	64QAM	0.4551	17	15264	32400
11	64QAM	0.5537	19	18336	32400
12	64QAM	0.6504	21	21384	32400
13	64QAM	0.7539	23	25456	32400
14	64QAM	0.8525	24	27376	32400
15	64QAM	0.9258	25	28336	32400
Note 1: Sub-frame#0 and #5 are not used for the corresponding requirement. The next subframe (i.e. sub-frame#1 or #6) shall be used for the retransmission.					

Table A.4-3c: Transport format corresponding to each CQI index for 50 PRB allocation (CSI-RS): 2 CRS ports, 4 CSI-RS ports, CSI-RS Subframe

CQI index	Modulation	Target code rate	Imcs	Information Bit Payload	Binary Channel Bits Per Sub-Frame
0	out of range	out of range	DTX	-	-
1	QPSK	0.0762	0	1384	10400
2	QPSK	0.1172	0	1384	10400
3	QPSK	0.1885	1	1800	10400
4	QPSK	0.3008	3	2856	10400
5	QPSK	0.4385	5	4392	10400
6	QPSK	0.5879	7	6200	10400
7	16QAM	0.3691	10	7992	20800
8	16QAM	0.4785	12	9912	20800
9	16QAM	0.6016	14	12960	20800
10	64QAM	0.4551	17	15264	31200
11	64QAM	0.5537	18	16416	31200
12	64QAM	0.6504	20	19848	31200
13	64QAM	0.7539	22	22920	31200
14	64QAM	0.8525	24	27376	31200
15	64QAM	0.9258	25	28336	31200
Note 1: Sub-frame#0 and #5 are not used for the corresponding requirement. The next subframe (i.e. sub-frame#1 or #6) shall be used for the retransmission.					

Table A.4-3d: Transport format corresponding to each CQI index for 50 PRB allocation (CSI-RS): 2 CRS ports, 8 CSI-RS ports, CSI-RS Subframe

CQI index	Modulation	Target code rate	Imcs	Information Bit Payload	Binary Channel Bits Per Sub-Frame
0	out of range	out of range	DTX	-	-
1	QPSK	0.0762	0	1384	10000
2	QPSK	0.1172	0	1384	10000
3	QPSK	0.1885	1	1800	10000
4	QPSK	0.3008	3	2856	10000
5	QPSK	0.4385	5	4392	10000
6	QPSK	0.5879	7	6200	10000
7	16QAM	0.3691	10	7992	20000
8	16QAM	0.4785	12	9912	20000
9	16QAM	0.6016	13	11448	20000
10	64QAM	0.4551	17	15264	30000
11	64QAM	0.5537	18	16416	30000
12	64QAM	0.6504	20	19848	30000
13	64QAM	0.7539	22	22920	30000
14	64QAM	0.8525	23	25456	30000
15	64QAM	0.9258	24	27376	30000
Note 1: Sub-frame#0 and #5 are not used for the corresponding requirement. The next subframe (i.e. sub-frame#1 or #6) shall be used for the retransmission.					

Table A.4-3e: Transport format corresponding to each CQI index for 50 PRB allocation (CSI-RS): 1 CRS port, Non CSI-RS subframe

CQI index	Modulation	Target code rate	Imcs	Information Bit Payload	Binary Channel Bits Per Sub-Frame
0	out of range	out of range	DTX	-	-
1	QPSK	0.0762	0	1384	11400
2	QPSK	0.1172	0	1384	11400
3	QPSK	0.1885	2	2216	11400
4	QPSK	0.3008	4	3624	11400
5	QPSK	0.4385	6	5160	11400
6	QPSK	0.5879	8	6968	11400
7	16QAM	0.3691	10	7992	22800
8	16QAM	0.4785	13	11448	22800
9	16QAM	0.6016	15	14112	22800
10	64QAM	0.4551	17	15264	34200
11	64QAM	0.5537	19	18336	34200
12	64QAM	0.6504	21	21384	34200
13	64QAM	0.7539	23	25456	34200
14	64QAM	0.8525	25	28336	34200
15	64QAM	0.9258	26	30576	34200
Note 1: Sub-frame#0 and #5 are not used for the corresponding requirement. The next subframe (i.e. sub-frame#1 or #6) shall be used for the retransmission.					

Table A.4-3f: Transport format corresponding to each CQI index for 50 PRB allocation (CSI-RS): 1 CRS port, 2 CSI-RS ports, CSI-RS Subframe

CQI index	Modulation	Target code rate	Imcs	Information Bit Payload	Binary Channel Bits Per Sub-Frame
0	out of range	out of range	DTX	-	-
1	QPSK	0.0762	0	1384	11200
2	QPSK	0.1172	0	1384	11200
3	QPSK	0.1885	2	2216	11200
4	QPSK	0.3008	4	3624	11200
5	QPSK	0.4385	6	5160	11200
6	QPSK	0.5879	7	6200	11200
7	16QAM	0.3691	10	7992	22400
8	16QAM	0.4785	12	9912	22400
9	16QAM	0.6016	14	12960	22400
10	64QAM	0.4551	17	15264	33600
11	64QAM	0.5537	19	18336	33600
12	64QAM	0.6504	21	21384	33600
13	64QAM	0.7539	23	25456	33600
14	64QAM	0.8525	25	28336	33600
15	64QAM	0.9258	26	30576	33600
Note 1: Sub-frame#0 and #5 are not used for the corresponding requirement. The next subframe (i.e. sub-frame#1 or #6) shall be used for the retransmission.					

Table A.4-4: Reference channel for CQI requirements (FDD) 6 PRB allocation (CRS)

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	6	6	6	6	6
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		8	8	8	8	8	8
Modulation					Table A.4-6		
Target coding rate					Table A.4-6		
Number of HARQ Processes	Processes	8	8	8	8	8	8
Maximum number of HARQ transmissions		1	1	1	1	1	1
Note 1: 3 symbols allocated to PDCCH Note 2: Only subframes 1,2,3,4,6,7,8, and 9 are allocated to avoid PBCH and synchronization signal overhead							

Table A.4-4a: Reference channel for CQI requirements (FDD) 6 PRB allocation (CSI-RS)

Parameter	Unit	Value						
Channel bandwidth	MHz	1.4	3	5	10		15	20
Allocated resource blocks		6	6	6	6		6	6
Subcarriers per resource block		12	12	12	12		12	12
Allocated subframes per Radio Frame		8	8	8	8		8	8
Modulation					Table A.4-6a	Table A.4-6b		
Target coding rate					Table A.4-6a	Table A.4-6b		
Number of HARQ Processes	Processes	8	8	8	8		8	8
Maximum number of HARQ transmissions		1	1	1	1		1	1
Note 1: 3 symbols allocated to PDCCH. Note 2: Only subframes 1,2,3,4,6,7,8, and 9 are allocated to avoid PBCH and synchronization signal overhead.								

Table A.4-5: Reference channel for CQI requirements (TDD) 6 PRB allocation (CRS)

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	6	6	6	6	6
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		4	4	4	4	4	4
Modulation					Table A.4-6		
Target coding rate					Table A.4-6		
Number of HARQ Processes	Processes	10	10	10	10	10	10
Maximum number of HARQ transmissions		1	1	1	1	1	1
Note 1: 3 symbols allocated to PDCCH Note 2: UL-DL configuration 2 is used and only subframes 3, 4, 8, and 9 are allocated to avoid PBCH and synchronization signal overhead							

Table A.4-5a: Reference channel for CQI requirements (TDD) 6 PRB allocation (CSI-RS)

Parameter	Unit	Value						
Channel bandwidth	MHz	1.4	3	5	10		15	20
Allocated resource blocks		6	6	6	6		6	6
Subcarriers per resource block		12	12	12	12		12	12
Allocated subframes per Radio Frame		4	4	4	4		4	4
Modulation					Table A.4-6a	Table A.4-6b		
Target coding rate					Table A.4-6a	Table A.4-6b		
Number of HARQ Processes	Processes	10	10	10	10		10	10
Maximum number of HARQ transmissions		1	1	1	1		1	1
Note 1: 3 symbols allocated to PDCCH. Note 2: UL-DL configuration 2 is used and only subframes 3, 4, 8, and 9 are allocated to avoid PBCH and synchronization signal overhead.								

Table A.4-6: Transport format corresponding to each CQI index for 6 PRB allocation (CRS)

CQI index	Modulation	Target code rate	Imcs	Information Bit Payload (Subframes 1,2,3,4,6,7,8,9)	Binary Channel Bits Per Sub-Frame (Subframes 1,2,3,4,6,7,8,9)	Actual Code rate
0	out of range	out of range	DTX	-	-	-
1	QPSK	0.0762	0	152	1512	0.1005
2	QPSK	0.1172	0	152	1512	0.1005
3	QPSK	0.1885	2	256	1512	0.1693
4	QPSK	0.3008	4	408	1512	0.2698
5	QPSK	0.4385	6	600	1512	0.3968
6	QPSK	0.5879	8	808	1512	0.5344
7	16QAM	0.3691	11	1032	3024	0.3413
8	16QAM	0.4785	13	1352	3024	0.4471
9	16QAM	0.6016	16	1800	3024	0.5952
10	64QAM	0.4551	19	2152	4536	0.4744
11	64QAM	0.5537	21	2600	4536	0.5732
12	64QAM	0.6504	23	2984	4536	0.6578
13	64QAM	0.7539	25	3496	4536	0.7707
14	64QAM	0.8525	27	3752	4536	0.8272
15	64QAM	0.9258	27	3752	4536	0.8272
Note1: Sub-frame#0 and #5 are not used for the corresponding requirement.						

Table A.4-6a: Transport format corresponding to each CQI index for 6 PRB allocation (CSI-RS): 1 CRS port, Non CSI-RS subframe

CQI index	Modulation	Target code rate	Imcs	Information Bit Payload	Binary Channel Bits Per Sub-Frame
0	out of range	out of range	DTX	-	-
1	QPSK	0.0762	0	152	1368
2	QPSK	0.1172	0	152	1368
3	QPSK	0.1885	2	256	1368
4	QPSK	0.3008	4	408	1368
5	QPSK	0.4385	6	600	1368
6	QPSK	0.5879	8	808	1368
7	16QAM	0.3691	11	1032	2736
8	16QAM	0.4785	13	1352	2736
9	16QAM	0.6016	14	1544	2736
10	64QAM	0.4551	17	1800	4104
11	64QAM	0.5537	20	2344	4104
12	64QAM	0.6504	21	2600	4104
13	64QAM	0.7539	23	2984	4104
14	64QAM	0.8525	25	3496	4104
15	64QAM	0.9258	27	3752	4104
Note 1: Sub-frame#0 and #5 are not used for the corresponding requirement.					

Table A.4-6b: Transport format corresponding to each CQI index for 6 PRB allocation (CSI-RS): 1 CRS port, 2 CSI-RS ports, CSI-RS Subframe

CQI index	Modulation	Target code rate	Imcs	Information Bit Payload	Binary Channel Bits Per Sub-Frame
0	out of range	out of range	DTX	-	-
1	QPSK	0.0762	0	152	1344
2	QPSK	0.1172	0	152	1344
3	QPSK	0.1885	1	208	1344
4	QPSK	0.3008	4	408	1344
5	QPSK	0.4385	6	600	1344
6	QPSK	0.5879	8	808	1344
7	16QAM	0.3691	10	936	2688
8	16QAM	0.4785	12	1192	2688
9	16QAM	0.6016	14	1544	2688
10	64QAM	0.4551	17	1800	4032
11	64QAM	0.5537	19	2152	4032
12	64QAM	0.6504	21	2600	4032
13	64QAM	0.7539	23	2984	4032
14	64QAM	0.8525	25	3496	4032
15	64QAM	0.9258	26	3624	4032
Note 1: Sub-frame#0 and #5 are not used for the corresponding requirement.					

Table A.4-7: Reference channel for CQI requirements (FDD) partial PRB allocation (CRS)

Parameter	Unit	Value				
Channel bandwidth	MHz	3	5	10	15	20
Allocated resource blocks				15 (Note 3)		
Subcarriers per resource block				12		
Allocated subframes per Radio Frame				8		
Modulation		Table A.4-9				
Target coding rate		Table A.4-9				
Number of HARQ processes				8		
Maximum number of HARQ transmissions				1		
Note 1: 3 symbols allocated to PDCCH Note 2: Only subframes 1,2,3,4,6,7,8, and 9 are allocated to avoid PBCH and synchronization signal overhead Note 3: Centred within the Transmission Bandwidth Configuration (Figure 5.4.2-1)						

Table A.4-8: Reference channel for CQI requirements (TDD) partial PRB allocation (CRS)

Parameter	Unit	Value				
Channel bandwidth	MHz	3	5	10	15	20
Allocated resource blocks				15 (Note 3)		
Subcarriers per resource block				12		
Allocated subframes per Radio Frame				4		
Modulation		Table A.4-9				
Target coding rate		Table A.4-9				
Number of HARQ processes				10		
Maximum number of HARQ transmissions				1		
Note 1: 3 symbols allocated to PDCCH Note 2: UL-DL configuration 2 is used and only subframes 3, 4, 8, and 9 are allocated to avoid PBCH and synchronization signal overhead Note 3: Centred within the Transmission Bandwidth Configuration (Figure 5.4.2-1)						

Table A.4-9: Transport format corresponding to each CQI index for 15 PRB allocation (CRS)

CQI index	Modulation	Target code rate	Imcs	Information Bit Payload (Subframes 1,2,3,4,6,7,8,9)	Binary Channel Bits Per Sub-Frame (Subframes 1,2,3,4,6,7,8,9)	Actual Code rate
0	out of range	out of range	DTX	-	-	-
1	QPSK	0.0762	0	392	3780	0.1037
2	QPSK	0.1172	0	392	3780	0.1037
3	QPSK	0.1885	2	648	3780	0.1714
4	QPSK	0.3008	4	1064	3780	0.2815
5	QPSK	0.4385	6	1544	3780	0.4085
6	QPSK	0.5879	8	2088	3780	0.5524
7	16QAM	0.3691	11	2664	7560	0.3524
8	16QAM	0.4785	13	3368	7560	0.4455
9	16QAM	0.6016	16	4584	7560	0.6063
10	64QAM	0.4551	18	4968	11340	0.4381
11	64QAM	0.5537	21	6456	11340	0.5693
12	64QAM	0.6504	23	7480	11340	0.6596
13	64QAM	0.7539	25	8504	11340	0.7499
14	64QAM	0.8525	27	9528	11340	0.8402
15	64QAM	0.9258	27	9528	11340	0.8402
Note1: Sub-frame#0 and #5 are not used for the corresponding requirement.						

Table A.4-10: Reference channel for CQI requirements (FDD) 3 PRB allocation (CRS)

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		3	3	3	3	3	3
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		8	8	8	8	8	8
Modulation					Table A.4-12		
Target coding rate					Table A.4-12		
Number of HARQ Processes	Processes	8	8	8	8	8	8
Maximum number of HARQ transmissions		1	1	1	1	1	1
Note 1: 3 symbols allocated to PDCCH Note 2: Only subframes 1,2,3,4,6,7,8, and 9 are allocated to avoid PBCH and synchronization signal overhead							

Table A.4-11: Reference channel for CQI requirements (TDD) 3 PRB allocation (CRS)

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		3	3	3	3	3	3
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		4	4	4	4	4	4
Modulation					Table A.4-12		
Target coding rate					Table A.4-12		
Number of HARQ Processes	Processes	10	10	10	10	10	10
Maximum number of HARQ transmissions		1	1	1	1	1	1
Note 1: 3 symbols allocated to PDCCH. Note 2: UL-DL configuration 2 is used and only subframes 3, 4, 8, and 9 are allocated to avoid PBCH and synchronization signal overhead.							

Table A.4-12: Transport format corresponding to each CQI index for 3 PRB allocation (CRS)

CQI index	Modulation	Target code rate	Imcs	Information Bit Payload (Subframes 1,2,3,4,6,7,8,9)	Binary Channel Bits Per Sub-Frame (Subframes 1,2,3,4,6,7,8,9)	Actual Code rate
0	out of range	out of range	DTX	-	-	-
1	QPSK	0.0762	0	56	756	0.0741
2	QPSK	0.1172	1	88	756	0.1164
3	QPSK	0.1885	2	144	756	0.1905
4	QPSK	0.3008	5	224	756	0.2963
5	QPSK	0.4385	7	328	756	0.4339
6	QPSK	0.5879	9	456	756	0.6032
7	16QAM	0.3691	12	584	1512	0.3862
8	16QAM	0.4785	13	744	1512	0.4921
9	16QAM	0.6016	16	904	1512	0.5979
10	64QAM	0.4551	19	1064	2268	0.4691
11	64QAM	0.5537	21	1288	2268	0.5679
12	64QAM	0.6504	23	1480	2268	0.6526
13	64QAM	0.7539	25	1736	2268	0.7654
14	64QAM	0.8525	27	1864	2268	0.8219
15	64QAM	0.9258	27	1864	2268	0.8219
Note1: Sub-frame#0 and #5 are not used for the corresponding requirement.						

A.4.1 Additional CSI reference measurement channels

This sections defines additional reference measurement channels for CSI testing, required to run the test properly according to the test parameters.

Table A.4.1-1: Uplink reference channels for transmitting CSI reports on PUSCH, when being in a PUCCH reporting mode (FDD)

Parameter	Unit	Value					
Channel bandwidth	MHz	10	10	10			
Allocated resource blocks		6	6	6			
DFT-OFDM Symbols per Sub-Frame		12	12	12			
Modulation		QPSK	QPSK	QPSK			
Target Coding rate		1/3	1/3	1/3			
Allocated Sub-Frames (Note 1)		1, 3, 5, 7	3, 8	0, 1, 2, 3, 4, 5, 6, 7, 8, 9			
Payload size	Bits	600	600	600			
Transport block CRC	Bits	24	24	24			
Number of code blocks per Sub-Frame (Note 2)		1	1	1			
Total number of bits per Sub-Frame	Bits	1728	1728	1728			
Total symbols per Sub-Frame		864	864	864			
UE Category		≥ 1	≥ 1	≥ 1			
Note 1: The remaining subframes are not allocated with data. All the allocation details specified in the reference channel are valid only for the allocated subframes. Note 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.4.1-2: Uplink reference channels for transmitting CSI reports on PUSCH, when being in a PUCCH reporting mode (TDD)

Parameter	Unit	Value					
Channel bandwidth	MHz	10	**10**				
Allocated resource blocks		6	6				
Uplink-Downlink Configuration (Note 1)		2	1				
DFT-OFDM Symbols per Sub-Frame		12	12				
Modulation		QPSK	QPSK				
Target Coding rate		1/3	1/3				
Allocated Sub-Frames (Note 2)		2, 7	3, 8				
Payload size	Bits	600	600				
Transport block CRC	Bits	24	24				
Number of code blocks per Sub-Frame (Note 3)		1	1				
Total number of bits per Sub-Frame	Bits	1728	1728				
Total symbols per Sub-Frame		864	864				
UE Category		≥ 1	≥ 1				
Note 1: As per Table 4.2-2 in TS 36.211 [4] Note 2: The remaining subframes are not allocated with data. All the allocation details specified in the reference channel are valid only for the allocated subframes. Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

A.5 OFDMA Channel Noise Generator (OCNG)

A.5.1 OCNG Patterns for FDD

The following OCNG patterns are used for modelling allocations to virtual UEs (which are not under test). The OCNG pattern for each sub frame specifies the allocations that shall be filled with OCNG, and furthermore, the relative power level of each such allocation.

In each test case the OCNG is expressed by parameters OCNG_RA and OCNG_RB which together with a relative power level (γ) specifies the PDSCH EPRE-to-RS EPRE ratios in OFDM symbols with and without reference symbols, respectively. The relative power, which is used for modelling boosting per virtual UE allocation, is expressed by:

$$\gamma_i = PDSCH_i\_RA / OCNG\_RA = PDSCH_i\_RB / OCNG\_RB,$$

where γ_i denotes the relative power level of the *i:th* virtual UE. The parameter settings of OCNG_RA, OCNG_RB, and the set of relative power levels γ are chosen such that when also taking allocations to the UE under test into account, as given by a PDSCH reference channel, a transmitted power spectral density that is constant on an OFDM symbol basis is targeted.

Moreover the OCNG pattern is accompanied by a PCFICH/PDCCH/PHICH reference channel which specifies the control region. For any aggregation and PHICH allocation, the PDCCH and any unused PHICH groups are padded with resource element groups with a power level given respectively by PDCCH_RA/RB and PHICH_RA/RB as specified in the test case such that a total power spectral density in the control region that is constant on an OFDM symbol basis is targeted.

A.5.1.1 OCNG FDD pattern 1: One sided dynamic OCNG FDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is continuous in frequency domain (one sided).

Table A.5.1.1-1: OP.1 FDD: One sided dynamic OCNG FDD Pattern

Relative power level γ_{PRB} [dB]			PDSCH Data
Subframe			
0	5	1 – 4, 6 – 9	
Allocation			
First unallocated PRB – Last unallocated PRB	First unallocated PRB – Last unallocated PRB	First unallocated PRB – Last unallocated PRB	
0	0	0	Note 1
Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH. Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter γ_{PRB} applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.			

A.5.1.2 OCNG FDD pattern 2: Two sided dynamic OCNG FDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is discontinuous in frequency domain (divided in two parts by the allocated area – two sided), starts with PRB 0 and ends with PRB $N_{RB} - 1$.

Table A.5.1.2-1: OP.2 FDD: Two sided dynamic OCNG FDD Pattern

Relative power level γ_{PRB} [dB]			PDSCH Data
Subframe			
0	5	1 – 4, 6 – 9	
Allocation			
0 – (First allocated PRB-1) and (Last allocated PRB+1) – ($N_{RB}-1$)	0 – (First allocated PRB-1) and (Last allocated PRB+1) – ($N_{RB}-1$)	0 – (First allocated PRB-1) and (Last allocated PRB+1) – ($N_{RB}-1$)	
0	0	0	Note 1
Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH. Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter γ_{PRB} applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.			

A.5.1.3 OCNG FDD pattern 3: 49 RB OCNG allocation with MBSFN in 10 MHz

Table A.5.1.3-1: OP.3 FDD: OCNG FDD Pattern 3

Allocation n_{PRB}	Relative power level γ_{PRB} [dB]				PDSCH Data	PMCH Data
	Subframe					
	0	5	4, 9	1 – 3, 6 – 8		
1 – 49	0	0 (Allocation: all empty PRB-s)	0	N/A	Note 1	N/A
0 – 49	N/A	N/A	N/A	0	N/A	Note 2
Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH. Note 2: Each physical resource block (PRB) is assigned to MBSFN transmission. The data in each PRB shall be uncorrelated with data in other PRBs over the period of any measurement. The MBSFN data shall be QPSK modulated. PMCH subframes shall contain cell-specific Reference Signals only in the first symbol of the first time slot. The parameter γ_{PRB} is used to scale the power of PMCH. Note 3: If two or more transmit antennas are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode 2. The transmit power shall be equally split between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213. N/A: Not Applicable						

A.5.1.4 OCNG FDD pattern 4: One sided dynamic OCNG FDD pattern for MBMS transmission

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is continuous in frequency domain (one sided) and MBMS performance is tested.

Table A.5.1.4-1: OP.4 FDD: One sided dynamic OCNG FDD Pattern for MBMS transmission

<table>
<tr><th rowspan="3">Allocation
n_{PRB}</th><th colspan="3">Relative power level γ_{PRB} [dB]</th><th rowspan="3">PDSCH Data</th><th rowspan="3">PMCH Data</th></tr>
<tr><th colspan="3">Subframe</th></tr>
<tr><th>0, 4, 9</th><th>5</th><th>1 – 3, 6 – 8</th></tr>
<tr><td>First unallocated PRB
–
Last unallocated PRB</td><td>0</td><td>0
(Allocation: all empty PRB-s)</td><td>N/A</td><td>Note 1</td><td>N/A</td></tr>
<tr><td>First unallocated PRB
–
Last unallocated PRB</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>Note 2</td></tr>
<tr><td colspan="6">Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.
Note 2: Each physical resource block (PRB) is assigned to MBSFN transmission. The data in each PRB shall be uncorrelated with data in other PRBs over the period of any measurement. The MBSFN data shall be QPSK modulated. PMCH subframes shall contain cell-specific Reference Signals only in the first symbol of the first time slot. The parameter γ_{PRB} is used to scale the power of PMCH.
Note 3: If two or more transmit antennas are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode 2. The transmit power shall be equally split between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

N/A: Not Applicable</td></tr>
</table>

A.5.1.5 OCNG FDD pattern 5: One sided dynamic 16QAM modulated OCNG FDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of DL sub-frames, when the unallocated area is continuous in the frequency domain (one sided).

Table A.5.1.5-1: OP.5 FDD: One sided dynamic 16QAM modulated OCNG FDD Pattern

Relative power level γ_{PRB} [dB]			PDSCH Data
Subframe			
0	5	1 – 4, 6 – 9	
Allocation			
First unallocated PRB – Last unallocated PRB	First unallocated PRB – Last unallocated PRB	First unallocated PRB – Last unallocated PRB	
0	0	0	Note 1

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is 16QAM modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.

Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 3 (Large Delay CDD). The parameter γ_{PRB} applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

A.5.1.6 OCNG FDD pattern 6: dynamic OCNG FDD pattern when user data is in 2 non-contiguous blocks

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is discontinuous in frequency domain (divided in two parts by the first allocated block). The second allocated block ends with PRB $N_{RB} - 1$.

Table A.5.1.6-1: OP.6 FDD: OCNG FDD Pattern when user data is in 2 non-contiguous blocks

Relative power level γ_{PRB} [dB]			PDSCH Data
Subframe			
0	5	1 – 4, 6 – 9	
Allocation			
0 – (First allocated PRB of first block -1) and (Last allocated PRB of first block +1) – (First allocated PRB of second block -1)	0 – (First allocated PRB of first block -1) and (Last allocated PRB of first block +1) – (First allocated PRB of second block -1)	0 – (First allocated PRB of first block -1) and (Last allocated PRB of first block +1) – (First allocated PRB of second block -1)	
0	0	0	Note 1

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.

Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter γ_{PRB} applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

A.5.2 OCNG Patterns for TDD

The following OCNG patterns are used for modelling allocations to virtual UEs (which are not under test). The OCNG pattern for each sub frame specifies the allocations that shall be filled with OCNG, and furthermore, the relative power level of each such allocation.

In each test case the OCNG is expressed by parameters OCNG_RA and OCNG_RB which together with a relative power level (γ) specifies the PDSCH EPRE-to-RS EPRE ratios in OFDM symbols with and without reference symbols, respectively. The relative power, which is used for modelling boosting per virtual UE allocation, is expressed by:

$$\gamma_i = PDSCH_i\_RA / OCNG\_RA = PDSCH_i\_RB / OCNG\_RB,$$

where γ_i denotes the relative power level of the *i:th* virtual UE. The parameter settings of OCNG_RA, OCNG_RB, and the set of relative power levels γ are chosen such that when also taking allocations to the UE under test into account, as given by a PDSCH reference channel, a transmitted power spectral density that is constant on an OFDM symbol basis is targeted.

Moreover the OCNG pattern is accompanied by a PCFICH/PDCCH/PHICH reference channel which specifies the control region. For any aggregation and PHICH allocation, the PDCCH and any unused PHICH groups are padded with resource element groups with a power level given respectively by PDCCH_RA/RB and PHICH_RA/RB as specified in the test case such that a total power spectral density in the control region that is constant on an OFDM symbol basis is targeted.

A.5.2.1 OCNG TDD pattern 1: One sided dynamic OCNG TDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the subframes available for DL transmission (depending on TDD UL/DL configuration), when the unallocated area is continuous in frequency domain (one sided).

Table A.5.2.1-1: OP.1 TDD: One sided dynamic OCNG TDD Pattern

<table>
<tr><th colspan="4">Relative power level γ_{PRB} [dB]</th><th rowspan="5">PDSCH Data</th></tr>
<tr><th colspan="4">Subframe (only if available for DL)</th></tr>
<tr><th>0</th><th>5</th><th>3, 4, 7, 8, 9
and 6 (as normal subframe) Note 2</th><th>1
and 6 (as special subframe) Note 2</th></tr>
<tr><th colspan="4">Allocation</th></tr>
<tr><th>First unallocated PRB
–
Last unallocated PRB</th><th>First unallocated PRB
–
Last unallocated PRB</th><th>First unallocated PRB
–
Last unallocated PRB</th><th>First unallocated PRB
–
Last unallocated PRB</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td>Note 1</td></tr>
<tr><td colspan="5">Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.
Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211.
Note 3: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter γ_{PRB} applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.</td></tr>
</table>

A.5.2.2 OCNG TDD pattern 2: Two sided dynamic OCNG TDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the subframes available for DL transmission (depending on TDD UL/DL configuration), when the unallocated area is discontinuous in frequency domain (divided in two parts by the allocated area – two sided), starts with PRB 0 and ends with PRB $N_{RB}-1$.

Table A.5.2.2-1: OP.2 TDD: Two sided dynamic OCNG TDD Pattern

Relative power level γ_{PRB} [dB]				PDSCH Data
Subframe (only if available for DL)				
0	5	3, 4, 6, 7, 8, 9 (6 as normal subframe) Note 2	1,6 (6 as special subframe) Note 2	
Allocation				
0 – (First allocated PRB-1) and (Last allocated PRB+1) – ($N_{RB}-1$)	0 – (First allocated PRB-1) and (Last allocated PRB+1) – ($N_{RB}-1$)	0 – (First allocated PRB-1) and (Last allocated PRB+1) – ($N_{RB}-1$)	0 – (First allocated PRB-1) and (Last allocated PRB+1) – ($N_{RB}-1$)	
0	0	0	0	Note 1
Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH. Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211. Note 3: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter γ_{PRB} applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.				

A.5.2.3 OCNG TDD pattern 3: 49 RB OCNG allocation with MBSFN in 10 MHz

Table A.5.2. 3-1: OP.3 TDD: OCNG TDD Pattern 3 for 5ms downlink-to-uplink switch-point periodicity

Allocation n_{PRB}	Relative power level γ_{PRB} [dB]				PDSCH Data	PMCH Data
	Subframe					
	0	5	4, 9 Note 2	1, 6		

1 – 49	0	0 (Allocation: all empty PRB-s)	N/A	0	Note 1	N/A
0 – 49	N/A	N/A	0	N/A	N/A	Note 3

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.
Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211.
Note 3: Each physical resource block (PRB) is assigned to MBSFN transmission. The data in each PRB shall be uncorrelated with data in other PRBs over the period of any measurement. The MBSFN data shall be QPSK modulated. PMCH symbols shall not contain cell-specific Reference Signals
Note 4: If two or more transmit antennas are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode 2. The transmit power shall be equally split between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

N/A: Not Applicable

A.5.2.4 OCNG TDD pattern 4: One sided dynamic OCNG TDD pattern for MBMS transmission

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is continuous in frequency domain (one sided) and MBMS performance is tested.

Table A.5.2.4-1: OP.4 TDD: One sided dynamic OCNG TDD Pattern for MBMS transmission

Allocation n_{PRB}	**Relative power level** γ_{PRB} **[dB]**				**PDSCH Data**	**PMCH Data**
	Subframe (only for DL)					
	0 and 6 (as normal subframe)	1 (as special subframe)	5	3, 4, 7 – 9		
First unallocated PRB – Last unallocated PRB	0	0 (Allocation: all empty PRB-s of DwPTS)	0 (Allocation: all empty PRB-s)	N/A	Note 1	N/A
First unallocated PRB – Last unallocated PRB	N/A	N/A	N/A	N/A	N/A	Note2

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.
Note 2: Each physical resource block (PRB) is assigned to MBSFN transmission. The data in each PRB shall be uncorrelated with data in other PRBs over the period of any measurement. The MBSFN data shall be QPSK modulated. PMCH symbols shall not contain cell-specific Reference Signals.
Note 3: If two or more transmit antennas are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode 2. The transmit power shall be equally split between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

N/A Not Applicable

A.5.2.5 OCNG TDD pattern 5: One sided dynamic 16QAM modulated OCNG TDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the sub-frames available for DL transmission (depending on TDD UL/DL configuration), when the unallocated area is continuous in frequency domain (one sided).

Table A.5.2.5-1: OP.5 TDD: One sided dynamic 16QAM modulated OCNG TDD Pattern

Relative power level γ_{PRB} [dB]				**PDSCH Data**
Subframe (only if available for DL)				
0	5	3, 4, 7, 8, 9 and 6 (as normal subframe) Note 2	1 and 6 (as special subframe) Note 2	
Allocation				
First unallocated PRB – Last unallocated PRB	First unallocated PRB – Last unallocated PRB	First unallocated PRB – Last unallocated PRB	First unallocated PRB – Last unallocated PRB	
0	0	0	0	Note 1
Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is 16QAM modulated. The parameter γ_{PRB} is used to scale the power of PDSCH. Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211 Note 3: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 3 (Large Delay CDD). The parameter γ_{PRB} applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.				

A.5.2.6 OCNG TDD pattern 6: dynamic OCNG TDD pattern when user data is in 2 non-contiguous blocks

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the subframes available for DL transmission (depending on TDD UL/DL configuration), when the unallocated area is discontinuous in frequency domain (divided in two parts by the first allocated block). The second allocated block ends with PRB $N_{RB} - 1$.

Table A.5.2.6-1: OP.6 TDD: OCNG TDD Pattern when user data is in 2 non-contiguous blocks

Relative power level γ_{PRB} [dB]				PDSCH Data
Subframe (only if available for DL)				
0	5	3, 4, 6, 7, 8, 9 (6 as normal subframe) Note 2	1,6 (6 as special subframe) Note 2	
Allocation				
0 – (First allocated PRB of first block -1) and (Last allocated PRB of first block +1) – (First allocated PRB of second block -1)	0 – (First allocated PRB of first block -1) and (Last allocated PRB of first block +1) – (First allocated PRB of second block -1)	0 – (First allocated PRB of first block -1) and (Last allocated PRB of first block +1) – (First allocated PRB of second block -1)	0 – (First allocated PRB of first block -1) and (Last allocated PRB of first block +1) – (First allocated PRB of second block -1)	
0	0	0	0	Note 1

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.

Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211

Note 3: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter γ_{PRB} applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

Annex B (normative): Propagation Conditions

The propagation conditions and channel models for various environments are specified. For each environment a propagation model is used to evaluate the propagation pathless due to the distance. Channel models are formed by combining delay profiles with a Doppler spectrum, with the addition of correlation properties in the case of a multi-antenna scenario.

B.0 No interference

The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects.

B.1 Static propagation condition

The downlink connection between the System Simulator and the UE is an Additive White Gaussian Noise (AWGN) environment with no fading or multipath effects.

For 2 port transmission the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{pmatrix} 1 & j \\ 1 & -j \end{pmatrix}$$

For 4 port transmission the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 & 1 & j & j \\ 1 & 1 & -j & -j \end{bmatrix}$$

For 8 port transmission the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 & 1 & 1 & 1 & j & j & j & j \\ 1 & 1 & 1 & 1 & -j & -j & -j & -j \end{bmatrix}$$

B.1.1 Definition of Additive White Gaussian Noise (AWGN) Interferer

Note that the AWGN interferer can be used in static propagation conditions, or in conjunction with multi-path fading.

The acceptable uncertainties of the AWGN interferer are defined in Annex F.

B.2 Multi-path fading Propagation Conditions

The multipath propagation conditions consist of several parts:

- A delay profile in the form of a "tapped delay-line", characterized by a number of taps at fixed positions on a sampling grid. The profile can be further characterized by the r.m.s. delay spread and the maximum delay spanned by the taps.

- A combination of channel model parameters that include the Delay profile and the Doppler spectrum, that is characterized by a classical spectrum shape and a maximum Doppler frequency
- A set of correlation matrices defining the correlation between the UE and eNodeB antennas in case of multi-antenna systems.

B.2.1 Delay profiles

The delay profiles are selected to be representative of low, medium and high delay spread environments. The resulting model parameters are defined in Table B.2.1-1 and the tapped delay line models are defined in Tables B.2.1-2, B.2.1-3 and B.2.1-4.

Table B.2.1-1: Delay profiles for E-UTRA channel models

Model	Number of channel taps	Delay spread (r.m.s.)	Maximum excess tap delay (span)
Extended Pedestrian A (EPA)	7	45 ns	410 ns
Extended Vehicular A model (EVA)	9	357 ns	2510 ns
Extended Typical Urban model (ETU)	9	991 ns	5000 ns

Table B.2.1-2: Extended Pedestrian A model (EPA)

Excess tap delay [ns]	Relative power [dB]
0	0.0
30	-1.0
70	-2.0
90	-3.0
110	-8.0
190	-17.2
410	-20.8

Table B.2.1-3: Extended Vehicular A model (EVA)

Excess tap delay [ns]	Relative power [dB]
0	0.0
30	-1.5
150	-1.4
310	-3.6
370	-0.6
710	-9.1
1090	-7.0
1730	-12.0
2510	-16.9

Table B.2.1-4: Extended Typical Urban model (ETU)

Excess tap delay [ns]	Relative power [dB]
0	-1.0
50	-1.0
120	-1.0
200	0.0
230	0.0
500	0.0
1600	-3.0
2300	-5.0
5000	-7.0

B.2.2 Combinations of channel model parameters

Table B.2.2-1 shows propagation conditions that are used for the performance measurements in multi-path fading environment for low, medium and high Doppler frequencies.

Table B.2.2-1: Channel model parameters

Model	Maximum Doppler frequency
EPA 5Hz	5 Hz
EVA 5Hz	5 Hz
EVA 70Hz	70 Hz
ETU 30Hz	30 Hz
ETU 70Hz	70 Hz
ETU 300Hz	300 Hz

B.2.3 MIMO Channel Correlation Matrices

The MIMO channel correlation matrices defined in B.2.3 apply for the antenna configuration using uniform linear arrays at both eNodeB and UE.

B.2.3.1 Definition of MIMO Correlation Matrices

Table B.2.3.1-1 defines the correlation matrix for the eNodeB

Table B.2.3.1-1: eNodeB correlation matrix

	One antenna	Two antennas	Four antennas
eNode B Correlation	$R_{eNB} = 1$	$R_{eNB} = \begin{pmatrix} 1 & \alpha \\ \alpha^* & \mathbf{1} \end{pmatrix}$	$R_{eNB} = \begin{pmatrix} 1 & \alpha^{1/9} & \alpha^{4/9} & \alpha \\ \alpha^{1/9^*} & 1 & \alpha^{1/9} & \alpha^{4/9} \\ \alpha^{4/9^*} & \alpha^{1/9^*} & 1 & \alpha^{1/9} \\ \alpha^* & \alpha^{4/9^*} & \alpha^{1/9^*} & 1 \end{pmatrix}$

Table B.2.3.1-2 defines the correlation matrix for the UE:

Table B.2.3.1-2: UE correlation matrix

	One antenna	Two antennas	Four antennas
UE Correlation	$R_{UE} = 1$	$R_{UE} = \begin{pmatrix} 1 & \beta \\ \beta^* & \mathbf{1} \end{pmatrix}$	$R_{UE} = \begin{pmatrix} 1 & \beta^{1/9} & \beta^{4/9} & \beta \\ \beta^{1/9^*} & 1 & \beta^{1/9} & \beta^{4/9} \\ \beta^{4/9^*} & \beta^{1/9^*} & 1 & \beta^{1/9} \\ \beta^* & \beta^{4/9^*} & \beta^{1/9^*} & 1 \end{pmatrix}$

Table B.2.3.1-3 defines the channel spatial correlation matrix R_{spat}. The parameters, α and β in Table B.2.3.1-3 defines the spatial correlation between the antennas at the eNodeB and UE.

Table B.2.3.1-3: R_{spat} correlation matrices

1x2 case	$R_{spat} = R_{UE} = \begin{bmatrix} 1 & \beta \\ \beta^* & 1 \end{bmatrix}$
2x2 case	$R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha \\ \alpha^* & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & \beta \\ \beta^* & 1 \end{bmatrix} = \begin{bmatrix} 1 & \beta & \alpha & \alpha\beta \\ \beta^* & 1 & \alpha\beta^* & \alpha \\ \alpha^* & \alpha^*\beta & 1 & \beta \\ \alpha^*\beta^* & \alpha^* & \beta^* & 1 \end{bmatrix}$
4x2 case	$R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha^{1/9} & \alpha^{4/9} & \alpha \\ \alpha^{1/9^*} & 1 & \alpha^{1/9} & \alpha^{4/9} \\ \alpha^{4/9^*} & \alpha^{1/9^*} & 1 & \alpha^{1/9} \\ \alpha^* & \alpha^{4/9^*} & \alpha^{1/9^*} & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & \beta \\ \beta^* & 1 \end{bmatrix}$
4x4 case	$R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha^{1/9} & \alpha^{4/9} & \alpha \\ \alpha^{1/9^*} & 1 & \alpha^{1/9} & \alpha^{4/9} \\ \alpha^{4/9^*} & \alpha^{1/9^*} & 1 & \alpha^{1/9} \\ \alpha^* & \alpha^{4/9^*} & \alpha^{1/9^*} & 1 \end{bmatrix} \otimes \begin{pmatrix} 1 & \beta^{1/9} & \beta^{4/9} & \beta \\ \beta^{1/9^*} & 1 & \beta^{1/9} & \beta^{4/9} \\ \beta^{4/9^*} & \beta^{1/9^*} & 1 & \beta^{1/9} \\ \beta^* & \beta^{4/9^*} & \beta^{1/9^*} & 1 \end{pmatrix}$

For cases with more antennas at either eNodeB or UE or both, the channel spatial correlation matrix can still be expressed as the Kronecker product of R_{eNB} and R_{UE} according to $R_{spat} = R_{eNB} \otimes R_{UE}$.

B.2.3.2 MIMO Correlation Matrices at High, Medium and Low Level

The α and β for different correlation types are given in Table B.2.3.2-1.

Table B.2.3.2-1

Low correlation		Medium Correlation		High Correlation	
α	β	α	β	α	β
0	0	0.3	0.9	0.9	0.9

The correlation matrices for high, medium and low correlation are defined in Table B.2.3.2-2, B.2.3.2-3 and B.2.3.2-4,as below.

The values in the Table B.2.3.2-2 table have been adjusted for the 4x2 and 4x4 high correlation cases to insure the correlation matrix is positive semi-definite after round-off to 4 digit precision. This is done using the equation:

$$\mathbf{R}_{high} = [\mathbf{R}_{spatial} + aI_n]/(1+a)$$

Where the value "a" is a scaling factor such that the smallest value is used to obtain a positive semi-definite result. For the 4x2 high correlation case, a=0.00010. For the 4x4 high correlation case, a=0.00012.

The same method is used to adjust the 4x4 medium correlation matrix in Table B.2.3.2-3 to insure the correlation matrix is positive semi-definite after round-off to 4 digit precision with a = 0.00012.

Table B.2.3.2-2: MIMO correlation matrices for high correlation

1x2 case	$R_{high} = \begin{pmatrix} 1 & 0.9 \\ 0.9 & 1 \end{pmatrix}$
2x2 case	$R_{high} = \begin{pmatrix} 1 & 0.9 & 0.9 & 0.81 \\ 0.9 & 1 & 0.81 & 0.9 \\ 0.9 & 0.81 & 1 & 0.9 \\ 0.81 & 0.9 & 0.9 & 1 \end{pmatrix}$
4x2 case	$R_{high} = \begin{bmatrix} 1.0000 & 0.8999 & 0.9883 & 0.8894 & 0.9542 & 0.8587 & 0.8999 & 0.8099 \\ 0.8999 & 1.0000 & 0.8894 & 0.9883 & 0.8587 & 0.9542 & 0.8099 & 0.8999 \\ 0.9883 & 0.8894 & 1.0000 & 0.8999 & 0.9883 & 0.8894 & 0.9542 & 0.8587 \\ 0.8894 & 0.9883 & 0.8999 & 1.0000 & 0.8894 & 0.9883 & 0.8587 & 0.9542 \\ 0.9542 & 0.8587 & 0.9883 & 0.8894 & 1.0000 & 0.8999 & 0.9883 & 0.8894 \\ 0.8587 & 0.9542 & 0.8894 & 0.9883 & 0.8999 & 1.0000 & 0.8894 & 0.9883 \\ 0.8999 & 0.8099 & 0.9542 & 0.8587 & 0.9883 & 0.8894 & 1.0000 & 0.8999 \\ 0.8099 & 0.8999 & 0.8587 & 0.9542 & 0.8894 & 0.9883 & 0.8999 & 1.0000 \end{bmatrix}$
4x4 case	$R_{high} = \begin{bmatrix} 1.0000 & 0.9882 & 0.9541 & 0.8999 & 0.9882 & 0.9767 & 0.9430 & 0.8894 & 0.9541 & 0.9430 & 0.9105 & 0.8587 & 0.8999 & 0.8894 & 0.8587 & 0.8099 \\ 0.9882 & 1.0000 & 0.9882 & 0.9541 & 0.9767 & 0.9882 & 0.9767 & 0.9430 & 0.9430 & 0.9541 & 0.9430 & 0.9105 & 0.8894 & 0.8999 & 0.8894 & 0.8587 \\ 0.9541 & 0.9882 & 1.0000 & 0.9882 & 0.9430 & 0.9767 & 0.9882 & 0.9767 & 0.9105 & 0.9430 & 0.9541 & 0.9430 & 0.8587 & 0.8894 & 0.8999 & 0.8894 \\ 0.8999 & 0.9541 & 0.9882 & 1.0000 & 0.8894 & 0.9430 & 0.9767 & 0.9882 & 0.8587 & 0.9105 & 0.9430 & 0.9541 & 0.8099 & 0.8587 & 0.8894 & 0.8999 \\ 0.9882 & 0.9767 & 0.9430 & 0.8894 & 1.0000 & 0.9882 & 0.9541 & 0.8999 & 0.9882 & 0.9767 & 0.9430 & 0.8894 & 0.9541 & 0.9430 & 0.9105 & 0.8587 \\ 0.9767 & 0.9882 & 0.9767 & 0.9430 & 0.9882 & 1.0000 & 0.9882 & 0.9541 & 0.9767 & 0.9882 & 0.9767 & 0.9430 & 0.9430 & 0.9541 & 0.9430 & 0.9105 \\ 0.9430 & 0.9767 & 0.9882 & 0.9767 & 0.9541 & 0.9882 & 1.0000 & 0.9882 & 0.9430 & 0.9767 & 0.9882 & 0.9767 & 0.9105 & 0.9430 & 0.9541 & 0.9430 \\ 0.8894 & 0.9430 & 0.9767 & 0.9882 & 0.8999 & 0.9541 & 0.9882 & 1.0000 & 0.8894 & 0.9430 & 0.9767 & 0.9882 & 0.8587 & 0.9105 & 0.9430 & 0.9541 \\ 0.9541 & 0.9430 & 0.9105 & 0.8587 & 0.9882 & 0.9767 & 0.9430 & 0.8894 & 1.0000 & 0.9882 & 0.9541 & 0.8999 & 0.9882 & 0.9767 & 0.9430 & 0.8894 \\ 0.9430 & 0.9541 & 0.9430 & 0.9105 & 0.9767 & 0.9882 & 0.9767 & 0.9430 & 0.9882 & 1.0000 & 0.9882 & 0.9541 & 0.9767 & 0.9882 & 0.9767 & 0.9430 \\ 0.9105 & 0.9430 & 0.9541 & 0.9430 & 0.9430 & 0.9767 & 0.9882 & 0.9767 & 0.9541 & 0.9882 & 1.0000 & 0.9882 & 0.9430 & 0.9767 & 0.9882 & 0.9767 \\ 0.8587 & 0.9105 & 0.9430 & 0.9541 & 0.8894 & 0.9430 & 0.9767 & 0.9882 & 0.8999 & 0.9541 & 0.9882 & 1.0000 & 0.8894 & 0.9430 & 0.9767 & 0.9882 \\ 0.8999 & 0.8894 & 0.8587 & 0.8099 & 0.9541 & 0.9430 & 0.9105 & 0.8587 & 0.9882 & 0.9767 & 0.9430 & 0.8894 & 1.0000 & 0.9882 & 0.9541 & 0.8999 \\ 0.8894 & 0.8999 & 0.8894 & 0.8587 & 0.9430 & 0.9541 & 0.9430 & 0.9105 & 0.9767 & 0.9882 & 0.9767 & 0.9430 & 0.9882 & 1.0000 & 0.9882 & 0.9541 \\ 0.8587 & 0.8894 & 0.8999 & 0.8894 & 0.9105 & 0.9430 & 0.9541 & 0.9430 & 0.9430 & 0.9767 & 0.9882 & 0.9767 & 0.9541 & 0.9882 & 1.0000 & 0.9882 \\ 0.8099 & 0.8587 & 0.8894 & 0.8999 & 0.8587 & 0.9105 & 0.9430 & 0.9541 & 0.8894 & 0.9430 & 0.9767 & 0.9882 & 0.8999 & 0.9541 & 0.9882 & 1.0000 \end{bmatrix}$

Table B.2.3.2-3: MIMO correlation matrices for medium correlation

1x2 case	N/A
2x2 case	$R_{medium} = \begin{pmatrix} 1 & 0.9 & 0.3 & 0.27 \\ 0.9 & 1 & 0.27 & 0.3 \\ 0.3 & 0.27 & 1 & 0.9 \\ 0.27 & 0.3 & 0.9 & 1 \end{pmatrix}$
4x2 case	$R_{medium} = \begin{pmatrix} 1.0000 & 0.9000 & 0.8748 & 0.7873 & 0.5856 & 0.5271 & 0.3000 & 0.2700 \\ 0.9000 & 1.0000 & 0.7873 & 0.8748 & 0.5271 & 0.5856 & 0.2700 & 0.3000 \\ 0.8748 & 0.7873 & 1.0000 & 0.9000 & 0.8748 & 0.7873 & 0.5856 & 0.5271 \\ 0.7873 & 0.8748 & 0.9000 & 1.0000 & 0.7873 & 0.8748 & 0.5271 & 0.5856 \\ 0.5856 & 0.5271 & 0.8748 & 0.7873 & 1.0000 & 0.9000 & 0.8748 & 0.7873 \\ 0.5271 & 0.5856 & 0.7873 & 0.8748 & 0.9000 & 1.0000 & 0.7873 & 0.8748 \\ 0.3000 & 0.2700 & 0.5856 & 0.5271 & 0.8748 & 0.7873 & 1.0000 & 0.9000 \\ 0.2700 & 0.3000 & 0.5271 & 0.5856 & 0.7873 & 0.8748 & 0.9000 & 1.0000 \end{pmatrix}$
4x4 case	$R_{medium} = \begin{pmatrix} 1.0000 & 0.9882 & 0.9541 & 0.8999 & 0.8747 & 0.8645 & 0.8347 & 0.7872 & 0.5855 & 0.5787 & 0.5588 & 0.5270 & 0.3000 & 0.2965 & 0.2862 & 0.2700 \\ 0.9882 & 1.0000 & 0.9882 & 0.9541 & 0.8645 & 0.8747 & 0.8645 & 0.8347 & 0.5787 & 0.5855 & 0.5787 & 0.5588 & 0.2965 & 0.3000 & 0.2965 & 0.2862 \\ 0.9541 & 0.9882 & 1.0000 & 0.9882 & 0.8347 & 0.8645 & 0.8747 & 0.8645 & 0.5588 & 0.5787 & 0.5855 & 0.5787 & 0.2862 & 0.2965 & 0.3000 & 0.2965 \\ 0.8999 & 0.9541 & 0.9882 & 1.0000 & 0.7872 & 0.8347 & 0.8645 & 0.8747 & 0.5270 & 0.5588 & 0.5787 & 0.5855 & 0.2700 & 0.2862 & 0.2965 & 0.3000 \\ 0.8747 & 0.8645 & 0.8347 & 0.7872 & 1.0000 & 0.9882 & 0.9541 & 0.8999 & 0.8747 & 0.8645 & 0.8347 & 0.7872 & 0.5855 & 0.5787 & 0.5588 & 0.5270 \\ 0.8645 & 0.8747 & 0.8645 & 0.8347 & 0.9882 & 1.0000 & 0.9882 & 0.9541 & 0.8645 & 0.8747 & 0.8645 & 0.8347 & 0.5787 & 0.5855 & 0.5787 & 0.5588 \\ 0.8347 & 0.8645 & 0.8747 & 0.8645 & 0.9541 & 0.9882 & 1.0000 & 0.9882 & 0.8347 & 0.8645 & 0.8747 & 0.8645 & 0.5588 & 0.5787 & 0.5855 & 0.5787 \\ 0.7872 & 0.8347 & 0.8645 & 0.8747 & 0.8999 & 0.9541 & 0.9882 & 1.0000 & 0.7872 & 0.8347 & 0.8645 & 0.8747 & 0.5270 & 0.5588 & 0.5787 & 0.5855 \\ 0.5855 & 0.5787 & 0.5588 & 0.5270 & 0.8747 & 0.8645 & 0.8347 & 0.7872 & 1.0000 & 0.9882 & 0.9541 & 0.8999 & 0.8747 & 0.8645 & 0.8347 & 0.7872 \\ 0.5787 & 0.5855 & 0.5787 & 0.5588 & 0.8645 & 0.8747 & 0.8645 & 0.8347 & 0.9882 & 1.0000 & 0.9882 & 0.9541 & 0.8645 & 0.8747 & 0.8645 & 0.8347 \\ 0.5588 & 0.5787 & 0.5855 & 0.5787 & 0.8347 & 0.8645 & 0.8747 & 0.8645 & 0.9541 & 0.9882 & 1.0000 & 0.9882 & 0.8347 & 0.8645 & 0.8747 & 0.8645 \\ 0.5270 & 0.5588 & 0.5787 & 0.5855 & 0.7872 & 0.8347 & 0.8645 & 0.8747 & 0.8999 & 0.9541 & 0.9882 & 1.0000 & 0.7872 & 0.8347 & 0.8645 & 0.8747 \\ 0.3000 & 0.2965 & 0.2862 & 0.2700 & 0.5855 & 0.5787 & 0.5588 & 0.5270 & 0.8747 & 0.8645 & 0.8347 & 0.7872 & 1.0000 & 0.9882 & 0.9541 & 0.8999 \\ 0.2965 & 0.3000 & 0.2965 & 0.2862 & 0.5787 & 0.5855 & 0.5787 & 0.5588 & 0.8645 & 0.8747 & 0.8645 & 0.8347 & 0.9882 & 1.0000 & 0.9882 & 0.9541 \\ 0.2862 & 0.2965 & 0.3000 & 0.2965 & 0.5588 & 0.5787 & 0.5855 & 0.5787 & 0.8347 & 0.8645 & 0.8747 & 0.8645 & 0.9541 & 0.9882 & 1.0000 & 0.9882 \\ 0.2700 & 0.2862 & 0.2965 & 0.3000 & 0.5270 & 0.5588 & 0.5787 & 0.5855 & 0.7872 & 0.8347 & 0.8645 & 0.8747 & 0.8999 & 0.9541 & 0.9882 & 1.0000 \end{pmatrix}$

Table B.2.3.2-4: MIMO correlation matrices for low correlation

1x2 case	$R_{low} = \mathbf{I}_2$
2x2 case	$R_{low} = \mathbf{I}_4$
4x2 case	$R_{low} = \mathbf{I}_8$
4x4 case	$R_{low} = \mathbf{I}_{16}$

In Table B.2.3.2-4, $\mathbf{I}_d$ is the $d \times d$ identity matrix.

B.2.3A MIMO Channel Correlation Matrices using cross polarized antennas

The MIMO channel correlation matrices defined in B.2.3A apply for the antenna configuration using cross polarized antennas at both eNodeB and UE. The cross-polarized antenna elements with +/-45 degrees polarization slant angles are deployed at eNB and cross-polarized antenna elements with +90/0 degrees polarization slant angles are deployed at UE.

For the cross-polarized antennas, the N antennas are labelled such that antennas for one polarization are listed from 1 to N/2 and antennas for the other polarization are listed from N/2+1 to N, where N is the number of transmit or receive antennas.

B.2.3A.1 Definition of MIMO Correlation Matrices using cross polarized antennas

For the channel spatial correlation matrix, the following is used:

$$R_{spat} = P\left(R_{eNB} \otimes \Gamma \otimes R_{UE}\right)P^{T}$$

Where

- R_{UE} is the spatial correlation matrix at the UE with same polarization,
- R_{eNB} is the spatial correlation matrix at the eNB with same polarization,
- Γ is a polarization correlation matrix, and
- $(\bullet)^{T}$ denotes transpose.

The matrix Γ is defined as

$$\Gamma = \begin{bmatrix} 1 & 0 & -\gamma & 0 \\ 0 & 1 & 0 & \gamma \\ -\gamma & 0 & 1 & 0 \\ 0 & \gamma & 0 & 1 \end{bmatrix}$$

A permutation matrix P elementis defined as:

$$P(a,b) = \begin{cases} 1 & for \quad a = (j-1)Nr + i \quad and \quad b = 2(j-1)Nr + i, \qquad i = 1,\cdots,Nr,\ j = 1,\cdots Nt/2 \\ 1 & for \quad a = (j-1)Nr + i \quad and \quad b = 2(j - Nt/2)Nr - Nr + i, \quad i = 1,\cdots,Nr,\ j = Nt/2+1,\cdots,Nt \\ 0 & otherwise \end{cases}$$

Where N_t and N_r is the number of transmitter and receiver respectively. This is used to map the spatial correlation coefficients in accordance with the antenna element labelling system described in B.2.3A.

B.2.3A.2 Spatial Correlation Matrices using cross polarized antennas at eNB and UE sides

B.2.3A.2.1 Spatial Correlation Matrices at eNB side

For 2-antenna transmitter using one pair of cross-polarized antenna elements, $R_{eNB} = 1$.

For 4-antenna transmitter using two pairs of cross-polarized antenna elements, $R_{eNB} = \begin{pmatrix} 1 & \alpha \\ \alpha^{*} & \mathbf{1} \end{pmatrix}$.

For 8-antenna transmitter using four pairs of cross-polarized antenna elements, $R_{eNB} = \begin{pmatrix} 1 & \alpha^{1/9} & \alpha^{4/9} & \alpha \\ \alpha^{1/9^{*}} & 1 & \alpha^{1/9} & \alpha^{4/9} \\ \alpha^{4/9^{*}} & \alpha^{1/9^{*}} & 1 & \alpha^{1/9} \\ \alpha^{*} & \alpha^{4/9^{*}} & \alpha^{1/9^{*}} & 1 \end{pmatrix}$.

B.2.3A.2.2 Spatial Correlation Matrices at UE side

For 2-antenna transmitter using one pair of cross-polarized antenna elements, $R_{UE} = 1$.

For 4-antenna transmitter using two pairs of cross-polarized antenna elements, $R_{UE} = \begin{pmatrix} 1 & \beta \\ \beta^{*} & \mathbf{1} \end{pmatrix}$.

B.2.3A.3 MIMO Correlation Matrices using cross polarized antennas

The values for parameters α, β and γ for low correlation and high spatial correlation are given in Table B.2.3A.3-1.

Table B.2.3A.3-1

High spatial correlation		
α	β	γ
0.9	0.9	0.3
Note 1: Value of α applies when more than one pair of cross-polarized antenna elements at eNB side. Note 2: Value of β applies when more than one pair of cross-polarized antenna elements at UE side.		

The correlation matrices for high spatial and low correlation are defined in Table B.2.3A.3-2 as below.

The values in Table B.2.3A.3-2 have been adjusted to insure the correlation matrix is positive semi-definite after round-off to 4 digit precision. This is done using the equation:

$$\mathbf{R}_{high} = [\mathbf{R}_{spat} + aI_n]/(1+a)$$

Where the value "a" is a scaling factor such that the smallest value is used to obtain a positive semi-definite result. For the 8x2 high spatial correlation case, a=0.00010.

Table B.2.3A.3-2: MIMO correlation matrices for high spatial correlation

8x2 case	$R_{high} = \begin{bmatrix} 1.0000 & 0.0000 & 0.9883 & 0.0000 & 0.9542 & 0.0000 & 0.8999 & 0.0000 & -0.3000 & 0.0000 & -0.2965 & 0.0000 & -0.2862 & 0.0000 & -0.2700 & 0.0000 \\ 0.0000 & 1.0000 & 0.0000 & 0.9883 & 0.0000 & 0.9542 & 0.0000 & 0.8999 & 0.0000 & 0.3000 & 0.0000 & 0.2965 & 0.0000 & 0.2862 & 0.0000 & 0.2700 \\ 0.9883 & 0.0000 & 1.0000 & 0.0000 & 0.9883 & 0.0000 & 0.9542 & 0.0000 & -0.2965 & 0.0000 & -0.3000 & 0.0000 & -0.2965 & 0.0000 & -0.2862 & 0.0000 \\ 0.0000 & 0.9883 & 0.0000 & 1.0000 & 0.0000 & 0.9883 & 0.0000 & 0.9542 & 0.0000 & 0.2965 & 0.0000 & 0.3000 & 0.0000 & 0.2965 & 0.0000 & 0.2862 \\ 0.9542 & 0.0000 & 0.9883 & 0.0000 & 1.0000 & 0.0000 & 0.9883 & 0.0000 & -0.2862 & 0.0000 & -0.2965 & 0.0000 & -0.3000 & 0.0000 & -0.2965 & 0.0000 \\ 0.0000 & 0.9542 & 0.0000 & 0.9883 & 0.0000 & 1.0000 & 0.0000 & 0.9883 & 0.0000 & 0.2862 & 0.0000 & 0.2965 & 0.0000 & 0.3000 & 0.0000 & 0.2965 \\ 0.8999 & 0.0000 & 0.9542 & 0.0000 & 0.9883 & 0.0000 & 1.0000 & 0.0000 & -0.2700 & 0.0000 & -0.2862 & 0.0000 & -0.2965 & 0.0000 & -0.3000 & 0.0000 \\ 0.0000 & 0.8999 & 0.0000 & 0.9542 & 0.0000 & 0.9883 & 0.0000 & 1.0000 & 0.0000 & 0.2700 & 0.0000 & 0.2862 & 0.0000 & 0.2965 & 0.0000 & 0.3000 \\ -0.3000 & 0.0000 & -0.2965 & 0.0000 & -0.2862 & 0.0000 & -0.2700 & 0.0000 & 1.0000 & 0.0000 & 0.9883 & 0.0000 & 0.9542 & 0.0000 & 0.8999 & 0.0000 \\ 0.0000 & 0.3000 & 0.0000 & 0.2965 & 0.0000 & 0.2862 & 0.0000 & 0.2700 & 0.0000 & 1.0000 & 0.0000 & 0.9883 & 0.0000 & 0.9542 & 0.0000 & 0.8999 \\ -0.2965 & 0.0000 & -0.3000 & 0.0000 & -0.2965 & 0.0000 & -0.2862 & 0.0000 & 0.9883 & 0.0000 & 1.0000 & 0.0000 & 0.9883 & 0.0000 & 0.9542 & 0.0000 \\ 0.0000 & 0.2965 & 0.0000 & 0.3000 & 0.0000 & 0.2965 & 0.0000 & 0.2862 & 0.0000 & 0.9883 & 0.0000 & 1.0000 & 0.0000 & 0.9883 & 0.0000 & 0.9542 \\ -0.2862 & 0.0000 & -0.2965 & 0.0000 & -0.3000 & 0.0000 & -0.2965 & 0.0000 & 0.9542 & 0.0000 & 0.9883 & 0.0000 & 1.0000 & 0.0000 & 0.9883 & 0.0000 \\ 0.0000 & 0.2862 & 0.0000 & 0.2965 & 0.0000 & 0.3000 & 0.0000 & 0.2965 & 0.0000 & 0.9542 & 0.0000 & 0.9883 & 0.0000 & 1.0000 & 0.0000 & 0.9883 \\ -0.2700 & 0.0000 & -0.2862 & 0.0000 & -0.2965 & 0.0000 & -0.3000 & 0.0000 & 0.8999 & 0.0000 & 0.9542 & 0.0000 & 0.9883 & 0.0000 & 1.0000 & 0.0000 \\ 0.0000 & 0.2700 & 0.0000 & 0.2862 & 0.0000 & 0.2965 & 0.0000 & 0.3000 & 0.0000 & 0.8999 & 0.0000 & 0.9542 & 0.0000 & 0.9883 & 0.0000 & 1.0000 \end{bmatrix}$

B.2.3A.4 Beam steering approach

Given the channel spatial correlation matrix in B.2.3A.1, the corresponding random channel matrix $\boldsymbol{H}$ can be calculated. The signal model for the k-th subframe is denoted as:

$$y = HD_{\theta_k}Wx + n$$

Where

- H is the N¬r xNt channel matrix per subcarrier.
- D_{θ_k} is the steering matrix, which is $D_{\theta_k} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & e^{j\theta_k} & 0 & 0 \\ 0 & 0 & e^{j2\theta_k} & 0 \\ 0 & 0 & 0 & e^{j3\theta_k} \end{bmatrix}$,
- θ_k controls the phase variation, and the phase for k-th subframe is denoted by $\theta_k = \theta_0 + \Delta\theta \cdot k$, where θ_0 is the random start value with the uniform distribution, i.e. $\theta_0 \in [0, 2\pi]$, $\Delta\theta$ is the step of phase variation, which is defined in Table B.2.3A.4-1, and $\boldsymbol{k}$ is the linear increment of 1 for every subframe throughout the simulation,

- W is the precoding matrix for 8 transmission antennas,
- y is the received signal, x is the transmitted signal, and n is AWGN.

Table B.2.3A.4-1: The step of phase variation

Variation Step	Value (rad/subframe)
$\Delta\theta$	1.2566×10^{-3}

B.2.4 Propagation conditions for CQI tests

[For Channel Quality Indication (CQI) tests, the following additional multi-path profile is used:

$$h(t,\tau) = \delta(\tau) + a\exp(-i2\pi f_D t)\delta(\tau - \tau_d)$$

in continuous time (t,τ) representation, with τ_d the delay, a a constant and f_D the Doppler frequency.]

B.2.5 FFS

B.2.6 MBSFN Propagation Channel Profile

Table B.2.6-1 shows propagation conditions that are used for the MBSFN performance requirements in multi-path fading environment in an extended delay spread environment.

Table B.2.6-1: Propagation Conditions for Multi-Path Fading Environments for MBSFN Performance Requirements in an extended delay spread environment

Extended Delay Spread	
Maximum Doppler frequency [5Hz]	
Relative Delay [ns]	**Relative Mean Power [dB]**
0	0
30	-1.5
150	-1.4
310	-3.6
370	-0.6
1090	-7.0
12490	-10
12520	-11.5
12640	-11.4
12800	-13.6
12860	-10.6
13580	-17.0
27490	-20
27520	-21.5
27640	-21.4
27800	-23.6
27860	-20.6
28580	-27.0

B.3 High speed train scenario

The high speed train condition for the test of the baseband performance is a non fading propagation channel with one tap. Doppler shift is given by

$$f_s(t) = f_d \cos\theta(t) \qquad \text{(B.3.1)}$$

where $f_s(t)$ is the Doppler shift and f_d is the maximum Doppler frequency. The cosine of angle $\theta(t)$ is given by

$$\cos\theta(t) = \frac{D_s/2 - vt}{\sqrt{D_{\min}{}^2 + (D_s/2 - vt)^2}}, \quad 0 \le t \le D_s/v \qquad \text{(B.3.2)}$$

$$\cos\theta(t) = \frac{-1.5D_s + vt}{\sqrt{D_{\min}{}^2 + (-1.5D_s + vt)^2}}, \quad D_s/v < t \le 2D_s/v \qquad \text{(B.3.3)}$$

$$\cos\theta(t) = \cos\theta(t \mod (2D_s/v)), \quad t > 2D_s/v \qquad \text{(B.3.4)}$$

where $D_s/2$ is the initial distance of the train form eNodeB, and $D_{\min}$ is eNodeB Railway track distance, both in meters; v is the velocity of the train in m/s, t is time in seconds.

Doppler shift and cosine angle are given by equation B.3.1 and B.3.2-B.3.4 respectively, where the required input parameters listed in table B.3-1 and the resulting Doppler shift is shown in Figure B.3-1 are applied for all frequency bands.

Table B.3-1: High speed train scenario

Parameter	Value
D_s	300 m
$D_{\min}$	2 m
v	300 km/h
f_d	750 Hz

NOTE 1: Parameters for HST conditions in table B.3-1 including f_d and Doppler shift trajectories presented on figure B.3-1 were derived for Band7.

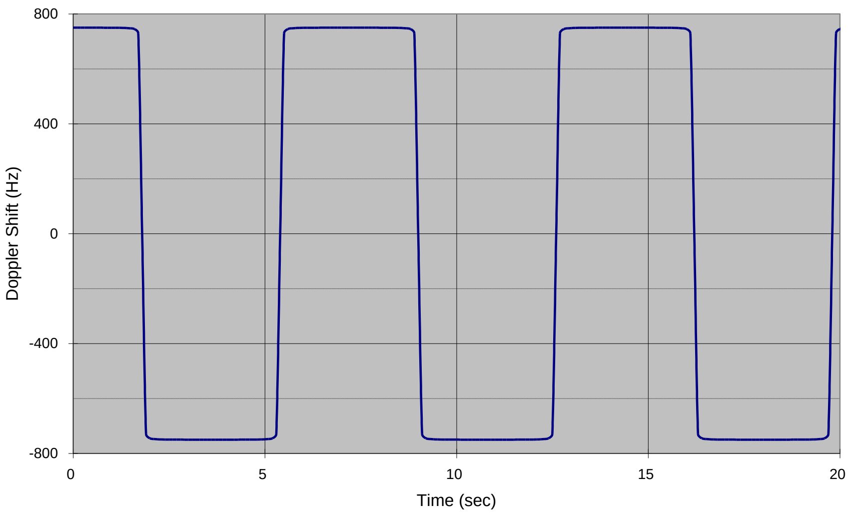


Figure B.3-1: Doppler shift trajectory

B.4 Beamforming Model

B.4.1 Single-layer random beamforming (Antenna port 5, 7 or 8)

Single-layer transmission on antenna port 5 or on antenna port 7 or 8 without a simultaneous transmission on the other antenna port, is defined by using a precoder vector $W(i)$ of size 2×1 randomly selected with the number of layers $\upsilon=1$ from Table 6.3.4.2.3-1 in TS 36.211 [8] as beamforming weights. This precoder takes as an input the signal $y^{(p)}(i)$, $i=0,1,\ldots,M_{\mathrm{symb}}^{\mathrm{ap}}-1$, for antenna port $p\in\{5,7,8\}$, with $M_{\mathrm{symb}}^{\mathrm{ap}}$ the number of modulation symbols including the user-specific reference symbols (DRS), and generates a block of signals $y_{bf}(i)=\left[y_{bf}(i)\quad \tilde{y}_{bf}(i)\right]^T$ the elements of which are to be mapped onto the same physical RE but transmitted on different antenna elements:

$$\begin{bmatrix} y_{bf}(i) \\ \tilde{y}_{bf}(i) \end{bmatrix} = W(i)y^{(p)}(i)$$

Single-layer transmission on antenna port 7 or 8 with a simultaneous transmission on the other antenna port, is defined by using a pair of precoder vectors $W_1(i)$ and $W_2(i)$ each of size 2×1, which are not identical and randomly selected with the number of layers $\upsilon=1$ from Table 6.3.4.2.3-1 in TS 36.211 [8], as beamforming weights, and normalizing the transmit power as follows:

$$\begin{bmatrix} y_{bf}(i) \\ \tilde{y}_{bf}(i) \end{bmatrix} = \frac{1}{\sqrt{2}}\left(W_1(i)y^{(7)}(i) + W_2(i)y^{(8)}(i)\right)$$

The precoder update granularity is specific to a test case.

The CSI reference symbols $a_{k,l}^{(p)}$ satisfying $p \bmod 2 = 1$, $p\in\{15,16,..,22\}$, are transmitted on the same physical antenna element as the modulation symbols $y_{bf}(i)$. The CSI reference symbols $a_{k,l}^{(p)}$ satisfying $p \bmod 2 = 0$, $p\in\{15,16,..,22\}$, are transmitted on the same physical antenna element as the modulation symbols $\tilde{y}_{bf}(i)$.

B.4.2 Dual-layer random beamforming (antenna ports 7 and 8)

Dual-layer transmission on antenna ports 7 and 8 is defined by using a precoder matrix $W(i)$ of size 2×2 randomly selected with the number of layers $\upsilon = 2$ from Table 6.3.4.2.3-1 in TS 36.211 [8] as beamforming weights. This precoder takes as an input a block of signals for antenna ports 7 and 8, $y(i) = \begin{bmatrix} y^{(7)}(i) & y^{(8)}(i) \end{bmatrix}^T$, $i = 0,1,..., M_{\text{symb}}^{\text{ap}} - 1$, with $M_{\text{symb}}^{\text{ap}}$ being the number of modulation symbols per antenna port including the user-specific reference symbols, and generates a block of signals $y_{bf}(i) = \begin{bmatrix} y_{bf}(i) & \tilde{y}_{bf}(i) \end{bmatrix}^T$ the elements of which are to be mapped onto the same physical RE but transmitted on different antenna elements:

$$\begin{bmatrix} y_{bf}(i) \\ \tilde{y}_{bf}(i) \end{bmatrix} = W(i) \begin{bmatrix} y^{(7)}(i) \\ y^{(8)}(i) \end{bmatrix},$$

The precoder update granularity is specific to a test case.

The CSI reference symbols $a_{k,l}^{(p)}$ satisfying $p \bmod 2 = 1$, $p \in \{15,16,..,22\}$, are transmitted on the same physical antenna element as the modulation symbols $y_{bf}(i)$. The CSI reference symbols $a_{k,l}^{(p)}$ satisfying $p \bmod 2 = 0$, $p \in \{15,16,..,22\}$, are transmitted on the same physical antenna element as the modulation symbols $\tilde{y}_{bf}(i)$.

B.4.3 Generic beamforming model (antenna ports 7-14)

The transmission on antenna port(s) $p = 7,8,...,\upsilon + 6$ is defined by using a precoder matrix $W(i)$ of size $N_{CSI} \times \upsilon$, where N_{CSI} is the number of CSI reference signals configured per test and υ is the number of spatial layers. This precoder takes as an input a block of signals for antenna port(s) $p = 7,8,...,\upsilon + 6$, $y^{(p)}(i) = \begin{bmatrix} y^{(7)}(i) & y^{(8)}(i) & \cdots & y^{(6+\upsilon)}(i) \end{bmatrix}$, $i = 0,1,..., M_{\text{symb}}^{\text{ap}} - 1$, with $M_{\text{symb}}^{\text{ap}}$ being the number of modulation symbols per antenna port including the user-specific reference symbols (DM-RS), and generates a block of signals $y_{bf}^{(q)}(i) = \begin{bmatrix} y_{bf}^{(0)}(i) & y_{bf}^{(1)}(i) & \ldots & y_{bf}^{(N_{CSI}-1)}(i) \end{bmatrix}^T$ the elements of which are to be mapped onto the same time-frequency index pair (k,l) but transmitted on different physical antenna elements:

$$\begin{bmatrix} y_{bf}^{(0)}(i) \\ y_{bf}^{(1)}(i) \\ \vdots \\ y_{bf}^{(N_{CSI}-1)}(i) \end{bmatrix} = W(i) \begin{bmatrix} y^{(7)}(i) \\ y^{(8)}(i) \\ \vdots \\ y^{(6+\upsilon)}(i) \end{bmatrix}$$

The precoder matrix $W(i)$ is specific to a test case.

The physical antenna elements are identified by indices $j = 0,1,..., N_{ANT} - 1$, where $N_{ANT} = N_{CSI}$ is the number of physical antenna elements configured per test.

Modulation symbols $y_{bf}^{(q)}(i)$ with (i.e. beamformed PDSCH and DM-RS) are mapped to the physical antenna index.

Modulation symbols with $p \in \{0,1,..., P-1\}$ (i.e. PBCH, PDCCH, PHICH, PCFICH) are mapped to the physical antenna index $j = p$, where P is the number of cell-specific reference signals configured per test.

Modulation symbols $a_{k,l}^{(p)}$ with $p \in \{0,1,..., P-1\}$ (i.e. CRS) are mapped to the physical antenna index $j = p$, where P is the number of cell-specific reference signals configured per test.

Modulation symbols $a_{k,l}^{(p)}$ with $p \in \{15,16,...,14+N_{CSI}\}$ (i.e. CSI-RS) are mapped to the physical antenna index $j = p-15$, where N_{CSI} is the number of CSI reference signals configured per test.

B.5 Interference models for enhanced performance requirements Type-A

This clause provides a description for the modelling of interfering cell transmissions for enhanced performance requirements Type-A including: definition of dominant interferer proportion, transmission mode 3, 4 and 9 type of interference modelling.

B.5.1 Dominant interferer proportion

Each interfering cell involved in enhanced performance requirements Type-A is characterized by its associated dominant interferer proportion (DIP) value:

$$DIP_i = \frac{\hat{I}_{or(i+1)}}{N_{oc}'}$$

where is $\hat{I}_{or(i+1)}$ is the average received power spectral density from the i-th strongest interfering cell involved in the requirement scenario ($\hat{I}_{or(1)}$ is assumed to be the power spectral density associated with the serving cell) and $N_{oc}' = \sum_{j=2}^{N} \hat{I}_{or(j)} + N_{oc}$ where N_{oc} is the average power spectral density of a white noise source consistent with the definition provided in subclause 3.2 and N is the total number of cells involved in a given requirement scenario.

B.5.2 Transmission mode 3 interference model

This subclause provides transmission mode 3 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the entire PDSCH region and the full transmission bandwidth. Transmitted physical channels shall include PSS, SSS and PBCH.

For each subframe and each CQI subband as defined in subclause 7.2 of [10], a transmission rank shall be randomly determined independently from other CQI subbands as well as other interfering cells. Probabilities of occurrence of each possible transmission rank are as specified in the requirement scenario.

For rank-1 transmission over a subband, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to 16QAM randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [8].

For rank-2 transmission over a subband, precoding for spatial multiplexing with large delay CDD over two layers for the number of antenna ports in the requirement scenario shall be applied to 16QAM randomly modulated layer symbols, as specified in subclause 6.3.4.2.2 of [8].

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [8]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

B.5.3 Transmission mode 4 interference model

This subclause provides transmission mode 4 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the entire PDSCH region and the full transmission bandwidth. Transmitted physical channels shall include PSS, SSS and PBCH.

For each subframe and each CQI subband as defined in subclause 7.2 of [10], a transmission rank shall be randomly determined independently from other CQI subbands as well as other interfering cells. Probabilities of occurrence of each possible transmission rank are as specified in the requirement scenario.

For each subframe and CQI subband, a precoding matrix for the number of layers υ associated to the selected rank shall be selected randomly from Table 6.3.4.2.3-1 of [8]. Note that codebook index 0 shall be excluded from random precoder selection when the number of layers is $\upsilon = 2$.

Precoding for spatial multiplexing with cell-specific reference signals for the number of antenna ports in the requirement scenario shall be applied to 16QAM randomly modulated layer symbols, as specified in subclause 6.3.4.2.1 of [8] with the selected precoding matrices for each subframe and each CQI subband.

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [8]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

B.5.4 Transmission mode 9 interference model

This subclause provides transmission mode 9 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the entire PDSCH region and the full transmission bandwidth. Transmitted physical channels shall include PSS, SSS and PBCH.

For each subframe and each CQI subband as defined in subclause 7.2 of [10], a transmission rank shall be randomly determined independently from other CQI subbands as well as other interfering cells. Probabilities of occurrence of each possible transmission rank are as specified in the requirement scenario.

For each subframe and each CQI subband, a precoding matrix for the number of layers υ associated to the selected rank shall be selected randomly from Table 6.3.4.2.3-2 of [8].

The generic beamforming model in subclause B.4.3 shall be applied assuming cell-specific reference signals and CSI reference signals as specified in the requirement scenario. Random precoding with selected rank and precoding matrices for each subframe and each CQI subband shall be applied to 16QAM randomly modulated layer symbols including the user-specific reference symbols over antenna port 7 when the rank is one and antenna ports 7, 8 when the rank is two.

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [8]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

Annex C (normative): Downlink Physical Channels

This annex specifies the downlink physical channels that are needed for setting a connection and channels that are needed during a connection.

C.0 Downlink signal levels

The downlink power settings in Table C.0-1 are used unless otherwise specified in a test case.

If the UE has two Rx antennas, the downlink signal is applied to each one. Both UE Rx antennas shall be connected.

If the UE has one Rx antenna, the downlink signal is applied to it.

Table C.0-1: Default Downlink power levels

	Unit	Channel bandwidth					
		1.4 MHz	**3 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
Number of RBs		6	15	25	50	75	100
Channel BW Power	dBm	-66	-62	-60	-57	-55	-54
RS EPRE	dBm/15kHz	-85	-85	-85	-85	-85	-85
Note 1: The channel bandwidth powers and RB allocations are informative, based on -85dBm/15kHz RS_EPRE, then scaled according to the number of RBs and rounded to the nearest integer dBm value. Full RE allocation with no boost or deboost is assumed in this calculation, but allocation may vary during setup. Note 2: The power level is specified at each UE Rx antenna.							

The default signal level uncertainty is +/-3dB at each test port, for any level specified. If the uncertainty value is critical for the test purpose, a tighter uncertainty is specified for the related test case in Annex F.

C.1 General

Table C.1-1 describes the mapping of downlink physical channels and signals to physical resources for FDD.

Table C.1-2 describes the mapping of downlink physical channels and signals to physical resources for TDD.

Table C.1-1: Mapping of downlink physical channels and signals to physical resources for FDD

Physical channel	Time Domain Location	Frequency Domain Location	Note
RS	Symbols 0, 4 of each subframe for antenna port 0 & 1 Symbol 1 of each subframe for antenna port 2 & 3	Downlink system bandwidth dependent.	Mapping rule is specified in TS36.211 6.10.1.2 - CELL_ID = 0
PBCH	Symbols 0 to 3 of slot 1 of subframe 0 of each radio frame	Occupies 72 subcarriers centred on the DC subcarrier	Mapping rule is specified in TS36.211 Section 6.6.4 (Note 2)
PSS	Symbol 6 of slot 0 and 10 of each radio frame	Occupies 62 subcarriers centred on the DC subcarrier. Additional 10 subcarriers (5 on each side) adjacent to the centred 62 subcarriers are reserved.	Mapping rule is specified in TS36.211 Section 6.11.1.2
SSS	Symbol 5 of slots 0 and 10 of each radio frame	Occupies 62 subcarriers centred on the DC subcarrier. Additional 10 subcarriers (5 on each side) adjacent to the centred 62 subcarriers are reserved.	Mapping rule is specified in TS36.211 Section 6.11.2.2
PCFICH	Symbol 0 of each subframe	Downlink system bandwidth dependent. Maps into 4 REGs uniformly spread in the frequency domain over the whole system bandwidth.	Mapping rule is specified in TS36.211 Section 6.7.4 (Note 1) - CELL_ID = 0
PHICH	Symbol 0 of each subframe	Downlink system bandwidth dependent. Each PHICH group maps into 3 REGs in the frequency domain on the REGs not assigned to PCFICH over the whole system bandwidth,	Mapping rule is specified in TS36.211 Section 6.9.3 (Note 1) - CELL_ID = 0 - Ng = 1 - Normal PHICH duration -Number of PHICH groups = 1(BW=1.4MHz)/2(BW=3MHz)/ 4(BW=5MHz)/7(BW=10MHz)/ 10(BW=15MHz)/13(BW=20MHz)
PDCCH	Symbols 0, 1, 2, 3 of each subframe for 1.4 MHz Symbols 0, 1, 2, of each subframe for 3 and 5 MHz Symbols 0, 1 of each subframe for 10, 15 and 20 MHz	The remaining REGs not allocated to both PCFICH and PHICH are used for PDCCH	Mapping rule is specified in TS36.211 Section 6.8.5 (Note 1)
PDSCH	All remaining OFDM symbols of each subframe not allocated to PDCCH	For Subframe 0, REs not allocated to RS, PSS, SSS and PBCH, is allocated to PDSCH For Subframe 5, REs not allocated to RS, PSS and SSS, is allocated to PDSCH For other subframes, REs not allocated to RS, is allocated to PDSCH	Note that there are reserved REs that are not used for transmission of any physical channels (Note 3) & (Note 4) which need to be taken into account when allocating REs to PDSCH
Note 1: In case a single cell-specific RS is configured, cell-specific RS shall be assume to be present on antenna ports 0 and 1 for the purpose of mapping a symbol-quadruplet to a REG (resource-element group). (See TS 36.211 Section 6.2.4). Note 2: PBCH is mapped into RE assuming RS from 4 antennas are used at the eNB transmitter, irrespective of the actual number of Tx antenna. Resource elements assumed to be reserved for RS but not used for transmission of RS shall not be used for transmission of any physical channel. (See TS 36.211 Section 6.6.4). Note 3: In slot 0 and slot 10 of each radio frame, there are reserved REs for PSS and SSS that are not used for transmission of any physical channels. (See TS 36.211 Section 6.11.1.2 & 6.11.2.2). Note 4: REs used for RS transmission on any of the antenna ports in a slot shall not be used for any transmission on any other antenna port in the same slot and set to zero. (See TS 36.211 Section 6.10.1.2).			

Table C.1-2: Mapping of downlink physical channels and signals to physical resources for TDD

Physical channel	Time Domain Location	Frequency Domain Location	Note
RS	Symbols 0, 4 of each subframe for antenna port 0 & 1 Symbol 1 of each subframe for antenna port 2 & 3	Downlink system bandwidth dependent.	Mapping rule is specified in TS36.211[8] 6.10.1.2 - CELL_ID = 0
PBCH	Symbols 0 to 3 of slot 1 of subframe 0 of each radio frame	Occupies 72 subcarriers centred on the DC subcarrier	Mapping rule is specified in TS36.211[8] Section 6.6.4 (Note 3)
PSS	Symbol 2 of slot 2 and 12 of each radio frame	Occupies 62 subcarriers centred on the DC subcarrier. Additional 10 subcarriers (5 on each side) adjacent to the centred 62 subcarriers are reserved.	Mapping rule is specified in TS36.211[8] Section 6.11.1.2
SSS	Symbol 6 of slots 1 and 11 of each radio frame	Occupies 62 subcarriers centred on the DC subcarrier. Additional 10 subcarriers (5 on each side) adjacent to the centred 62 subcarriers are reserved.	Mapping rule is specified in TS36.211[8] Section 6.11.2.2
PCFICH	Symbol 0 of each subframe and special subframe	Downlink system bandwidth dependent. Maps into 4 REGs uniformly spread in the frequency domain over the whole system bandwidth.	Mapping rule is specified in TS36.211[8] Section 6.7.4 (Note 2) - CELL_ID = 0
PHICH	Symbol 0 of each subframe and special subframe	Downlink system bandwidth dependent. Each PHICH group maps into 3 REGs in the frequency domain on the REGs not assigned to PCFICH over the whole system bandwidth,	Mapping rule is specified in TS36.211[8] Section 6.9.3 (Note 2) - CELL_ID = 0 - Ng = 1 - Normal PHICH duration -Number of PHICH groups = 1(BW=1.4MHz)/2(BW=3MHz)/ 4(BW=5MHz)/7(BW=10MHz)/ 10(BW=15MHz)/13(BW=20MHz)
PDCCH	For normal subframes(0,4,5,9) Symbols 0, 1, 2, 3 of each subframe for 1.4 MHz Symbols 0, 1, 2, of each subframe for 3 and 5 MHz Symbols 0, 1 of each subframe for 10, 15 and 20 MHz For special subframe (1&6) Symbols 0, 1 of each subframe for all BWs	The remaining REGs not allocated to both PCFICH and PHICH are used for PDCCH	Mapping rule is specified in TS36.211[8] Section 6.8.5 (Note 2)
PDSCH	,All remaining OFDM symbols of each subframe not allocated to PDCCH with the following exception: For 1.4MHz,no data shall be scheduled on special subframes (1&6) to avoid problems with insufficient PDCCH performance	For Subframe 0, REs not allocated to RS, SSS and PBCH, is allocated to PDSCH For Subframe 5, REs not allocated to RS and SSS, is allocated to PDSCH For Subframe 1 and 6, REs not allocated to RS, PSS, GP and UpPTS is allocated to PDSCH For other downlink subframes, REs not allocated to RS is allocated to PDSCH	Note that there are reserved REs that are not used for transmission of any physical channels (Note 4) & (Note 5) which need to be taken into account when allocating REs to PDSCH
Note 1: The mapping is based on the default TDD configuration for subframe assignment and special subframe patterns (see 36.508 [7]subclause 4.6.3) Note 2: In case a single cell-specific RS is configured, cell-specific RS shall be assume to be present on antenna ports 0 and 1 for the purpose of mapping a symbol-quadruplet to a REG (resource-element group). (See TS			

36.211[8] Section 6.2.4). Note 3: PBCH is mapped into RE assuming RS from 4 antennas are used at the eNB transmitter, irrespective of the actual number of Tx antenna. Resource elements assumed to be reserved for RS but not used for transmission of RS shall not be used for transmission of any physical channel. (See TS 36.211[8] Section 6.6.4). Note 4: In slot 1,2,11 and 12 of each radio frame, there are reserved REs for PSS and SSS that are not used for transmission of any physical channels. (See TS 36.211[8] Section 6.11.1.2 & 6.11.2.2). Note 5: REs used for RS transmission on any of the antenna ports in a slot shall not be used for any transmission on any other antenna port in the same slot and set to zero. (See TS 36.211[8] Section 6.10.1.2).

C.2 Set-up

Table C.2-1 describes the downlink Physical Channels that are required for connection set up.

Table C.2-1: Downlink Physical Channels required for connection set-up

Physical Channel	EPRE Ratio	Note
PBCH	PBCH_RA = 0 dB	
	PBCH_RB = 0 dB	
PSS	PSS_RA = 0 dB	
SSS	SSS_RA = 0 dB	
PCFICH	PCFICH_RB = 0 dB	
PDCCH	PDCCH_RA = 0 dB	
	PDCCH_RB = 0 dB	
PDSCH	PDSCH_RA = 0 dB	
	PDSCH_RB = 0 dB	
PHICH	PHICH_RA = 0 dB	Note 2
	PHICH_RB = 0 dB	
Note 1: No boosting is applied. Note 2: PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group.		

Table C.2-2 describes the configuration of PDSCH and PDCCH before measurement for FDD and Table C.2-3 for TDD.

Table C.2-2: PDSCH and PDCCH configuration for FDD

Parameter	Unit	Value	Comments
Allocated resource blocks		6	
MCS Index		-	TB Size with transmitting message in 1TTI
Number of HARQ processes	Processes	8	
Maximum number of HARQ transmission		5	
Aggregation level	CCE	2	Note 4
DCI Format for PDSCH		Format 1A	
DCI Format for PUSCH		Format 0	
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz. Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]. Note 3: The PDSCH shall be occupied 6 resource blocks centred on the DC subcarrier. Note 4: For PDCCH using SI-RNTI, Aggregation level: a)Tables C.3.0-3, C.3.1-3, and C.3.2-3 for RF tests b)Table A.2.1-1 of 36.521-3 for RRM tests.			

Table C.2-3: PDSCH and PDCCH configuration for TDD

Parameter	Unit	Value	Comments
Allocated resource blocks		6	
MCS Index		0	TB Size with transmitting message in 1TTI
Number of HARQ processes (Note 1)	Processes	7	
Maximum number of HARQ transmission		4	
Aggregation level	CCE	2	Note 5
DCI Format for PDSCH		Format 1A	
DCI Format for PUSCH		Format 0	
Note 1: Number of HARQ processes shall be determined by UL/DL configuration, for configuration other than 1,the process number shall be set per TS 36.213 [10] Table 8-1. Note 2: For normal downlink subframes, 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs. Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]. Note 4: The PDSCH shall be occupied 6 resource blocks centred on the DC subcarrier. Note 5: For PDCCH using SI-RNTI, Aggregation level: a)Tables C.3.0-3, C.3.1-3, and C.3.2-3 for RF tests b)Table A.2.2-1 of 36.521-3 for RRM tests			

C.3 Connection

The following clauses describes the downlink Physical Channels that are transmitted during a connection i.e., when measurements are done.

C.3.0 Measurement of Transmitter Characteristics

Table C.3.0-1 is applicable for measurements on the Transmitter Characteristics (clause 6).

Table C.3.0-1: Downlink Physical Channels transmitted during a connection (FDD and TDD)

Physical Channel	EPRE Ratio	Note
PBCH	PBCH_RA = 0 dB	
	PBCH_RB = 0 dB	
PSS	PSS_RA = 0 dB	
SSS	SSS_RA = 0 dB	
PCFICH	PCFICH_RB = 0 dB	
PDCCH	PDCCH_RA = 0 dB	
	PDCCH_RB = 0 dB	
PDSCH	PDSCH_RA = 0 dB	
	PDSCH_RB = 0 dB	
PHICH	PHICH_RB = 0 dB	Note 1
Note 1: PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group.		

NOTE 1: No boosting is applied.

Table C.3.0-2: Power allocation for OFDM symbols and reference signals

Parameter	Unit	Value	Note
Transmitted power spectral density I_{or}	dBm/15 kHz	Test specific	1. I_{or} shall be kept constant throughout all OFDM symbols
Cell-specific reference signal power ratio E_{RS}/I_{or}		0 dB	

Table C.3.0-3: PDCCH Aggregation Level (in CCE-s)

Bandwidth	DCI for DL (SI-RNTI)	DCI for DL (C-RNTI)	DCI for UL (C-RNTI)	Notes
1.4 MHz	4	1	1	Note 1
3 MHz	4	4	4	Note 1
5 MHz	4	4	4	Note 1
10 MHz	8	8	8	Note 1
15 MHz	8	8	8	Note 1
20 MHz	8	8	8	Note 1
Note 1: No DL data allocated on TDD special subframes				

C.3.1 Measurement of Receiver Characteristics

Table C.3.1-1 is applicable for measurements on the Receiver Characteristics (clause 7).

Table C.3.1-1: Downlink Physical Channels transmitted during a connection (FDD and TDD)

Physical Channel	EPRE Ratio	Note
PBCH	PBCH_RA = 0 dB	
	PBCH_RB = 0 dB	
PSS	PSS_RA = 0 dB	
SSS	SSS_RA = 0 dB	
PCFICH	PCFICH_RB = 0 dB	
PDCCH	PDCCH_RA = 0 dB	
	PDCCH_RB = 0 dB	
PDSCH	PDSCH_RA = 0 dB	
	PDSCH_RB = 0 dB	
PHICH	PHICH_RB = 0 dB	Note 1
OCNG	OCNG_RA = 0 dB	
	OCNG_RB = 0 dB	
Note 1: PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group.		

NOTE 1: No boosting is applied.

Table C.3.1-2: Power allocation for OFDM symbols and reference signals

Parameter	Unit	Value	Note
Transmitted power spectral density I_{or}	dBm/15 kHz	Test specific	1. I_{or} shall be kept constant throughout all OFDM symbols
Cell-specific reference signal power ratio E_{RS} / I_{or}		0 dB	

Table C.3.1-3: PDCCH Aggregation Level (in CCE-s)

Bandwidth	DCI for DL (SI-RNTI)	DCI for DL (C-RNTI)	DCI for UL (C-RNTI)	Notes
1.4 MHz	4	4	2	Note 1, 2
3 MHz	4	4	2	Note 2
5 MHz	8	8	4	Note 2
10 MHz	8	8	8	Note 2
15 MHz	8	8	8	Note 2
20 MHz	8	8	8	Note 2
Note 1: No DL data allocated on TDD special subframes Note 2: No DL data allocated on subframe 5				

C.3.2 Measurement of Performance requirements

Table C.3.2-1 is applicable for measurements in which uniform RS-to-EPRE boosting for all downlink physical channels.

Table C.3.2-1: Downlink Physical Channels transmitted during a connection (FDD and TDD)

Physical Channel	EPRE Ratio	Note
PBCH	PBCH_RA = $\rho_A + \sigma$	
	PBCH_RB = $\rho_B + \sigma$	
PSS	PSS_RA = 0 (Note 4)	
SSS	SSS_RA = 0 (Note 4)	
PCFICH	PCFICH_RB = $\rho_B + \sigma$	
PDCCH	PDCCH_RA = $\rho_A + \sigma$	
	PDCCH_RB = $\rho_B + \sigma$	
PDSCH	PDSCH_RA = ρ_A	
	PDSCH_RB = ρ_B	
PMCH	PMCH_RA = ρ_A	
	PMCH_RA = ρ_B	
MBSFN RS	MBSFN RS_RA = ρ_A	
	MBSFN RS_RA = ρ_B	
PHICH	PHICH_RB = $\rho_B + \sigma$	Note 1
OCNG	OCNG_RA = $\rho_A + \sigma$	
	OCNG_RB = $\rho_B + \sigma$	
Note 1: PHICH group power, i.e. the total power of all active PHICH sequences within a PHICH group.		

NOTE 1: ρ_A denotes the ratio of PDSCH EPRE to cell-specific RS EPRE among PDSCH REs in all the OFDM symbols not containing cell-specific RS. ρ_B denotes the ratio of PDSCH EPRE to cell-specific RS EPRE among PDSCH REs in all the OFDM symbols containing cell-specific RS.

NOTE 2: $\rho_A = \rho_B = 0$ dB means no RS boosting.

NOTE 3: MBSFN RS and OCNG are not defined downlink physical channels in [8].

NOTE 4: Assuming PSS and SSS transmitted on a single antenna port.

NOTE 5: $\rho_{A,}$ $\rho_{B,}$ and σ are test specific, $\sigma = 0$ dB otherwise.

NOTE 6: For TM8 and TM9 ρ_A and ρ_B are used for the purpose of the test set up only.

Table C.3.2-2: Power allocation for OFDM symbols and reference signals

Parameter	Unit	Value	Note
Total transmitted power spectral density I_{or}	dBm/15 kHz	Test specific	1. I_{or} shall be kept constant throughout all OFDM symbols
Cell-specific reference signal power ratio E_{RS} / I_{or}		Test specific	1. Applies for antenna port *p*
Energy per resource element EPRE		Test specific	1. The complex-valued symbols $y^{(p)}(i)$ and $a_{k,l}^{(p)}$ defined in [8] shall conform to the given EPRE value. 2. For TM8 and TM9 the reference point for EPRE is before the precoder in Annex B.4.

Table C.3.2-3: PDCCH Aggregation Level (in CCE-s) for PDSCH demodulation and PMI performance tests

Bandwidth	DCI for DL (SI-RNTI)	DCI for DL (C-RNTI)	DCI for UL (C-RNTI)	Notes
1.4 MHz	4	4	2	Note 1, 2
3 MHz	4	4	2	Note 2
5 MHz	8	8	4	Note 2
10 MHz	8	8	8	Note 2
15 MHz	8	8	8	Note 2
20 MHz	8	8	8	Note 2
Note 1: No DL data allocated on TDD special subframes Note 2: No DL data allocated on subframe 5				

Table C.3.2-4: PDCCH Aggregation Level for CQI and RI performance tests (in CCE-s)

Bandwidth	DCI for DL (SI-RNTI)	DCI for DL (C-RNTI)	DCI for UL (C-RNTI)	Notes
1.4 MHz				
3 MHz				
5 MHz				
10 MHz	8	8	8	Note 1,2
15 MHz				
20 MHz				
Note 1: 3 symbols allocated to PDCCH Note 2: No DL data allocated on subframes 0 and 5 for FDD and 0, 1, 5 and 6 for TDD				

Table C.3.2-5: PDCCH Aggregation Level for sustained downlink data rate performance tests (in CCE-s)

Bandwidth	DCI for DL (SI-RNTI)	DCI for DL (C-RNTI)	DCI for UL (C-RNTI)	Notes
1.4 MHz				
3 MHz				
5 MHz				
10 MHz	4	4	4	Note 1,2,4
15 MHz	4	8	4	Note 1,3,4
20 MHz	8	8	8	Note 1,3,4
Note 1: 1 symbol allocated to PDCCH Note 2: On subframe 5 Aggregation level 2 is used to transmit DCI for DL(C-RNTI) and UL(C-RNTI). Note 3: On subframe 5, Aggregation level 4 is used to transmit DCI for DL(C-RNTI) and UL(C-RNTI). Note 4: No DL data allocated on subframes 1 for TDD.				

C.3.3 Aggressor cell power allocation for Measurement of Performance Requirements when ABS is Configured

For the performance requirements and channel state information reporting when ABS is configured, the power allocation for the physical channels of the aggressor cell in non-ABS and ABS is listed in Table C.3.3-1.

Table C.3.3-1: Downlink physical channels transmitted in aggressor cell when ABS is configured in this cell

Physical Channel	Parameters	Unit	EPRE Ratio	
			Non-ABS	ABS
PBCH	PBCH_RA	dB	ρ_A	Note 1
	PBCH_RB	dB	ρ_B	Note 1
PSS	PSS_RA	dB	ρ_A	Note 1
SSS	SSS_RA	dB	ρ_A	Note 1
PCFICH	PCFICH_RB	dB	ρ_B	Note 1
PHICH	PHICH_RA	dB	ρ_A	Note 1
	PHICH_RB	dB	ρ_B	Note 1
PDCCH	PDCCH_RA	dB	ρ_A	Note 1
	PDCCH_RB	dB	ρ_B	Note 1
PDSCH	PDSCH_RA	dB	N/A	Note 1
	PDSCH_RB	dB	N/A	Note 1
OCNG	OCNG_RA	dB	ρ_A	Note 1
	OCNG_RB	dB	ρ_B	Note 1
Note 1: $-\infty$ dB is allocated for this channel in this test.				

Table C.3.3-2: Downlink physical channels transmitted in aggressor cell when ABS is configured in this cell when the CRS assistance information is provided

Physical Channel	Parameters	Unit	EPRE Ratio	
			Non-ABS	ABS
PBCH	PBCH_RA	dB	ρ_A	ρ_A
	PBCH_RB	dB	ρ_B	ρ_B
PSS	PSS_RA	dB	ρ_A	ρ_A
SSS	SSS_RA	dB	ρ_A	ρ_A
PCFICH	PCFICH_RB	dB	ρ_B	Note 1
PHICH	PHICH_RA	dB	ρ_A	Note 1
	PHICH_RB	dB	ρ_B	Note 1
PDCCH	PDCCH_RA	dB	ρ_A	Note 1
	PDCCH_RB	dB	ρ_B	Note 1
PDSCH	PDSCH_RA	dB	N/A	Note 1
	PDSCH_RB	dB	N/A	Note 1
OCNG	OCNG_RA	dB	ρ_A	Note 1
	OCNG_RB	dB	ρ_B	Note 1
Note 1: $-\infty$ dB is allocated for this channel in this test.				

Annex D (normative): Characteristics of the Interfering Signal

D.1 General

Some RF performance requirements for the E-UTRA UE receiver are defined with interfering signals present in addition to the wanted signal. When the wanted channel band width is wider than or equal to 5MHz, a modulated 5MHz full band width E-UTRA down link signal, and in some cases an additional CW signal, are used. For wanted channel band widths below 5MHz, the band width of the modulated interferer should be equal to the channel band width of the wanted signal.

D.2 Interference signals

Table D.2-1 describes the modulated interferer for different channel band width options.

Table D.2-1: Description of modulated E-UTRA interferer

	Channel bandwidth					
	1.4 MHz	**3 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
RB	6	15	25	25	25	25
$BW_{Interferer}$	1.4 MHz	3 MHz	5 MHz	5 MHz	5 MHz	5 MHz

Annex E (normative): Global In-Channel TX-Test

Note: Clauses E.2.2 to E.5.9.3 are descriptions, which assume no power ramping adjacent to the measurement period. *Power ramping adjacent to the measurement period requires exclusion periods, described in clause E.7*

E.1 General

The global in-channel TX test enables the measurement of all relevant parameters that describe the in-channel quality of the output signal of the TX under test in a single measurement process.

The parameters describing the in-channel quality of a transmitter, however, are not necessarily independent. The algorithm chosen for description inside this annex places particular emphasis on the exclusion of all interdependencies among the parameters.

E.2 Signals and results

E.2.1 Basic principle

The process is based on the comparison of the actual **output signal of the TX under test**, received by an ideal receiver, with a **reference signal**, that is generated by the measuring equipment and represents an ideal error free received signal. All signals are represented as equivalent (generally complex) baseband signals.

The description below uses numbers as examples. These numbers are taken from frame structure 1 with normal CP length and 20 MHz bandwidth. The application of the text below, however, is not restricted to this frame structure and bandwidth.

E.2.2 Output signal of the TX under test

The output signal of the TX under test is acquired by the measuring equipment and stored for further processing. It is sampled at a sampling rate of 30.72 Msps. In the time domain it comprises at least 10 uplink subframes. The measurement period is derived by concatenating the correct number of individual uplink slots until the correct measurement period is reached. The output signal is named $z(\nu)$. Each slot is modelled as a signal with the following parameters: demodulated data content, carrier frequency, amplitude and phase for each subcarrier, timing, carrier leakage.

NOTE 1: TDD

For frame structure type 2, subframes with special fields (UpPTS) do not undergo any evaluation. Since the uplink subframes are not continuous, the 20 slots should be extracted from more than 1 continuous radio frame:

Figure E.2.2-1 is an example for uplink-downlink configuration 1 (DSUUDDSUUD) as specified in TS 36.211 [8] Table 4.2-2,assuming all uplink subframes are active.

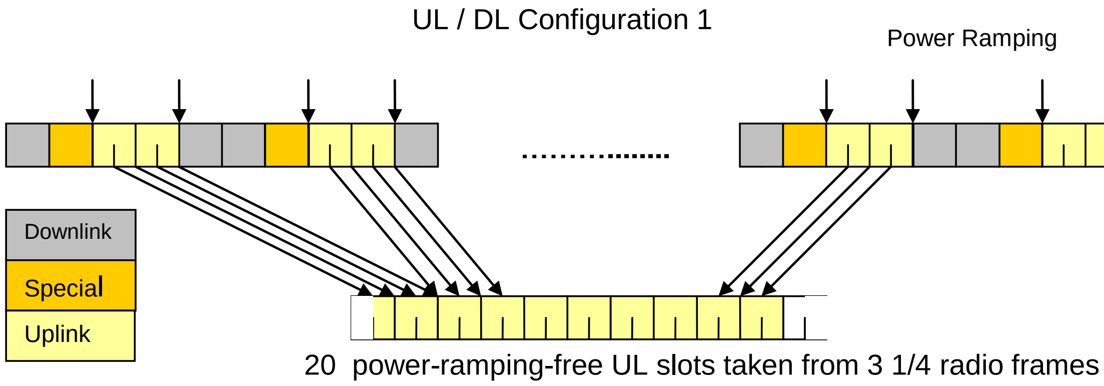


Figure E.2.2-1: Example of uplink – downlink configuration 1

E.2.3 Reference signal

Two types of reference signal are defined:

The reference signal $i_1(\nu)$ is constructed by the measuring equipment according to the relevant TX specifications, using the following parameters: demodulated data content, nominal carrier frequency, nominal amplitude and phase for each subcarrier, nominal timing, no carrier leakage. It is represented as a sequence of samples at a sampling rate of 30.72 Msps in the time domain.

The reference signal $i_2(\nu)$ is constructed by the measuring equipment according to the relevant TX specifications, using the following parameters: restricted data content: nominal reference symbols, (all modulation symbols for user data symbols are set to 0V) , nominal carrier frequency, nominal amplitude and phase for each applicable subcarrier, nominal timing, no carrier leakage. It is represented as a sequence of samples at a sampling rate of 30.72 Msps in the time domain.

NOTE: The PUCCH is off during the time under test.

E.2.4 Measurement results

The measurement results, achieved by the global in channel TX test are the following:

- Carrier Frequency error
- EVM (Error Vector Magnitude)
- Carrier leakage
- Unwanted emissions, falling into non allocated resource blocks.
- EVM equalizer spectrum flatness

E.2.5 Measurement points

The unwanted emission falling into non-allocated RB(s) is calculated directly after the FFT as described below. In contrast to this, the EVM for the allocated RB(s) is calculated after the IDFT. The samples after the TX-RX chain equalizer are used to calculate EVM equalizer spectrum flatness. Carrier frequency error and carrier leakage is calculated in the block “RF correction”.

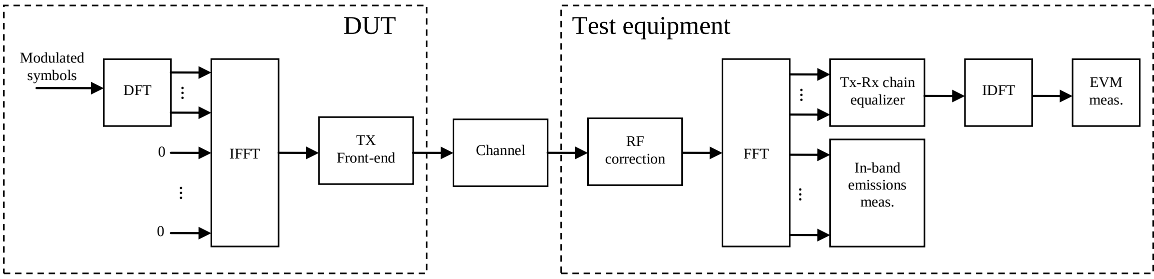


Figure E.2.5-1: EVM measurement points

E.3 Signal processing

E.3.1 Pre FFT minimization process

Before applying the pre-FFT minimization process, z(ν) and i(ν) are portioned into 20 pieces, comprising one slot each. Each slot is processed separately. Sample timing, Carrier frequency and baseband-I/Q offset (corresponding carrier leakage in RF) in z(ν) are jointly varied in order to minimise the difference between z(ν) and i(ν). Best fit (minimum difference) is achieved when the RMS difference value between z(ν) and i(ν) is an absolute minimum.

The carrier frequency variation and the IQ variation are the measurement results: Carrier Frequency Error and Carrier leakage.

From the acquired samples 20 carrier frequencies and 20 carrier leakages can be derived.

NOTE 1: The minimisation process, to derive carrier leakage and RF error can be supported by Post FFT operations. However the minimisation process defined in the pre FFT domain comprises all acquired samples (i.e. it does not exclude the samples in between the FFT widths and it does not exclude the bandwidth outside the transmission bandwidth configuration

NOTE 2: The algorithm would allow to derive Carrier Frequency error and Sample Frequency error of the TX under test separately. However there are no requirements for Sample Frequency error. Hence the algorithm models the RF and the sample frequency commonly (not independently). It returns one error and does not distinguish between both.

After this process the samples z(ν) are called $z^0(\nu)$.

E.3.2 Timing of the FFT window

The FFT window length is 2048 samples per OFDM symbol. 7 FFTs (14336 samples) cover less than the acquired number of samples (15360 samples) The position in time for FFT must be determined.

In an ideal signal, the FFT may start at any instant within the cyclic prefix without causing an error. The TX filter, however, reduces the window. The EVM requirements shall be met within a window W<CP. There are three different instants for FFT:

Centre of the reduced window, called $\Delta\tilde{c}$, $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2.

The timing of the measured signal is determined in the pre FFT domain as follows, using $z^0(\nu)$ and $i_2(\nu)$:

1. The measured signal is delay spread by the TX filter. Hence the distinct boarders between the OFDM symbols and between Data and CP are also spread and the timing is not obvious.

2. In the Reference Signal $i_2(\nu)$ the timing is known.

3. Correlation between (1.) and (2.) will result in a correlation peak. The meaning of the correlation peak is approx. the “impulse response” of the TX filter. The meaning of “impulse response” assumes that the autocorrelation of the reference signal $i_2(\nu)$ is a Dirac peak and that the correlation between the reference signal $i_2(\nu)$ and the data

in the measured signal is 0. The correlation peak, (the highest, or in case of more than one, the earliest) indicates the timing in the measured signal.

From the acquired samples 20 timings can be derived.

For all calculations, except EVM, the number of samples in $z^0(\nu)$ is reduced to 7 blocks of samples, comprising 2048 samples (FFT width) and starting with $\Delta\tilde{c}$ in each OFDM symbol including the demodulation reference signal.

For the EVM calculation the output signal under test is reduced to 14 blocks of samples, comprising 2048 samples (FFT width) and starting with $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2 in each OFDM symbol including the demodulation reference signal.

The number of samples, used for FFT is reduced compared to $z^0(\nu)$. This subset of samples is called z'(ν).

The timing of the centre $\Delta\tilde{c}$ with respect to the different CP length in a slot is as follows: (Frame structure 1, normal CP length)

$\Delta\tilde{c}$ is on T_f=72 within the CP of length 144 (in OFDM symbol 1 to 6)

$\Delta\tilde{c}$ is on T_f=88 (=160-72) within the CP of length 160 (in OFDM symbol 0)

E.3.3 Post FFT equalisation

Perform 7 FFTs on z'(ν), one for each OFDM symbol in a slot using the timing $\Delta\tilde{c}$, including the demodulation reference symbol. The result is an array of samples, 7 in the time axis t times 2048 in the frequency axis f. The samples represent the DFT coded data symbols (in OFDM-symbol 0,1,2,4,5and 6 in each slot) and demodulation reference symbols (OFDM symbol 3 in each slot) in the allocated RBs and inband emissions in the non allocated RBs within the transmission BW.

Only the allocated resource blocks in the frequency domain are used for equalisation.

The nominal demodulation reference symbols and nominal DFT coded data symbols are used to equalize the measured data symbols. (Location for equalization see Figure E.2.5-1)

NOTE: The nomenclature inside this note is local and not valid outside.

The nominal DFT coded data symbols are created by a demodulation process. The location to gain the demodulated data symbols is "EVM" in Figure E.2.5-1. A demodulation process as follows is recommended:

1. Equalize the measured DFT coded data symbols using the reference symbols for equalisation. Result: Equalized DFT coded data symbols
2. iDFT transform the equalized DFT coded data symbols: Result: Equalized data symbols
3. Decide for the nearest constellation point: Result: Nominal data symbols
4. DFT transform the nominal data symbols: Result: Nominal DFT coded data symbols

At this stage we have an array of Measured DFT coded data-Symbols and reference-Symbols (MS(f,t))

versus an array of Nominal DFT coded data-Symbols and reference Symbols (NS(f,t))

(complex, the arrays comprise 6 DFT coded data symbols and 1 demodulation reference symbol in the time axis and the number of allocated subcarriers in the frequency axis.)

MS(f,t) and NS(f,t) are processed with a least square (LS) estimator, to derive one equalizer coefficient per time slot and per allocated subcarrier. EC(f)

$$EC(f) = \frac{\sum_{t=0}^{6} NS(f,t)^* NS(f,t)}{\sum_{t=0}^{6} NS(f,t)^* MS(f,t)}$$

With * denoting complex conjugation.

EC(f) are used to equalize the DFT-coded data symbols. The measured DFT-coded data and the references symbols are equalized by:

$$Z'(f,t) = MS(f,t) \cdot EC(f)$$

With $\cdot$ denoting multiplication.

Z'(f,t), restricted to the data symbol (excluding t=3) is used to calculate EVM, as described in E.4.1.

EC(f) is used in E.4.4 to calculate EVM equalizer spectral flatness.

NOTE: although an exclusion period for EVM may be applicable in E.7, the post FFT minimisation process is done over 7 symbols (6 DFT-coded data symbols and 1 reference symbol).

The samples of the non allocated resource blocks within the transmission bandwidth configuration in the post FFT domain are called Y(f,t) (f covering the non allocated subcarriers within the transmission bandwidth configuration, t covering the OFDM symbols during 1 slot).

E.4 Derivation of the results

E.4.1 EVM

For EVM create two sets of Z'(f,t)., according to the timing " $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2" using the equalizer coefficients from E.3.3.

Perform the iDFTs on Z'(f,t). The IDFT-decoding preserves the meaning of t but transforms the variable f (representing the allocated sub carriers) into an another variable g, covering the same count and representing the demodulated symbols. The samples in the post IDFT domain are called iZ'(g, t). The equivalent ideal samples are called iI(g,t). Those samples of Z'(f,t), carrying the reference symbols (=symbol 3) are not iDFT processed.

The EVM is the difference between the ideal waveform and the measured and equalized waveform for the allocated RB(s)

$$EVM = \sqrt{\frac{\sum_{t \in T} \sum_{g \in G} \left| iZ'(g,t) - iI(g,t) \right|^2}{|G| \cdot |T| \cdot P_0}} ,$$

where

t covers the count of demodulated symbols with the considered modulation scheme being active within the measurement period, (i.e. symbol 0,1,2,4,5and 6 in each slot, →|T|=6)

g covers the count of demodulated symbols with the considered modulation scheme being active within the allocated bandwidth. (|G|=12* L_{CRBs} (with L_{CRBs} : number of allocated resource blocks)).

$iZ'(g,t)$ are the samples of the signal evaluated for the EVM.

$iI(g,t)$ is the ideal signal reconstructed by the measurement equipment, and

P_0 is the average power of the ideal signal. For normalized modulation symbols P_0 is equal to 1.

From the acquired samples 40 EVM value can be derived, 20 values for the timing $\Delta\tilde{c}$ –W/2 and 20 values for the timing $\Delta\tilde{c}$ +W/2

E.4.2 Averaged EVM

EVM is averaged over all basic EVM measurements.

The averaging comprises 20 UL slots (for frame structure 2: excluding special fields(UpPTS))

$$\overline{EVM} = \sqrt{\frac{1}{20}\sum_{i=1}^{20} EVM_i^2}$$

The averaging is done separately for timing¦ $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2 leading to $\overline{\mathrm{EVM}}_l$ and $\overline{\mathrm{EVM}}_h$

$EVM_{\mathrm{final}} = \max(\overline{\mathrm{EVM}}_l, \overline{\mathrm{EVM}}_h)$ is compared against the test requirements.

E.4.3 In-band emissions measurement

The in-band emissions are a measure of the interference falling into the non-allocated resources blocks.

Explanatory Note:

The inband emission measurement is only meaningful with allocated RBs next to non allocated RB. The allocated RBs are necessary but not under test. The non allocated RBs are under test. The RB allocation for this test is as follows: The allocated RBs are at one end of the channel BW, leaving the other end unallocated. The number of allocated RBs is smaller than half of the number of RBs, available in the channel BW. This means that the vicinity of the carrier in the centre is unallocated.

There are 3 types of inband emissions:

1. General
2. IQ image
3. Carrier leakage

Carrier leakage are inband emissions next to the carrier.

IQ image are inband emissions symmetrically (with respect to the carrier) on the other side of the allocated RBs.

General are applied to all unallocated RBs.

For each evaluated RB, the minimum requirement is calculated as the higher of P_{RB} - 30 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply.

In specific the following combinations:

- Power (General)
- Power (General + Carrier leakage)
- Power (General + IQ Image)

 1 and 2 is expressed in terms of power in one non allocated RB under test, normalized to the average power of an allocated RB (unit dB).

 3 is expressed in terms of power in one non allocated RB, normalized to the power of all allocated RBs. (unit dBc).

This is the reason for two formulas $Emissions_{relative}$.

Create one set of Y(t,f) per slot according to the timing “ $\Delta\tilde{c}$ ”

For the non-allocated RBs below the in-band emissions are calculated as follows

$$Emissions_{absolute}(\Delta_{RB}) = \begin{cases} \dfrac{1}{|T_s|}\sum_{t \in T_s} \sum_{\max(f_{\min},(c_l+12\cdot\Delta_{RB}*\Delta f))}^{c_l+(12\cdot\Delta_{RB}+11)*\Delta f} |Y(t,f)|^2, \Delta_{RB} < 0 \\ \dfrac{1}{|T_s|}\sum_{t \in T_s} \sum_{c_h+(12\cdot\Delta_{RB}-11)*\Delta f}^{\min(f_{\max},(c_h+12\cdot\Delta_{RB}*\Delta f))} |Y(t,f)|^2, \Delta_{RB} > 0 \end{cases},$$

where

the upper formula represents the in band emissions below the allocated frequency block and the lower one the in band emissions above the allocated frequency block.

T_s is a set of $|T_s|$ SC-FDMA symbols with the considered modulation scheme being active within the measurement period,

Δ_{RB} is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ for the first upper or $\Delta_{RB} = -1$ for the first lower adjacent RB),

$f_{\min}$ and $f_{\max}$ are the lower and upper edge of the UL transmission BW configuration,

c_l and c_h are the lower and upper edge of the allocated BW,

Δf is 15kHz,and

$Y(t, f)$ is the frequency domain signal evaluated for in-band emissions as defined in the subsection E.3.3

The allocated RB power per RB and the total allocated RB power are given by:

$$P_{RB} = \frac{1}{|T_s| \cdot L_{CRBs}} \sum_{t \in T_s} \sum_{c_l}^{c_l+(12\cdot L_{CRBs}-1)*\Delta f} |MS(t,f)|^2 \text{ [dBm/180 kHz]}$$

$$P_{All-RBs} = \frac{1}{|T_s|} \sum_{t \in T_s} \sum_{c_l}^{c_l+(12\cdot L_{CRBs}-1)*\Delta f} |MS(t,f)|^2 \text{ [dBm]}$$

The relative in-band emissions, applicable for General and IQ image, are given by:

$$Emissions_{relative}(\Delta_{RB}) = 10 \cdot \log_{10}\left(\frac{Emissions_{absolute}(\Delta_{RB})}{\frac{1}{|T_s| \cdot L_{CRBs}} \sum_{t \in T_s} \sum_{c_l}^{c_l+(12\cdot L_{CRBs}-1)*\Delta f} |MS(t,f)|^2}\right) \text{[dB]}$$
$$= Emissions_{absolute}(\Delta_{RB}) \text{ [dBm/180 kHz]} - P_{RB} \text{ [dBm/180 kHz]}$$

where

L_{CRBs} is the number of allocated resource blocks,

and

$MS(t, f)$ is the frequency domain samples for the allocated bandwidth, as defined in the subsection E.3.3.

The relative in-band emissions, applicable for carrier leakage, is given by:

$$Emissions_{relative} = 10 \cdot \log_{10}\left(\frac{Emissions_{absolute}(RBnextDC)}{\frac{1}{|T_s|}\sum_{t \in T_s}\sum_{c_1}^{c_1+(12 \cdot L_{CRBs}-1)*\Delta f}|\mathrm{MS}(t,f)|^2}\right)[\mathrm{dBc}]$$
$$= Emissions_{absolute}(RBnextDC)\,[\mathrm{dBm/180\,kHz}] - P_{All-RBs}\,[\mathrm{dBm}]$$

where RBnextDC means: Resource Block next to the carrier.

This is one RB, namely the central one in case of an odd number of RBs in the channel BW.

This is one pair of RBs, namely the immediately adjacent RBs to the carrier in case of an even number of RBs in the channel BW.

Although an exclusion period may be applicable in the time domain, when evaluating EVM (clause E.7), the inband emissions measurement interval is defined over one complete slot in the time domain.

From the acquired samples 20 functions for general in band emissions and IQ image inband emissions can be derived. 20 values or 20 pairs of carrier leakage inband emissions can be derived. They are compared against different limits.

E.4.4 EVM equalizer spectrum flatness

For EVM equalizer spectrum flatness use EC(f) as defined in E.3.3. Note, EC(f) represents equalizer coefficient $f \in F$, f is the allocated subcarriers within the transmission bandwidth (($|F| = 12 * L_{CRBs}$)

From the acquired samples 20 functions EC(f) can be derived.

EC(f) is broken down to 2 functions:

$$\mathrm{EC}_1(\mathrm{f}),\ f \in Range\ \ 1$$

$$\mathrm{EC}_2(\mathrm{f}),\ f \in Range\ \ 2$$

Where Range 1 and Range 2 are as defined in Table 6.5.2.4.5-1 for normal condition and Table 6.5.2.4.5-2 for extreme condition

The following peak to peak ripple is calculated:

$\mathrm{RP}_1 = 20 * \log(\max(|\mathrm{EC}_1(\mathrm{f})|)/\min(|\mathrm{EC}_1(\mathrm{f})|))$,which denote the maximum ripple in Range 1

$\mathrm{RP}_2 = 20 * \log(\max(|\mathrm{EC}_2(\mathrm{f})|)/\min(|\mathrm{EC}_2(\mathrm{f})|))$,which denote the maximum ripple in Range 2

$\mathrm{RP}_{12} = 20 * \log(\max(|\mathrm{EC}_1(\mathrm{f})|)/\min(|\mathrm{EC}_2(\mathrm{f})|))$,which denote the maximum ripple between the upper side of Range 1 and lower side of Range 2

$\mathrm{RP}_{21} = 20 * \log(\max(|\mathrm{EC}_2(\mathrm{f})|)/\min(|\mathrm{EC}_1(\mathrm{f})|))$,which denote the maximum ripple between the upper side of Range 2 and lower side of Range 1

E.4.5 Frequency error and Carrier leakage

See E.3.1.

E.4.6 EVM of Demodulation reference symbols (EVM_{DMRS})

For the purpose of EVM_{DMRS}, the steps E.2.2 to E.4.2 are repeated 6 times, constituting 6 EVM_{DMRS} sub-periods. The only purpose of the repetition is to cover the longer gross measurement period of EVM_{DMRS} (120 time slots) and to derive the FFT window timing per sub-period.

The bigger of the EVM results in one 20 TS period corresponding to the timing¦ $\Delta\tilde{c}$ –W/2 or $\Delta\tilde{c}$ +W/2 is compared against the limit. (Clause E.4.2) This timing is re-used for EVM_{DMRS} in the equivalent EVM_{DMRS} sub-period.

For EVM the demodulation reference symbols are excluded, while the data symbols are used. For EVM_{DMRS} the data symbols are excluded, while the demodulation references symbols are used. This is illustrated in figure E.4.6-1

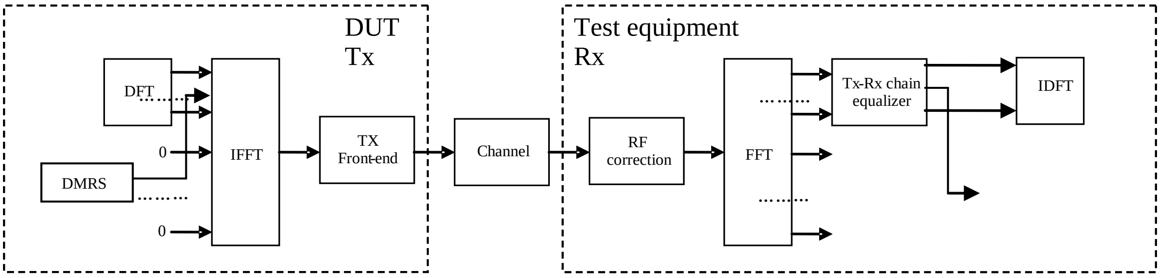


Figure E.4.6-1: EVM_{DMRS} measurement points

Re-use the following formula from E.3.3:

$$Z'(f,t) = MS(f,t) \cdot EC(f)$$

To calculate EVM_{DMRS} , the data symbol (t=0,1,2,4,5,6) in Z'(f,t) are excluded and only the reference symbol (t=3) is used.

The EVM_{DMRS} is the difference between the ideal waveform and the measured and equalized waveform for the allocated RB(s)

$$EVM_{DMRS} = \sqrt{\frac{\sum_{t \in T} \sum_{f \in F} \left| Z'(f,t) - I(f,t) \right|^2}{|T| \cdot P_0 \cdot |F|}},$$

where

t covers the count of demodulation reference symbols (i.e. only symbol 3 in each slot, so count =1)

f covers the count of demodulation reference symbols within the allocated bandwidth. (|F|=12* L_{CRBs} (with L_{CRBs} : number of allocated resource blocks)).

$Z'(f,t)$ are the samples of the signal evaluated for the EVM_{DMRS}

$I(f,t)$ is the ideal signal reconstructed by the measurement equipment, and

P_0 is the average power of the ideal signal. For normalized modulation symbols P_0 is equal to 1.

20 such results are generated per measurement sub-period.

E.4.6.1 1st average for EVM_{DMRS}

EVM_{DMRS} is averaged over all basic EVM_{DMRS} measurements in one sub-period

The averaging comprises 20 UL slots (for frame structure 2: excluding special fields(UpPTS))

$$1stEVM_{DMRS} = \sqrt{\frac{1}{20}\sum_{i=1}^{20} EVM_{DMRS_i}^2}$$

The timing is taken from the EVM for the data. 6 of those results are achieved from the samples. In general the timing is not the same for each result.

E.4.6.2 Final average for EVM $_{DMRS}$

$$finalEVM_{DMRS} = \sqrt{\frac{1}{6}\sum_{i=1}^{6} 1stEVM_{DMRS_i}^2}$$

E.5 EVM and inband emissions for PUCCH

For the purpose of worst case testing, the PUCCH shall be located on the edges of the Transmission Bandwidth Configuration (6,15,25,50,75,100 RBs).

The EVM for PUCCH (EVM_{PUCCH}) is averaged over 20 slots. At least 20 TSs shall be transmitted by the UE without power change. SRS multiplexing shall be avoided during this period. The following transition periods are applicable: One OFDM symbol on each side of the slot border (instant of band edge alternation).

The description below is generic in the sense that all 6 PUCCH formats are covered. Although the number of OFDM symbols in one slot is 6 or 7 (depending on the cyclic prefix length), the text below uses 7 without excluding 6.

E.5.1 Basic principle

The basis principle is the same as described in E.2.1

E.5.2 Output signal of the TX under test

The output signal of the TX under test is processed same as described in E.2.2

E.5.3 Reference signal

The reference signal is defined same as in E.2.3. Same as in E.2.3, $i_1(\nu)$ is the ideal reference for EVM_{PUCCH} and $i_2(\nu)$ is used to estimate the FFT window timing.

Note PUSCH is off during the PUCCH measurement period.

E.5.4 Measurement results

The measurement results are:

- EVM_{PUCCH}
- Inband emissions with the sub-results: General in-band emission, IQ image (according to: 36.101. Annex F.4, Clause starting with: "At this stage the ….")

E.5.5 Measurement points

The measurement points are illustrated in the figure below:

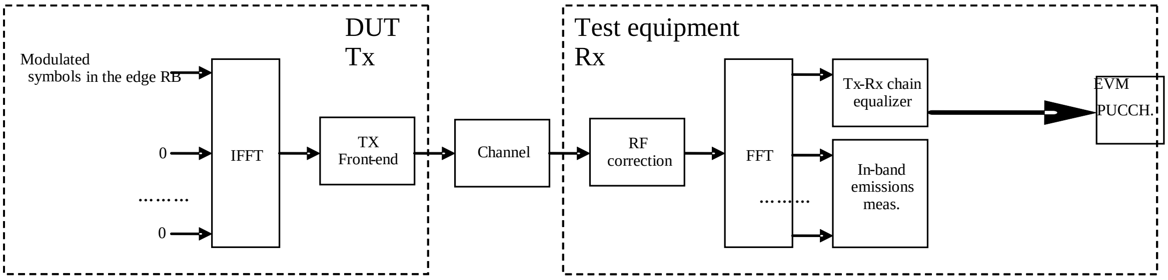


Figure E.5.5-1

E.5.6 Pre FFT minimization process

The pre FFT minimisation process is the same as describes in clause E.3.1.

NOTE: although an exclusion period for EVM_{PUCCH} is applicable in E.5.9.1, the pre FFT minimisation process is done over the complete slot.

RF error, and carrier leakage are necessary for best fit of the measured signal towards the ideal signal in the pre FFT domain. However they are not used to compare them against the limits.

E.5.7 Timing of the FFT window

Timing of the FFT window is estimated with the same method as described in E.3.2.

E.5.8 Post FFT equalisation

The post FFT equalisation is described separately without reference to E.3.3:

Perform 7 FFTs on z'(v), one for each OFDM symbol in a slot using the timing $\Delta\tilde{c}$, including the demodulation reference symbol. The result is an array of samples, 7 in the time axis t times 2048 in the frequency axis f. The samples represent the OFDM symbols (data and reference symbols) in the allocated RBs and inband emissions in the non allocated RBs within the transmission BW.

Only the allocated resource blocks in the frequency domain are used for equalisation.

The nominal reference symbols and **nominal** OFDM data symbols are used to equalize the measured data symbols.

Note: (The nomenclature inside this note is local and not valid outside)

The nominal OFDM data symbols are created by a demodulation process. A demodulation process as follows is recommended:

1. Equalize the measured OFDM data symbols using the reference symbols for equalisation. Result: Equalized OFDM data symbols

2. Decide for the nearest constellation point, however not independent for each subcarrier in the RB. 12 constellation points are decided dependent, using the applicable CAZAC sequence. Result: Nominal OFDM data symbols

At this stage we have an array of Measured data-Symbols and reference-Symbols (MS(f,t))

versus an array of Nominal data-Symbols and reference Symbols (NS(f,t))

The arrays comprise in sum 7 data and reference symbols, depending on the PUCCH format, in the time axis and the number of allocated sub-carriers in the frequency axis.

MS(f,t) and NS(f,t) are processed with a least square (LS) estimator, to derive one equalizer coefficient per time slot and per allocated subcarrier. EC(f)

$$EC(f) = \frac{\sum_{t=0}^{6} NS(f,t)^{*} NS(f,t)}{\sum_{t=0}^{6} MS(f,t)^{*} NS(f,t)}$$

With * denoting complex conjugation.

EC(f) are used to equalize the OFDM data together with the demodulation reference symbols by:

$$Z'(f,t) = MS(f,t) \cdot EC(f)$$

With · denoting multiplication.

Z'(f,t) is used to calculate EVM_{PUCCH}, as described in E.5.9 1

NOTE: although an exclusion period for EVM_{PUCCH} is applicable in E.5.9.1, the post FFT minimisation process is done over 7 OFDM symbols.

The samples of the non allocated resource blocks within the transmission bandwidth configuration in the post FFT domain are called Y(f,t) (f covering the non allocated subcarriers within the transmission bandwidth configuration, t covering the OFDM symbols during 1 slot).

E.5.9 Derivation of the results

E.5.9.1 EVM_{PUCCH}

For EVM_{PUCCH} create two sets of Z'(f,t)., according to the timing " $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2" using the equalizer coefficients from E.5.8

The EVM_{PUCCH} is the difference between the ideal waveform and the measured and equalized waveform for the allocated RB(s)

$$EVM_{PUCCH} = \sqrt{\frac{\sum_{t \in T} \sum_{f \in F} \left| Z'(f,t) - I(f,t) \right|^2}{|T| \cdot P_0 \cdot |F|}} ,$$

where

the OFDM symbols next to slot boarders (instant of band edge alternation) are excluded:

t covers less than the count of demodulated symbols in the slot (|T|= 5)

f covers the count of subcarriers within the allocated bandwidth. (|F|=12)

$Z'(f,t)$ are the samples of the signal evaluated for the EVM_{PUCCH}

$I(f,t)$ is the ideal signal reconstructed by the measurement equipment, and

P_0 is the average power of the ideal signal. For normalized modulation symbols P_0 is equal to 1.

From the acquired samples 40 EVM_{PUCCH} value can be derived, 20 values for the timing $\Delta\tilde{c}$ –W/2 and 20 values for the timing $\Delta\tilde{c}$ +W/2

E.5.9.2 Averaged EVM_{PUCCH}

EVM_{PUCCH} is averaged over all basic EVM_{PUCCH} measurements

The averaging comprises 20 UL slots (for frame structure 2: excluding special fields(UpPTS))

$$\overline{EVM}_{PUCCH} = \sqrt{\frac{1}{20}\sum_{i=1}^{20} EVM_{PUCCH_i}^{2}}$$

The averaging is done separately for timing $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2 leading to $\overline{EVM}_{PUCCH,low}$ and $\overline{EVM}_{PUCCH,high}$

$EVM_{PUCCH,\,final} = \max(\overline{EVM}_{PUCCH,low}, \overline{EVM}_{PUCCH,high}$ is compared against the test requirements.

E.5.9.3 In-band emissions measurement

The in-band emissions are a measure of the interference falling into the non-allocated resources blocks

Create one set of Y(t,f) per slot according to the timing " $\Delta\tilde{c}$ "

For the non-allocated RBs the in-band emissions are calculated as follows

$$Emissions_{absolute}(\Delta_{RB}) = \begin{cases} \dfrac{1}{|T_s|}\displaystyle\sum_{t\in T_s} \sum_{\max(f_{\min},(c_l+12\cdot\Delta_{RB}*\Delta f))}^{c_l+(12\cdot\Delta_{RB}+11)*\Delta f} |Y(t,f)|^2, \Delta_{RB} < 0 \\ \dfrac{1}{|T_s|}\displaystyle\sum_{t\in T_s} \sum_{c_h+(12\cdot\Delta_{RB}-11)*\Delta f}^{\min(f_{\max},(c_h+12\cdot\Delta_{RB}*\Delta f))} |Y(t,f)|^2, \Delta_{RB} > 0 \end{cases},$$

where

the upper formula represents the inband emissions below the allocated frequency block and the lower one the inband emissions above the allocated frequency block.

T_s is a set of $|T_s|$ OFDM symbols in the measurement period,

Δ_{RB} is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ for the first upper or $\Delta_{RB} = -1$ for the first lower adjacent RB),

$f_{\min}$ and $f_{\max}$ are the lower and upper edge of the UL system BW,

c_l and c_h are the lower and upper edge of the allocated BW,

Δf is 15kHz,and

$Y(t,f)$ is the frequency domain signal evaluated for in-band emissions as defined in the subsection E.5.8

The relative in-band emissions are, given by

$$Emissions_{relative}(\Delta_{RB}) = 10 * \log_{10} \frac{Emissions_{absolute}(\Delta_{RB})}{\dfrac{1}{|T_s|\cdot L_{CRBs}}\displaystyle\sum_{t\in T_s}\sum_{c_l}^{c_l+(12\cdot L_{CRBs}-1)*\Delta f} |MS(t,f)|^2}[dB]$$

where

L_{CRBs} is the number of allocated RBs, which is always 1 in case of PUCCH

and $MS(t,f)$ is the frequency domain samples for the allocated bandwidth, as defined in the subsection E.5.8

Although an exclusion period for EVM is applicable in E.5.9.1, the inband emissions measurement interval is defined over one complete slot in the time domain.

From the acquired samples 20 functions for inband emissions can be derived.

Since the PUCCH allocation is always on the upper or lower band-edge, the opposite to the allocated one represents the IQ image, and the remaining inner RBs represent the general inband emissions. They are compared against different limits.

E.6 EVM for PRACH

The description below is generic in the sense that all 5 PRACH formats are covered. The numbers, used in the text below are taken from PRACH format#0 without excluding the other formats. The sampling rate for the PUSCH, 30.72 Msps in the time domain, is re-used for the PRACH. The carrier spacing of the PUSCH is 12 (format 0 to 3) and 2 (format 4) times of the PRACH. This results in an oversampling factor of 12 (format 0 to 3) and 2 (format 4), when acquiring the time samples for the PRACH. The pre-FFT algorithms (clauses E.6.6 and E.6.7) use all time samples, although oversampled. For the FFT the time samples are decimated by the factor of 12 (format 0 to 3) and 2 (format 4), resulting in the same FFT size as for the other transmit modulation tests (2048). Decimation requires a decision, which samples are used and which ones are rejected. The algorithm in E.6.6, Timing of the FFT window, can also be used the decide about the used samples.

E.6.1 Basic principle

The basis principle is the same as described in E.2.1

E.6.2 Output signal of the TX under test

The output signal of the TX under test is processed same as described in E.2.2

The measurement period is different:

- 2 PRACH preambles are recorded for format 0and 1,
- 1 PRACH preamble is recorded for format 2 and 3, each containing 1 CP and 2 preamble sequences
- 10 RPRACH preambles are recorded for format 4.

E.6.3 Reference signal

The test description in 6.5.2.1.4.1A is based on non contention based access:

- PRACH configuration index (responsible for Preamble format, System frame number and subframe number)
- Preamble ID
- Preamble power

signalled to the UE, defines the reference signal unambiguously, such that no demodulation process is necessary to gain the reference signal.

The reference signal i(v) is constructed by the measuring equipment according to the relevant TX specifications, using the following parameters: the applicable Zadoff Chu sequence, nominal carrier frequency, nominal amplitude and phase for each subcarrier, nominal timing, no carrier leakage. It is represented as a sequence of samples at a sampling rate of 30.72 Msps in the time domain.

E.6.4 Measurement results

The measurement result is:

- EVMPRACH

E.6.5 Measurement points

The measurement points are illustrated in the figure below:

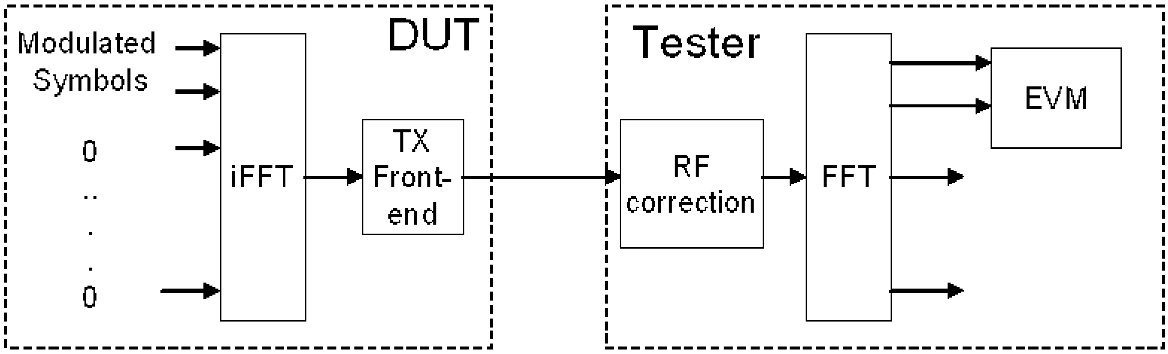


Figure E.6.5-1

E.6.6 Pre FFT minimization process

The pre-FFT minimization process is applied to each PRACH preamble separately. The time period for the pre- FFT minimisation process includes the complete CP and Zadoff-Chu sequence (in other words, the power transition period is per definition outside of this time period) Sample timing, Carrier frequency and I/Q offset in z(v) are jointly varied in order to minimise the difference between z(v) and i(v). Best fit (minimum difference) is achieved when the RMS difference value between z(v) and i(v) is an absolute minimum.

After this process the samples z(v) are called $z^0(v)$.

RF error, and carrier leakage are necessary for best fit of the measured signal towards the ideal signal in the pre FFT domain. However they are not used to compare them against the limits.

E.6.7 Timing of the FFT window

The FFT window length is 24576 samples for preamble format 0, however in the measurement period is at least 27744 samples are taken. The position in time for FFT must be determined.

In an ideal signal, the FFT may start at any instant within the cyclic prefix without causing an error. The TX filter, however, reduces the window. The EVM requirements shall be met within a window W<CP.

The reference instant for the FFT start is the centre of the reduced window, called $\Delta\tilde{c}$,

EVM is measured at the following two instants: $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2.

The timing of the measured signal $z^0(v)$ with respect to the ideal signal i(v) is determined in the pre FFT domain as follows:

Correlation between $z^0(v)$ and i(v) will result in a correlation peak. The meaning of the correlation peak is approx. the “impulse response” of the TX filter. The correlation peak, (the highest, or in case of more than one, the earliest) indicates the timing in the measured signal with respect to the ideal signal.

W is different for different preamble formats and shown in Table E.6.7-1.

Table E.6.7-1EVM window length for PRACH

Preamble format	Cyclic prefix length[1] N_{cp}	Nominal FFT size[2]	EVM window length *W* in FFT samples	Ratio of *W* to CP[3]
0	3168	24576	3072	96.7%
1	21024	24576	20928	99.5%
2	6240	49152	6144	98.5%
3	21024	49152	20928	99.5%
4	448	4096	432	96.4%
Note 1: The unit is number of samples, sampling rate of 30.72MHz is assumed Note 2: Decimation of time samples by 12(format 0 to 3) and factor 2 (format 4) is assumed, leading to a uniform FFT size of 2048 for all formats. Note 3: These percentages are informative				

The number of samples, used for FFT is reduced compared to $z^0(\nu)$. This subset of samples is called z''(ν).

The sample frequency 30.72 MHz is oversampled with respect to the PRACH-subcarrier spacing of 1.25kHz (format 0 to 3) and 7.5kHz (format 4). EVM is based on 2048 samples per PRACH preamble and requires decimation of the time samples by the factor of 12 (format 0 to 3) and factor 2 (format 4). The final number of samples per PRACH preamble, used for FFT is reduced compared to $z^{''}(\nu)$ by the factor of 12 (format 0 to 3) and factor 2 (format 4). This subset of samples is called z'(ν).

E.6.8 Post FFT equalisation

Equalisation is not applicable for the PRACH.

E.6.9 Derivation of the results

E.6.9.1 $\text{EVM}_{\text{PRACH}}$

Perform FFT on z'(ν) and i(ν) using the FFT timing $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2.

For format 2 and 3 the first and the repeated preamble sequence are FFT-converted separately. using the standard FFT length 0f 2048

The $\text{EVM}_{\text{PRACH}}$ is the difference between the ideal waveform and the measured and equalized waveform for the allocated RB(s).

$$EVM_{PRACH} = \sqrt{\frac{\sum_{f \in F} \left| Z'(f) - I(f) \right|^2}{N_{ZC} \cdot P_0}},$$

where

f covers the count of demodulated symbols within the allocated bandwidth.

$Z'(f)$ are the samples of the signal evaluated for the $\text{EVM}_{\text{PRACH}}$

$I(f)$ is the ideal signal reconstructed by the measurement equipment, and

P_0 is the average power of the ideal signal. For normalized modulation symbols P_0 is equal to 1.

N_{ZC} is random access preamble sequence length.

From the acquired samples 4 EVM_{PRACH} value can be derived, 2 values for the timing $\Delta\tilde{c}$ –W/2 and 2 values for the timing $\Delta\tilde{c}$ +W/2 (4 and 2 applies for format 0,1,2,3. 20 and 10 applies for format 4).

E.6.9.2 Averaged EVM_{PRACH}

EVM_{PRACH} is averaged over all basic EVM_{PRACH} measurements

$$\overline{EVM}_{PRACH} = \sqrt{\frac{1}{2}\sum_{i=1}^{2} EVM_{PRACH,i}^{2}}$$

(i= 2 applies for format 0,1,2,3. i= 10 applies for format 4)

The averaging is done separately for timing $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2 leading to $\overline{EVM}_{PRACH,\tilde{c}l}$ and $\overline{EVM}_{PRACH,\tilde{c}h}$

$EVM_{PRACH} = \max(\overline{EVM}_{PRACH,\tilde{c}l}, \overline{EVM}_{PRACH,\tilde{c}h})$ is compared against the test requirements.

E.7 EVM with exclusion period

E.7.1 General

EVM with exclusion periods is defined in clause 6.5.2.1.1, third paragraph. For PUCCH entire symbols are excluded, if applicable. For PUSCH fractions of symbols are excluded, if applicable. The exclusion period for PUSCH is defined at the air interface, leading to exclusion periods in the EVM domain. The necessary mapping is described in this clause.

E.7.2 The model

The exclusion period in the time domain has corresponding periods in the quasi time domains (Table E.7.2). The mapping of corresponding periods needs only scaling and cyclic shifting.

The algorithm below uses a sampling frequency 30.72 MHz and FFT-width 2048 for all bandwidths. Bandwidth-adapted sampling frequencies and FFT-widths are not excluded. Only normal cyclic prefix is mentioned in the model without excluding the extended CP.

Table. E.7.2: Model for mapping exclusion period in the time domain

	TX				Channel	EVM meter				
Operation		DFT		iFFT			FFT		iDFT	
Meaning	Modulation symbols		Precoded symbols		BB samples	BB samples		Precoded symbols		demodulated symbols
No of samples	allocated Sub Carriers		allocated subcarriers + unallocated subcarriers = 2048		allocated subcarriers + unallocated subcarriers + CP samples	2048, position depending on EVM window		allocated subcarriers		allocated subcarriers
Domain	Quasi time domain		Frequency domain		Time domain	Time domain		Frequency domain		Quasi time domain
text below		1	2	3	4	7	7	8	9	11

1. A sequence of complex valued modulation symbols are Transform-Precoded (DFT) according to 36.211 clause 5.3.3. The size of this transformation is the number of allocated subcarriers.

2. The outcome of (1) is supplemented by 0 for the non allocated subcarriers. In sum 2048 subcarriers.

3. The baseband time signal (without CP) is then calculated by a iFFT according to 36.211 clause 5.6

4. (3) is then supplemented by a cyclic prefix (144 or 160 samples) leading to 2192 or 2208 samples. (144 CP samples = 144 tail samples from the data field)

5. (4) is transmitted over the channel and sampled by the EVM meter.

6. In case of an exclusion period those samples of (5) are marked, where the exclusion applies. The exclusion period is an unbroken leading or lagging exclusion period next to a subframe or timeslot boarder.

7. Depending on early or late EVM-window a subset of 2048 samples (out of 2192 or 2208 samples) are the input for the subsequent FFT . These samples may or may not comprise marked samples. The result are 2048 frequency domain samples.

8. The non allocated subcarriers are removed from the 2048 samples.

9. (8) is then iDFT transformed. The result are demodulated complex valued symbols in the same domain as (1)

10. Step 7, 8 and 9 are modified by an equalizer algorithm.
    For the purpose of this clause, the equalizer partly re-does step 4 (CP insertion):
    The equalizer algorithm cuts that subset of CP samples, covered by the FFT, from the head and copies it to the tail of the data field.

11. The result of (10) is: complex valued symbols in the same sequence as in (1) They are compared with (1) symbol by symbol for EVM. Due to exclusion in the time domain (6) we have marked corresponding symbols, which are disregarded for EVM.

12. From step 1 to 4 the number of samples is expanded. A subset of expanded samples is marked as excluded. Form step 6 to step 9 the number of samples is compressed, leading to a non integer number of samples, marked as excluded. The number of marked samples in this domain is rounded up at the expense of the EVM samples

E.7.3 Illustration

The figures below illustrate the cyclic shift due to the equalizer and scaling.

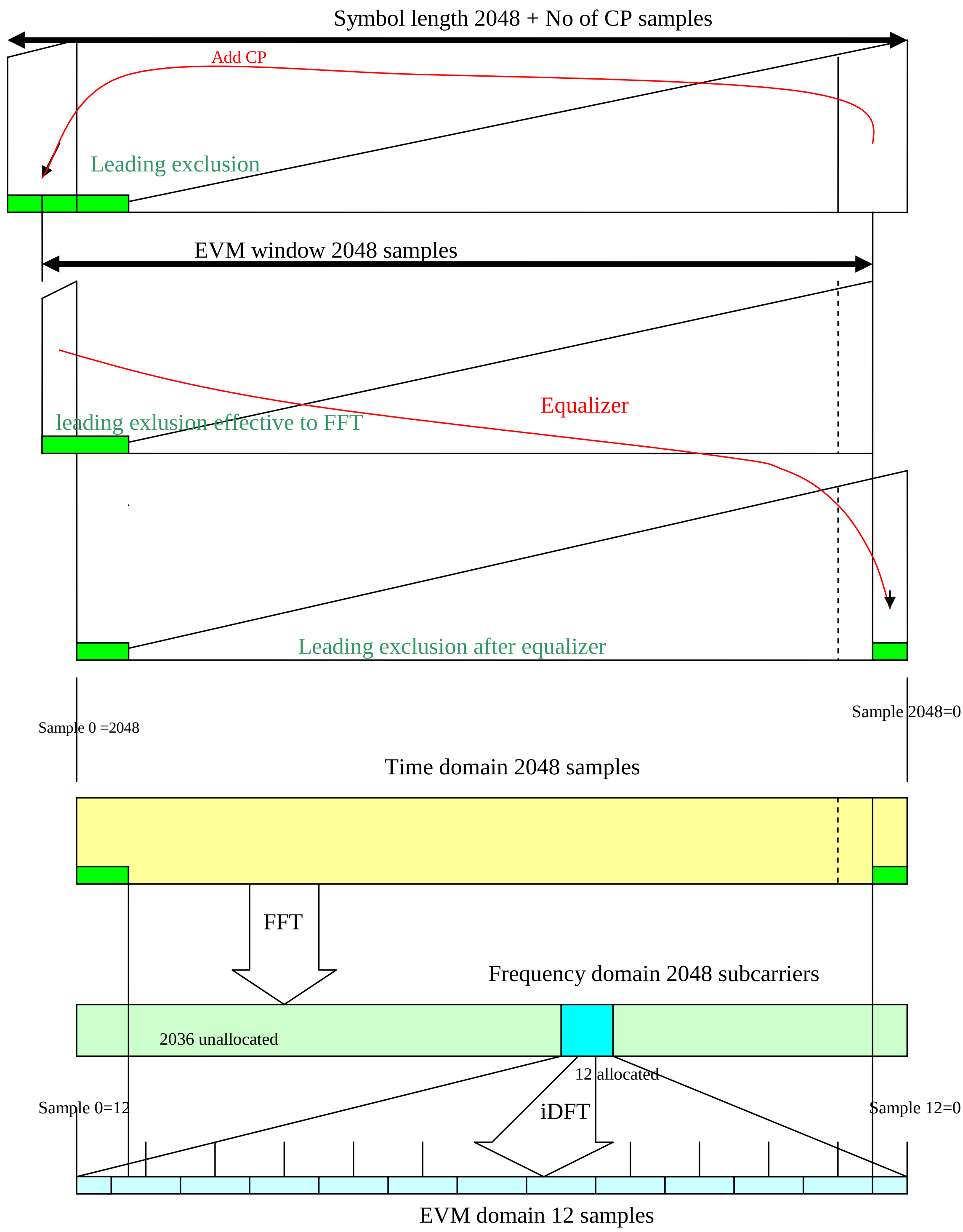


Figure E.7.3-1: leading exclusion period (when number of RBs=1)

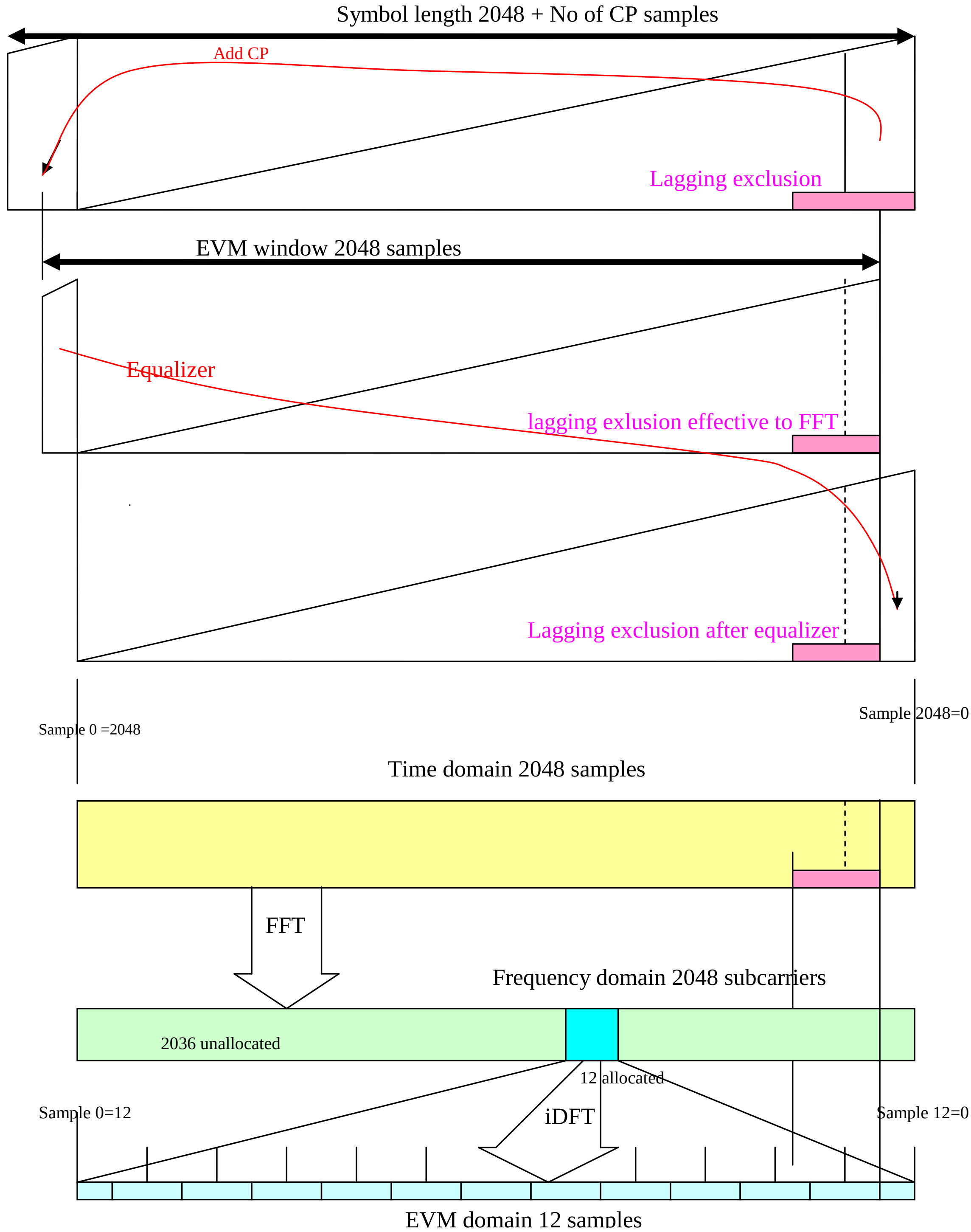


Figure E.7.3-2: lagging exclusion period (when number of RBs=1)

Legend to figure E.7.3-1

The figure contains 6 related subfigures.

The upper 3 triangles illustrate the cyclic shift due to EVM windowing and equalizer.

The lower 3 boxes illustrate the mapping from the time domain, where the exclusion period is defined, into the EVM domain, where EVM samples are actually excluded.

Cyclic shift

The leading exclusion period covers the entire CP and a part of the data field. The EVM window masks a part of the exclusion period. For the purpose of this annex, the equalizer re-arranges the time domain samples into the original order, splitting the exclusion period into two parts.

Mapping

The split exclusion period (after cyclic shift) is copied from above. The frequency domain is derived by Fast Fourier Transformation from the time domain and represent the frequency domain with 2048 subcarriers, 12 of them are allocated, the rest is unallocated. The 12 allocated subcarriers are iDFT transformed into the EVM domain comprising 12 samples. Note that all 3 domains are displayed cyclically: the leftmost sample is identical to the rightmost sample.

The two transformations map the time domain into the EVM domain, carrying out a compression of samples 12/2048. In spite of the compression, there is a correspondence of ranges in the time domain and in the EVM domain. One sample in the EVM domain comprises a range, which is influenced from (and only from) the equivalent samples in the time domain vertically above. Note that this correspondence holds irrespective of the position of the 12 allocated samples in the frequency domain.

Example leading exclusion (figure E.7.3-1)

Sample No in the EVM domain	Influence(exclusion) from the time domain	EVM exclusion
12=0	full	excluded
1	partly	excluded
2 to 11	none	counted

Example lagging exclusion example (figure E.7.3-2)

Sample No in the EVM domain	Influence(exclusion) from the time domain	EVM exclusion
12=0	none	counted
1 to 9	none	counted
10	partly	excluded
11	full	excluded

E.7.4 Formula

The exclusion period is defined in µs at the air interface.

Convert the µs's into No of samples in the time domain.

No of exclusion samples (before EVM windowing and equalizer) is calculated from:

No of exclusion sample = ceil (30.72 * Exclusion µs)

then, EVM windowing and equalizer is applied by 2048 samples based cyclic shift process.

(the upper 3 triangles illustrate in fig. E.7.3-1 and -2.)

Determine the indices **k**, to be excluded in the time domain, according to fig. E.7.3-1 and -2 (after application of EVM windowing and equaliser, original sample order,

k = subset from the set (0 to 2047))

The indices **l** in the EVM domain, to be excluded, are:

l = [round (**k***12* L_{CRBs} / 2048)]mod(12*L_{CRBs})

with L_{CRBs} number of allocated resource blocks

Annex F (normative): Measurement uncertainties and Test Tolerances

F.1 Acceptable uncertainty of Test System (normative)

The maximum acceptable uncertainty of the Test System is specified below for each test, where appropriate. The Test System shall enable the stimulus signals in the test case to be adjusted to within the specified range, and the equipment under test to be measured with an uncertainty not exceeding the specified values. All ranges and uncertainties are absolute values, and are valid for a confidence level of 95 %, unless otherwise stated.

A confidence level of 95 % is the measurement uncertainty tolerance interval for a specific measurement that contains 95 % of the performance of a population of test equipment.

For RF tests it should be noted that the uncertainties in clause F.1 apply to the Test System operating into a nominal 50 ohm load and do not include system effects due to mismatch between the DUT and the Test System.

The downlink signal uncertainties apply at each receiver antenna connector.

F.1.1 Measurement of test environments

The measurement accuracy of the UE test environments defined in TS 36.508 subclause 4.1, Test environments shall be.

- Pressure ±5 kPa.
- Temperature ±2 degrees.
- Relative Humidity ±5 %.
- DC Voltage ±1,0 %.
- AC Voltage ±1,5 %.
- Vibration 10 %.
- Vibration frequency 0,1 Hz.

The above values shall apply unless the test environment is otherwise controlled and the specification for the control of the test environment specifies the uncertainty for the parameter.

F.1.2 Measurement of transmitter

Table F.1.2-1: Maximum Test System Uncertainty for transmitter tests

Subclause	Maximum Test System Uncertainty	Derivation of Test System Uncertainty
6.2.2 UE Maximum Output Power	±0.7 dB, f ≤ 3.0GHz ±1.0 dB, 3.0GHz < f ≤ 4.2GHz	
6.2.2_1 Maximum Output Power for HPUE	±0.7 dB, f ≤ 3.0GHz	
6.2.2A.1 UE Maximum Output Power for CA (intra-band contiguous DL CA and UL CA)	Same as 6.2.2 for each CC	
6.2.2B UE Maximum Output Power for UL-MIMO	Same as 6.2.2 for each antenna	
6.2.3 Maximum Power Reduction	±0.7 dB, f ≤ 3.0GHz ±1.0 dB, 3.0GHz < f ≤ 4.2GHz	
6.2.3_1 Maximum Power Reduction (MPR) for HPUE	±0.7 dB, f ≤ 3.0GHz	
6.2.3A.1 Maximum Power Reduction (MPR) for CA (intra-band contiguous DL CA and UL CA)	Same as 6.2.3 for each CC	
6.2.3B Maximum Power Reduction (MPR) for UL-MIMO	Same as 6.2.3 for each antenna	
6.2.4 UE Maximum Output Power with additional requirements	±0.7 dB, f ≤ 3.0GHz ±1.0 dB, 3.0GHz < f ≤ 4.2GHz	
6.2.4_1 Additional Maximum Power Reduction (A-MPR) for HPUE	±0.7 dB, f ≤ 3.0GHz	
6.2.4A.1 Additional Maximum Power Reduction (A-MPR) for CA (intra-band contiguous DL CA and UL CA)	Same as 6.2.4 for each CC	
6.2.4B Additional Maximum Power Reduction (A-MPR) for UL-MIMO	Same as 6.2.4 for each antenna	
6.2.5 Configured UE transmitted Output Power	±0.7 dB, f ≤ 3.0GHz ±1.0 dB, 3.0GHz < f ≤ 4.2GHz	
6.2.5_1 Configured UE transmitted Output Power for HPUE	±0.7 dB, f ≤ 3.0GHz	
6.2.5A.1 Configured UE transmitted Output Power for CA (intra-band contiguous DL CA and UL CA)	Same as 6.2.5 for each CC	
6.2.5A.2 Configured UE transmitted Output Power for CA (inter-band DL CA without UL CA)	TBD	
6.2.5B Configured UE transmitted output power for UL-MIMO	Same as 6.2.5 for each antenna	
6.3.2 Minimum Output Power	±1.0 dB, f ≤ 3.0GHz ±1.3 dB, 3.0GHz < f ≤ 4.2GHz	
6.3.2A.1 Minimum Output Power for CA (intra-band contiguous DL CA and UL CA)	Same as 6.3.2 for each CC	
6.3.2B Minimum Output Power for UL-MIMO	Same as 6.3.2 for each antenna	

6.3.3 Transmission ON/OFF Power	Transmission OFF Power: ±1.5 dB, f ≤ 3.0GHz ±1.8 dB, 3.0GHz < f ≤ 4.2GHz	
6.3.3A.1 UE Transmit OFF power for CA (intra-band contiguous DL CA and UL CA)	Same as 6.3.3 for each CC	
6.3.3B UE Transmit OFF power for UL-MIMO	Same as 6.3.3 for each antenna	
6.3.4.1 General ON/OFF time mask	Transmission ON/OFF Power: ±1.5 dB, f ≤ 3.0GHz ±1.8 dB, 3.0GHz < f ≤ 4.2GHz	
6.3.4.2 PRACH and SRS time mask	Transmission ON/OFF Power: ±1.5 dB, f ≤ 3.0GHz ±1.8 dB, 3.0GHz < f ≤ 4.2GHz	
6.3.4A.1.1 General ON/OFF time mask for CA (intra-band contiguous DL CA and UL CA)	Same as 6.3.4.1 for each CC	
6.3.4B.1 General ON/OFF time mask for UL-MIMO	Same as 6.3.4.1 for each antenna	
6.3.5.1 Power Control Absolute power tolerance	±1.0 dB, f ≤ 3.0GHz ±1.4 dB, 3.0GHz < f ≤ 4.2GHz	Overall system uncertainty comprises two quantities: 1. Downlink signal level uncertainty 2. Uplink level measurement uncertainty Items 1 and 2 are assumed to be uncorrelated so can be root sum squared. Test System uncertainty = [SQRT (DL level uncert ^{2} + UL measurement uncert ^{2})] f ≤ 3.0GHz DL signal level uncert ± 0.7dB UL meas't uncert ± 0.7dB 3.0GHz < f ≤ 4.2GHz DL signal level uncert ± 1.0dB UL meas't uncert ± 1.0dB
6.3.5.2 Power Control Relative power tolerance	±0.7 dB	
6.3.5_1.1 Power Control Absolute power tolerance for HPUE	±1.0 dB, f ≤ 3.0GHz	
6.3.5_1.2 Power Control Relative power tolerance for HPUE	±0.7 dB	
6.3.5A.1.1 Power Control Absolute power tolerance for CA (intra-band contiguous DL CA and UL CA)	Same as 6.3.5.1 for each CC	
6.3.5A.2.1 Power Control Relative power tolerance for CA (intra-band contiguous DL CA and UL CA)	Same as 6.3.5.2 for each CC	
6.3.5B.1 Power Control Absolute Power Tolerance for UL- MIMO	Same as 6.3.5.1 for each antenna	
6.3.5B.2 Power Control Relative power tolerance for UL-MIMO	Same as 6.3.5.2 for each antenna	
6.3.5.3 Aggregate power control tolerance	±0.7 dB	
6.3.5_1.3 Aggregate power control tolerance for HPUE	±0.7 dB	
6.3.5A.3.1 Aggregate power control tolerance for CA (intra-band contiguous DL CA and UL CA)	Same as 6.3.5.3 for each CC	

6.3.5B.3 Aggregate power control tolerance for UL-MIMO	Same as 6.3.5.3 for each antenna	
6.5.1 Frequency Error	±15 Hz DL Signal level: ±0.7 dB, f ≤ 3.0GHz DL Signal level: ±1.0 dB, 3.0GHz < f ≤ 4.2GHz	
6.5.1A.1 Frequency error for CA (intra-band contiguous DL CA and UL CA)	TBD	
6.5.1B Frequency Error for UL-MIMO	Same as 6.5.1 for each antenna DL signal level same as 6.5.1	
6.5.2.1 Error Vector Magnitude	PUSCH: ± 2.5% PUCCH: ± 2.5% PRACH: ± 2.5%	
6.5.2A.1.1 Error Vector Magnitude (EVM) for CA (intra-band contiguous DL CA and UL CA)	Same as 6.5.2.1	
6.5.2B.1 Error Vector Magnitude (EVM) for UL-MIMO	Same as 6.5.2.1 for each antenna	
6.5.2.1A PUSCH-EVM with exclusion period	PUSCH : ± 2.5%	

6.5.2.2 Carrier leakage	±0.8dB	
6.5.2A.2.1 Carrier leakage for CA (intra-band contiguous DL CA and UL CA)	TBD	
6.5.2.3 In-band emissions for non allocated RB	±0.8dB	
6.5.2.4 EVM equalizer Spectrum flatness	±1.4dB	
6.5.2A.3.1 In-band emissions for non allocated RB for CA (intra-band contiguous DL CA and UL CA)	TBD	
6.5.2B.1 Error vector magnitude (EVM) for UL-MIMO	TBD	
6.5.2B.2 Carrier leakage for UL-MIMO	Same as 6.5.2.2 for each antenna	
6.5.2B.3 In-band emissions for non allocated RB for UL-MIMO	Same as 6.5.2.3 for each antenna	
6.5.2B.4 EVM equalizer spectrum flatness for UL-MIMO	Same as 6.5.2.4 for each antenna	
6.6.1 Occupied bandwidth	1.4MHz, 3MHz: 30kHz 5MHz, 10MHz: 100kHz 15MHz, 20MHz: 300kHz	
6.6.1A.1 Occupied bandwidth for CA (intra-band contiguous DL CA and UL CA)	1.4MHz, 3MHz: 30kHz 5MHz, 10MHz: 100kHz 15MHz, 20MHz: 300kHz 20MHz < f ≤ 40MHz: 500kHz	
6.6.1B Occupied bandwidth for UL-MIMO	Same as 6.6.1 for each antenna	
6.6.2.1 Spectrum Emission Mask	±1.5 dB, f ≤ 3.0GHz ±1.8 dB, 3.0GHz < f ≤ 4.2GHz	
6.6.2.1A.1 Spectrum emission mask for CA (intra-band contiguous DL CA and UL CA)	Same as 6.6.2.1	
6.6.2.1B Spectrum Emission Mask for UL-MIMO	Same as 6.6.2.1 for each antenna	
6.6.2.2 Additional Spectrum Emission Mask	±1.5 dB, f ≤ 3.0GHz ±1.8 dB, 3.0GHz < f ≤ 4.2GHz	
6.6.2.3 Adjacent Channel Leakage power Ratio	±0.8 dB	
6.6.2.3_1 Adjacent Channel Leakage power Ratio for HPUE	±0.8 dB	
6.6.2.3A.1 Adjacent Channel Leakage power Ratio for CA	±0.8 dB	
6.6.2.3B Adjacent Channel Leakage power Ratio for UL-MIMO	Same as 6.6.2.3 for each antenna	
6.6.2.4 Additional ACLR requirements	±0.8 dB	
6.6.3.1 Transmitter Spurious emissions	9kHz < f ≤ 4 GHz: ± 2.0 dB 4 GHz < f ≤ 19 GHz: ± 4.0 dB	
6.6.3.1A.1 Transmitter Spurious emissions for CA (intra-band contiguous DL CA and UL CA)	Same as 6.6.3.1	
6.6.3B.1Transmitter Spurious emissions for UL-MIMO	Same as 6.6.3.1, at each antenna used for transmission	The overall UL power is the linear sum of the output powers over all Tx antenna connectors

6.6.3.2 Spurious emission band UE co-existence	± 2.0 dB for results > -60 dBm, f ≤ 3.0GHz ±2.5 dB, 3.0GHz < f ≤ 4.2GHz ± 3.0 dB for results ≤ -60 dBm, f ≤ 3.0GHz ±3.6 dB, 3.0GHz < f ≤ 4.2GHz	
6.6.3.2A.1 Spurious emission band UE co-existence for CA (intra-band contiguous DL CA and UL CA)	TBD	
6.6.3.3 Additional spurious emissions	9kHz < f ≤ 4 GHz: ± 2.0 dB NS-07 769 ≤ f ≤ 775 MHz: ± 1.5 dB	
6.6.3.3A.1 Additional spurious emissions for CA (intra-band contiguous DL CA and UL CA)	9kHz < f ≤ 4 GHz: ± 2.0 dB	
6.6.3B.2 Spurious emission band UE co-existence for UL-MIMO	Same as 6.6.3.2 at each antenna used for transmission	
6.6.3B.3 Additional spurious emissions for UL-MIMO	Same as 6.6.3.3, at each antenna used for transmission	
6.7 Transmit intermodulation	± 2.6 dB, f ≤ 3.0GHz ±3.6 dB, 3.0GHz < f ≤ 4.2GHz	Overall system uncertainty comprises four quantities: 1. Wanted signal setting error 2. CW Interferer level error 3. Wanted signal meas. error 4. Intermodulation product measurement error The relative level of the wanted signal and the CW interferer has 2 x effect on the intermodulation product. Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared to provide the combined effect. Test System uncertainty = SQRT [(2 x SQRT (Wanted setting_error^2 + CW_level_error^2) ^{2} + Wanted_level_meas error^2 + Intermodulation product measurement error^2] f ≤ 3.0GHz Wanted signal setting ± 0.7dB CW Interferer level ± 1.0dB Wanted signal meas ± 0.7dB Intermodulation product measurement error ± 0.7dB 3.0GHz < f ≤ 4.2GHz Wanted signal setting ± 1.0dB CW Interferer level ± 1.3dB Wanted signal meas ± 1.0dB Intermodulation product measurement error ± 1.0dB
6.7A.1 Transmit intermodulation	TBD	
6.8B Time alignment error for UL-MIMO	±25 ns	

F.1.3 Measurement of receiver

Table F.1.3-1: Maximum Test System Uncertainty for receiver tests

Subclause	Maximum Test System Uncertainty[1]	Derivation of Test System Uncertainty
7.3 Reference sensitivity power level	Downlink power ±0.7 dB, f ≤ 3.0GHz ±1.0 dB, 3.0GHz < f ≤ 4.2GHz	
7.3A.1 Reference sensitivity level for CA (intra-band contiguous DL CA and UL CA)	Same as 7.3 for each CC	
7.3A.2 Reference sensitivity level for CA (intra-band contiguous DL CA without UL CA)	Same as 7.3A.1	
7.3A.3 Reference sensitivity level for CA (inter-band DL CA without UL CA)	Same as 7.3A.1	
7.3B Reference Sensitivity Level for UL-MIMO	Same as 7.3	
7.4 Maximum input level	Downlink power ±0.7 dB, f ≤ 3.0GHz ±1.0 dB, 3.0GHz < f ≤ 4.2GHz Uplink power measurement ±0.7 dB, f ≤ 3.0GHz ±1.0 dB, 3.0GHz < f ≤ 4.2GHz	
7.4A.1 Maximum input level for CA (intra band contiguous DL CA and UL CA)	Downlink power same as 7.4 Uplink power measurement TBD	Uncertainties apply for each CC or group of CCs, at the antenna port where received
7.4A.2 Maximum input level for CA (intra band contiguous DL CA without UL CA)	Downlink power same as 7.4 Uplink power measurement same as 7.4	Uncertainties apply for each CC or group of CCs, at the antenna port where received
7.4A.3 Maximum input level for CA (inter-band DL CA without UL CA)	Downlink power same as 7.4 Uplink power measurement same as 7.4	Uncertainties apply for each CC or group of CCs, at the antenna port where received
7.4B Maximum Input Level for UL-MIMO	Downlink power same as 7.4 Uplink power measurement same as 7.4, at each antenna connector used for transmission	The overall UL power is the linear sum of the output powers over all Tx antenna connectors

7.5 Adjacent Channel Selectivity (ACS)	ACS value ±1.1 dB, f ≤ 3.0GHz ±1.5 dB, 3.0GHz < f ≤ 4.2GHz Uplink power measurement ±0.7 dB, f ≤ 3.0GHz ±1.0 dB, 3.0GHz < f ≤ 4.2GHz	Overall ACS uncertainty comprises three quantities: 1. Wanted signal level error 2. Interferer signal level error 3. Additional impact of interferer ACLR Items 1 and 2 are assumed to be uncorrelated so can be root sum squared to provide the ratio error of the two signals. The interferer ACLR effect is systematic, and is added arithmetically. Test System uncertainty = [SQRT (wanted_level_error^2 + interferer_level_error^2)] + ACLR effect. f ≤ 3.0GHz Wanted signal level ± 0.7dB Interferer signal level ± 0.7dB 3.0GHz < f ≤ 4.2GHz Wanted signal level ± 1.0dB Interferer signal level ± 1.0dB f ≤ 4.2GHz Impact of interferer ACLR 0.1dB
7.5A.1 Adjacent Channel Selectivity (ACS) for CA (intra band contiguous DL CA and UL CA)	Same as 7.5 for each CC	Same as 7.5 The wanted signal level uncertainty applies for each CC. Overall ACS uncertainty calculation includes the uncertainty for wanted level error only once, as the uncertainty of other CCs is not expected to have any significant effect.
7.5A.2 Adjacent Channel Selectivity (ACS) for CA (intra band contiguous DL CA without UL CA)	Same as 7.5A.1	
7.5A.3 Adjacent Channel Selectivity (ACS) for CA (inter band DL CA without UL CA)	Same as 7.5A.1	
7.5B Adjacent Channel Selectivity (ACS) for UL-MIMO	ACS value same as 7.5 Uplink power measurement same as 7.5, at each antenna connector used for transmission	The overall UL power is the linear sum of the output powers over all Tx antenna connectors

7.6.1 In-band blocking	Blocking ±1.4 dB, f ≤ 3.0GHz ±1.8 dB, 3.0GHz < f ≤ 4.2GHz Uplink power measurement ±0.7 dB, f ≤ 3.0GHz ±1.0 dB, 3.0GHz < f ≤ 4.2GHz	Overall blocking uncertainty can have these contributions: 1. Wanted signal level error 2. Interferer signal level error 3. Interferer ACLR 4. Interferer broadband noise Items 1 and 2 are assumed to be uncorrelated so can be root sum squared to provide the ratio error of the two signals. The Interferer ACLR or Broadband noise effect is systematic, and is added arithmetically. Test System uncertainty = [SQRT (wanted_level_error^2 + interferer_level_error^2)] + ACLR effect + Broadband noise effect. In-band blocking, using modulated interferer: f ≤ 3.0GHz Wanted signal level ± 0.7dB Interferer signal level: ± 0.7dB 3.0GHz < f ≤ 4.2GHz Wanted signal level ± 1.0dB Interferer signal level ± 1.0dB f ≤ 4.2GHz Interferer ACLR 0.4dB Broadband noise not applicable
7.6.1A.1 In-band blocking for CA (intra band contiguous DL CA and UL CA)	Same as 7.6.1 for each CC	Same as 7.6.1 The wanted signal level uncertainty applies for each CC. Overall blocking uncertainty calculation includes the uncertainty for wanted level error only once, as the uncertainty of other CCs is not expected to have any significant effect.
7.6.1A.2 In-band blocking for CA (intra band contiguous DL CA without UL CA)	Same as 7.6.1A.1	Same as 7.6.1A.1
7.6.1A.3 In-band blocking for CA (inter band DL CA without UL CA)	Same as 7.6.1A.1	Same as 7.6.1A.1
7.6.1B In-band blocking for UL-MIMO	Blocking same as 7.6.1 Uplink power measurement same as 7.6.1, at each antenna connector used for transmission	The overall UL power is the linear sum of the output powers over all Tx antenna connectors

7.6.2 Out of-band blocking	Wanted signal f ≤ 3.0GHz Blocking, 1MHz < $f_{interferer}$ ≤ □3 GHz: ±1.3 dB Blocking, 3 GHz < $f_{interferer}$ ≤ □12.75 GHz: ±3.2 dB Uplink power measurement ±0.7 dB Wanted signal 3.0GHz < f ≤ 4.2GHz Blocking, 1MHz < $f_{interferer}$ ≤ □3 GHz: ±1.5 dB Blocking, 3 GHz < $f_{interferer}$ ≤ □12.75 GHz: ±3.3 dB Uplink power measurement ±1.0 dB	Out of band blocking, using CW interferer: f ≤ 3.0GHz Wanted signal level ± 0.7dB 3.0GHz < f ≤ 4.2GHz Wanted signal level ± 1.0dB Interferer signal level: ± 1.0dB up to 3GHz ± 3.0dB up to 12.75GHz Interferer ACLR not applicable Impact of interferer Broadband noise 0.1dB Figures are combined to give Test System uncertainty, using formula given for 7.6.1
7.6.2A.1 Out-of-band blocking for CA (intra band contiguous DL CA and UL CA)	Same as 7.6.2 for each CC	Same as 7.6.2 The wanted signal level uncertainty applies for each CC. Overall blocking uncertainty calculation includes the uncertainty for wanted level error only once, as the uncertainty of other CCs is not expected to have any significant effect.
7.6.2A.2 Out-of-band blocking for CA (intra band contiguous DL CA without UL CA)	Same as 7.6.2A.1	Same as 7.6.2A.1
7.6.2A.3 Out-of-band blocking for CA (inter band DL CA without UL CA)	Same as 7.6.2A.1	Same as 7.6.2A.1
7.6.2B Out-of-band blocking for UL-MIMO	Blocking same as 7.6.2 Uplink power measurement same as 7.6.2, at each antenna connector used for transmission	The overall UL power is the linear sum of the output powers over all Tx antenna connectors
7.6.3 Narrow band blocking	Blocking ±1.3 dB, f ≤ 3.0GHz ±1.8 dB, 3.0GHz < f ≤ 4.2GHz Uplink power measurement ±0.7 dB, f ≤ 3.0GHz ±1.0 dB, 3.0GHz < f ≤ 4.2GHz	Narrow band blocking, using CW interferer: Wanted signal level ± 0.7dB Interferer signal level: ± 1.0dB Interferer ACLR not applicable Impact of interferer Broadband noise 0.1dB Figures are combined to give Test System uncertainty, using formula given for 7.6.1
7.6.3A.1 Narrow band blocking for CA (intra band contiguous DL CA and UL CA)	Same as 7.6.3 for each CC	Same as 7.6.3 The wanted signal level uncertainty applies for each CC. Overall blocking uncertainty calculation includes the uncertainty for wanted level error only once, as the uncertainty of other CCs is not expected to have any significant effect.
7.6.3A.2 Narrow band blocking for CA (intra band contiguous DL CA without UL CA)	Same as 7.6.3A.1	Same as 7.6.3A.1
7.6.3A.3 Narrow band blocking for CA (inter band DL CA without UL CA)	Same as 7.6.3A.1	Same as 7.6.3A.1

7.6.3B Narrow band blocking for UL-MIMO	Blocking same as 7.6.3 Uplink power measurement same as 7.6.3, at each antenna connector used for transmission	The overall UL power is the linear sum of the output powers over all Tx antenna connectors
7.7 Spurious response	Same as 7.6.2	Same as 7.6.2.
7.7A.1 Spurious response for CA (intra band contiguous DL CA and UL CA)	Same as 7.6.2A.1	Same as 7.6.2A.1
7.7A.2 Spurious response for CA (intra band contiguous DL CA without UL CA)	Same as 7.6.2A.1	Same as 7.6.2A.1
7.7A.3 Spurious response for CA (inter band DL CA without UL CA)	Same as 7.6.2A.1	Same as 7.6.2A.1
7.7B Spurious response for UL-MIMO	Same as 7.7 Uplink power measurement same as 7.6.2, at each antenna connector used for transmission	The overall UL power is the linear sum of the output powers over all Tx antenna connectors
7.8.1 Wide band intermodulation	Intermodulation ±1.4 dB, f ≤ 3.0GHz ±2.6 dB, 3.0GHz < f ≤ 4.2GHz Uplink power measurement ±0.7 dB, f ≤ 3.0GHz ±1.0 dB, 3.0GHz < f ≤ 4.2GHz	Overall intermodulation uncertainty comprises three quantities: 1. Wanted signal level error 2. CW Interferer level error 3. Modulated Interferer level error Effect of interferer ACLR has not been included as modulated interferer has larger frequency offset The effect of the closer CW signal has twice the effect. Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared to provide the combined effect of the three signals. Test System uncertainty = SQRT [(2 x CW_level_error)^2 +(mod interferer_level_error)^2 +(wanted signal_level_error)^2] f ≤ 3.0GHz Wanted signal level ± 0.7dB CW Interferer level ± 0.5dB Mod Interferer level ± 0.7dB 3.0GHz < f ≤ 4.2GHz Wanted signal level ± 1.0dB CW Interferer level ± 0.8dB Mod Interferer level ± 1.0dB
7.8.1A.1 Wideband intermodulation for CA (intra band contiguous DL CA and UL CA)	Same as 7.8.1 for each CC	Same as 7.8.1 The wanted signal level uncertainty applies for each CC. Overall intermodulation uncertainty calculation includes the uncertainty for wanted level error only once, as the uncertainty of other CCs is not expected to have any significant effect.
7.8.1A.2 Wideband intermodulation for CA (intra band contiguous DL CA without UL CA)	Same as 7.8.1A.1	Same as 7.8.1A.1

7.8.1A.3 Wideband intermodulation for CA (inter band DL CA without UL CA)	Same as 7.8.1A.1	Same as 7.8.1A.1
7.8.1B Wide band intermodulation for UL-MIMO	Intermodulation same as 7.8.1 Uplink power measurement same as 7.8.1, at each antenna connector used for transmission	The overall UL power is the linear sum of the output powers over all Tx antenna connectors
7.9 Spurious emissions	30MHz ≤ f ≤ 4.0GHz: ± 2.0 dB 4 GHz < f ≤ 19 GHz: ± 4.0 dB	
Note 1: Unless otherwise noted, only the Test System stimulus error is considered here. The effect of errors in the throughput measurements due to finite test duration is not considered.		

F.1.4 Measurement of performance requirements

Table F.1.4-1: Maximum Test System Uncertainty for Performance Requirements

Subclause	Maximum Test System Uncertainty[1]	Derivation of Test System Uncertainty
8.2.1.1.1 Multiple PRBs - Propagation Condition EVA5 - Propagation Condition ETU70 - Propagation Condition ETU300	± 0.8 dB	Overall system uncertainty for fading conditions comprises three quantities: 1. Signal-to-noise ratio uncertainty 2. Fading profile power uncertainty 3. Effect of AWGN flatness and signal flatness Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty^2 + Fading profile power uncertainty^2 + (0.25 x AWGN flatness and signal flatness)^2) Signal-to-noise ratio uncertainty ±0.3 dB Fading profile power uncertainty ±0.5 dB for single Tx AWGN flatness and signal flatness ±2.0 dB
8.2.1.1.1 Multiple PRBs - Propagation Condition HST	± 0.6 dB	Overall system uncertainty for HST condition comprises two quantities: 1. Signal-to-noise ratio uncertainty 2. Effect of AWGN flatness and signal flatness Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty^2 + (0.25 x AWGN flatness and signal flatness)^2) Signal-to-noise ratio uncertainty ±0.3 dB AWGN flatness and signal flatness ±2.0 dB
8.2.1.1.1 Single PRB - Propagation Condition ETU70	± 0.8 dB	Overall system uncertainty for fading condition comprises three quantities: 1. Average Signal-to-noise ratio uncertainty 2. Signal-to noise ratio variation for single PRB 3. Fading profile power uncertainty Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared: Test System uncertainty = SQRT (Average signal-to-noise ratio uncertainty^2 + Signal-to-noise ratio variation^2 + Fading profile power uncertainty^2) Signal-to-noise ratio uncertainty ±0.3 dB Signal-to-noise ratio variation ±0.5 dB Fading profile power uncertainty ±0.5 dB for single Tx
8.2.1.1.1_A.1	Same as 8.2.1.1.1 Multiple PRBs, for each CC	Same as 8.2.1.1.1 Multiple PRBs Calculation applies for each CC
8.2.1.1.1_A.2	Same as 8.2.1.1.1 Multiple PRBs, for each CC	Same as 8.2.1.1.1 Multiple PRBs Calculation applies for each CC
8.2.1.1.1_1 Multiple PRBs - Propagation Condition EVA5 - Propagation Condition ETU70 - Propagation Condition ETU300	Same as 8.2.1.1.1 Multiple PRBs Propagation EVA5, ETU70, ETU300	
8.2.1.1.2 Single PRB	± 0.8 dB	Same as 8.2.1.1.1 Single PRB

8.2.1.2.1 - Propagation Condition EVA5	± 0.9 dB	Overall system uncertainty for fading conditions comprises three quantities: 1. Signal-to-noise ratio uncertainty 2. Fading profile power uncertainty 3. Effect of AWGN flatness and signal flatness Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty ^{2} + Fading profile power uncertainty ^{2} + (0.25 x AWGN flatness and signal flatness) ^{2}) Signal-to-noise ratio uncertainty ±0.3 dB Fading profile power uncertainty ±0.7 dB for Tx Diversity AWGN flatness and signal flatness ±2.0 dB
8.2.1.2.1 - Propagation Condition HST	± 0.6 dB	Overall system uncertainty for HST condition comprises two quantities: 1. Signal-to-noise ratio uncertainty 2. Effect of AWGN flatness and signal flatness Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty ^{2} + (0.25 x AWGN flatness and signal flatness) ^{2}) Signal-to-noise ratio uncertainty ±0.3 dB AWGN flatness and signal flatness ±2.0 dB
8.2.1.2.1_1 - Propagation Condition EVA5	Same as 8.2.1.2.1 Propagation EVA5	
8.2.1.2.2	± 0.9 dB	Same as 8.2.1.2.1 Propagation Condition EVA5
8.2.1.2.2_1	Same as 8.2.1.2.2	
8.2.1.2.3_C.1 - Propagation Condition EVA5	[TBD]	[TBD]
8.2.1.3.1	± 0.9 dB	Overall system uncertainty for fading conditions comprises three quantities: 1. Signal-to-noise ratio uncertainty 2. Fading profile power uncertainty 3. Effect of AWGN flatness and signal flatness Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty ^{2} + Fading profile power uncertainty ^{2} + (0.25 x AWGN flatness and signal flatness) ^{2}) Signal-to-noise ratio uncertainty ±0.3 dB Fading profile power uncertainty ±0.7 dB for MIMO AWGN flatness and signal flatness ±2.0 dB
8.2.1.3.1_A.1 FDD PDSCH Open Loop Spatial Multiplexing 2x2 (intra band contiguous DL CA)	Same as 8.2.1.3.1 for each CC	Same as 8.2.1.3.1 Calculation applies for each CC
8.2.1.3.1_A.2 FDD PDSCH Open Loop Spatial Multiplexing 2x2 (inter band DL CA)	Same as 8.2.1.3.1 for each CC	Same as 8.2.1.3.1 Calculation applies for each CC
8.2.1.3.2	± 0.9 dB	Same as 8.2.1.3.1
8.2.1.4.1	± 0.9 dB	Same as 8.2.1.3.1

8.2.1.4.1_1	Same as 8.2.1.4.1	
8.2.1.4.2	± 0.9 dB	Same as 8.2.1.3.1
8.2.1.4.2_1	Same as 8.2.1.4.2	
8.2.1.4.2_A.1	TBD	TBD
8.2.1.7.1_A.1	TBD	TBD
8.2.2.1.1 Multiple PRBs - Propagation Condition EVA5 - Propagation Condition ETU70 - Propagation Condition ETU300	± 0.8 dB	Overall system uncertainty for fading conditions comprises three quantities: 1. Signal-to-noise ratio uncertainty 2. Fading profile power uncertainty 3. Effect of AWGN flatness and signal flatness Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty^2 + Fading profile power uncertainty^2 + (0.25 x AWGN flatness and signal flatness)^2) Signal-to-noise ratio uncertainty ±0.3 dB Fading profile power uncertainty ±0.5 dB for single Tx AWGN flatness and signal flatness ±2.0 dB
8.2.2.1.1 Multiple PRBs - Propagation Condition HST	± 0.6 dB	Overall system uncertainty for HST condition comprises two quantities: 1. Signal-to-noise ratio uncertainty 2. Effect of AWGN flatness and signal flatness Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty^2 + (0.25 x AWGN flatness and signal flatness)^2) Signal-to-noise ratio uncertainty ±0.3 dB AWGN flatness and signal flatness ±2.0 dB
8.2.2.1.1 Single PRB - Propagation Condition ETU70	± 0.8 dB	Overall system uncertainty for fading condition comprises three quantities: 1. Average Signal-to-noise ratio uncertainty 2. Signal-to noise ratio variation for single PRB 3. Fading profile power uncertainty Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared: Test System uncertainty = SQRT (Average signal-to-noise ratio uncertainty^2 + Signal-to-noise ratio variation^2 + Fading profile power uncertainty^2) Signal-to-noise ratio uncertainty ±0.3 dB Signal-to-noise ratio variation ±0.5 dB Fading profile power uncertainty ±0.5 dB for single Tx
8.2.2.1.1_1 Multiple PRBs - Propagation Condition EVA5 - Propagation Condition ETU70 - Propagation Condition ETU300	Same as 8.2.2.1.1 Multiple PRBs Propagation EVA5, ETU70, ETU300	
8.2.2.1.1_A.1	Same as 8.2.2.1.1 Multiple PRBs for each CC	Same as 8.2.2.1.1 Multiple PRBs Calculation applies for each CC
8.2.2.1.2 Single PRB	± 0.8 dB	Same as 8.2.2.1.1 Single PRB

8.2.2.2.1 - Propagation Condition EVA5	± 0.9 dB	Overall system uncertainty for fading conditions comprises three quantities: 1. Signal-to-noise ratio uncertainty 2. Fading profile power uncertainty 3. Effect of AWGN flatness and signal flatness Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty ^{2} + Fading profile power uncertainty ^{2} + (0.25 x AWGN flatness and signal flatness) ^{2}) Signal-to-noise ratio uncertainty ±0.3 dB Fading profile power uncertainty ±0.7 dB for Tx Diversity AWGN flatness and signal flatness ±2.0 dB
8.2.2.2.1 - Propagation Condition HST	± 0.6 dB	Overall system uncertainty for HST condition comprises two quantities: 1. Signal-to-noise ratio uncertainty 2. Effect of AWGN flatness and signal flatness Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty ^{2} + (0.25 x AWGN flatness and signal flatness) ^{2}) Signal-to-noise ratio uncertainty ±0.3 dB AWGN flatness and signal flatness ±2.0 dB
8.2.2.2.1_1 - Propagation Condition EVA5	Same as 8.2.2.2.1 Propagation EVA5	
8.2.2.2.2	± 0.9 dB	Same as 8.2.2.2.1 Propagation Condition EVA5
8.2.2.2.2_1	Same as 8.2.2.2.2	
8.2.2.3.1	± 0.9 dB	Overall system uncertainty for fading conditions comprises three quantities: 1. Signal-to-noise ratio uncertainty 2. Fading profile power uncertainty 3. Effect of AWGN flatness and signal flatness Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty ^{2} + Fading profile power uncertainty ^{2} + (0.25 x AWGN flatness and signal flatness) ^{2}) Signal-to-noise ratio uncertainty ±0.3 dB Fading profile power uncertainty ±0.7 dB for MIMO AWGN flatness and signal flatness ±2.0 dB
8.2.2.3.1_A.1	Same as 8.2.2.3.1 for each CC	Same as 8.2.2.3.1 Calculation applies for each CC
8.2.2.3.2	± 0.9 dB	Same as 8.2.2.3.1
8.2.2.4.1	± 0.9 dB	Same as 8.2.2.3.1
8.2.2.4.1_1	Same as 8.2.2.4.1	
8.2.2.4.2	± 0.9 dB	Same as 8.2.2.3.1
8.2.2.4.2_1	Same as 8.2.2.4.2	
8.2.2.4.2_A.1	TBD	TBD
8.2.2.7.1_A.1	TBD	TBD

8.3.1.1.1_D	± 0.9 dB	Overall system uncertainty for fading conditions comprises three quantities: 1. Signal-to-noise ratio uncertainty 2. Fading profile power uncertainty 3. Effect of AWGN flatness and signal flatness Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty ^{2} + Fading profile power uncertainty ^{2} + (0.25 x AWGN flatness and signal flatness) ^{2}) Signal-to-noise ratio uncertainty ±0.3 dB Fading profile power uncertainty ±0.7 dB for MIMO AWGN flatness and signal flatness ±2.0 dB
8.3.1.1.2_D	± 0.9 dB	Same as 8.3.1.1.1_D
8.3.1.2.1_D	± 0.9 dB	Same as 8.3.1.1.1_D
8.3.2.1.1	± 0.9 dB	Overall system uncertainty for fading conditions comprises three quantities: 1. Signal-to-noise ratio uncertainty 2. Fading profile power uncertainty 3. Effect of AWGN flatness and signal flatness Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty ^{2} + Fading profile power uncertainty ^{2} + (0.25 x AWGN flatness and signal flatness) ^{2}) Signal-to-noise ratio uncertainty ±0.3 dB Fading profile power uncertainty ±0.7 dB for Tx Diversity AWGN flatness and signal flatness ±2.0 dB
8.3.2.1.1_1	± 0.9 dB	Same as 8.3.2.1.1
8.3.2.1.2	± 0.9 dB	Same as 8.2.2.3.1
8.3.2.1.2_D	± 0.9 dB	Same as 8.2.2.3.1
8.3.2.1.3	± 0.9 dB	Same as 8.2.2.3.1
8.3.2.1.3_D	± 0.9 dB	Same as 8.2.2.3.1
8.3.2.2.1	± 0.9 dB	Same as 8.2.2.3.1
8.3.2.2.1_D	± 0.9 dB	Same as 8.2.2.3.1

8.4.1.1	± 0.8 dB	Overall system uncertainty for fading conditions comprises four quantities: 1. Signal-to-noise ratio uncertainty 2. Fading profile power uncertainty 3. Effect of AWGN flatness and signal flatness 4. Result variation due to finite test time Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty ^{2} + Fading profile power uncertainty ^{2} + (0.25 x AWGN flatness and signal flatness) ^{2} + variation due to finite test time ^{2}) Signal-to-noise ratio uncertainty ±0.3 dB Fading profile power uncertainty ±0.5 dB for single Tx AWGN flatness and signal flatness ±2.0 dB Result variation due to finite test time ±0.2 dB
8.4.1.2.1	± 1.0 dB	Overall system uncertainty for fading conditions comprises four quantities: 1. Signal-to-noise ratio uncertainty 2. Fading profile power uncertainty 3. Effect of AWGN flatness and signal flatness 4. Result variation due to finite test time Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty ^{2} + Fading profile power uncertainty ^{2} + (0.25 x AWGN flatness and signal flatness) ^{2} + variation due to finite test time ^{2}) Signal-to-noise ratio uncertainty ±0.3 dB Fading profile power uncertainty ±0.7 dB for Tx Diversity AWGN flatness and signal flatness ±2.0 dB Result variation due to finite test time ±0.4 dB
8.4.1.2.1_1	Same as 8.4.1.2.1	
8.4.1.2.2	± 1.0 dB	Overall system uncertainty for fading conditions comprises four quantities: 1. Signal-to-noise ratio uncertainty 2. Fading profile power uncertainty 3. Effect of AWGN flatness and signal flatness 4. Result variation due to finite test time Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty ^{2} + Fading profile power uncertainty ^{2} + (0.25 x AWGN flatness and signal flatness) ^{2} + variation due to finite test time ^{2}) Signal-to-noise ratio uncertainty ±0.3 dB Fading profile power uncertainty ±0.7 dB for MIMO AWGN flatness and signal flatness ±2.0 dB Result variation due to finite test time ±0.4 dB
8.4.1.2.2_1	Same as 8.4.1.2.2	

8.4.1.2.3_C.1	[TBD]	[TBD]
8.4.1.2.3_C.2	[TBD]	[TBD]
8.4.2.1	± 0.8 dB	Overall system uncertainty for fading conditions comprises four quantities: 1. Signal-to-noise ratio uncertainty 2. Fading profile power uncertainty 3. Effect of AWGN flatness and signal flatness 4. Result variation due to finite test time Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty^2 + Fading profile power uncertainty^2 + (0.25 x AWGN flatness and signal flatness)^2 + variation due to finite test time^2) Signal-to-noise ratio uncertainty ±0.3 dB Fading profile power uncertainty ±0.5 dB for single Tx AWGN flatness and signal flatness ±2.0 dB Result variation due to finite test time ±0.2 dB
8.4.2.2.1	± 1.0 dB	Overall system uncertainty for fading conditions comprises four quantities: 1. Signal-to-noise ratio uncertainty 2. Fading profile power uncertainty 3. Effect of AWGN flatness and signal flatness 4. Result variation due to finite test time Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty^2 + Fading profile power uncertainty^2 + (0.25 x AWGN flatness and signal flatness)^2 + variation due to finite test time^2) Signal-to-noise ratio uncertainty ±0.3 dB Fading profile power uncertainty ±0.7 dB for Tx Diversity AWGN flatness and signal flatness ±2.0 dB Result variation due to finite test time ±0.4 dB
8.4.2.2.1_1	Same as 8.4.2.2.1	

8.4.2.2.2	± 1.0 dB	Overall system uncertainty for fading conditions comprises four quantities: 1. Signal-to-noise ratio uncertainty 2. Fading profile power uncertainty 3. Effect of AWGN flatness and signal flatness 4. Result variation due to finite test time Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty ^{2} + Fading profile power uncertainty ^{2} + (0.25 x AWGN flatness and signal flatness) ^{2} + variation due to finite test time ^{2}) Signal-to-noise ratio uncertainty ±0.3 dB Fading profile power uncertainty ±0.7 dB for MIMO AWGN flatness and signal flatness ±2.0 dB Result variation due to finite test time ±0.4 dB
8.4.2.2.2_1	Same as 8.4.2.2.2	
8.5.1.1	± 0.9 dB	Overall system uncertainty for fading conditions comprises four quantities: 1. Signal-to-noise ratio uncertainty 2. Fading profile power uncertainty 3. Effect of AWGN flatness and signal flatness 4. Result variation due to finite test time Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty ^{2} + Fading profile power uncertainty ^{2} + (0.25 x AWGN flatness and signal flatness) ^{2} + variation due to finite test time ^{2}) Signal-to-noise ratio uncertainty ±0.3 dB Fading profile power uncertainty ±0.5 dB for single Tx AWGN flatness and signal flatness ±2.0 dB Result variation due to finite test time ±0.4 dB
8.5.1.2.1	± 1.1 dB	Overall system uncertainty for fading conditions comprises four quantities: 1. Signal-to-noise ratio uncertainty 2. Fading profile power uncertainty 3. Effect of AWGN flatness and signal flatness 4. Result variation due to finite test time Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty ^{2} + Fading profile power uncertainty ^{2} + (0.25 x AWGN flatness and signal flatness) ^{2} + variation due to finite test time ^{2}) Signal-to-noise ratio uncertainty ±0.3 dB Fading profile power uncertainty ±0.7 dB for Tx Diversity AWGN flatness and signal flatness ±2.0 dB Result variation due to finite test time ±0.6 dB
8.5.1.2.1_1	Same as 8.5.1.2.1	

8.5.1.2.2	± 1.0 dB	Overall system uncertainty for fading conditions comprises four quantities: 1. Signal-to-noise ratio uncertainty 2. Fading profile power uncertainty 3. Effect of AWGN flatness and signal flatness 4. Result variation due to finite test time Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty ^{2} + Fading profile power uncertainty ^{2} + (0.25 x AWGN flatness and signal flatness) ^{2} + variation due to finite test time ^{2}) Signal-to-noise ratio uncertainty ±0.3 dB Fading profile power uncertainty ±0.7 dB for MIMO AWGN flatness and signal flatness ±2.0 dB Result variation due to finite test time ±0.4 dB
8.5.1.2.2_1	Same as 8.5.1.2.2	
8.5.1.2.3_C.1	[TBD]	[TBD]
8.5.2.1	± 0.9 dB	Overall system uncertainty for fading conditions comprises four quantities: 1. Signal-to-noise ratio uncertainty 2. Fading profile power uncertainty 3. Effect of AWGN flatness and signal flatness 4. Result variation due to finite test time Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty ^{2} + Fading profile power uncertainty ^{2} + (0.25 x AWGN flatness and signal flatness) ^{2} + variation due to finite test time ^{2}) Signal-to-noise ratio uncertainty ±0.3 dB Fading profile power uncertainty ±0.5 dB for single Tx AWGN flatness and signal flatness ±2.0 dB Result variation due to finite test time ±0.4 dB
8.5.2.2.1	± 1.1 dB	Overall system uncertainty for fading conditions comprises four quantities: 1. Signal-to-noise ratio uncertainty 2. Fading profile power uncertainty 3. Effect of AWGN flatness and signal flatness 4. Result variation due to finite test time Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty ^{2} + Fading profile power uncertainty ^{2} + (0.25 x AWGN flatness and signal flatness) ^{2} + variation due to finite test time ^{2}) Signal-to-noise ratio uncertainty ±0.3 dB Fading profile power uncertainty ±0.7 dB for Tx Diversity AWGN flatness and signal flatness ±2.0 dB Result variation due to finite test time ±0.6 dB

8.5.1.2.2_1	Same as 8.5.2.2.1	
8.5.2.2.2	± 1.0 dB	Overall system uncertainty for fading conditions comprises four quantities: 1. Signal-to-noise ratio uncertainty 2. Fading profile power uncertainty 3. Effect of AWGN flatness and signal flatness 4. Result variation due to finite test time Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty ^{2} + Fading profile power uncertainty ^{2} + (0.25 x AWGN flatness and signal flatness) ^{2} + variation due to finite test time ^{2}) Signal-to-noise ratio uncertainty ±0.3 dB Fading profile power uncertainty ±0.7 dB for MIMO AWGN flatness and signal flatness ±2.0 dB Result variation due to finite test time ±0.4 dB
8.5.2.2.2_1	Same as 8.5.2.2.2	
8.7.1.1 FDD sustained data rate performance	Downlink absolute power uncertainty, averaged over BW_{Config} ±1.0 dB Downlink EVM ≤ 3%	3% EVM is equivalent to a Test system downlink SNR of 30.5dB. The noise from the Test system is then sufficiently below that required for the UE to demodulate the signal with the required % success rate. Under these conditions the UE throughput is limited by the Reference measurement channel and the UE capability, and not by the Test system EVM.
8.7.1.1_1	Same as 8.7.1.1	Same as 8.7.1.1
8.7.1.1_A.1	Same as 8.7.1.1 for each CC	Same as 8.7.1.1 Calculation applies for each CC
8.7.1.1_A.2	Same as 8.7.1.1A.1	Same as 8.7.1.1A.1
8.7.2.1 TDD sustained data rate performance	Same as 8.7.1.1	Same as 8.7.1.1
8.7.2.1_1	Same as 8.7.2.1	Same as 8.7.2.1
8.7.2.1_A.1	Same as 8.7.2.1 for each CC	Same as 8.7.2.1 Calculation applies for each CC
8.7.2.1_A.2	Same as 8.7.2.1A.1	Same as 8.7.2.1A.1
10.1	± 0.9 dB	Overall system uncertainty for fading conditions comprises three quantities: 1. Signal-to-noise ratio uncertainty 2. Fading profile power uncertainty 3. Effect of AWGN flatness and signal flatness Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared: AWGN flatness and signal flatness has x 0.25 effect on the required SNR, so use sensitivity factor of x 0.25 for the uncertainty contribution. Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty ^{2} + Fading profile power uncertainty ^{2} + (0.25 x AWGN flatness and signal flatness) ^{2}) Signal-to-noise ratio uncertainty ±0.3 dB Fading profile power uncertainty ±0.7 dB for Tx Diversity AWGN flatness and signal flatness ±2.0 dB
10.2	± 0.9 dB	Same as 10.1
[Other tests FFS]		
In addition, the following Test System uncertainties and related constraints apply:		
AWGN Bandwidth		≥ 1.08MHz, 2.7MHz, 4.5MHz, 9MHz, 13.5MHz, 18MHz; N_{RB} x 180kHz according to BW_{Config}
AWGN absolute power uncertainty, averaged over BW_{Config}		±3 dB

AWGN flatness and signal flatness, max deviation for any Resource Block, relative to average over BW_{Config}	±2 dB
AWGN peak to average ratio	≥10 dB @0.001%
Signal-to noise ratio uncertainty, averaged over downlink transmission Bandwidth	±0.3 dB (includes uncertainty in precoding applied by the test system, where applicable)
Signal-to noise ratio variation for any resource block, relative to average over downlink transmission Bandwidth	±0.5 dB
Fading profile power uncertainty	Test-specific
Fading profile delay uncertainty, relative to frame timing	±5 ns (excludes absolute errors related to baseband timing)
CA performance requirements only: Relative frequency error between carriers	30Hz, measured over a 1ms period, and maximum carrier spacing 80MHz
Note 1: Only the overall stimulus error is considered here. The effect of errors in the throughput measurements due to finite test duration is not considered. Note 2: The AWGN parameters apply to all test cases except 8.7.1 and 8.7.2. The fading parameters apply to test cases using fading Note 3: In CA test cases using multiple component carriers (CCs), the uncertainties and related constraints apply for each CC.	

F.1.5 Measurement of Channel State Information reporting

Table F.1.5-1: Maximum Test System Uncertainty for Channel State Information reporting

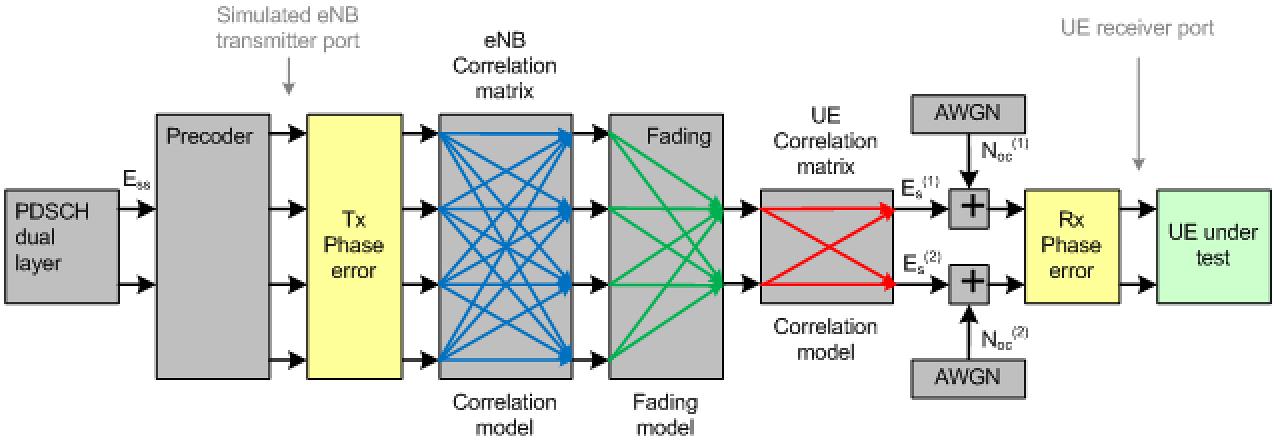
Subclause	Maximum Test System Uncertainty[1]	Derivation of Test System Uncertainty
9.2.1.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-0	± 0.3 dB	Signal-to-noise ratio uncertainty ±0.3 dB *AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* *AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect*
9.2.1.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-0	± 0.3 dB	Same as 9.2.1.1
9.2.1.3_C.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for eICIC (non-MBSFN ABS)	± 0.3 dB	Same as 9.2.1.1
9.2.1.4_C.1 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for eICIC (non-MBSFN ABS)	FFS	FFS
9.2.2.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-1	± 0.3 dB	Signal-to-noise ratio uncertainty ±0.3 dB *AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* *AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect*
9.2.2.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-1	± 0.3 dB	Same as 9.2.1.1
9.2.3.1_D FDD CQI Reporting under AWGN conditions – PUCCH 1-1 for eDL-MIMO	± 0.3 dB	Same as 9.2.2.1
9.2.3.2_D TDD CQI Reporting under AWGN conditions – PUCCH 1-1 for eDL-MIMO	± 0.3 dB	Same as 9.2.2.1
9.3.1.1.1 FDD CQI Reporting under fading conditions – PUSCH 3-0	± 0.6 dB	Overall system uncertainty for fading conditions comprises two quantities: 1. Signal-to-noise ratio uncertainty ±0.3 dB 2. Fading profile power uncertainty ±0.5 dB Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty^2 + Fading profile power uncertainty^2) *AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* *AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect*
9.3.1.1.2 TDD CQI Reporting under fading conditions – PUSCH 3-0	± 0.6 dB	Same as 9.3.1.1.1
9.3.1.2.1_D FDD CQI Reporting under fading conditions – PUSCH 3-1 for eDL-MIMO	± 0.6 dB	Same as 9.3.1.1.1
9.3.1.2.2_D TDD CQI Reporting under fading conditions – PUSCH 3-1 for eDL-MIMO	± 0.6 dB	Same as 9.3.1.1.1

9.3.2.1.1 FDD CQI Reporting under fading conditions – PUCCH 1-0	± 0.6 dB	Overall system uncertainty for fading conditions comprises two quantities: 1. Signal-to-noise ratio uncertainty ±0.3 dB 2. Fading profile power uncertainty ±0.5 dB Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty^2 + Fading profile power uncertainty^2) *AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* *AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect*
9.3.2.1.1_1 FDD CQI Reporting under fading conditions – PUCCH 1-0	± 0.6 dB	Same as 9.3.2.1.1
9.3.2.1.2 TDD CQI Reporting under fading conditions – PUCCH 1-0	± 0.6 dB	Same as 9.3.2.1.1
9.3.2.1.2_1 TDD CQI Reporting under fading conditions – PUCCH 1-0	± 0.6 dB	Same as 9.3.2.1.1
9.3.2.2.1_D FDD CQI Reporting under fading conditions – PUCCH 1-1 for eDL-MIMO	± 0.6 dB	Same as 9.3.2.1.1
9.3.2.2.2_D TDD CQI Reporting under fading conditions – PUCCH 1-1 for eDL-MIMO	± 0.6 dB	Same as 9.3.2.1.1
9.3.3.1.1 FDD CQI Reporting under fading conditions and frequency-selective interference – PUSCH 3-0	± 1.2 dB	Overall system uncertainty for fading conditions comprises two quantities: 1. Ior/Iot ratio uncertainty ±1.0 dB 2. Fading profile power uncertainty ±0.5 dB Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: Test System uncertainty = SQRT (Ior/Iot ratio uncertainty^2 + Fading profile power uncertainty^2) *Ior absolute power uncertainty ±3.0 dB not expected to have any significant effect*
9.3.3.1.2 TDD CQI Reporting under fading conditions and frequency-selective interference – PUSCH 3-0	± 1.2 dB	Same as 9.3.3.1.1
9.3.4.1.1 FDD CQI Reporting under fading conditions – PUSCH 2-0	± 0.6 dB	Overall system uncertainty for fading conditions comprises two quantities: 1. Signal-to-noise ratio uncertainty ±0.3 dB 2. Fading profile power uncertainty ±0.5 dB Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty^2 + Fading profile power uncertainty^2) *AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* *AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect*
9.3.4.1.2 TDD CQI Reporting under fading conditions – PUSCH 2-0	± 0.6 dB	Same as 9.3.4.1.1
9.3.4.2.1 FDD CQI Reporting under fading conditions – PUCCH 2-0	± 0.6 dB	Same as 9.3.4.1.1
9.3.4.2.2 TDD CQI Reporting under fading conditions – PUCCH 2-0	± 0.6 dB	Same as 9.3.4.1.1

9.4.1.1.1 FDD PMI Reporting – PUSCH 3-1 (Single PMI)	± 0.6 dB	Overall system uncertainty for fading conditions comprises two quantities: 1. Signal-to-noise ratio uncertainty ±0.3 dB 2. Fading profile power uncertainty ±0.5 dB Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty ^{2} + Fading profile power uncertainty ^{2}) *AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* *AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect*
9.4.1.1.2 TDD PMI Reporting – PUSCH 3-1 (Single PMI)	± 0.6 dB	Same as 9.4.1.1.1
9.4.1.2.1 FDD PMI Reporting – PUCCH 2-1 (Single PMI)	± 0.6 dB	Overall system uncertainty for fading conditions comprises two quantities: 1. Signal-to-noise ratio uncertainty ±0.3 dB 2. Fading profile power uncertainty ±0.5 dB Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty ^{2} + Fading profile power uncertainty ^{2}) *AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* *AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect*
9.4.1.2.2 TDD PMI Reporting – PUCCH 2-1 (Single PMI)	± 0.6 dB	Same as 9.4.1.2.1
9.4.1.3.1_D FDD Reporting of PMI – PUSCH 3-1 (Single PMI) for eDL-MIMO	± 0.6 dB	Same as 9.4.1.1.1
9.4.1.3.2_D TDD Reporting of PMI – PUSCH 3-1 (Single PMI) for eDL-MIMO	± 0.6 dB	Same as 9.4.1.1.1
9.4.2.1.1 FDD PMI Reporting – PUSCH 1-2 (Multiple PMI)	± 0.6 dB	Overall system uncertainty for fading conditions comprises two quantities: 1. Signal-to-noise ratio uncertainty ±0.3 dB 2. Fading profile power uncertainty ±0.5 dB Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty ^{2} + Fading profile power uncertainty ^{2}) *AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* *AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect*
9.4.2.1.1_1 FDD PMI Reporting – PUSCH 1-2 (Multiple PMI)	± 0.6 dB	Same as 9.4.2.1.1
9.4.2.1.2 TDD PMI Reporting – PUSCH 1-2 (Multiple PMI)	± 0.6 dB	Same as 9.4.2.1.1
9.4.2.1.2_1 TDD PMI Reporting – PUSCH 1-2 (Multiple PMI)	± 0.6 dB	Same as 9.4.2.1.1
9.4.2.2.1 FDD PMI Reporting – PUSCH 2-2 (Multiple PMI)	± 0.6 dB	Same as 9.4.2.1.1
9.4.2.2.2 TDD PMI Reporting – PUSCH 2-2 (Multiple PMI)	± 0.6 dB	Same as 9.4.2.1.1

9.4.2.3.1_D FDD PMI Reporting – PUSCH 1-2 (Multiple PMI) for eDL-MIMO	± 0.6 dB	Same as 9.4.2.1.1
9.4.2.3.2_D TDD PMI Reporting – PUSCH 1-2 (Multiple PMI) for eDL-MIMO	± 0.6 dB	Same as 9.4.2.1.1
9.5.1.1 FDD RI Reporting– PUCCH 1-1	± 0.6 dB	Overall system uncertainty for fading conditions comprises two quantities: 1. Signal-to-noise ratio uncertainty ±0.3 dB 2. Fading profile power uncertainty ±0.5 dB Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: Test System uncertainty = SQRT (Signal-to-noise ratio uncertainty ^{2} + Fading profile power uncertainty ^{2}) *AWGN flatness and signal flatness ±2.0 dB not expected to have any significant effect* *AWGN absolute power uncertainty ±3.0 dB not expected to have any significant effect*
9.5.1.1_1 FDD RI Reporting– PUCCH 1-1 (Release 10)	± 0.6 dB	Same as 9.5.1.1
9.5.1.1_2 FDD RI Reporting– PUCCH 1-1 (Release 11)	± 0.6 dB	Same as 9.5.1.1
9.5.1.2 TDD RI Reporting– PUSCH 3-1	± 0.6 dB	Same as 9.5.1.1
9.5.1.2_1 TDD RI Reporting– PUSCH 3-1 (Release 10)	± 0.6 dB	Same as 9.5.1.1
9.5.1.2_2 TDD RI Reporting– PUSCH 3-1 (Release 11)	± 0.6 dB	Same as 9.5.1.1
9.5.2.1_D FDD RI Reporting – PUCCH 1-1 for eDL-MIMO	± 0.6 dB	Same as 9.5.1.1
9.5.2.2_D TDD RI Reporting – PUCCH 1-1 for eDL-MIMO	± 0.6 dB	Same as 9.5.1.1
In addition, the following Test System uncertainties and related constraints apply:		
AWGN Bandwidth		≥ 1.08MHz, 2.7MHz, 4.5MHz, 9MHz, 13.5MHz, 18MHz; N_{RB} x 180kHz according to BW_{Config}
AWGN absolute power uncertainty, averaged over BW_{Config}		±3 dB
AWGN flatness and signal flatness, max deviation for any Resource Block, relative to average over BW_{Config}		±2 dB
AWGN peak to average ratio		≥10 dB @0.001%
Signal-to noise ratio uncertainty, averaged over downlink transmission Bandwidth		±0.3 dB (includes uncertainty in precoding applied by the test system, where applicable)
Signal-to noise ratio variation for any resource block, relative to average over downlink transmission Bandwidth		±0.5 dB
Fading profile power uncertainty		Test-specific
Fading profile delay uncertainty, relative to frame timing		±5 ns (excludes absolute errors related to baseband timing)
Downlink channel matrix uncertainties:		
Tx phase error, as shown in Figure F.1.5-1		$\Theta_{Tx} = \begin{bmatrix} e^{j\theta_1} & 0 & \cdots & 0 \\ 0 & e^{j\theta_2} & \ddots & 0 \\ \vdots & \ddots & \ddots & \vdots \\ 0 & 0 & \cdots & e^{j\theta_{N_{Tx}}} \end{bmatrix}$ θ_n is defined for each Tx antenna up to N_{Tx} $\theta_n \in \left(-\theta_{MAX}, \theta_{MAX}\right)$ θ_{MAX} ≤ 10° θ_n is constant for the duration of the test

Rx phase error, as shown in Figure F.1.5-1	$$\Theta_{Rx} = \begin{bmatrix} e^{j\theta_1} & 0 & \cdots & 0 \\ 0 & e^{j\theta_2} & \ddots & 0 \\ \vdots & \ddots & \ddots & \vdots \\ 0 & 0 & \cdots & e^{j\theta_{N_{Tx}}} \end{bmatrix}$$ θ_n is defined for each Rx antenna up to N_{Rx} There is no constraint on the value of θ_n except that it is constant for the duration of the test
Note 1: Only the overall stimulus error is considered. The effect of errors in the throughput measurements due to finite test duration is not considered. Note 2: The AWGN parameters apply to all test cases except 9.3.3.1.1 and 9.3.3.1.2. The fading parameters apply to test cases using fading Note 3: Downlink channel matrix uncertainties apply to eDL-MIMO CSI test cases	



Example for dual layer PDSCH, 4Tx antennas x 2Rx antennas, fading propagation, with correlation and AWGN

Figure F.1.5-1: Location of Tx Phase error and Rx Phase error for eDL-MIMO (Informative)

F.2 Interpretation of measurement results (normative)

The measurement results returned by the Test System are compared – without any modification – against the Test Requirements as defined by the shared risk principle.

The Shared Risk principle is defined in ETR 273-1-2 clause 6.5.

The actual measurement uncertainty of the Test System for the measurement of each parameter shall be included in the test report.

The recorded value for the Test System uncertainty shall be, for each measurement, equal to or lower than the appropriate figure in clause F.1 of the present document.

If the Test System for a test is known to have a measurement uncertainty greater than that specified in clause F.1, it is still permitted to use this apparatus provided that an adjustment is made value as follows:

Any additional uncertainty in the Test System over and above that specified in clause F.1 shall be used to tighten the Test Requirement, making the test harder to pass. For some tests, for example receiver tests, this may require modification of stimulus signals. This procedure will ensure that a Test System not compliant with clause F.1does not increase the chance of passing a device under test where that device would otherwise have failed the test if a Test System compliant with clause F.1 had been used.

F.3 Test Tolerance and Derivation of Test Requirements (informative)

The Test Requirements in the present document have been calculated by relaxing the Minimum Requirements of the core specification using the Test Tolerances defined in this clause. When the Test Tolerance is zero, the Test Requirement will be the same as the Minimum Requirement. When the Test Tolerance is non-zero, the Test Requirements will differ from the Minimum Requirements, and the formula used for the relaxation is given in this clause.

The Test Tolerances are derived from Test System uncertainties, regulatory requirements and criticality to system performance. As a result, the Test Tolerances may sometimes be set to zero.

The test tolerances should not be modified for any reason e.g. to take account of commonly known test system errors (such as mismatch, cable loss, etc.).

The downlink Test Tolerances apply at each receiver antenna connector.

F.3.1 Measurement of test environments

The UE test environments are set to the values defined in TS 36.508 subclause 4.1, without any relaxation. The applied Test Tolerance is therefore zero.

F.3.2 Measurement of transmitter

Table F.3.2-1: Derivation of Test Requirements (Transmitter tests)

Test	Minimum Requirement in TS 36.101	Test Tolerance (TT)	Test Requirement in TS 36.521-1
6.2.2 UE Maximum Output Power	 f ≤ 3.0GHz Power class 1: [FFS] Power class 2: [FFS] Power class 3: 23dBm ±2 dB Power class 4: [FFS] 3.0GHz < f ≤ 4.2GHz Power class 3: 23dBm +2/-3 dB	 0.7 dB 0.7 dB 0.7 dB 0.7 dB 1.0 dB	Formula: Upper limit + TT, Lower limit - TT Power class 1: [FFS] Power class 2: [FFS] Power class 3: 23dBm ±2.7 dB Power class 4: [FFS] Power class 3: 23dBm +3.0/-4.0 dB
6.2.2_1 UE Maximum Output Power for HPUE	 f ≤ 3.0GHz Power class 1: 31dBm +2/-3dB	 0.7dB	Formula: Upper limit + TT, Lower limit - TT Power class 1: 31dBm +2.7/-3.7dB
6.2.2A.1 UE Maximum Output Power for CA (intra-band contiguous DL CA and UL CA)	Same as 6.2.2	Same as 6.2.2	Same as 6.2.2
6.2.2B UE Maximum Output Power for UL-MIMO	 f ≤ 3.0GHz Power class 1: [FFS] Power class 2: [FFS] Power class 3: 23dBm +2/-3 dB Power class 4: [FFS] 3.0GHz < f ≤ 4.2GHz Power class 3: 23dBm +2/-4 dB	Same as 6.2.2	Formula: Upper limit +TT, Lower limit - TT Power class 1: [FFS] Power class 2: [FFS] Power class 3: 23dBm +2.7/-3.7 dB Power class 4: [FFS] Power class 3: 23dBm +3.0/-5.0 dB Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.2.3 Maximum Power Reduction	Power class 3 f ≤ 3.0GHz QPSK: MPR ≤ 1dB 16QAM: MPR ≤ 1dB 16QAM: MPR ≤ 2dB 3.0GHz < f ≤ 4.2GHz QPSK: MPR ≤ 1dB 16QAM: MPR ≤ 1dB 16QAM: MPR ≤ 2dB	 0.7 dB 0.7 dB 0.7 dB 1.0 dB 1.0 dB 1.0 dB	Formula: Upper limit + TT, Lower limit – MPR – TT Power class 3: QPSK: 23dBm +2.7 / - 3.7dB 16QAM: 23dBm +2.7 / - 3.7dB 16QAM: 23dBm +2.7 / - 4.7dB QPSK: 23dBm +3.0 / - 5.0dB 16QAM: 23dBm +3.0 / - 5.0dB 16QAM: 23dBm +3.0 / - 6.0dB
6.2.3_1 Maximum Power Reduction for HPUE	Power class 1 f ≤ 3.0GHz QPSK: MPR ≤ 1dB 16QAM: MPR ≤ 1dB 16QAM: MPR ≤ 2dB	 0.7 dB 0.7 dB 0.7 dB	Formula: Upper limit + TT, Lower limit – MPR – TT Power class 1: QPSK: 31dBm +2.7 / - 4.7dB 16QAM: 31dBm +2.7 / - 4.7dB 16QAM: 31dBm +2.7 / - 5.7dB
6.2.3A.1 Maximum Power Reduction (MPR) for CA (intra-band contiguous DL CA and UL CA)	TBD	TBD	TBD
6.2.3B Maximum Power Reduction (MPR) for UL-MIMO	Same as 6.2.3	Same as 6.2.3	Same as 6.2.3 Uplink power measurement applies to

			overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.2.4 UE Maximum Output Power with additional requirements	For the UE maximum output power modified by MPR and A-MPR, the power limits specified in TS 36.101 [2] clause 6.2.5 apply. For transmission bandwidths (Figure 5.4.2-1) confined within FUL_low and FUL_low + 4 MHz or FUL_high – 4 MHz and FUL_high, the power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB. Power class 3: QPSK: MPR ≤ 1dB 16QAM: Depending on the number RB allocated: 16QAM: MPR ≤ 1dB 16QAM: MPR ≤ 2dB For network signalled value NS_03 , NS_04 (5MHz only), NS_05, to NS_06: A-MPR ≤ 1dB For network signalled value NS-04; Depending on the RB_start and RB allocation (10MHz, 15MHz and 20MHz): For 10MHz Region A with RB_start=0 – 12: A-MPR ≤ 3dB. Region B with RB_start=13 – 36 : A-MPR ≤ 2dB. Region C with RB_start=37 – 49 : A-MPR ≤ 3dB. For 15MHz Region A with RB_start=0 – 18: A-MPR ≤ 3dB. Region B with RB_start=19 – 55 : A-MPR ≤ 2dB. Region C with RB_start=56 – 74 : A-MPR ≤ 3dB. For 20MHz Region A with RB_start=0 – 24: A-MPR ≤ 3dB. Region B with RB_start=25 – 74 : A-MPR ≤ 2dB.	0.7 dB	Formula: Upper limit + TT, A: Lower limit – TT, B: (UE Maximum Output Power from 6.2.2) - T(P_{CMAX}) – MPR – TT, C: (UE Maximum Output Power from 6.2.2) - T(P_{CMAX}) – A-MPR – TT, D: (UE Maximum Output Power from 6.2.2) - T(P_{CMAX}) – A-MPR – MPR – TT Power class 3: Test Requirement Configuration ID versus Formula Above Network signalled value NS_03: [A]: 2, 5, 10, 15, 20, 25 [B]: 1, 3, 7 [C]:9, 14, 19, 24 [D]:4, 6, 8, 11, 12, 13, 16, 17, 18, 21, 22, 23, 26, 27 Network signalled value NS_04 (5, 10, 15, 20MHz): [A] 3 [B] 10, 11, 19, 20, 28, 29 [C] 2, 6, 7, 13, 14, 15, 16, 23, 24, 25, 32 [D] 1, 4, 5, 8, 9, 12, 17, 18, 21, 22, 26, 27, 30, 31 Network signalled value NS_05: [A] 1, 3, 4, 8, 9, 14, 15, [B] 2, 5, 10, 11, 16, 17 [C] None [D] 6, 7, 12, 13, 18, 19 Network signalled value NS_06: [A]: 2, 5, 8, 11, 14, 17 [B]: 1, 3, 4, 6, 7, 9, 10, 12, 13, 15, 16, 18 [C]:None [D]:None Network signalled value NS_07: [A]:3, 8, 12 [B]: 7, 9 [C]:1, 2, 5, 13, 15 [D]:4, 6, 10, 11, 14, 16

	Region C with RB_start=75 – 99 : A-MPR ≤ 3dB. For network signalled value NS-11; Depending on the RB_start and RB allocation (15MHz and 20MHz): For 15MHz Fc < 2012.5 Region A with RB_start=0 – 4: A-MPR ≤ 15dB. Region B with RB_start=5 – 21: A-MPR ≤ 7dB (L_{CRB}=7-50) or ≤ 10dB (L_{CRB}=0-6 & ≥50). Region C with RB_start=22 – 56: A-MPR ≤ 0dB (L_{CRB}=≤25) or ≤ 6dB (L_{CRB}>25). Region D with RB_start=57 – 74: A-MPR ≤ 15dB. For 15MHz Fc = 2012.5 Region A with RB_start=0 – 12: A-MPR ≤ 10dB. Region B with RB_start=13 – 39: A-MPR ≤ 6dB (L_{CRB}=≥ 30) or ≤ 0dB (L_{CRB}=< 30). Region C with RB_start=40 – 65: A-MPR ≤ 2dB. Region D with RB_start=66 – 74: A-MPR ≤ 6.5dB. For 20MHz Region A with RB_start=0 – 12: A-MPR ≤ 15dB. Region B with RB_start=13 – 29: A-MPR ≤ 7dB (L_{CRB}=10-60) or ≤ 10dB (L_{CRB}=1-9 & > 60). Region C with RB_start=30 – 68: A-MPR ≤ 0dB (L_{CRB}=1-24) or ≤ 7dB (L_{CRB}= ≥ 25). Region D with RB_start=69 – 99: A-MPR ≤ 15dB. For network signalled value NS-20; Depending on the RB_start and RB allocation (5MHZ, 10 MHz, 15MHz and 20MHz): For 5MHz Region A with RB_start=≤24: A-MPR ≤ 17dB. Region B with RB_start=0 – 3: A-MPR ≤ 1dB (L_{CRB}=15-19) or ≤ 4dB (L_{CRB}= ≥ 20). Region C with RB_start=4 – 6:		Network signalled value NS_08: [A]:1, 2, 4, 5, 12 [B]: 3, 6, 11, 13 [C]:None [D]: 7, 8, 9, 10, 14, 15, 16, 17 Network signalled value NS_11: [A]: 5c, 6b, 10c, 11c, 25 [B]: 8b, 12c, 13c, 14c, 17a, 17b, 21a, 21b, 28 [C]:5a, 5b, 6a, 6c, 10a, 10b, 11, 11b, 15a, 15b, 16a, 16b, 24 [D]: 1a, 1b, 2a, 2b, 3a, 3b, 4a, 4b ,, 7a,7b,7c, 8a, 8c, 9a, 9b,9c, 12a, 12b, 13a, 13b, 14a, 14b, 18a, 18b, 19a, 19b, 20a, 20b, 22a, 22b, 23a, 23b, 26, 27, 29, 30 Network signalled value NS_12: [A]: 3, 8, 13 [B]: None [C]: 1, 4, 6, 11 [D]: 2, 5, 7, 9, 10, 12, 14, 15 Network signalled value NS_13: [A]: None [B]: 3, 4 [C]: 1 [D]: 2, 5 Network signalled value NS_14: [A]: None [B]: 2, 4, 7, 9 [C]: 1, 6 [D]: 3, 5, 8, 10 Network signalled value NS_15: [A]: 8 [B]: 27 [C]: 1, 2, 3, 4, 15, 19, 21, 26, 31 [D]: 5, 6, 7, 9, 10, 11, 12, 13, 14, 16, 17, 18, 20, 22, 23, 24, 25, 28, 29, 30, 32, 33, 34, 35 Network signalled value NS_20: [A]: 1b, 1c, 1d, 6b, 7b [B]: 2d, 3d, 4d, 5d, 9b [C]: 1a, 6a, 7a, 11, 18, 19 [D]: 2a, 2b, 2c, 3a, 3b, 3c, 4a, 4b, 4c, 5a, 5b, 5c, 8a, 8b, 9a, 10a, 11b, 12, 13, 14, 15, 16, 17, 20, 21, 22, 23, 24, 25, 26

	A-MPR ≤ 2dB. Region D with RB_start=≤24: A-MPR ≤ 0dB. For 10MHz Fc = 2005 Region A with RB_start=0 – 25: A-MPR ≤ 16dB. Region B with RB_start=26 – 34: A-MPR ≤ 2dB (L_{CRB}=8-15) or ≤ 5dB (L_{CRB}= > 15). Region C with RB_start=35 – 49: A-MPR ≤ 6dB. For 10MHz Fc = 2015 Region A with RB_start=0 – 5: A-MPR ≤ 4dB. Region B with RB_start=6 – 10: A-MPR ≤ 2dB. For 15MHz Region A with RB_start=0 – 14: A-MPR ≤ 11dB (L_{CRB}=1-9 & 40-5) or ≤ 6dB (L_{CRB}= 10-39). Region B with RB_start=15 – 24: A-MPR ≤ 1dB (L_{CRB}=24-29) or ≤ 7dB (L_{CRB}=≥30). Region C with RB_start=25 – 39: A-MPR ≤ 5dB. Region D with RB_start=61 – 74: A-MPR ≤ 6dB. For 20MHz Region A with RB_start=0 – 21: A-MPR ≤ 17dB. Region B with RB_start=22 – 31: A-MPR ≤ 12dB (L_{CRB}=1-9 & 31-75) or ≤ 6dB (L_{CRB}=10-30). Region C with RB_start=32 – 38: A-MPR ≤ 9dB. Region D with RB_start=39 – 49: A-MPR ≤ 7dB. Region E with RB_start=50 – 69: A-MPR ≤ 5dB. Region F with RB_start=70 – 99: A-MPR ≤ 16dB.		
6.2.4_1 Additional Maximum Power Reduction (A-MPR) for HPUE	For the UE maximum output power modified by MPR and A-MPR, the power limits specified in TS 36.101 [2] clause 6.2.5 apply. For transmission bandwidths (Figure 5.4.2-1) confined within FUL_low and FUL_low + 4 MHz or FUL_high – 4 MHz and	0.7dB	Formula: Upper limit + TT, (UE Maximum Output Power from 6.2.2) - T(P_{CMAX}) – A-MPR – MPR – TT

	FUL_high, the power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB. Power class 1: QPSK: MPR ≤ 1dB 16QAM: Depending on the number RB allocated: 16QAM: MPR ≤ 1dB 16QAM: MPR ≤ 2dB Power class 1: For network signalled value NS_06: A-MPR 0dB		
6.2.4A.1 Additional Maximum Power Reduction (A-MPR) for CA (intra-band contiguous DL CA and UL CA)	Power class 3: For network signalled value CA_NS_01: [TBC] For network signalled value CA_NS_02: [TBD] For network signalled value CA_NS_03: [TBD]	Same as 6.2.4	TBD
6.2.4B Additional Maximum Power Reduction (A-MPR) for UL-MIMO	Same as 6.2.4	Same as 6.2.4	Same as 6.2.4 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.2.5 Configured UE transmitted Output Power	<u>f ≤ 3.0GHz</u> 13 ≤ PCMAX < 18 ± 5.0 8 ≤ PCMAX < 13 ± 6.0 -40 ≤ PCMAX < 8 ± 7.0 <u>3.0GHz < f ≤ 4.2GHz</u> 13 ≤ PCMAX < 18 ± 5.0 8 ≤ PCMAX < 13 ± 6.0 -40 ≤ PCMAX < 8 ± 7.0	0.7 dB 0.7 dB 0.7 dB 1.0 dB 1.0 dB 1.0 dB	Formula: Upper limit + TT, Lower limit – TT 13 ≤ PCMAX < 18 ± 5.7 8 ≤ PCMAX < 13 ± 6.7 -40 ≤ PCMAX < 8 ± 7.7 13 ≤ PCMAX < 18 ± 6.0 8 ≤ PCMAX < 13 ± 7.0 -40 ≤ PCMAX < 8 ± 8.0
6.2.5_1 Configured UE transmitted Output Power for HPUE	<u>f ≤ 3.0GHz</u> 23 ≤ PCMAX < 33 ± 2.0 13 ≤ PCMAX < 18 ± 5.0 8 ≤ PCMAX < 13 ± 6.0 -40 ≤ PCMAX < 8 ± 7.0	0.7 dB 0.7 dB 0.7 dB 0.7 dB	Formula: Upper limit + TT, Lower limit – TT 23 ≤ PCMAX < 33 ± 2.7 13 ≤ PCMAX < 18 ± 5.7 8 ≤ PCMAX < 13 ± 6.7 -40 ≤ PCMAX < 8 ± 7.7
6.2.5A.1 Configured UE transmitted Output Power for CA (intra-band contiguous DL CA and UL CA)	<u>f ≤ 3.0GHz</u> 13 ≤ PCMAX < 18 ± 5.0 8 ≤ PCMAX < 13 ± 6.0 -40 ≤ PCMAX < 8 ± 7.0 <u>3.0GHz < f ≤ 4.2GHz</u> 13 ≤ PCMAX < 18 ± 5.0 8 ≤ PCMAX < 13 ± 6.0 -40 ≤ PCMAX < 8 ± 7.0	0.7 dB 0.7 dB 0.7 dB 1.0 dB 1.0 dB 1.0 dB	Formula: Upper limit + TT, Lower limit – TT 13 ≤ PCMAX < 18 ± 5.7 8 ≤ PCMAX < 13 ± 6.7 -40 ≤ PCMAX < 8 ± 7.7 13 ≤ PCMAX < 18 ± 6.0 8 ≤ PCMAX < 13 ± 7.0 -40 ≤ PCMAX < 8 ± 8.0
6.2.5A.2 Configured UE transmitted Output Power for CA (inter-band DL CA without UL CA)	<u>TBD</u>	TBD	TBD

6.2.5B Configured UE transmitted output power for UL-MIMO	f ≤ 3.0GHz [16] ≤ PCMAX < [20] ± [5.0] [11] ≤ PCMAX < [16] ± [6.0] [-40] ≤ PCMAX < [11] ± [7.0] 3.0GHz < f ≤ 4.2GHz [16] ≤ PCMAX < [20] ± [5.0] [11] ≤ PCMAX < [16] ± [6.0] [-40] ≤ PCMAX < [11] ± [7.0]	Same as 6.2.5	Formula: Upper limit + TT, Lower limit – TT [16] ≤ PCMAX < [20] ± [5.7] [11] ≤ PCMAX < [16] ± [6.7] [-40] ≤ PCMAX < [11] ± [7.7] [16] ≤ PCMAX < [20] ± [6.0] [11] ≤ PCMAX < [16] ± [7.0] [-40] ≤ PCMAX < [11] ± [8.0] Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.3.2 Minimum Output Power	f ≤ 3.0GHz -40 dBm 3.0GHz < f ≤ 4.2GHz -40 dBm	1.0 dB 1.3 dB	Formula: Minimum Requirement + TT UE min. output power =–39 dBm UE min. output power =–38.7 dBm
6.3.2A.1 Minimum Output Power for CA (intra-band contiguous DL CA and UL CA)	Same as 6.3.2	Same as 6.3.2	[Same as 6.3.2
6.3.2B Minimum Output Power for UL-MIMO	Same as 6.3.2	Same as 6.3.2	Same as 6.3.2 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.3.3 Transmission ON/OFF Power	f ≤ 3.0GHz ≤ -50 dBm 3.0GHz < f ≤ 4.2GHz ≤ -50 dBm	1.5 dB 1.8 dB	Formula: Minimum Requirement + TT UE OFF Power ≤ -48.5 dBm UE OFF Power ≤ -48.2 dBm
6.3.3A.1 UE Transmit OFF power for CA (intra-band contiguous DL CA and UL CA)	Same as 6.3.3	Same as 6.3.3	Same as 6.3.3
6.3.3B UE Transmit OFF power for UL-MIMO	Same as 6.3.3	Same as 6.3.3	Same as 6.3.3 Uplink power measurement applies to each Tx antenna connector
6.3.4.1 General ON/OFF time mask	f ≤ 3.0GHz OFF Power ≤ -50 dBm ON Power BW dependent 3.0GHz < f ≤ 4.2GHz OFF Power ≤ -50 dBm ON Power BW dependent Transmission ON Power value depends on the test parameters. In the particular test case parameters the ON power measurement has minimum requirements of ±6.0 dB	1.5 dB 1.5 dB 1.8 dB 1.8 dB	Formulae: OFF Power Minimum Req't + TT ON Power Upper limit + TT, Lower limit – TT UE OFF Power ≤ -48.5 dBm UE ON Power: Test value ± 7.5 dB UE OFF Power ≤ -48.2 dBm UE ON Power: Test value ± 7.8 dB
6.3.4A.1.1 General ON/OFF time mask for CA (intra-band contiguous DL CA and UL CA)	TBD	Same as 6.3.4.1	TBD

6.3.4B.1 General ON/OFF time mask for UL-MIMO	Same as 6.3.4.1	Same as 6.3.4.1	Same as 6.3.4.1 Uplink OFF power measurement applies to each Tx antenna connector Uplink ON power measurement applies to [FFS]
6.3.4.2 PRACH and SRS time mask	<u>f ≤ 3.0GHz</u> OFF Power ≤ -50 dBm ON Power BW dependent <u>3.0GHz < f ≤ 4.2GHz</u> OFF Power ≤ -50 dBm ON Power BW dependent Transmission ON Power value depends on the test parameters. In the particular test case parameters the ON power measurement has minimum requirements of ±6.0 dB	1.5 dB 1.5 dB 1.8 dB 1.8 dB	Formulae: OFF Power Minimum Req't + TT ON Power Upper limit + TT, Lower limit – TT UE OFF Power ≤ -48.5 dBm UE ON Power: Test value ± 7.5 dB UE OFF Power ≤ -48.2 dBm UE ON Power: Test value ± 7.8 dB
6.3.5.1 Power Control Absolute power tolerance	<u>f ≤ 3.0GHz</u> Normal conditions ± 9.0 dB Extreme conditions ± 12.0 dB <u>3.0GHz < f ≤ 4.2GHz</u> Normal conditions ± 9.0 dB Extreme conditions ± 12.0 dB	1.0 dB 1.0 dB 1.4 dB 1.4 dB	Formula: Upper limit + TT, Lower limit – TT Normal conditions ± 10.0 dB Extreme conditions ± 13.0 dB Normal conditions ± 10.4 dB Extreme conditions ± 13.4 dB
6.3.5_1.1 Power Control Absolute power tolerance for HPUE	<u>f ≤ 3.0GHz</u> Normal conditions ± 9.0 dB Extreme conditions ± 12.0 dB	1.0 dB 1.0 dB	Formula: Upper limit + TT, Lower limit – TT Normal conditions ± 10.0 dB Extreme conditions ± 13.0 dB
6.3.5_1.2 Power Control Relative power tolerance for HPUE	Same as 6.3.5.2	Same as 6.3.5.2	Same as 6.3.5.2
6.3.5_1.3 Aggregate power control tolerance for HPUE	Same as 6.3.5.3	Same as 6.3.5.3	Same as 6.3.5.3
6.3.5A.1.1 Power Control Absolute power tolerance for CA (intra-band contiguous DL CA and UL CA)	TBD	Same as 6.3.5.1	TBD
6.3.5B.1 Power Control Absolute Power Tolerance for UL- MIMO	Same as 6.3.5.1	Same as 6.3.5.1	Same as 6.3.5.1 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.3.5.2 Power Control Relative power tolerance	TS 36.101 [2] clause 6.3.5.1 All combinations of PUSCH and PUCCH transitions: ΔP < 2; ±2.5 dB 2 ≤ ΔP < 3; ±3.0 dB 3 ≤ ΔP < 4; ±3.5 dB 4 ≤ ΔP ≤ 10; ±4.0 dB 10 ≤ ΔP < 15; ±5.0 dB 15 ≤ ΔP; ±6.0 dB	0.7 dB	Formula: Upper limit + TT, Lower limit – TT All combinations of PUSCH and PUCCH transitions: ΔP < 2; ±3.2 dB 2 ≤ ΔP < 3; ±3.7 dB 3 ≤ ΔP < 4; ±4.2 dB 4 ≤ ΔP < 10; ±4.7 dB 10 ≤ ΔP < 15; ±5.7 dB 15 ≤ ΔP; ±6.7 dB
6.3.5.3 Aggregate power control tolerance	Aggregate power control tolerance within 21 ms:	0.7 dB	Formula: Upper limit + TT, Lower limit - TT

	PUCCH = ±2.5 dB PUSCH = ±3.5 dB		PUCCH = ±3.2 dB PUSCH = ±4.2 dB
6.3.5A.2.1 Power Control Relative power tolerance for CA (intra-band contiguous DL CA and UL CA)	TBD	Same as 6.3.5.2	TBD
6.3.5B.2 Power Control Relative power tolerance for UL-MIMO	Same as 6.3.5.2	Same as 6.3.5.2	Same as 6.3.5.2 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.3.5A.3.1 Aggregate power control tolerance for CA (intra-band contiguous DL CA and UL CA)	Same as 6.3.5.3	Same as 6.3.5.3	Same as 6.3.5.3
6.3.5B.3 Aggregate power control tolerance for UL-MIMO	Same as 6.3.5.3	Same as 6.3.5.3	Same as 6.3.5.3 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.5.1 Frequency Error	Modulated carrier, f ≤ 4.2GHz Within ±0.1 ppm compared to the received carrier frequency f ≤ 3.0GHz DL power: Refsens 3.0GHz < f ≤ 4.2GHz DL power: Refsens	15 Hz 0.7 dB 1.0 dB	Formulae: Modulated carrier frequency: Upper limit + TT, Lower limit – TT DL power: Refsens + TT Modulated carrier frequency error = ±(0.1 ppm + 15 Hz) Refsens +0.7dB Refsens +1.0dB
6.5.1A.1 Frequency error for CA (intra-band contiguous DL CA and UL CA)	TBD	TBD	TBD
6.5.1B Frequency Error for UL-MIMO	Same as 6.5.1	Same as 6.5.1	Same as 6.5.1
6.5.2.1 Error Vector Magnitude	EVM limit: BPSK :17.5 % QPSK: 17.5 % 16QAM: 12.5 %	0%	Formula: Minimum Requirement + TT
6.5.2.1A PUSCH-EVM with exclusion period	EVM limit: QPSK: 17.5 % 16QAM: 12.5 %	0%	Formula: Minimum Requirement + TT
6.5.2A.1.1 Error Vector Magnitude (EVM) for CA (intra-band contiguous DL CA and UL CA)	Same as 6.5.2.1	Same as 6.5.2.1	Same as 6.5.2.1
6.5.2B.1 Error Vector Magnitude (EVM) for UL-MIMO	Same as 6.5.2.1	Same as 6.5.2.1	Same as 6.5.2.1 Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.5.2.2 Carrier leakage	For Output power >0 dBm -25dBc For -30 dBm ≤ Output power ≤0 dBm -20dBc For -40 dBm ≤ Output power <	0.8dB	Formula: Minimum Requirement + TT

	-30 dBm -10dBc		
6.5.2.3 In-band emissions for non allocated RB	For general emissions: $\max\{\ -25-10\cdot\log_{10}(N_{RB}/L_{CRB}$ $20\cdot\log_{10}EVM\ -3-5\cdot(\lvert\Delta_{RB}\rvert-1)$ $-57\,dBm/180kHz-P_{RB}\}$ For IQ image: -25dB For Carrier leakage: Output power >0 dBm -25dBc -30 dBm ≤ Output power ≤0 dBm -20dBc -40 dBm ≤ Output power < -30 dBm -10dBc For each evaluated RB, the test requirement is calculated as the higher of $P_{RB}-30\,\mathrm{dB}$ and the power sum of all limit values (General, IQ Image or Carrier leakage)	0.8dB	Formula: Minimum Requirement + TT

6.5.2.4 EVM equalizer Spectrum flatness	Normal conditions.
	
	If (F-FUL_low ≥ [3MHz])&(FUL_high-F≥ [3MHz])
	4 dB
	else
	8 dB
	
	maximum coefficient in Range 1 - the minimum coefficient in Range 2
	5 dB
	the maximum coefficient in Range 2 - the minimum coefficient in Range
	7 dB
	Extreme conditions:
	
	If (F-FUL_low ≥ [5MHz])&(FUL_high-F≥ [5MHz])
	4 dB
	else
	12 dB
	
	maximum coefficient in Range 1 - the minimum coefficient in Range 2
	6 dB
	the maximum coefficient in Range 2 - the minimum coefficient in Range
	10 dB
		1.4dB	Formula:
			Minimum Requirement + TT

6.5.2A.2.1 Carrier leakage for CA (intra-band contiguous DL CA and UL CA)	TBD	TBD	TBD
6.5.2A.3.1 In-band emissions for non allocated RB for CA (intra-band contiguous DL CA and UL CA)	TBD	TBD	TBD

6.5.2B.1 Error vector magnitude (EVM) for UL-MIMO	TBD	TBD	TBD
6.5.2B.2 Carrier leakage for UL-MIMO	Same as 6.5.2.2	Same as 6.5.2.2	Same as 6.5.2.2 Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.5.2B.3 In-band emissions for non allocated RB for UL-MIMO	Same as 6.5.2.3	Same as 6.5.2.3	Same as 6.5.2.3 Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.5.2B.4 EVM equalizer spectrum flatness for UL-MIMO	Same as 6.5.2.4	Same as 6.5.2.4	Same as 6.5.2.4
6.6.1 Occupied bandwidth	For 1.4 MHz channel bandwidth: Occupied channel bandwidth = 1.4 MHz For 3.0 MHz channel bandwidth: Occupied channel bandwidth = 3.0 MHz For 5 MHz channel bandwidth: Occupied channel bandwidth = 5 MHz For 10 MHz channel bandwidth: Occupied channel bandwidth = 10 MHz For 15 MHz channel bandwidth: Occupied channel bandwidth = 15 MHz For 20 MHz channel bandwidth: Occupied channel bandwidth = 20 MHz	0kHz	Formula: Minimum Requirement + TT
6.6.1A.1 Occupied bandwidth for CA (intra-band contiguous DL CA and UL CA)	TBD	Same as 6.6.1	Same as 6.6.1
6.6.1B Occupied bandwidth for UL-MIMO	Same as 6.6.1	Same as 6.6.1	Same as 6.6.1
6.6.2.1 Spectrum Emission Mask	For 1.4 MHz BW: -10 dBm / 30kHz -25dBm to -10dBm / 1MHz For 3 MHz BW: -13 dBm / 30kHz -25dBm to -10dBm / 1MHz For 5 MHz BW: -15dBm / 30kHz -25dBm to -10dBm / 1MHz For 10 MHz BW: -18dBm / 30kHz -25dBm to -10dBm / 1MHz For 15 MHz BW: -20dBm / 30kHz -25dBm to -10dBm / 1MHz For 20 MHz BW: -21dBm / 30kHz -25dBm to -10dBm / 1MHz	All cases: f ≤ 3.0GHz 1.5dB 3.0GHz < f ≤ 4.2GHz 1.8dB	Formula: Minimum Requirement + TT Note: The Test Tolerance would be 0dB for $\Delta f_{OOB} \geq 2$ x Channel Bandwidth, but taking into account the filter position, the Test requirements specified all have $\Delta f_{OOB} < 2$ x Channel Bandwidth
6.6.2.1A.1 Spectrum emission mask for CA (intra-band contiguous DL	For 29.9 MHz BW: -22.5 dBm / 30kHz -25dBm to -10dBm / 1MHz	Same as 6.6.2.1	Same as 6.6.2.1

CA and UL CA)	For 30 MHz BW: -22.5 dBm / 30kHz -25dBm to -10dBm / 1MHz For 34.85 MHz BW: -23.5dBm / 30kHz -25dBm to -10dBm / 1MHz For 39.8 MHz BW: -24dBm / 30kHz -25dBm to -10dBm / 1MHz		
6.6.2.1B Spectrum Emission Mask for UL-MIMO	Same as 6.6.2.1	Same as 6.6.2.1	Same as 6.6.2.1
6.6.2.2 Additional Spectrum Emission Mask	For 1.4 MHz BW: NS_03, NS_04 -10 dBm / 30 kHz -25 dBm to -13 dBm / 1MHz NS_06 or NS_07 -13 dBm / 30 kHz -13 dBm / 100 kHz -25 dBm to -13 dBm / 1MHz For 3 MHz BW: NS_03, NS_04 -13 dBm / 30 kHz -25 dBm to -13 dBm / 1 MHz NS_06 or NS_07 -13 dBm / 30 kHz -13 dBm / 100kHz -25 dBm to -13 dBm / 1 MHz For 5 MHz BW: NS_03, NS_04 -15 dBm / 30 kHz -25 dBm to -13 dBm / 1 MHz NS_06 or NS_07 -15 dBm / 30 kHz -13 dBm / 100 kHz -25 dBm to -13 dBm / 1 MHz For 10 MHz BW: NS_03, NS_04, -18 dBm / 30 kHz -25 dBm to - 13dBm / 1 MHz NS_06 or NS_07 -18 dBm / 30 kHz -13 dBm / 100 kHz -25 dBm to - 13dBm / 1 MHz For 15 MHz BW: NS_03, NS_04 -20 dBm / 30kHz -25 dBm to -13 dBm / 1 MHz For 20 MHz BW: NS_03, NS_04 -21 dBm / 30 kHz -25 dBm to -13 dBm / 1 MHz	All cases: f ≤ 3.0GHz 1.5dB 3.0GHz < f ≤ 4.2GHz 1.8dB	Formula: Minimum Requirement + TT Note: The Test Tolerance would be 0dB for $\Delta f_{OOB} \geq 2$ x Channel Bandwidth, but taking into account the filter position, the Test requirements specified all have $\Delta f_{OOB} < 2$ x Channel Bandwidth
6.6.2.2B Additional Spectrum Emission Mask for UL-MIMO	Same as 6.6.2.2	Same as 6.6.2.2	Same as 6.6.2.2
6.6.2.3 Adjacent Channel Leakage power Ratio	If the adjacent channel power is greater than –50 dBm then the ACLR shall be higher than the values specified below.	0 dB	Formula: ACLR Minimum Requirement + TT Formula:

	E-UTRA ACLR: 30 dB UTRA ACLR: 33 dB for UTRA ACLR 1 36 dB for UTRA ACLR 2	 0.8 dB 0.8 dB 0.8 dB	ACLR Minimum Requirement - TT E-UTRA ACLR: 29.2 dB UTRA ACLR: 32.2 dB for UTRA ACLR 1 35.2 dB for UTRA ACLR 2
6.6.2.3_1 Adjacent Channel Leakage power Ratio for HPUE	If the adjacent channel power is greater than –50 dBm then the ACLR shall be higher than the values specified below. E-UTRA ACLR: 37 dB	0dB 0.8dB	Formula: ACLR Minimum Requirement + TT Formula: ACLR Minimum Requirement - TT E-UTRA ACLR: 36.2 dB
6.6.2.3A.1 Adjacent Channel Leakage power Ratio for CA	If the adjacent channel power is greater than –50 dBm then the ACLR shall be higher than the values specified below. UTRA ACLR: 33 dB for UTRA ACLR 1 36 dB for UTRA ACLR 2 E-UTRA ACLR: 30 dB	0 dB 0.8 dB 0.8 dB 0.8 dB	Formula: ACLR Minimum Requirement + TT Formula: ACLR Minimum Requirement - TT UTRA ACLR: 32.2 dB for UTRA ACLR 1 35.2 dB for UTRA ACLR 2 E-UTRA ACLR: 29.2 dB
6.6.2.3B Adjacent Channel Leakage power Ratio for UL-MIMO	Same as 6.6.2.3	Same as 6.6.2.3	Same as 6.6.2.3
6.6.2.4 Additional ACLR requirements	If the adjacent channel power is greater than –50 dBm then the ACLR shall be higher than the values specified below. E-UTRA ACLR: 43 dB for UTRA ACLR 2	0 dB 0.8 dB	Formula: ACLR Minimum Requirement + TT Formula: ACLR Minimum Requirement – TT E-UTRA ACLR: 42.2 dB for UTRA ACLR 2
6.6.3.1 Transmitter Spurious emissions	9 kHz ≤ f < 150 kHz: -36dBm / 1kHz 150 kHz ≤ f < 30 MHz: -36dBm / 10kHz 30 MHz ≤ f < 1 GHz: -36dBm / 100kHz 1 GHz ≤ f < 12.75 GHz: -30dBm / 1MHz 12.75 GHz ≤ f < 19 GHz: -30dBm / 1MHz	0 dB	Formula: Minimum Requirement + TT
6.6.3.1A.1 Transmitter Spurious emissions for CA (intra-band contiguous DL CA and UL CA)	TBD	Same as 6.6.3.1	TBD
6.6.3B.1Transmitter Spurious emissions for UL-MIMO	Same as 6.6.3.1	Same as 6.6.3.1	Formula: Minimum Requirement + TT
6.6.3.2 Spurious emission band UE co-existence	-35 dBm / 6.25kHz -36 dBm / 100kHz -41 dBm / 300kHz -37 dBm / 1MHz -40 dBm / 1MHz -50 dBm / 1MHz Frequencies as detailed in core	0 dB	Formula: Minimum Requirement + TT

	requirement		
6.6.3.2A.1 Spurious emission band UE co-existence for CA (intra-band contiguous DL CA and UL CA)	TBD	TBD	TBD
6.6.3.3 Additional spurious emissions	NS_05 1884.5MHz ≤ f ≤ 1915.7MHz: -41dBm / 300kHz NS_07 769MHz ≤ f ≤ 775MHz -57dBm / 6.25kHz NS_08 860MHz ≤ f ≤ 895MHz -40dBm / 1MHz NS_09 1475.9MHz ≤ f ≤ 1510.9MHz -35dBm / 1MHz	0 dB 1.5dB 0 dB 0 dB	Formula: Minimum Requirement + TT -41dBm / 300kHz -55.5 dBm / 6.25kHz -40dBm / 1MHz -35dBm / 1MHz
6.6.3.3A.1 Additional spurious emissions for CA (intra-band contiguous DL CA and UL CA)	CA_NS_01 E-UTRA band 34: -50dBm / 1MHz 1884.5MHz ≤ f ≤ 1915.7MHz: -41dBm / 300kHz CA_NS_02 E-UTRA band 33: -50dBm / 1MHz E-UTRA band 34: -50dBm / 1MHz CA_NS_03 E-UTRA band 34: -50dBm / 1MHz E-UTRA band 39: -50dBm / 1MHz	0 dB 0 dB 0 dB 0 dB 0 dB 0 dB	Formula: Minimum Requirement + TT -50 MHz / 1MHz -41 dBm / 300kHz -50 MHz / 1MHz -50 MHz / 1MHz -50 MHz / 1MHz -50 MHz / 1MHz
6.6.3B.2 Spurious emission band UE co-existence for UL-MIMO	Same as 6.6.3.2	Same as 6.6.3.2	Formula: Minimum Requirement + TT
6.6.3B.3 Additional spurious emissions for UL-MIMO	Same as 6.6.3.3	Same as 6.6.3.3	Formula: Minimum Requirement + TT
6.7 Transmit intermodulation	Intermodulation Product 5MHz -29 dBc 10MHz -35 dBc CW Interferer level = -40 dBc	0 dB	Formula: CW interferer Minimum Requirement– TT Intermod Products limits remain unchanged. CW interferer level = -40 dBc
6.7A.1 Transmit intermodulation	TBD	TBD	TBD
6.7B Transmit intermodulation for UL-MIMO	Same as 6.7	Same as 6.7	Same as 6.7
6.8B Time alignment error for UL-MIMO	The Time Alignment Error (TAE) shall not exceed 130 ns	25 ns	Formula: Minimum Requirement+ TT

F.3.3 Measurement of receiver

Table F.3.3-1: Derivation of Test Requirements (Receiver tests)

Test	Minimum Requirement in TS 36.101	Test Tolerance (TT)	Test Requirement in TS 36.521-1
7.3 Reference sensitivity power level	Reference sensitivity power level: For 1.4MHz -102.2dBm -103.2dBm -105.2dBm -106.2dBm For 3MHz -99.2dBm -100.2dBm -102.2dBm For 5MHz -97dBm -98dBm -98.5dBm -99dBm -100dBm -96.5dBm Band 9 with Multi band For 10MHz -94dBm -95dBm -95.5dBm -96dBm -97dBm -93.5dBm Band 9 with Multi band For 15MHz -92.2dBm -93.2dBm -93.7dBm -94.2dBm -95.2dBm -91.7dBm Band 9 with Multi band For 20MHz -91dBm -92dBm -93dBm -94dBm -90.5dBm Band 9 with Multi band T-put limit = 95% of maximum for the Ref Meas channel	All cases: f ≤ 3.0GHz 0.7dB 3.0GHz < f ≤ 4.2GHz 1.0 dB	Formula: Reference sensitivity power level + TT T-put limit unchanged
7.3A.1 Reference sensitivity level for CA (intra-band contiguous DL CA and UL CA)	TBD	Same as 7.3	TBD
7.3A.2 Reference sensitivity level for CA (intra-band contiguous DL CA without UL CA)	TBD	Same as 7.3A.1	TBD

7.3A.3 Reference sensitivity level for CA (inter-band DL CA without UL CA)	TBD	Same as 7.3A.1	TBD
7.3B Reference Sensitivity Level for UL-MIMO	Same as 7.3	Same as 7.3	Same as 7.3
7.4 Maximum input level	Signal level -25dBm T-put limit = 95% of maximum for the Ref Meas channel Uplink power	f ≤ 3.0GHz0.7 dB 3.0GHz < f ≤ 4.2GHz 1.0 dB f ≤ 3.0GHz 0dB, -3.4dB 3.0GHz < f ≤ 4.2GHz 0dB, -4.0dB	Formula: Maximum input level - TT Signal level: f ≤ 3.0GHz: -25.7 dBm 3.0GHz < f ≤ 4.2GHz: -26.0 dBm T-put limit unchanged Uplink power measurement window comprises four quantities: 1. UE power step size 1dB 2. UE Power step tolerance ±1dB 3. Test system power measurement at top of window: f ≤ 3.0GHz ±0.7 dB 3.0GHz < f ≤ 4.2GHz ±1.0 dB. 4. Test system power measurement at bottom of window: f ≤ 3.0GHz ±0.7 dB 3.0GHz < f ≤ 4.2GHz ±1.0 dB. Items 1 to 4 are added arithmetically: Overall UL power window size: f ≤ 3.0GHz: (1dB+1dB+0.7dB+0.7dB) =3.4dB 3.0GHz < f ≤ 4.2GHz: (1dB+1dB+1dB+1dB) =4dB Top of window is aligned to UL power requirement, hence +0dB, -3.4dB or +0dB, -4.0dB according to frequency
7.4A.1 Maximum input level for CA (intra band contiguous DL CA and UL CA)	Signal level -22dBm T-put limit = 95% of maximum for the Ref Meas channel Uplink power	f ≤ 3.0GHz 0.7 dB 3.0GHz < f ≤ 4.2GHz 1.0 dB Uplink power TBD	Formula: Maximum input level - TT Signal level: f ≤ 3.0GHz: -22.7 dBm 3.0GHz < f ≤ 4.2GHz: -23.0 dBm T-put limit unchanged Uplink power TBD
7.4A.2 Maximum input level for CA (intra band contiguous DL CA without UL CA)	Signal level -22dBm T-put limit = 95% of maximum for the Ref Meas channel Uplink power	f ≤ 3.0GHz 0.7 dB 3.0GHz < f ≤ 4.2GHz 1.0 dB f ≤ 3.0GHz 0dB, -3.4dB 3.0GHz < f ≤ 4.2GHz 0dB, -4.0dB	Formula: Maximum input level - TT Signal level: f ≤ 3.0GHz: -22.7 dBm 3.0GHz < f ≤ 4.2GHz: -23.0 dBm T-put limit unchanged Uplink power measurement window same as 7.4
7.4A.3 Maximum input level for CA (inter-band DL CA without UL CA)	Signal level -25dBm T-put limit = 95% of maximum for the Ref Meas channel Uplink power	f ≤ 3.0GHz 0.7 dB 3.0GHz < f ≤ 4.2GHz 1.0 dB f ≤ 3.0GHz 0dB, -3.4dB 3.0GHz < f	Formula: Maximum input level - TT Signal level: f ≤ 3.0GHz: -25.7 dBm 3.0GHz < f ≤ 4.2GHz: -26.0 dBm T-put limit unchanged Uplink power measurement window same as 7.4

		≤ 4.2GHz 0dB, -4.0dB	

7.4B Maximum Input Level for UL-MIMO	Same as 7.4	Same as 7.4	Same as 7.4 Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
7.5 Adjacent Channel Selectivity (ACS)	Case 1: Wanted signal power, all BWs: (REFSENS + 14 dB) Interferer signal power For 1.4 MHz, 3 MHz, 5 MHz, 10 MHz BW: (REFSENS + 45.5 dB) For 15 MHz BW: (REFSENS + 42.5 dB) For 20 MHz BW: (REFSENS + 39.5 dB) Case 2: Wanted signal power For 1.4 MHz, 3 MHz, 5 MHz, 10 MHz BW: -56.5 dBm For 15 MHz BW: -53.5 dBm For 20 MHz BW: -50.5 dBm Interferer signal power, all BWs: -25 dBm T-put limit = 95% of maximum for the Ref Meas channel Uplink power	0 dB f ≤ 3.0GHz 0dB, -3.4dB 3.0GHz < f ≤ 4.2GHz 0dB, -4.0dB	Formula: Wanted signal power + TT Interferer signal power unchanged T-put limit unchanged Uplink power measurement window same as 7.4
7.5.1A.1 Adjacent Channel Selectivity (ACS) for CA (intra-band contiguous DL CA and UL CA)	Case 1: Wanted signal power: (REFSENS + 14 dB) Interferer signal power For CA BW Class C: (Aggregated power + 22.5 dB) Case 2: Wanted signal power: -50.5 dBm Interferer signal power For CA BW Class C: -25 dBm T-put limit = 95% of maximum for the Ref Meas channel Uplink power	0 dB f ≤ 3.0GHz 0dB, -3.4dB 3.0GHz < f ≤ 4.2GHz 0dB, -4.0dB	Formula: Wanted signal power + TT Interferer signal power unchanged T-put limit unchanged Uplink power measurement window same as 7.4
7.5.1A.2 Adjacent Channel Selectivity (ACS) for CA (intra band contiguous DL CA without UL CA)	Same as 7.5A.1	Same as 7.5A.1	Same as 7.5A.1
7.5.1A.3 Adjacent Channel	Same as 7.5 for each CC	Same as	Same as 7.5 for each CC

Selectivity (ACS) for CA (inter band DL CA without UL CA)		7.5	
7.5B Adjacent Channel Selectivity (ACS) for UL-MIMO	Same as 7.5	Same as 7.5	Same as 7.5 Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
7.6.1 In-band blocking	Wanted signal power: (REFSENS + BW dependent value) Interferer signal power: -56dBm or -44dBm T-put limit = 95% of maximum for the Ref Meas channel Uplink power	0 dB f ≤ 3.0GHz 0dB, -3.4dB 3.0GHz < f ≤ 4.2GHz 0dB, -4.0dB	Formula: Wanted signal power + TT Interferer signal power unchanged T-put limit unchanged Uplink power measurement window same as 7.4
7.6.1A.1 In-band blocking for CA (intra band contiguous DL CA and UL CA)	Wanted signal power: (REFSENS + CA BW Class specific value) Interferer signal power: -56dBm or -44dBm T-put limit = 95% of maximum for the Ref Meas channel Uplink power	Same as 7.6.1	Formula: Wanted signal power + TT Interferer signal power unchanged T-put limit unchanged Uplink power measurement window same as 7.4A
7.6.1A.2 In-band blocking for CA (intra band contiguous DL CA without UL CA)	Same as 7.6.1A.1	Same as 7.6.1A.1	Same as 7.6.1A.1
7.6.1A.3 In-band blocking for CA (inter band DL CA without UL CA)	Same as 7.6.1A.1	Same as 7.6.1A.1	Same as 7.6.1A.1
7.6.1B In-band blocking for UL-MIMO	Same as 7.6.1	Same as 7.6.1	Same as 7.6.1 Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
7.6.2 Out of-band blocking	Wanted signal power: (REFSENS + BW dependent value) Interferer signal power: -44dBm, -30dBm or -15dBm T-put limit = 95% of maximum for the Ref Meas channel Uplink power	0 dB f ≤ 3.0GHz 0dB, -3.4dB 3.0GHz < f ≤ 4.2GHz 0dB, -4.0dB	Formula: Wanted signal power + TT Interferer signal power unchanged T-put limit unchanged Uplink power measurement window same as 7.4
7.6.2A.1 Out-of-band blocking for CA (intra band contiguous DL CA and UL CA)	Wanted signal power: (REFSENS + CA BW Class specific value) Interferer signal power: -44dBm, -30dBm or -15dBm T-put limit = 95% of maximum for	Same as 7.6.2	Formula: Wanted signal power + TT Interferer signal power unchanged T-put limit unchanged

	the Ref Meas channel Uplink power		Uplink power measurement window same as 7.4A
7.6.2A.2 Out-of-band blocking for CA (intra band contiguous DL CA without UL CA)	Same as 7.6.2A.1	Same as 7.6.2A.1	Same as 7.6.2A.1
7.6.2A.3 Out-of-band blocking for CA (inter band DL CA without UL CA)	TBD	TBD	TBD
7.6.2B Out-of-band blocking for UL-MIMO	Same as 7.6.2	Same as 7.6.2	Same as 7.6.2 Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
7.6.3 Narrow band blocking	Wanted signal power,: (REFSENS + BW dependent value) Interferer signal power: -55dBm T-put limit = 95% of maximum for the Ref Meas channel Uplink power	0 dB <u>f ≤ 3.0GHz</u> 0dB, -3.4dB <u>3.0GHz < f ≤ 4.2GHz</u> 0dB, -4.0dB	Formula: Wanted signal power + TT Interferer signal power unchanged T-put limit unchanged Uplink power measurement window same as 7.4
7.6.3A.1 Narrow band blocking for CA (intra band contiguous DL CA and UL CA)	Wanted signal power: (REFSENS + CA BW Class specific value) Interferer signal power: -55dBm T-put limit = 95% of maximum for the Ref Meas channel Uplink power	Same as 7.6.3	Formula: Wanted signal power + TT Interferer signal power unchanged T-put limit unchanged Uplink power measurement window same as 7.4A
7.6.3A.2 Narrow band blocking for CA (intra band contiguous DL CA without UL CA)	Same as 7.6.3A.1	Same as 7.6.3A.1	Same as 7.6.3A.1
7.6.3A.3 Narrow band blocking for CA (inter band DL CA without UL CA)	Same as 7.6.3A.1	Same as 7.6.3A.1	Same as 7.6.3A.1
7.6.3B Narrow band blocking for UL-MIMO	Same as 7.6.3	Same as 7.6.3	Same as 7.6.3 Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
7.7 Spurious response	Wanted signal power: (REFSENS + BW dependent value) Interferer signal power: -44dBm T-put limit = 95% of maximum for the Ref Meas channel Uplink power	0 dB <u>f ≤ 3.0GHz</u> 0dB, -3.4dB <u>3.0GHz < f ≤ 4.2GHz</u>	Formula: Wanted signal power + TT Interferer signal power unchanged T-put limit unchanged Uplink power measurement window same as 7.4

		0dB, -4.0dB	
7.7A.1 Spurious response for CA (intra band contiguous DL CA and UL CA)	Wanted signal power: (REFSENS + CA BW Class specific value) Interferer signal power: -44dBm T-put limit = 95% of maximum for the Ref Meas channel Uplink power	Same as 7.7	Formula: Wanted signal power + TT Interferer signal power unchanged T-put limit unchanged Uplink power measurement window same as 7.4A
7.7A.2 Spurious response for CA (intra band contiguous DL CA without UL CA)	Same as 7.7A.1	Same as 7.7A.1	Same as 7.7A.1
7.7A.3 Spurious response for CA (inter band DL CA without UL CA)	TBD	TBD	TBD
7.7B Spurious response for UL-MIMO	Same as 7.7	Same as 7.7	Same as 7.7 Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
7.8.1 Wide band intermodulation	Wanted signal power: For 1.4 MHz BW: (REFSENS + 12 dB) For 3 MHz BW: (REFSENS + 8 dB) For 5 MHz and 10MHz BW: (REFSENS + 6 dB) For 15 MHz BW: (REFSENS + 7 dB) For 20 MHz BW: (REFSENS + 9 dB) CW Interferer power, all BWs: -46 dBm Modulated Interferer power:, all BWs: -46 dBm T-put limit = 95% of maximum for the Ref Meas channel Uplink power	0 dB f ≤ 3.0GHz 0dB, -3.4dB 3.0GHz < f ≤ 4.2GHz 0dB, -4.0dB	Formula: Wanted signal power +TT CW Interferer signal power unchanged Modulated Interferer signal power unchanged T-put limit unchanged Uplink power measurement window same as 7.4
7.8.1A.1 Wideband intermodulation for CA (intra band contiguous DL CA and UL CA)	Wanted signal power: (REFSENS + CA BW Class specific value) CW Interferer power, all BWs: -46 dBm Modulated Interferer power:, all BWs: -46 dBm T-put limit = 95% of maximum for the Ref Meas channel Uplink power	0 dB f ≤ 3.0GHz 0dB, -3.4dB	Formula: Wanted signal power +TT CW Interferer signal power unchanged Modulated Interferer signal power unchanged T-put limit unchanged Uplink power measurement window same as 7.4

		3.0GHz < f ≤ 4.2GHz 0dB, -4.0dB	
7.8.1A.2 Wideband intermodulation for CA (intra band contiguous DL CA without UL CA)	Same as 7.8.1A.1	Same as 7.8.1A.1	Same as 7.8.1A.1
7.8.1A.3 Wideband intermodulation for CA (inter band DL CA without UL CA)	Same as 7.8.1A.1	Same as 7.8.1A.1	Same as 7.8.1A.1
7.8.1B Wide band intermodulation for UL-MIMO	Same as 7.8.1	Same as 7.8.1	Same as 7.8.1 Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
7.9 Spurious emissions	30MHz ≤ f < 1GHz: -57dBm / 100kHz 1GHz ≤ f ≤ 12.75 GHz: -47dBm / 1MHz 12.75GHz ≤ f ≤ 19 GHz: -47dBm / 1MHz	0 dB	Formula: Minimum Requirement + TT

F.3.4 Measurement of performance requirements

Table F.3.4-1: Derivation of Test Requirements (performance tests)

Test	Minimum Requirement in TS 36.133	Test Tolerance (TT)	Test Requirement in TS 36.521-1
8.2.1.1.1 Multiple PRBs - Prop'n Condition EVA5 - Prop'n Condition ETU70 - Prop'n Condition ETU300	SNRs as specified	0.8dB	Formula: SNR + TT T-put limit unchanged
8.2.1.1.1 Multiple PRBs - Prop'n Condition HST	SNR as specified	0.6dB	Formula: SNR + TT T-put limit unchanged
8.2.1.1.1 Single PRB - Prop'n Condition ETU70	SNRs as specified	0.8dB	Formula: SNR + TT T-put limit unchanged
8.2.1.1.1_1 Multiple PRBs - Prop'n Condition EVA5 - Prop'n Condition ETU70 - Prop'n Condition ETU300	SNRs as specified	Same as 8.2.1.1.1 Multiple PRBs Propagation EVA5, ETU70, ETU300	Formula: SNR + TT T-put limit unchanged
8.2.1.1.1_A.1	TBD	TBD	TBD
8.2.1.1.1_A.2	TBD	TBD	TBD
8.2.1.1.2 Single PRB	SNR as specified	0.8dB	Formula: SNR + TT T-put limit unchanged
8.2.1.2.1 - Prop'n Condition EVA5	SNR as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.2.1.2.1 - Prop'n Condition HST	SNR as specified	0.6 dB	Formula: SNR + TT T-put limit unchanged
8.2.1.2.1_1 - Prop'n Condition EVA5	SNR as specified	Same as 8.2.1.2.1	Formula: SNR + TT T-put limit unchanged
8.2.1.2.2	SNR as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.2.1.2.2_1	SNR as specified	Same as 8.2.1.2.2	Formula: SNR + TT T-put limit unchanged
8.2.1.2.3_C.1 - Prop'n Condition EVA5	[TBD]	[TBD]	[TBD]
8.2.1.3.1	SNR as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.2.1.3.1_A.1	TBD	TBD	TBD
8.2.1.3.1_A.2	TBD	TBD	TBD
8.2.1.3.2	SNR as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.2.1.4.1	SNRs as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.2.1.4.1_1	SNR as specified	Same as 8.2.1.4.1	Formula: SNR + TT T-put limit unchanged
8.2.1.4.2	SNRs as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.2.1.4.2_1	SNR as specified	Same as 8.2.1.4.2	Formula: SNR + TT T-put limit unchanged
8.2.1.4.2_A.1	TBD	TBD	TBD
8.2.1.7.1_A.1	TBD	TBD	TBD
8.2.2.1.1 Multiple PRBs - Prop'n Condition EVA5 - Prop'n Condition ETU70 - Prop'n Condition ETU300	SNRs as specified	0.8dB	Formula: SNR + TT T-put limit unchanged
8.2.2.1.1 Multiple PRBs - Prop'n Condition HST	SNR as specified	0.6dB	Formula: SNR + TT T-put limit unchanged
8.2.2.1.1 Single PRB - Prop'n Condition ETU70	SNRs as specified	0.8dB	Formula: SNR + TT T-put limit unchanged

8.2.2.1.1_1 Multiple PRBs - Prop'n Condition EVA5 - Prop'n Condition ETU70 - Prop'n Condition ETU300	SNRs as specified	Same as 8.2.2.1.1 Multiple PRBs Propagation EVA5, ETU70, ETU300	Formula: SNR + TT T-put limit unchanged
8.2.2.1.1_A.1	TBD	TBD	TBD
8.2.2.1.2 Single PRB	SNR as specified	0.8dB	Formula: SNR + TT T-put limit unchanged
8.2.2.2.1 - Prop'n Condition EVA5	SNR as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.2.2.2.1 - Prop'n Condition HST	SNR as specified	0.6 dB	Formula: SNR + TT T-put limit unchanged
8.2.2.2.1_1 - Prop'n Condition EVA5	SNR as specified	Same as 8.2.2.2.1	Formula: SNR + TT T-put limit unchanged
8.2.2.2.2	SNR as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.2.2.2.2_1	SNR as specified	Same as 8.2.2.2.2	Formula: SNR + TT T-put limit unchanged
8.2.2.3.1	SNR as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.2.2.3.1_A.1	TBD	TBD	TBD
8.2.2.3.2	SNR as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.2.2.4.1	SNRs as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.2.2.4.1_1	SNR as specified	Same as 8.2.2.4.1	Formula: SNR + TT T-put limit unchanged
8.2.2.4.2	SNRs as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.2.2.4.2_1	SNR as specified	Same as 8.2.2.4.2	Formula: SNR + TT T-put limit unchanged
8.3.1.2.1_D	TBD		
8.2.2.4.2_A.1	TBD	TBD	TBD
8.2.2.7.1_A.1	TBD	TBD	TBD
8.3.1.1.1_D	SNR as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.3.1.1.2_D	SNR as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.3.1.2.1_D	SNR as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.3.2.1.1	SNRs as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.3.2.1.1_1	SNRs as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.3.2.1.2	SNRs as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.3.2.1.2_D	SNR as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.3.2.1.3	SNRs as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.3.2.1.3_D	SNR as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.3.2.2.1	SNRs as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.3.2.2.1_D	SNR as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.4.1.1	SNR as specified	0.8 dB	Formula: SNR + TT T-put limit unchanged
8.4.1.2.1	SNR as specified	1.0 dB	Formula: SNR + TT T-put limit unchanged
8.4.1.2.1_1	SNR as specified	Same as 8.4.1.2.1	Formula: SNR + TT T-put limit unchanged
8.4.1.2.2	SNR as specified	1.0 dB	Formula: SNR + TT T-put limit unchanged

8.4.1.2.2_1	SNR as specified	Same as 8.4.1.2.2	Formula: SNR + TT T-put limit unchanged
8.4.1.2.3_C.1	[TBD]	[TBD]	[TBD]
8.4.1.2.3_C.2	[TBD]	[TBD]	[TBD]
8.4.2.1	SNR as specified	0.8 dB	Formula: SNR + TT T-put limit unchanged
8.4.2.2.1	SNR as specified	1.0 dB	Formula: SNR + TT T-put limit unchanged
8.4.2.2.1_1	SNR as specified	Same as 8.4.2.2.1	Formula: SNR + TT T-put limit unchanged
8.4.2.2.2	SNR as specified	1.0 dB	Formula: SNR + TT T-put limit unchanged
8.4.2.2.2_1	SNR as specified	Same as 8.4.2.2.2	Formula: SNR + TT T-put limit unchanged
8.5.1.1	SNRs as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.5.1.2.1	SNR as specified	1.1 dB	Formula: SNR + TT T-put limit unchanged
8.5.1.2.1_1	SNR as specified	Same as 8.5.1.2.1	Formula: SNR + TT T-put limit unchanged
8.5.1.2.2	SNR as specified	1.0 dB	Formula: SNR + TT T-put limit unchanged
8.5.1.2.3_C.1	[TBD]	[TBD]	[TBD]
8.5.1.2.2_1	SNR as specified	Same as 8.5.1.2.2	Formula: SNR + TT T-put limit unchanged
8.5.2.1	SNRs as specified	0.9 dB	Formula: SNR + TT T-put limit unchanged
8.5.2.2.1	SNR as specified	1.1 dB	Formula: SNR + TT T-put limit unchanged
8.5.2.2.1_1	SNR as specified	Same as 8.5.2.2.1	Formula: SNR + TT T-put limit unchanged
8.5.2.2.2	SNR as specified	1.0 dB	Formula: SNR + TT T-put limit unchanged
8.5.2.2.2_1	SNR as specified	Same as 8.5.2.2.2	Formula: SNR + TT T-put limit unchanged
8.7.1.1 FDD sustained data rate performance	Downlink power -85dBm/15kHz	0 dB	Formula: Downlink power + TT T-put limit unchanged
8.7.1.1_1	Same as 8.7.1.1	Same as 8.7.1.1	Formula: Downlink power + TT T-put limit unchanged
8.7.1.1_A.1	TBD	TBD	TBD
8.7.1.1_A.2	TBD	TBD	TBD
8.7.2.1 TDD sustained data rate performance	Same as 8.7.1.1	Same as 8.7.1.1	Same as 8.7.1.1
8.7.2.1_1	Same as 8.7.2.1	Same as 8.7.2.1	Formula: Downlink power + TT T-put limit unchanged
8.7.2.1_A.1	TBD	TBD	TBD
8.7.2.1_A.2	TBD	TBD	TBD
10.1	SNR as specified	0.9dB	Formula: SNR + TT T-put limit unchanged
10.2	SNR as specified	0.9dB	Formula: SNR + TT T-put limit unchanged
[Other tests FFS]			

F.3.5 Measurement of Channel State Information reporting

Table F.3.5-1: Derivation of Test Requirements (Channel State Information reporting tests)

Test	Minimum Requirement in TS 36.101	Test Tolerance (TT)	Test Requirement in TS 36.521-1
9.2.1.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-0	SNRs as specified Limits as in the Test Procedure	No test tolerances applied	SNR and limits unchanged
9.2.1.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-0	SNRs as specified Limits as in the Test Procedure	No test tolerances applied	SNR and limits unchanged
9.2.1.3_C.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-0 for eICIC (non-MBSFN ABS)	SNRs as specified Limits as in the Test Procedure	No test tolerances applied	SNR and limits unchanged
9.2.1.4_C.1 TDD CQI Reporting under AWGN conditions – PUCCH 1-0 for eICIC (non-MBSFN ABS)	FFS	FFS	FFS
9.2.2.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-1	SNRs as specified Limits as in the Test Procedure	No test tolerances applied	SNR and limits unchanged
9.2.2.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-1	SNRs as specified Limits as in the Test Procedure	No test tolerances applied	SNR and limits unchanged
9.2.3.1_D FDD CQI Reporting under AWGN conditions – PUCCH 1-1 for eDL-MIMO	SNRs as specified Limits as in the Test Procedure	No test tolerances applied	SNR and limits unchanged
9.2.3.2_D TDD CQI Reporting under AWGN conditions – PUCCH 1-1 for eDL-MIMO	SNRs as specified Limits as in the Test Procedure	No test tolerances applied	SNR and limits unchanged
9.3.1.1.1 FDD CQI Reporting under fading conditions – PUSCH 3-0	SNRs as specified α 2% β 55% γ 1.10 BLER 0.05	SNR 0dB α 0% β 0% γ 0.01 BLER 0	SNR unchanged α limit unchanged β limit unchanged γ 1.09 as per Table G.5.4-1 BLER limit unchanged
9.3.1.1.2 TDD CQI Reporting under fading conditions – PUSCH 3-0	Same as 9.3.1.1.1	Same as 9.3.1.1.1	Same as 9.3.1.1.1
9.3.1.2.1_D FDD CQI Reporting under fading conditions – PUSCH 3-1 for eDL-MIMO	Same as 9.3.1.1.1	Same as 9.3.1.1.1	Same as 9.3.1.1.1
9.3.1.2.2_D TDD CQI Reporting under fading conditions – PUSCH 3-1 for eDL-MIMO	Same as 9.3.1.1.1	Same as 9.3.1.1.1	Same as 9.3.1.1.1
9.3.2.1.1 FDD CQI Reporting under fading conditions – PUCCH 1-0	SNRs as specified α 20% γ 1.05 BLER 0.02	SNR 0dB α 0% γ 0.01 BLER 0	SNR and α, BLER limits unchanged α limit unchanged γ 1.04 as per Table G.5.4-1 BLER limit unchanged
9.3.2.1.1_1 FDD CQI Reporting under fading conditions – PUCCH 1-0	Same as 9.3.2.1.1	Same as 9.3.2.1.1	Same as 9.3.2.1.1

9.3.2.1.2 TDD CQI Reporting under fading conditions – PUCCH 1-0	Same as 9.3.2.1.1	Same as 9.3.2.1.1	Same as 9.3.2.1.1
9.3.2.1.2_1 TDD CQI Reporting under fading conditions – PUCCH 1-0	Same as 9.3.2.1.1	Same as 9.3.2.1.1	Same as 9.3.2.1.1
9.3.2.2.1_D FDD CQI Reporting under fading conditions – PUCCH 1-1 for eDL-MIMO	Same as 9.3.2.1.1	Same as 9.3.2.1.1	Same as 9.3.2.1.1
9.3.2.2.2_D TDD CQI Reporting under fading conditions – PUCCH 1-1 for eDL-MIMO	Same as 9.3.2.1.1	Same as 9.3.2.1.1	Same as 9.3.2.1.1
9.3.3.1.1 FDD CQI Reporting under fading conditions and frequency-selective interference – PUSCH 3-0	Ior and Iot as specified α 60% γ 1.60	Ior, Iot 0dB α 20% γ 0.10	Ior and Iot unchanged α 40%, Formula: Min Req't – Test Tol γ 1.50, Formula: Min Req't – Test Tol The effect of AWGN flatness and signal flatness on the α requirement was derived by simulation. AWGN flatness / signal flatness and the statistical effect of a finite test time both affect the T-put result. The Test Tolerance comprises two quantities: 1. Effect of AWGN flatness and signal flatness, derived by simulation 2. Statistical effect as per Table G.5.4-1 Items 1 and 2 are assumed to be uncorrelated so can be root sum squared T-put requirement Test Tol = SQRT (AWGN flatness and signal flatness effect ^{2} + Statistical effect ^{2}) AWGN flatness and signal flatness effect 0.1, Statistical effect 0.01, giving overall effect 0.10
9.3.3.1.2 TDD CQI Reporting under fading conditions and frequency-selective interference – PUSCH 3-0	Same as 9.3.3.1.1	Same as 9.3.3.1.1	Same as 9.3.3.1.1
9.3.4.1.1 FDD CQI Reporting under fading conditions – PUSCH 2-0	SNRs as specified Limits as in the Test Procedure γ 1.2	γ 0.01	SNR unchanged γ 1.19 as per Table G.5.4-1
9.3.4.1.2 TDD CQI Reporting under fading conditions – PUSCH 2-0	Same as 9.3.4.1.1	Same as 9.3.4.1.1	Same as 9.3.4.1.1
9.3.4.2.1 FDD CQI Reporting under fading conditions – PUCCH 2-0	SNRs as specified Limits as in the Test Procedure γ 1.15	γ 0.01	SNR unchanged γ 1.14 as per Table G.5.4-1
9.3.4.2.2 TDD CQI Reporting under fading conditions – PUCCH 2-0	Same as 9.3.4.2.1	Same as 9.3.4.2.1	Same as 9.3.4.2.1
9.4.1.1.1 FDD PMI Reporting – PUSCH 3-1 (Single PMI)	γ 1.10	γ 0.01	γ 1.09 as per Table G.5.4-1

9.4.1.1.2 TDD PMI Reporting – PUSCH 3-1 (Single PMI)	Same as 9.4.1.1.1	Same as 9.4.1.1.1	Same as 9.4.1.1.1
9.4.1.2.1 FDD PMI Reporting – PUCCH 2-1 (Single PMI)	N_{oc} as specified in test procedure γ 1.2	γ 0.01	N_{oc} unchanged Ior/ N_{oc}=SNR_{rnd} is a result of an approach according to G.5.2 and is reused unchanged as setting in procedure step 3. γ 1.19 as per Table G.5.4-1
9.4.1.2.2 TDD PMI Reporting – PUCCH 2-1 (Single PMI)	Same as 9.4.1.2.1	Same as 9.4.1.2.1	Same as 9.4.1.2.1
9.4.1.3.1_D FDD Reporting of PMI – PUSCH 3-1 (Single PMI) for eDL-MIMO	Same as 9.4.1.2.1	Same as 9.4.1.2.1	Same as 9.4.1.2.1
9.4.1.3.2_D TDD Reporting of PMI – PUSCH 3-1 (Single PMI) for eDL-MIMO	Same as 9.4.1.2.1	Same as 9.4.1.2.1	Same as 9.4.1.2.1
9.4.2.1.1 FDD PMI Reporting – PUSCH 1-2 (Multiple PMI)	N_{oc} as specified in test procedure γ 1.20	γ 0.01	N_{oc} unchanged Ior/ N_{oc}=SNR_{rnd} is a result of an approach according to G.5.2 and is reused unchanged as setting in procedure step 3. γ 1.19 as per Table G.5.4-1
9.4.2.1.1_1 FDD PMI Reporting – PUSCH 1-2 (Multiple PMI)	Same as 9.4.2.1.1	Same as 9.4.2.1.1	Same as 9.4.2.1.1
9.4.2.1.2 TDD PMI Reporting – PUSCH 1-2 (Multiple PMI)	Same as 9.4.2.1.1	Same as 9.4.2.1.1	Same as 9.4.2.1.1
9.4.2.1.2_1 TDD PMI Reporting – PUSCH 1-2 (Multiple PMI)	Same as in 9.4.2.1.1	Same as in 9.4.2.1.1	Same as in 9.4.2.1.1
9.4.2.2.1 FDD PMI Reporting – PUSCH 2-2 (Multiple PMI)	Same as in 9.4.2.1.1	Same as in 9.4.2.1.1	Same as in 9.4.2.1.1
9.4.2.2.2 TDD PMI Reporting – PUSCH 2-2 (Multiple PMI)	N_{oc} as specified in test procedure γ 1.15	γ 0.01	N_{oc} unchanged Ior/ N_{oc}=SNR_{rnd} is a result of an approach according to G.5.2 and is reused unchanged as setting in procedure step 3. γ 1.14 as per Table G.5.4-1
9.4.2.3.1_D FDD PMI Reporting – PUSCH 1-2 (Multiple PMI) for eDL-MIMO	N_{oc} as specified in test procedure γ 1.30	γ 0.01	N_{oc} unchanged Ior/ N_{oc}=SNR_{rnd} is a result of an approach according to G.5.2 and is reused unchanged as setting in procedure step 3. γ 1.29 as per Table G.5.4-1
9.4.2.3.2_D TDD PMI Reporting – PUSCH 1-2 (Multiple PMI) for eDL-MIMO	N_{oc} as specified in test procedure γ 3.50	γ 0.01	N_{oc} unchanged Ior/ N_{oc}=SNR_{rnd} is a result of an approach according to G.5.2 and is reused unchanged as setting in procedure step 3. γ 3.49 as per Table G.5.4-1
9.5.1.1 FDD RI Reporting– PUCCH 1-1	SNRs as specified Test 1: γ_2 1.00 Test 2: γ_1 1.05 Test 3: γ_2 1.10	SNR 0dB γ_2 0.01 γ_1 0.01 γ_2 0.01	SNR unchanged γ_2 0.99 as per Table G.5.4-1 γ_1 1.04 as per Table G.5.4-1 γ_2 1.09 as per Table G.5.4-1
9.5.1.1_1 FDD RI Reporting– PUCCH 1-1 (Release 10)	SNRs as specified Test 1: γ_2 1.00 Test 2: γ_1 1.05 Test 3: γ_1 0.90, γ_2 1.10	SNR 0dB γ_2 0.01 γ_1 0.01 γ_2 0.01	SNR unchanged γ_2 0.99 as per Table G.5.4-1 γ_1 1.04 as per Table G.5.4-1 γ_1 0.89, γ_2 1.09 as per Table G.5.4-1

9.5.1.1_2 FDD RI Reporting– PUCCH 1-1 (Release 11)	SNRs as specified Test 1: γ_2 1.00 Test 2: γ_1 1.05 Test 3: γ_1 0.90	SNR 0dB γ_2 0.01 γ_1 0.01 γ_1 0.01	SNR unchanged γ_2 0.99 as per Table G.5.4-1 γ_1 1.04 as per Table G.5.4-1 γ_1 0.89 as per Table G.5.4-1
9.5.1.2 TDD RI Reporting– PUSCH 3-1	Same as 9.5.1.1	Same as 9.5.1.1	Same as 9.5.1.1
9.5.1.2_1 TDD RI Reporting– PUSCH 3-1 (Release 10)	Same as 9.5.1.1_1	Same as 9.5.1.1_1	Same as 9.5.1.1_1
9.5.1.2_2 TDD RI Reporting– PUSCH 3-1 (Release 11)	Same as 9.5.1.1_2	Same as 9.5.1.1_2	Same as 9.5.1.1_2
9.5.2.1_D FDD RI Reporting – PUCCH 1-1 for eDL-MIMO	SNR as specified Test 1: γ_2 1.00 Test 2: γ_1 1.05 Test 3: γ_1 0.9	SNR 0dB γ_2 0.01 γ_1 0.01 γ_2 0.01	SNR unchanged γ_2 0.99 as per Table G.5.4-1 γ_1 1.04 as per Table G.5.4-1 γ_1 0.89 as per Table G.5.4-1
9.5.2.2_D TDD RI Reporting – PUCCH 1-1 for eDL-MIMO	SNR as specified Test 1: γ_2 1.00 Test 2: γ_1 1.05 Test 3: γ_1 0.9	SNR 0dB γ_2 0.01 γ_1 0.01 γ_2 0.01	SNR unchanged γ_2 0.99 as per Table G.5.4-1 γ_1 1.04 as per Table G.5.4-1 γ_1 0.89 as per Table G.5.4-1

Annex G (normative): Statistical Testing

G.1 General

FFS.

G.2 Statistical testing of receiver characteristics

G.2.1 General

The test of receiver characteristics is two fold.

1. A signal or a combination of signals is offered to the RX port(s) of the receiver.

2. The ability of the receiver to demodulate /decode this signal is verified by measuring the throughput.

In (2) is the statistical aspect of the test and is treated here.

The minimum requirement for all receiver tests is >95% of the maximum throughput.

All receiver tests are performed in static propagation conditions. No fading conditions are applied.

G.2.2 Mapping throughput to error ratio

a) The measured information bit throughput R is defined as the sum (in kilobits) of the information bit payloads successfully received during the test interval, divided by the duration of the test interval (in seconds).

b) In measurement practice the UE indicates successfully received information bit payload by signalling an ACK to the SS.
If payload is received, but damaged and cannot be decoded, the UE signals a NACK.

c) Only the ACK and NACK signals, not the data bits received, are accessible to the SS.
The number of bits is known in the SS from knowledge of what payload was sent.

d) For the reference measurement channel, applied for testing, the number of bits is different in different subframes, however in a radio frame it is fixed during one test.

e) The time in the measurement interval is composed of successfully received subframes (ACK), unsuccessfully received subframes (NACK) and no reception at all (DTX-subframes).

f) DTX-subframes may occur regularly according the applicable reference measurement channel (regDTX).
In real live networks this is the time when other UEs are served. In TDD these are the UL and special subframes.
regDTX vary from test to test but are fixed within the test.

g) Additional DTX-subframes occur statistically when the UE is not responding ACK or NACK where it should. (statDTX)
This may happen when the UE was not expecting data or decided that the data were not intended for it.

The pass / fail decision is done by observing the:

- number of NACKs

- number of ACKs and

- number of statDTXs (regDTX is implicitly known to the SS)

The ratio (NACK + statDTX)/(NACK+ statDTX + ACK) is the Error Ratio (ER). Taking into account the time consumed by the ACK, NACK, and DTX-TTIs (regular and statistical), ER can be mapped unambiguously to throughput for any single reference measurement channel test.

G.2.3 Design of the test

The test is defined by the following design principles (see clause G.x, Theory ….):

1. The early decision concept is applied.
2. A second limit is introduced: Bad DUT factor M>1
3. To decide the test pass:

   Supplier risk is applied based on the Bad DUT quality

   To decide the test fail

   Customer Risk is applied based on the specified DUT quality

The test is defined by the following parameters:

1. Limit ER = 0.05 (Throughput limit = 95%)
2. Bad DUT factor M=1.5 (selectivity)
3. Confidence level CL = 95% (for specified DUT and Bad DUT-quality)

G.2.4 Numerical definition of the pass fail limits

Table G.2.4-1: pass fail limits

ne	ns_p	ns_f	ne	ns_p	ns_f	ne	ns_p	ns_f	ne	ns_p	ns_f
0	67	NA	39	763	500	78	1366	1148	117	1951	1828
1	95	NA	40	778	516	79	1381	1166	118	1965	1845
2	119	2	41	794	532	80	1396	1183	119	1980	1863
3	141	7	42	810	548	81	1412	1200	120	1995	1881
4	162	14	43	826	564	82	1427	1217	121	2010	1899
5	183	22	44	842	580	83	1442	1234	122	2025	1916
6	202	32	45	858	596	84	1457	1252	123	2039	1934
7	222	42	46	873	612	85	1472	1269	124	2054	1952
8	241	53	47	889	629	86	1487	1286	125	2069	1969
9	259	64	48	905	645	87	1502	1303	126	2084	1987
10	278	76	49	920	661	88	1517	1321	127	2099	2005
11	296	88	50	936	678	89	1532	1338	128	2113	2023
12	314	100	51	952	694	90	1547	1355	129	2128	2040
13	332	113	52	967	711	91	1562	1373	130	2143	2058
14	349	126	53	983	727	92	1577	1390	131	2158	2076
15	367	140	54	998	744	93	1592	1407	132	2172	2094
16	384	153	55	1014	760	94	1607	1425	133	2187	2111
17	401	167	56	1029	777	95	1623	1442	134	2202	2129
18	418	181	57	1045	793	96	1637	1459	135	2217	2147
19	435	195	58	1060	810	97	1652	1477	136	2231	2165
20	452	209	59	1076	827	98	1667	1494	137	2246	2183
21	469	224	60	1091	844	99	1682	1512	138	2261	2201
22	486	238	61	1106	860	100	1697	1529	139	2275	2218
23	503	253	62	1122	877	101	1712	1547	140	2290	2236
24	519	268	63	1137	894	102	1727	1564	141	2305	2254

25	536	283	64	1153	911	103	1742	1582	142	2320	2272
26	552	298	65	1168	928	104	1757	1599	143	2334	2290
27	569	313	66	1183	944	105	1772	1617	144	2349	2308
28	585	328	67	1199	961	106	1787	1634	145	2364	2326
29	602	343	68	1214	978	107	1802	1652	146	2378	2344
30	618	359	69	1229	995	108	1817	1669	147	2393	2361
31	634	374	70	1244	1012	109	1832	1687	148	2408	2379
32	650	389	71	1260	1029	110	1847	1704	149	2422	2397
33	667	405	72	1275	1046	111	1861	1722	150	2437	2415
34	683	421	73	1290	1063	112	1876	1740	151	2452	2433
35	699	436	74	1305	1080	113	1891	1757	152	2466	2451
36	715	452	75	1321	1097	114	1906	1775	153*)	NA	2469
37	731	468	76	1336	1114	115	1921	1793			
38	747	484	77	1351	1131	116	1936	1810	*) note 2 in G.2.5		

NOTE 1: The first column is the number of errors (ne = number of NACK + statDTX)

NOTE 2: The second column is the number of samples for the pass limit (ns_p , ns=Number of Samples= number of `NACK + statDTX + ACK`)

NOTE 3: The third column is the number of samples for the fail limit (ns_f)

G.2.5 Pass fail decision rules

The pass fail decision rules apply for a single test, comprising one component in the test vector. The over all Pass /Fail conditions are defined in clause G.2.1.5.

Having observed 0 errors, pass the test at 67+ samples, otherwise continue

Having observed 1 error, pass the test at 95+ otherwise continue

Having observed 2 errors, pass the test at 119+ samples, fail the test at 2- samples, otherwise continue

Etc. etc.

Having observed 151 errors, pass the test at 2452+ samples, fail the test at 2433- samples, otherwise continue

Having observed 152 errors, pass the test at 2466+ samples, fail the test at 2451- samples.

Where x+ means: x or more, x- means x or less

NOTE 1: an ideal DUT passes after 67 samples. The maximum test time is 2466 samples.

NOTE 2: It is allowed to deviate from the early decision concept by postponing the decision (pass/fail or continue). Postponing the decision to or beyond the end of Table G.2.4-1 requires a pass fail decision against the test limit: pass the DUT for ER<0.0618, otherwise fail.

G.2.6 Test conditions for receiver tests

Table G.2.6-1: Test conditions for receiver tests

Test	Statistical independence	Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test	Over all Pass/Fail condition
7.3 Reference sensitivity level	Yes: the inherent receiver noise is assumed to be AWGN	tbd	To pass 7.3 each component in the test vector must pass
7.4 Maximum input level	Unclear: in case, clipping causes errors, errors are data dependent. Statistical independence is assumed.	tbd	To pass 7.4 each component in the test vector must pass
7.5 Adjacent Channel Selectivity (ACS)	Unclear: errors are data dependent on the interferers data. Statistical independence is assumed.	tbd	To pass 7.5 each component in the test vector must pass
7.6.1 In-band blocking	Unclear: errors are data dependent on the interferers data. Statistical independence is assumed.	tbd	To pass 7.6.1 each component in the test vector must pass
7.6.2 Out of-band blocking	yes: it is assumed that the CW interferer causes errors, which are independent and time invariant.	tbd	To pass 7.6.2, all except [tbd] components in the test vector must pass
7.6.3 Narrow band blocking	yes: it is assumed that the CW interferer causes errors, which are independent and time invariant.	tbd	To pass 7.6.3 each component in the test vector must pass
7.7 Spurious response	yes: it is assumed that the CW interferer causes errors, which are independent and time invariant.	tbd	To pass 7.7 each component in the test vector must pass
7.8.1 Wide band Intermodulation	Unclear: errors are dependent on the data content of the interferer. Statistical independence is assumed.	tbd	To pass 7.8.1 each component in the test vector must pass

G.2A Statistical testing of receiver characteristics with CA

G.2A.1 General

G.2.1 applies.

G.2A.2 Mapping throughput to error ratio

The test is defined by the following design principles (see clause G.x, Theory ….):

1. The standard concept is applied. (not the early decision concept).
2. A second limit is introduced, defining the Bad DUT.

3. To decide the test pass:

   - Supplier risk is applied based on the Bad DUT quality.

   - To decide the test fail.

   - Customer Risk is applied based on the specified DUT quality.

The test is defined by the following parameters:

1) Limit Error Ratio = 0.05 (95% throughput is tested).

2) Bad DUT factor M=1.5 (selectivity).

3) Confidence level CL = 95% (for specified DUT and Bad DUT-quality).

G.2A.4 Pass fail limits

Apply 1003 samples to the DUT per CC.

Decide pass per CC in case of ≤ 62 errors, otherwise fail.

NOTE 1: The pass fail decision is done individually for each CC. The pass fail decision for one component in the test vector is as follows: pass if all CCs or SCC only according to the test cases pass, otherwise fail. The overall pass fail decision is according to clause G.2A.6

NOTE 2: It is allowed to apply more samples to the DUT, common for all CCs, (e.g. up to an integer number of frames). Use the ratio (62/1003) for the pass fail decision.

NOTE 3: 62/1003 = 0.0618, the same test limit is used at the end of Table G.2.4-1

G.2A.5 void

G.2A.6 Test conditions for receiver tests with CA

Table G.2A.6-1: Test conditions for receiver tests with CA

Test	Statistical independence	Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test Note 1	Over all Pass/Fail condition Note 1
7.3A Reference sensitivity level for CA	Yes: the inherent receiver noise is assumed to be AWGN	tbd	To pass 7.3A each component in the test vector must pass
7.4A Maximum input level for CA	Unclear: in case, clipping causes errors, errors are data dependent. Statistical independence is assumed.	tbd	To pass 7.4A each component in the test vector must pass
7.5A Adjacent Channel Selectivity (ACS) for CA	Unclear: errors are data dependent on the interferers data. Statistical independence is assumed.	tbd	To pass 7.5A each component in the test vector must pass
7.6.1A In-band blocking for CA	Unclear: errors are data dependent on the interferers data. Statistical independence is assumed.	tbd	To pass 7.6.1A each component in the test vector must pass
7.6.2.A Out of-band blocking for CA	yes: it is assumed that the CW interferer causes errors, which are independent and time invariant.	tbd	To pass 7.6.2A, all except [tbd] components in the test vector must pass
7.6.3A Narrow band blocking for CA	yes: it is assumed that the CW interferer causes errors, which are independent and time invariant.	tbd	To pass 7.6.3A each component in the test vector must pass
7.7A Spurious response for CA	yes: it is assumed that the CW interferer causes errors, which are independent and time invariant.	tbd	To pass 7.7A each component in the test vector must pass
[place holder] 7.8.1A Wide band Intermodulation			
Note 1: A DUT with marginal performance on one component in the test vector passes this component with a confidence level of 95%, which is a false fail probability of 5%. All components in the test vector shall pass, to pass the test, For more than 1 component, performing marginal, there is an increased probability of a false fail for the test.			

G.3 Statistical testing of Performance Requirements with throughput

G.3.1 General

The test of receiver performance characteristics is two fold.

1. A signal or a combination of signals is offered to the RX port(s) of the receiver.

2. The ability of the receiver to demodulate /decode this signal is verified by measuring the throughput.

In (2) is the statistical aspect of the test and is treated here.

The minimum requirement for all receiver performance tests is either 70% or 30% of the maximum throughput.

All receiver performance tests are performed in fading conditions. In addition to the statistical considerations, this requires the definition of a minimum test time.

G.3.2 Mapping throughput to error ratio

G.2.2 applies

G.3.3 Design of the test

The test is defined by the following design principles (see clause G.x, Theory ….):

1. The standard concept is applied. (not the early decision concept)
2. A second limit is introduced: The second limit is different, whether 30% or 70% throughput is tested.
3. To decide the test pass:

   Supplier risk is applied based on the Bad DUT quality

   To decide the test fail:

   Customer Risk is applied based on the specified DUT quality

The test is defined by the following parameters:

1a) Limit Error Ratio = 0.3 (in case 70% Throughput is tested) or

1b) Limit Throughput = 0.3 (in case 30% Throughput is tested)

2a) Bad DUT factor M=1.378 (selectivity)

2b) Bad DUT factor m=0.692 (selectivity)

justification see: TS 34.121 Clause F.6.3.3

3) Confidence level CL = 95% (for specified DUT and Bad DUT-quality)

G.3.4 Pass Fail limit

Testing Throughput = 30%, then the test limit is

Number of successes (ACK) / number of samples ≥ 59 / 233

Testing Throughput = 70% then the test limit is

Number of fails (NACK and statDTX) / number of samples ≤ 66 / 184

We have to distinguish 3 cases:

a) The duration for the number of samples (233 or 184) is greater than the minimum test time:

Then the number of samples (233 or 184) is predefined and the decision is done according to the number of events (59 successes or 66 fails)

b) Since subframe 0 and 5 contain less bits than the remaining subframes, it is allowed to predefine a number of samples contained in an integer number of frames. In this case test-limit-ratio applies.

c) The minimum test time is greater than the duration for the number of samples:

The minimum test time is predefined and the decision is done comparing the measured ratio at that instant against the test-limit-ratio.

NOTE: The test time for most of the tests is governed by the Minimum Test Time

G.3.5 Minimum Test time

If a pass fail decision in G.3.4 can be achieved earlier than the minimum test time, then the test shall not be decided, but continued until the minimum test time is elapsed.

The tables below contain the minimum number of subframes for FDD and TDD.

By simulations the minimum number of active subframes (carrying DL payload) was derived (MNAS),

then adding inactive subframes to the active ones (e.g. subframe 5 contains no DL payload. For TDD additional subframes contain no DL payload)

then rounding up to full thousand and

then adding a bias of 1000 (BMNSF).

Simulation method to derive minimum test time:

With a level, corresponding a throughput at the test limit (here 30% or 70% of the max. throughput) the preliminary throughput versus time converges towards the final throughput. The allowance of ± 0.2 dB around the above mentioned level is predefined by RAN5 to find the minimum test time. The allowance of ±0.2 dB maps through the function "final throughput versus level" into a throughput corridor. The minimum test time is achieved when the preliminary throughput escapes the corridor the last time. The two functions "final throughput versus level" and "preliminary throughput versus time" are simulation results, which are done individual for each demodulation scenario. HST-scenarios and scenarios with MNAS ≥ 50000 are derived differently.

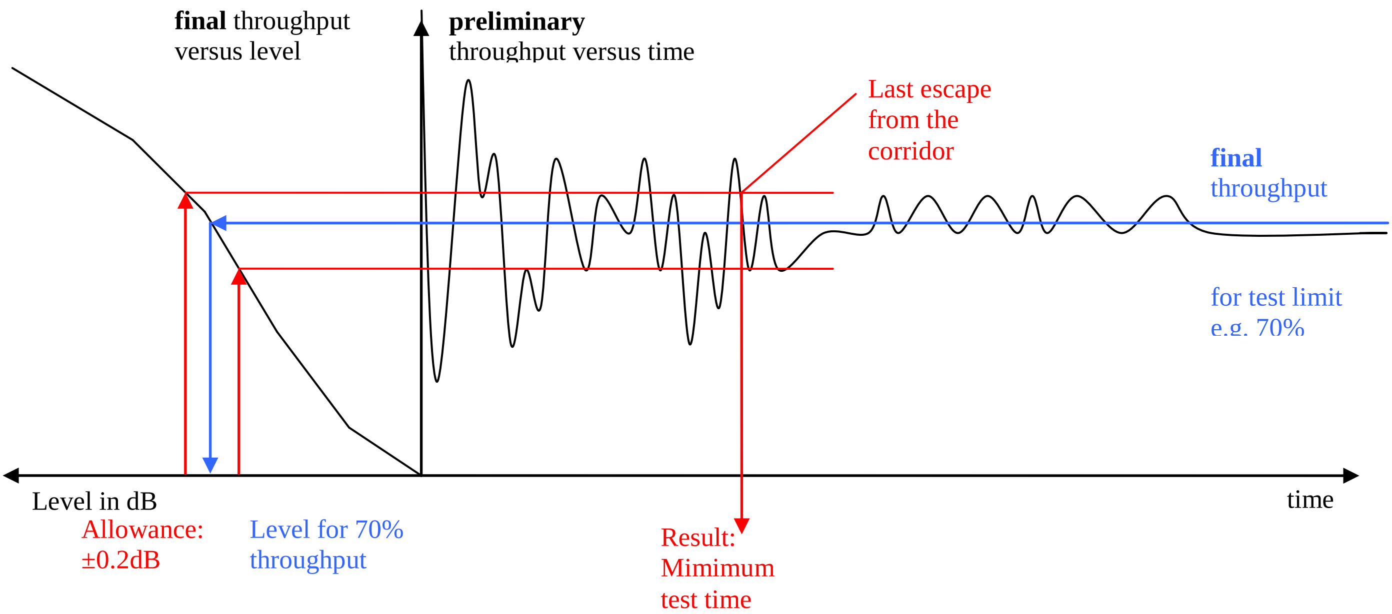


Fig. G.3.5-1: Simulation method to derive minimum test time

Table G.3.5-1: Minimum Test time for PDSCH Single Antenna Port Performance

Test No	Demod. scenario	Demodulation scenario plain text: RMC (Bandwidth, allocated RBs, modulation, coding) Antenna (configuration, correlation) Propagation condition, Doppler [additional parameters, if applicable] (info only)	Minimum Number of Active Subframes (MNAS) to reach the corridor (Simulation, info only)	Minimum Number of Subframes (MNS) to reach the corridor (MNS = active and inactive subframes) (Calculation, info only)		Biased Minimum Number of SubFrames (BMNSF) BMNSF= $1000 * \left\lceil \frac{MNS}{1000} \right\rceil$ +1000 (mandatory)	
				FDD	TDD	FDD	TDD
1	[1.1]	R.2 (10 MHz, full, QPSK, 1/3) (1x2 Low) EVA,5	38 764	43 072	77 528	45 000	79 000
2	[1.2]	R.2 (10 MHz, full, QPSK, 1/3) (1x2 Low) ETU,70	2 764	3 072	5 528	5 000	7 000
3	[1.3]	R.2 (10 MHz, full, QPSK, 1/3) (1x2 Low) ETU,300	1 424	1 583	2 848	3 000	4 000
4	[1.4]	R.2 (10 MHz , full, QPSK, 1/3) (1x2 Low) HST	28 800	NA	NA	28 800	57 600
5	[2.1]	R.4 (1.4 MHz, full, QPSK, 1/3) (1x2 Low) EVA,5	44 354	49 283	147 847	51 000	149 000
6	[1.5]	R.3 (10 MHz, full, 16QAM, ½) (1x2 Low) EVA,5	39 020	43 356	78 040	45 000	80 000
6 Rel-9		R.3-1 (5MHz, full, 16QAM, ½) (1x2 Low) EVA5	39 020 (MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-1 Test6)	43 356	78 040	45 000	80 000
7	[1.6]	R.3 (10 MHz, full, 16QAM, ½) (1x2 Low) ETU,70	1 366	1 518	2 732	3 000	4 000
7 Rel-9		R.3-1 (5MHz, full, 16QAM, ½) (1x2 Low) ETU70	1 366 (MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-1 Test7)	1 518	2 732	3 000	4 000
8	[1.7]	R.3 (10 MHz, full, 16QAM, ½)	3 189	3 544	6 378	5 000	8 000

		(1x2 High) ETU,300					
8 Rel-9		R.3-1 (5MHz, full, 16QAM, ½) (1x2 High) ETU300	3 189 (MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-1 Test8)	3 544	6 378	5 000	8 000
9	[2.2]	R.5 (3 MHz, full, 64QAM, ¾) (1x2 Low) EVA,5	50 000	55 556	100 000	57 000	101 000
10	[2.3]	R.6 (5 MHz, full, 64QAM, 3/4) (1x2 Low) EVA,5	48 847	54 275	97 694	56 000	99 000
10 Rel-9		R.6-1 (5MHz, partial, 64QAM, ¾) (1x2 Low) EVA5	48 847 (MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-1 Test10)	54 275	97 694	56 000	99 000
11	[1.8]	R.7 (10 MHz, full, 64QAM, ¾) (1x2 Low) EVA,5	46 524	51 694	93 048	53 000	95 000
11 Rel-9		R.7-1 (10MHz, partial, 64QAM, ¾) (1x2 Low) EVA5	46 524 (MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-1 Test11)	51 694	93 048	53 000	95 000
12	[1.9]	R.7 (10 MHz, full, 64QAM, ¾) (1x2 Low) ETU,70	4 722	5 247	9 444	7 000	11 000
12 Rel-9		R.7-1 (10MHz, partial, 64QAM, ¾) (1x2 Low) ETU70	4 722 (MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-1 Test12)	5 247	9 444	7 000	11 000
13	[1.10]	R.7 (10 MHz, full, 64 QAM, 3/4) (1x2High) EVA,5	100 000	111 112	200 000	113 000	201 000
13 Rel-		R.7-1 (10MHz, partial, 64QAM,	100 000 (MNAS is	111 112	200 000	113 000	201 000

9		¾) (1x2 High) EVA5	not simulated, but estimated based on similar scenario in Table G.3.5-1 Test13)				
14	[2.4]	R.8 (15 MHz, full, 64QAM, ¾) (1x2 Low) EVA,5	48 434	53 816	96 868	55 000	98 000
14 Rel-9		R.8-1 (15MHz, partial, 64QAM, ¾) (1x2 Low) EVA5	48 434 (MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-1 Test14)	53 816	96 868	55 000	98 000
15	[2.5]	R.9 (20 MHz, full, 64QAM,3/4) (1x2 Low) EVA,5	100 000	111 112	200 000	113 000	201 000
15 Rel-9		R.9-1 (20MHz, partial, 64QAM, ¾) (1x2 Low) EVA5	100 000 (MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-1 Test15)	111 112	200 000	113 000	201 000
15 Rel-9		R.9-2 (20MHz, partial, 64QAM, ¾) (1x2 Low) EVA5	100 000 (MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-1 Test15)	111 112	200 000	113 000	201 000
16	[3.1]	R.0 (3 MHz, 1PRB,16QAM, ½) (1x2 Low) ETU,70	5 710	6 345	11 420	8 000	13 000
17	[3.2]	R.1 (10MHz,1PRB,16QAM, ½) (1x2 Low) ETU,70	9 234	10 260	18 468	12 000	20 000
18	[3.3]	R.1 (20MHz,1PRB,16QAM, ½) (1x2 Low) ETU,70	13 373	14 859	26 746	16 000	28 000

Table G.3.5-2: Minimum Test time for PDSCH Single Antenna Port Performance with 1 PRB

Test No	Demod. scenario	Demodulation scenario (info only)	MNAS (Simulation)	MNS (Calculation)		MNSF (Min No Sub Frames, mandatory)	
				FDD	TDD	FDD	TDD
1	[3.4]	R.29 (10MHz,1PRB,16QAM,½) (1x2 Low) ETU,70 [MBFSN]	5 246	17 487	17 487	19 000	19 000

Table G.3.5-3: Minimum Test time for PDSCH Transmit diversity 2x2

Test No	Demod. scenario	Demodulation scenario (info only)	MNAS (Simulation)	MNS (Calculation)		MNSF (Min No Sub Frames, mandatory)	
				FDD	TDD	FDD	TDD
1	[7.1]	R11 (10MHz, full, 16QAM, ½) (2x2 Med) EVA,5 [SFBC, Space Frequency Block Code]	50 000	55 556	100 000	57 000	101 000
1 Rel-9		R.11-2 (5MHz, full, 16QAM, ½) (2x2 Med) EVA5 [SFBC]	50 000 (MNAS is not simulated, but estimated based on similar scenario in Table G.3.5-2 Test1)	55 556	100 000	57 000	101 000
2	[7.2]	R.10 (10MHz, Full, QPSK, 1/3) (2x2 low) HST [SFBC]	28 800	NA	NA	28 800	57 600

Table G.3.5-4: Minimum Test time for PDSCH Transmit diversity 4x2

Test No	Demod. scenario	Demodulation scenario (info only)	MNAS (Simulation)	MNS (Calculation)		MNSF (Min No Sub Frames, mandatory)	
				FDD	TDD	FDD	TDD
1	[7.3]	R.12 (1.4MHz, full, QPSK, 1/3) (4x2 med) EPA,5 [SFBC-FSTD, SFBC-Frequency Shifted Transmit Diversity]	150 000	166 667	300 000	168 000	301 000
1 Rel-9		R.13 (10 MHz, full, QPSK, 1/3) (4x2 Low) ETU70 [SFBC-FSTD]	10 000 (MNAS is not simulated, but estimated based on similar scenarios in Table G.3.5-4 Test1)	11 112	20 000	13 000	21 000

Table G.3.5-5: Minimum Test time for PDSCH Open Loop Spacial Multiplexing 2x2

Test No	Demod. scenario	Demodulation scenario (info only)	MNAS (Simulation)	MNS (Calculation)		MNSF (Min No Sub Frames, mandatory)	
				FDD	TDD	FDD	TDD
1	[6.1]	R.11 (10MHz, Full, 16QAM, ½) (2x2 Low) EVA,70 [LD-CDD, Large Delay-Cyclic Delay Diversity]	7 600	8 445	19 000	10 000	20 000

Table G.3.5-6: Minimum Test time for PDSCH Open Loop Spacial Multiplexing 4x2

Test No	Demod. scenario	Demodulation scenario (info only)	MNAS (Simulation)	MNS (Calculation)		MNSF (Min No Sub Frames, mandatory)	
				FDD	TDD	FDD	TDD
1	[6.2]	R.14 (10MHz, full, 16 QAM, ½) (4x2 low) EVA,70 [LD-CDD]	4 860	5 400	12 150	7 000	14 000

Table G.3.5-7: Minimum Test time for PDSCH Closed LoopSingle/Multilayer Spacial Multiplexing 2x2

Test No	Demod. scenario	Demodulation scenario (info only)	MNAS (Simulation)	MNS (Calculation)		MNSF (Min No Sub Frames, mandatory)	
				FDD	TDD	FDD	TDD
1	[4.1]	R.10 (10MHz, Full, QPSK,1/3) (2x2 Low) EVA,5 [SCW, Single CodeWord]	49 140	54 600	98 280	56 000	100 000
2	[4.2]	R.10 (10MHz, Full, QPSK, 1/3) (2x2 High) EPA,5 [SCW]	50 000	55 556	100 000	57 000	101 000
3 FDD	[5.1]	R.11 (10MHz,full, 16QAM, ½) (2x2Low) EVA,5 [MCW, Multiple Code Word]	34 266	38 074	-	40 000	-
3 TDD	[5.1]	R.11-1 (10MHz,full, 16QAM, ½) (2x2Low) EVA,5 [MCW, Multiple Code Word]	34 266	-	85 665	-	87 000
3 Rel-9		R.35 (10MHz, full, 64QAM, ½) (2x2 Low) EPA5 [MCW]	48 000 (MNAS is not simulated, but estimated based on similar scenarios in Table G.3.5-12 Test5)	53 333	120 000	55 000	121 000
4 FDD	[5.2]	R.11 (10MHz, full, 16QAM, ½) (2x2Low) ETU,70 [MCW]	2 736	3 040	-	5 000	-
4 TDD	[5.2]	R.11-1 (10MHz, full, 16QAM, ½) (2x2Low) ETU,70 [MCW]	2 736	-	6840	-	8000

Table G.3.5-8: Minimum Test time for PDSCH Closed Loop Single/Multilayer Spacial Multiplexing 4x2

Test No	Demod. scenario	Demodulation scenario (info only)	MNAS (Simulation)	MNS (Calculation)		MNSF (Min No Sub Frames, mandatory)	
				FDD	TDD	FDD	TDD
1	[4.3]	R.13 (10 MHz, Full, QPSK, 1/3) (4x2 Low) EVA,5 [SCW]	26 528	29 476	53 056	31 000	55 000
2	[5.3]	R.14 (10MHz, Full, 16QAM, ½) (4x2low) EVA5 [MCW]	26 066	28 963	65 165	30 000	67 000
2 Rel-9		R.36 (10MHz, full, 64QAM 1/2) (4x2 Low) EPA5 [MCW]	30 000 (MNAS is not simulated, but estimated based on similar scenarios in Table G.3.5-4 Test1)	33 333	75 000	35 000	76 000

Table G.3.5-9: Minimum Test time for PDSCH Single-layer Spatial Multiplexing on antenna port 5 (Release 8 and forward)

Test No	Demod. scenario	Demodulation scenario (info only)	MNAS (Simulation)	MNS (Calculation)		MNSF (Min No Sub Frames, mandatory)	
				FDD	TDD	FDD	TDD
1	[11.1]	R.25 (10 MHz, full, QPSK, 1/3) (1x2 Low) EPA,5	38 879	43 199	77 758	45 000	79 000
2	[11.2]	R.26 (10MHz, full, 16QAM, ½) (1x2 Low) EPA5	47 781	53 090	95 562	55 000	97 000
3	[11.3]	R.27 (10MHz, full, 64QAM, 3/4) (1x2 Low) EPA,5	48 685	54 095	97 370	56 000	99 000
4	[11.4]	R.28 (10MHz, 1PRB, 16QAM, ½) (1x2 Low) EPA,5	100 000	111 112	200 000	113 000	201 000

Table G.3.5-10: Minimum Test time for PDSCH Single-layer Spatial Multiplexing on antenna port 5 (Release 9 and forward)

Test No	Demod. scenario	Demodulation scenario (info only)	MNAS (Simulation)	MNSF (Min No Sub Frames, mandatory)	
				FDD	TDD
1 NA					
2	[ ]	R.26 (5MHz, full, 16QAM ½) (2x2 Low) EPA5	Note: MNAS is not simulated. Because of same demodulation scenario except for antenna configuration, MNSF is reused from Table G.3.5-9, Test 2	55 000	97 000
3	[ ]	R.27 (10MHz, part, 64QAM 3/4) (2x2 Low) EPA,5	Note: MNAS is not simulated. Because of same demodulation scenario except for antenna configuration, MNSF is reused from Table G.3.5-9, Test 3	56 000	99 000
4 NA					

Table G.3.5-11: Minimum Test time for PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 without simultaneous transmission

Test No	Demod. scenario	Demodulation scenario (info only)	MNAS (Simulation)	MNSF (Min No Sub Frames, mandatory)	
				FDD	TDD
1	[ ]	R.31 (10 MHz, full, QPSK, 1/3) (2x2 Low) EVA,5	Note: MNAS is not simulated. Because of same demodulation scenario except for RMC, antenna configuration, MNSF is reused from Table G.3.5-9, Test 1	45 000	79 000
2	[ ]	R.32 (10MHz, full, 16QAM, ½) (2x2 Medium) EPA5	Note: MNAS is not simulated. Because of same demodulation scenario except for RMC, antenna configuration, MNSF is reused from Table G.3.5-9, Test 2	55 000	97 000
		R.32-1 (5MHz, full, 16QAM, ½) (2x2 Medium) EPA5	Note: MNAS is not simulated. Because of same demodulation scenario except for RMC, channel BW, antenna configuration, MNSF is reused from Table G.3.5-9, Test 2		
3	[ ]	R.33 (10MHz, full, 64QAM, 3/4) (2x2 Low) EPA,5	Note: MNAS is not simulated. Because of same demodulation scenario except for RMC, antenna configuration, MNSF is reused from Table G.3.5-9, Test 3	56 000	99 000
		R.33-1 (10MHz, part, 64QAM, 3/4) (2x2 Low) EPA5	Note: MNAS is not simulated. Because of same demodulation scenario except for RMC, allocation, antenna configuration, MNSF is reused from Table G.3.5-9, Test 3		

Table G.3.5-12: Minimum Test time for PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 with a simultaneous transmission

Test No	Demod. scenario	Demodulation scenario (info only)	MNAS (Simulation)	MNSF (Min No Sub Frames, mandatory)	
				FDD	TDD
4	[ ]	R.32 (10MHz, full, 16QAM, 1/2) (2x2 Medium) EPA,5	Note: MNAS is not simulated. Because of same demodulation scenario except for RMC number, antenna configuration, MNSF is reused from Table G.3.5-9, Test 2	55 000	97 000
5		R.34 (10MHz, full, 64QAM, 1/2) (2x2 Low) EPA,5	Note: MNAS is not simulated. Because of same demodulation scenario except for RMC number, target coding rate, antenna configuration, MNSF is reused from Table G.3.5-9, Test 3	56 000	99 000

Table G.3.5-12a: Minimum Test time for PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 without simultaneous transmission for eDL-MIMO

Test No	Demod. scenario	Demodulation scenario (info only)	MNAS (Simulation)	MNSF (Min No Sub Frames, mandatory)	
				FDD	TDD
1	[ ]	R.43 FDD, R50 TDD (10 MHz, full, QSPK, 1/3) (2x2 Low) EVA,5	Note: MNAS is not simulated. Because of same demodulation scenario except for RMC, antenna configuration, propagation condition, MNSF is reused from Table G.3.5-9, Test 1	45 000	79 000

Table G.3.5-12b: Minimum Test time for PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 with a simultaneous transmission for eDL-MIMO

Test No	Demod. scenario	Demodulation scenario (info only)	MNAS (Simulation)	MNSF (Min No Sub Frames, mandatory)	
				FDD	TDD
2	[ ]	R.50 FDD, R.44 TDD (10MHz, full, 64QAM, 1/2) (2x2 Low) EPA,5	Note: MNAS is not simulated. Because of same demodulation scenario except for RMC, target coding rate, antenna configuration, MNSF is reused from Table G.3.5-9, Test 3	56 000	99 000

Table G.3.5-13: Minimum Test time for PDSCH Dual-layer Spatial Multiplexing

Test No	Demod. scenario	Demodulation scenario (info only)	MNAS (Simulation)	MNSF (Min No Sub Frames, mandatory)	
				FDD	TDD
1	[ ]	R.31 (10 MHz, full, QPSK, 1/3) (2x2 Low) EVA,5	Note: MNAS is not simulated. Because of same demodulation scenario except for RMC, antenna configuration, MNSF is reused from Table G.3.5-9, Test 1	[45 000]	[79 000]
2	[ ]	R.32 (10MHz, full, 16QAM, ½) (2x2 Medium) EPA5	Note: MNAS is not simulated. Because of same demodulation scenario except for RMC, antenna configuration, MNSF is reused from Table G.3.5-9, Test 2	[55 000]	[97 000]

Table G.3.5-13a: Minimum Test time for PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO

Test No	Demod. scenario	Demodulation scenario (info only)	MNAS (Simulation)	MNSF (Min No Sub Frames, mandatory)	
				FDD	TDD
1	[ ]	R.51 (10MHz, full, 16QAM, 1/2) (2x2 Low) EPA5	Note: MNAS is not simulated. Because of same demodulation scenario except for RMC, antenna configuration, MNSF is reused from Table G.3.5-9, Test 2	55 000	97 000

G.3.6 Test conditions for receiver performance tests

Table G.3.6: Test conditions for receiver performance tests

Table G.3.6-1: Single Antenna Port Performance (Cell-specific Reference Symbols) for test case 8.2.1.1 and 8.2.2.1 demodulation of PDSCH

<table>
<tr><th>Test</th><th>Statistical independence</th><th colspan="4">Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test</th><th>Over all Pass/Fail condition</th></tr>
<tr><td rowspan="3">8.2.1.1 FDD PDSCH Single Antenna Port Performance (Cell-Specific Reference Symbols)</td><td rowspan="3">subframes are independent</td><td>CAT</td><td>1</td><td>2</td><td>3-5</td><td rowspan="6">To pass 8.2.1.1 and 8.2.2.1each component in the test vector must pass

For UEs, supporting multiple E_UTRA-bands (number of bands =B), the number of repetitions must be multiplied by B.

If a test is defined over a BW>(BW of the E_UTRA band), the test is not applicable and reduces the number of repetitions.

If a test is defined over a BW, which is not supported in the E_UTRAN band, the test is not applicable and reduces the number of repetitions.</td></tr>
<tr><td>QPSK</td><td>5</td><td>5</td><td>5</td></tr>
<tr><td>16QAM</td><td>0</td><td>3</td><td>3</td></tr>
<tr><td rowspan="3">8.2.1.2 TDD PDSCH Single Antenna Port Performance (Cell-Specific Reference Symbols)</td><td rowspan="3">subframes are independent</td><td>64 QAM</td><td>1</td><td>6</td><td>7</td></tr>
<tr><td>1PRB</td><td>4</td><td>4</td><td>4</td></tr>
<tr><td>Σ</td><td>10</td><td>18</td><td>19</td></tr>
</table>

Table G.3.6-2: Transmit Diversity Performance (Cell-specific Reference Symbols) for test case 8.2.1.2 and 8.2.2.2 demodulation of PDSCH

Test	Statistical independence	Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test				Over all Pass/Fail condition
8.2.1.2 FDD PDSCH Transmit Diversity Performance (Cell-Specific Reference Symbols)	subframes are independent	CAT	1	2	3-5	To pass 8.2.1.2 and 8.2.2.2 each component in the test vector must pass For UEs, supporting multiple E_UTRA-bands (number of bands =B), the number of repetitions must be multiplied by B. If a test is defined over a BW, which is not supported in the E_UTRAN band, the test is not applicable and reduces the number of repetitions.
		QPSK	2	2	2	
8.2.2.2 TDD PDSCH Transmit Diversity Performance (Cell-Specific Reference Symbols)	subframes are independent	16QAM	0	1	1	
		Σ	2	3	3	

Table G.3.6-3: Open Loop Spatial Multiplexing Performance (Cell-specific Reference Symbols) for test case 8.2.1.3 and 8.2.2.3 demodulation of PDSCH

Test	Statistical independence	Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test				Over all Pass/Fail condition
8.2.1.3 FDD PDSCH Open Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols)	subframes are independent	CAT	1	2	3-5	To pass 8.2.1.3 and 8.2.2.3 each component in the test vector must pass
		16QAM	0	2	2	
8.2.2.3 TDD PDSCH Open Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols)	subframes are independent	Σ	0	2	2	

Table G.3.6-4: Closed Loop Spatial Multiplexing Performance (Cell-specific Reference Symbols) for test case 8.2.1.4 and 8.2.2.4 demodulation of PDSCH

Test	Statistical independence	Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test				Over all Pass/Fail condition
8.2.1.4 FDD PDSCH Closed Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols)	subframes are independent	CAT	1	2	3-5	To pass 8.2.1.4 and 8.2.2.4 each component in the test vector must pass
		Single layer QPSK	3	3	3	
8.2.2.4 TDD PDSCH Closed Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols)	subframes are independent	Multi layer 16QAM	0	3	3	
		Σ	3	6	6	

Table G.3.6-5: TDD PDSCH Single-layer Spatial Multiplexing on antenna port 5 (Release 8 and forward)

Test	Statistical independence	Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test				Over all Pass/Fail condition
8.3.2.1.1 TDD PDSCH Single-layer Spatial Multiplexing on antenna port 5 (Release 8 and forward)	subframes are independent	CAT	1	2	3-5	To pass 8.3.2.1 each component in the test vector must pass
		QPSK	1	1	1	
		16QAM	1	2	2	
		64 QAM	0	1	1	
		Σ	2	4	4	

Table G.3.6-6: TDD PDSCH Single-layer Spatial Multiplexing on antenna port 5 (Release 9 and forward)

Test	Statistical independence	Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test				Over all Pass/Fail condition
8.3.2.1.1_1 TDD PDSCH Single-layer Spatial Multiplexing on antenna port 5 (Release 9 and forward)	subframes are independent	CAT	1	2	3-5	To pass 8.3.2.1.1_1 each component in the test vector must pass
		16QAM	1	0	0	
		64 QAM	1	0	0	
		Σ	2	0	0	

Table G.3.6-7: TDD PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 without a simultaneous transmission

Test	Statistical independence	Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test				Over all Pass/Fail condition
8.3.2.1.2 TDD PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 without a simultaneous transmission	subframes are independent	CAT	1	2-5		To pass 8.3.2.1.2 each component in the test vector must pass
		QPSK	1	1		
		16QAM	1	1		
		64 QAM	1	1		
		Σ	3	3		

Table G.3.6-8: TDD PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 with a simultaneous transmission

Test	Statistical independence	Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test				Over all Pass/Fail condition
8.3.2.1.3 TDD PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 with a simultaneous transmission	subframes are independent	CAT	1	2-5		To pass 8.3.2.1.3 each component in the test vector must pass
		16QAM	0	1		
		64 QAM	0	1		
		Σ	0	2		

Table G.3.6-8a: TDD PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 without a simultaneous transmission for eDL-MIMO

Test	Statistical independence	Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test				Over all Pass/Fail condition
8.3.1.1.1_D FDD PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 without a simultaneous transmission	subframes are independent	CAT	1-8			To pass 8.3.1.1.1_D and 8.3.2.1.2_D each component in the test vector must pass
		QPSK	1			
8.3.2.1.2_D TDD PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 without a simultaneous transmission	subframes are independent	QPSK	1			
		Σ	2			

Table G.3.6-8b: TDD PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 with a simultaneous transmission for eDL-MIMO

Test	Statistical independence	Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test				Over all Pass/Fail condition
8.3.1.1.2_D FDD PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 with a simultaneous transmission for eDL-MIMO	subframes are independent	CAT	1	2-8		To pass 8.3.1.1.2_D and 8.3.2.1.3_D each component in the test vector must pass
		64QAM	0	1		
8.3.2.1.3_D TDD PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 with a simultaneous transmission for eDL-MIMO	subframes are independent	64QAM	0	1		
		Σ	0	2		

Table G.3.6-9: TDD PDSCH Dual-layer Spatial Multiplexing

Test	Statistical independence	Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test				Over all Pass/Fail condition
8.3.2.2.1 TDD PDSCH Dual-layer Spatial Multiplexing	subframes are independent	CAT	1	2	3-5	To pass 8.3.2.2.1 each component in the test vector must pass
		QPSK	1	1	1	
		16QAM	1	2	2	
		64 QAM	0	1	1	
		Σ	2	4	4	

Table G.3.6-9a: PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO

Test	Statistical independence	Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test				Over all Pass/Fail condition
8.3.1.2.1_D FDD PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO	subframes are independent	CAT	1	2-8		To pass 8.3.1.2.1_D and 8.3.2.2.1_D each component in the test vector must pass
		16QAM	0	1		
8.3.2.2.1_D TDD PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO	subframes are independent	16QAM	0	1		
		Σ	0	2		

G.3A Statistical testing of Performance Requirements with throughput for CA

G.3A.1 General

The minimum requirements for performance tests in fading conditions in clause 8 with respect to CA are 70% of the maximum throughput. The minimum requirements in static conditions in clause 8 with respect to CA are [TBD]. Statistical tests in static propagation conditions lead to a statistically justified number of samples (testtime) and a test limit. The fading conditions require a minimum test time, overriding the statistically justified test time. It can be found in Tables G.3A.5. The statistically justified test limit is also used for the tests under fading conditions. The throughput is measured on both carriers in parallel (unless otherwise stated). The test for both carriers need the same time. The sum of the CC's throughput is compared against the limit, where the limit is the sum of the individual carrier's limit.

G.3A.2 Mapping throughput to error ratio

G.2.2 applies separate for each CC

G.3A.3 Design of the test

The test is defined by the following design principles (see clause G.x, Theory ….):

1. The standard concept is applied (not the early decision concept).
2. A second limit is introduced, defining the Bad DUT.
3. To decide the test pass:
   - Supplier risk is applied based on the Bad DUT quality.
   - To decide the test fails.
   - Customer Risk is applied based on the specified DUT quality.

The test is defined by the following parameters:

1) Limit Error Ratio = 0.3.
   (in case 70% throughput is tested , otherwise [TBD]).
2) Bad DUT factor M = 1.378 (selectivity) justification see: TS 34.121 Clause F.6.3.3.
   (M = 1.378 is tied to 70% throughput, otherwise M is [TBD].)
3) Confidence level CL = 95% (for specified DUT and Bad DUT-quality).

G.3A.4 Pass Fail limit

Testing with the parameters from G.3A.3 (70% throughput, M = 1.378, CL95%): Apply 184 samples to the DUT per CC and count the errors for each CC. The test limit to pass for one CC is ≤ 66 errors, however this is not individually applicable for CA.

Pass fail decision for one test point in CA: The sum of the CC's errors is compared against the test limit, where the test limit is the sum of the individual carrier's test limit.

It is allowed to apply more samples, in parallel for all CCs, to the DUT (e.g. up to an integer number of frames).

In fading conditions it is necessary to apply more samples, in parallel for all CCs, to the DUT, as in fading conditions the minimum test time overrides the statistically justified test time.

When more samples are applied, decide against the ratio 66/184 = 0.3587.

Testing with parameters from G.3A.3 ([TBD]% throughput, M = [TBD], CL = 95%) is [TBD].

G.3A.5 Minimum test time

In contrast to G.3.5, where the minimum test time is derived from simulations, the test time here is selected without simulation utilising test time information from similar demodulation scenarios in non-CA test cases and while maintaining the reasonable testing time.

Note MNAS values in this clause may need to be changed in future if current MNAS values turn out to be too short for giving stable CA throughput results.

Table G.3A.5-1: Minimum Test time FDD PDSCH Single Antenna Port Performance (intra-band contiguous DL CA)

Clause 8.2.1.1.1_A.1 Test No	Demodulation scenario plain text: RMC (Bandwidth, allocated RBs, modulation, coding) Antenna (configuration, correlation) Propagation condition, Doppler [additional parameters, if applicable] (info only)	Minimum Number of Active Subframes in each CC	Minimum Number of Subframes (MNS) in each CC (MNS = active and inactive subframes)
			FDD
1	R.42FDD (2x20 MHz,full,QPSK,1/3) (1x2 Low) EVA5	50 000	55 556

Table G.3A.5-2: Minimum Test time FDD PDSCH Single Antenna Port Performance (inter-band DL CA)

Clause 8.2.1.1.1_A.2 Test No	Demodulation scenario plain text: RMC (Bandwidth, allocated RBs, modulation, coding) Antenna (configuration, correlation) Propagation condition, Doppler [additional parameters, if applicable] (info only)	Minimum Number of Active Subframes in each CC	Minimum Number of Subframes (MNS) in each CC (MNS = active and inactive subframes)
			FDD
1	R.2FDD (2x10 MHz,full,QPSK,1/3) (1x2 Low) EVA5	50 000	55 556
2	R.42FDD (2x20 MHz,full,QPSK,1/3) (1x2 Low) EVA5	50 000	55 556

Table G.3A.5-3: Minimum Test time FDD PDSCH Open Loop Spatial Multiplexing 2x2 (intra band contiguous DL CA)

Clause 8.2.1.3.1_A.1 Test No	Demodulation scenario plain text: RMC (Bandwidth, allocated RBs, modulation, coding) Antenna (configuration, correlation) Propagation condition, Doppler [additional parameters, if applicable] (info only)	Minimum Number of Active Subframes in each CC	Minimum Number of Subframes (MNS) in each CC (MNS = active and inactive subframes)
			FDD
1	R.30FDD (2x20 MHz, full,16QAM,1/2) (2x2 Low) EVA70	10 000	11 112

Table G.3A.5-4: Minimum Test time FDD PDSCH Open Loop Spatial Multiplexing 2x2 (inter band DL CA)

Clause 8.2.1.3.1_A.2 Test No	Demodulation scenario plain text: RMC (Bandwidth, allocated RBs, modulation, coding) Antenna (configuration, correlation) Propagation condition, Doppler [additional parameters, if applicable] (info only)	Minimum Number of Active Subframes in each CC	Minimum Number of Subframes (MNS) in each CC (MNS = active and inactive subframes)
			FDD
1	R.11FDD (2x10 MHz,full,16QAM, 1/2) (2x2 Low) EVA 70	10 000	11 112
2	R.30FDD (2x20 MHz, full,16QAM,1/2) (2x2 Low) EVA70	10 000	11 112

Table G.3A.5-4A: Minimum Test time FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 (intra band contiguous DL CA)

Clause 8.2.1.4.2_A.1 Test No	Demodulation scenario plain text: RMC (Bandwidth, allocated RBs, modulation, coding) Antenna (configuration, correlation) Propagation condition, Doppler [additional parameters, if applicable] (info only)	Minimum Number of Active Subframes in each CC	Minimum Number of Subframes (MNS) in each CC (MNS = active and inactive subframes)
			FDD
1	R.14-3 FDD (2x20 MHz, full,16QAM,1/2) (4x2 Low) EVA5	50 000	55 556

Table G.3A.5-5: Minimum Test time FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 (inter band DL CA)

Clause 8.2.1.4.2_A.2 Test No	Demodulation scenario plain text: RMC (Bandwidth, allocated RBs, modulation, coding) Antenna (configuration, correlation) Propagation condition, Doppler [additional parameters, if applicable] (info only)	Minimum Number of Active Subframes in each CC	Minimum Number of Subframes (MNS) in each CC (MNS = active and inactive subframes)
			FDD
1	R.14FDD (2x10 MHz,full,16QAM, 1/2) (4x2 Low) EVA 5	10 000	11 112

Table G.3A.5-6: Minimum Test time TDD PDSCH Single Antenna Port Performance (intra-band contiguous DL CA)

Clause 8.2.2.1.1_A.1 Test No	Demodulation scenario plain text: RMC (Bandwidth, allocated RBs, modulation, coding) Antenna (configuration, correlation) Propagation condition, Doppler [additional parameters, if applicable] (info only)	Minimum Number of Active Subframes in each CC	Minimum Number of Subframes (MNS) in each CC (MNS = active and inactive subframes)
			TDD
1	R.42TDD (2x20 MHz,full,QPSK,1/3) (1x2 Low) EVA5	50 000	100 000

Table G.3A.5-7: Minimum Test time TDD PDSCH Open Loop Spatial Multiplexing 2x2 (intra band contiguous DL CA)

Clause 8.2.2.3.1_A.1 Test No	Demodulation scenario plain text: RMC (Bandwidth, allocated RBs, modulation, coding) Antenna (configuration, correlation) Propagation condition, Doppler [additional parameters, if applicable] (info only)	Minimum Number of Active Subframes in each CC	Minimum Number of Subframes (MNS) in each CC (MNS = active and inactive subframes)
			TDD
1	R.30-1 TDD (2x20 MHz, full,16QAM,1/2) (2x2 Low) EVA70	10 000	20 000

Table G.3A.5-8: Minimum Test time TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 (intra band contiguous DL CA)

Clause 8.2.2.4.2_A.1 Test No	Demodulation scenario plain text: RMC (Bandwidth, allocated RBs, modulation, coding) Antenna (configuration, correlation) Propagation condition, Doppler [additional parameters, if applicable] (info only)	Minimum Number of Active Subframes in each CC	Minimum Number of Subframes (MNS) in each CC (MNS = active and inactive subframes)
			TDD
1	R.43TDD (2x20 MHz,full,16QAM, 1/2) (4x2 Low) EVA5	50 000	100 000

G.3A.6 Test conditions

Table G.3A.6-1: Test conditions for CA performance tests

Test	Statistical independence	Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test	Over all Pass/Fail condition
8.2.1.1.1_A.1 FDD PDSCH Single Antenna Port Performance for CA (intra-band contiguous DL CA)	subframes are independent	1	To pass the test case each component in the test vector must pass
8.2.1.1.1_A.2 FDD PDSCH Single Antenna Port Performance for CA (inter-band DL CA)	subframes are independent	2	To pass the test case each component in the test vector must pass
8.2.1.3.1_A.1 FDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (intra-band contiguous DL CA)	subframes are independent	1	To pass the test case each component in the test vector must pass
8.2.1.3.1_A.2 FDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (inter-band DL CA)	subframes are independent	2	To pass the test case each component in the test vector must pass
8.2.1.4.2_A.1 FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4 x 2 for CA (intra-band contiguous DL CA)	subframes are independent	1	To pass the test case each component in the test vector must pass
8.2.1.4.2_A.2 FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4 x 2 for CA (inter-band DL CA)	subframes are independent	1	To pass the test case each component in the test vector must pass
8.2.2.1.1_A.1 TDD PDSCH Single Antenna Port Performance for CA (intra-band contiguous DL CA)	subframes are independent	1	To pass the test case each component in the test vector must pass
8.2.2.3.1_A.1 TDD PDSCH Open Loop Spatial Multiplexing 2x2 for CA (intra-band contiguous DL CA)	subframes are independent	1	To pass the test case each component in the test vector must pass
8.2.2.4.2_A.1 TDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (intra-band contiguous DL CA)	subframes are independent	1	To pass the test case each component in the test vector must pass

G.4 Statistical testing of Performance Requirements with probability of misdetection

G.4.1 General

The test of receiver performance characteristics is two fold.

1. A signal or a combination of signals is offered to the RX port(s) of the receiver.

2. The ability of the receiver to demodulate /decode this signal is verified by analyzing the reaction of the UE to this signal.

In (2) is the statistical aspect of the test and is treated here.

The minimum requirement for those receiver performance tests are 1% or 0.1% misdetection probability

All receiver performance tests are performed in fading conditions. In addition to the statistical considerations, this requires the definition of a minimum test time.

NOTE: All demodulation performance tests (state from version 9.5.0) require a minimum test time, which exceeds the maximum test time in tables G.4.4. Under this circumstances only the test limit at the end of tables G.4.4.-1 resp. G.4.4.-2 is applicable.

G.4.2 Mapping the UE reaction to error ratio

The UE can not indicate the detection or misdetection of the physical channel under test directly. Indirect methods are described in the procedure of the applicable test.

G.4.3 Design of the test

G.2.3 applies, exception:

Limit ER = 0.01 and ER = 0.001

G.4.4 Numerical definition of the pass fail limits

Table G.4.4-1 pass fail limits for ER = 0.01

ne	ns_p	ns_f	ne	ns_p	ns_f	ne	ns_p	ns_f	ne	ns_p	ns_f
0	344	NA	40	3929	2553	80	7033	5874	120	10036	9354
1	485	NA	41	4009	2632	81	7109	5960	121	10110	9442
2	607	10	42	4089	2712	82	7185	6046	122	10184	9530
3	719	33	43	4168	2792	83	7261	6131	123	10259	9619
4	826	66	44	4247	2873	84	7336	6217	124	10333	9707
5	929	107	45	4327	2953	85	7412	6303	125	10407	9796
6	1029	152	46	4406	3034	86	7488	6389	126	10481	9884
7	1127	202	47	4484	3115	87	7564	6475	127	10555	9972
8	1223	255	48	4563	3196	88	7639	6561	128	10629	10061
9	1317	311	49	4642	3278	89	7715	6648	129	10703	10150
10	1409	370	50	4720	3359	90	7790	6734	130	10777	10238
11	1501	430	51	4799	3441	91	7866	6820	131	10851	10327
12	1592	492	52	4877	3523	92	7941	6907	132	10925	10416
13	1681	555	53	4955	3605	93	8017	6993	133	10999	10504
14	1770	620	54	5033	3688	94	8092	7080	134	11073	10593
15	1858	686	55	5111	3770	95	8167	7167	135	11147	10682
16	1946	754	56	5189	3853	96	8242	7253	136	11221	10771
17	2032	822	57	5267	3935	97	8317	7340	137	11295	10860
18	2119	891	58	5344	4018	98	8393	7427	138	11369	10949
19	2204	961	59	5422	4101	99	8468	7514	139	11442	11038
20	2290	1032	60	5499	4185	100	8543	7601	140	11516	11127
21	2374	1103	61	5577	4268	101	8618	7688	141	11590	11216
22	2459	1175	62	5654	4352	102	8693	7775	142	11664	11305
23	2543	1248	63	5731	4435	103	8768	7863	143	11737	11394
24	2627	1321	64	5809	4519	104	8843	7950	144	11811	11483
25	2710	1395	65	5886	4603	105	8917	8037	145	11885	11573
26	2793	1470	66	5963	4687	106	8992	8125	146	11958	11662
27	2876	1544	67	6039	4771	107	9067	8212	147	12032	11751
28	2958	1620	68	6116	4855	108	9142	8300	148	12105	11840
29	3040	1696	69	6193	4940	109	9216	8387	149	12179	11930
30	3122	1772	70	6270	5024	110	9291	8475	150	12252	12019
31	3204	1848	71	6346	5109	111	9366	8562	151	12326	12109
32	3285	1925	72	6423	5193	112	9440	8650	152	12399	12198
33	3366	2003	73	6499	5278	113	9515	8738	153	12473	12288
34	3447	2080	74	6576	5363	114	9589	8826	154	12546	12377
35	3528	2158	75	6652	5448	115	9664	8914	155	12620	12467
36	3609	2237	76	6728	5533	116	9738	9002	156	12693	12556
37	3689	2315	77	6805	5618	117	9813	9090	157	12767	12646
38	3769	2394	78	6881	5704	118	9887	9178	158	12840	12736
39	3850	2473	79	6957	5789	119	9962	9266	159	12913	12826
									160	NA	12915
									Test limit = 1.2352E-2		

Table G.4.4-2 pass fail limits for ER = 0.001

ne	ns_p	ns_f	ne	ns_p	ns_f	ne	ns_p	ns_f	ne	ns_p	ns_f
0	3463	NA	41	40174	26265	82	71961	60368	123	102723	96075
1	4874	4	42	40971	27063	83	72720	61225	124	103465	96958
2	6096	99	43	41766	27863	84	73479	62083	125	104208	97842
3	7226	329	44	42559	28666	85	74237	62941	126	104949	98726
4	8298	658	45	43352	29471	86	74995	63801	127	105691	99610
5	9330	1059	46	44142	30279	87	75752	64661	128	106432	100495
6	10332	1513	47	44932	31088	88	76509	65522	129	107173	101380
7	11310	2009	48	45720	31899	89	77265	66383	130	107914	102266
8	12269	2539	49	46507	32713	90	78020	67246	131	108655	103152
9	13212	3096	50	47293	33528	91	78776	68109	132	109395	104039
10	14141	3677	51	48078	34345	92	79530	68973	133	110135	104926
11	15058	4278	52	48861	35164	93	80285	69838	134	110875	105813
12	15965	4896	53	49644	35984	94	81038	70704	135	111614	106701
13	16863	5530	54	50425	36807	95	81792	71570	136	112353	107589
14	17753	6177	55	51205	37631	96	82544	72437	137	113092	108478
15	18635	6836	56	51985	38456	97	83297	73305	138	113830	109367
16	19511	7507	57	52763	39283	98	84049	74173	139	114569	110257
17	20380	8188	58	53541	40112	99	84800	75042	140	115307	111146
18	21244	8878	59	54317	40942	100	85551	75911	141	116045	112037
19	22103	9576	60	55092	41773	101	86302	76782	142	116782	112927
20	22957	10282	61	55867	42606	102	87052	77653	143	117520	113818
21	23806	10995	62	56641	43440	103	87802	78524	144	118257	114710
22	24652	11715	63	57414	44276	104	88552	79396	145	118994	115602
23	25493	12441	64	58186	45113	105	89301	80269	146	119730	116494
24	26331	13173	65	58957	45951	106	90050	81143	147	120466	117386
25	27166	13911	66	59728	46790	107	90798	82017	148	121203	118279
26	27997	14654	67	60497	47631	108	91546	82891	149	121939	119173
27	28826	15401	68	61266	48472	109	92293	83766	150	122674	120066
28	29651	16154	69	62035	49315	110	93041	84642	151	123410	120960
29	30474	16910	70	62802	50159	111	93787	85518	152	124145	121855
30	31294	17671	71	63569	51004	112	94534	86395	153	124880	122749
31	32111	18436	72	64335	51851	113	95280	87273	154	125615	123644
32	32927	19204	73	65100	52698	114	96026	88151	155	126349	124540
33	33740	19976	74	65865	53546	115	96771	89029	156	127083	125435
34	34551	20752	75	66629	54396	116	97516	89908	157	127818	126332
35	35360	21531	76	67393	55246	117	98261	90788	158	128551	127228
36	36166	22312	77	68156	56097	118	99005	91668	159	129285	128125
37	36971	23097	78	68918	56950	119	99750	92548	160	130019	129022
38	37775	23885	79	69679	57803	120	100493	93429	161	130752	129919
39	38576	24676	80	70440	58657	121	101237	94311	162	NA	130817
40	39376	25469	81	71201	59512	122	101980	95193	Test limit = 1.2345E-3		

NOTE 1: The first column is the number of errors (ne = number of misdetections)

NOTE 2: The second column is the number of samples for the pass limit (ns_p , ns=Number of Samples= number misdetections + number of detections)

NOTE 3: The third column is the number of samples for the fail limit (ns_f)

NOTE 4: The test limit at the end of the table is applicable, when the minimum test time in clause 3.5 governs the test. Pass the test for ER ≤ Test limit, otherwise fail.

G.4.5 Pass fail decision rules

G.2.5 applies

NOTE: For ER=0.01 an ideal DUT passes after 344 samples. The maximum test time is 12913 samples. .For ER=0.001 an ideal DUT passes after 3463 samples. The maximum test time is 130752 samples.

G.4.6 Minimum Test time

Table G.4.6-1: Minimum Test time for Demodulation of PCFICH/PDCCH

Test No	Demod. Scenario	Demodulation scenario (info only)	MNAS (Simulation)	MNS (Calculation)		MNSF (Min No Sub Frames, mandatory)	
				FDD	TDD	FDD	TDD
1	[8.1]	R.15 (10 MHz, 8CCE, full, QPSK 1/3) (1x2 Low) ETU70	200 000	222 222	400 000	224 000	401 000
1	[8.2]	R.16 (1.4MHz, 2CCE, full, QPSK 1/3) (2x2 Low) EPA5	200 000	222 222	400 000	224 000	401 000
1 Rel-9 …	[ ]	R.16_1 (10MHz, 4CCE, full, QPSK 1/3) (2x2 Low) EVA70	200 000	222 222	400 000	224 000	401 000
1	[8.3]	R.17 (10MHz, 4CCE, full, QPSK 1/3) (4x2 Medium) EVA5	200 000	222 222	400 000	224 000	401 000
1 Rel-9 …	[ ]	R.17_1 (5MHz, 2CCE, full, QPSK 1/3) (4x2 Medium) EPA5	200 000	222 222	400 000	224 000	401 000
Note: Simulation method to derive MNAS is based on finite test time and its effect on test system uncertainty specified in clause F.1.4.							

Table G.4.6-2: Minimum Test time for Demodulation of PHICH

Test No	Demod. scenario	Demodulation scenario (info only)	MNAS (Simulation)	MNS (Calculation)		MNSF (Min No Sub Frames, mandatory)	
				FDD	TDD	FDD	TDD
1	[9.1]	R.18 (10 MHz, full, QPSK 1/3) (1x2 Low) ETU70	200 000	200 000	500 000	200 000	500 000
2	[9.4]	R.24 (10MHz, full, 16QAM ½) (1x2 Low) ETU70	200 000	200 000	500 000	200 000	500 000
1	[9.2]	R.19 (1.4MHz, full, 64QAM 3/4) (2x2 Low) EPA5	200 000	200 000	500 000	200 000	500 000
1 Rel-9…	[ ]	R.19_1 (10MHz, full, 64QAM 3/4) (2x2 Low) EVA70	200 000	200 000	500 000	200 000	500 000
1	[9.3]	R.20 (10MHz, 1PRB, 16QAM ½) (4x2 Medium) EVA5	200 000	200 000	500 000	200 000	500 000
1 Rel-9…	[ ]	R.20_1 (5MHz, 1PRB, 16QAM ½) (4x2 Medium) EPA5	200 000 R.20 has 5MHz BW Scenario 9.3. has EVA5	200 000	500 000	200 000	500 000
Note: Simulation method to derive MNAS is based on finite test time and its effect on test system uncertainty specified in clause F.1.4.							

G.4.7 Test conditions for receiver performance tests

Table G.4.7: Test conditions for receiver performance tests

Test	Statistical independence	Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test	Over all Pass/Fail condition Restrictions and extensions see Table G.3.6-1
8.4.1.1 FDD PCFICH/PDCCH Single-antenna Port Performance	A misdetection is an independent event	1	NA
8.4.1.2 FDD PCFICH/PDCCH Transmit Diversity Performance	A misdetection is an independent event	2	To pass 8.4.1.2 each component in the test vector must pass
8.4.2.1 TDD PCFICH/PDCCH Single-antenna Port Performance	A misdetection is an independent event	1	NA
8.4.2.2 TDD PCFICH/PDCCH Transmit Diversity Performance	A misdetection is an independent event	2	To pass 8.4.2.2 each component in the test vector must pass
8.5.1.1 FDD PHICH Single-antenna Port Performance	A misdetection is an independent event	2	To pass 8.5.1.1 each component in the test vector must pass
8.5.1.2 FDD PHICH Transmit Diversity Performance	A misdetection is an independent event	2	To pass 8.5.1.2 each component in the test vector must pass
8.5.2.1 TDD PHICH Single-antenna Port Performance	A misdetection is an independent event	2	To pass 8.5.2.1 each component in the test vector must pass
8.5.2.2 TDD PHICH Transmit Diversity Performance	A misdetection is an independent event	2	To pass 8.5.2.2 each component in the test vector must pass

G.5 Measuring throughput ratio

G.5.1 General

Annex G.5 is applicable for clauses 9.3, 9.4 and 9.5. Common to those clauses is, that a throughput ratio γ is measured. These clauses are tested exclusively with "slow" multipath fading profiles. Hence the test time is governed by test time due to fading, and number of samples due to statistical significance is not applicable.

The test requirements in clause 9.4 are a ratio of 2 throughput tests according to $\gamma = \frac{t_{ue}}{t_{rnd}}$. The denominator must be established by an approach, resulting in the denominator throughput t_{rnd} and the reference SNR_{rnd}, the latter is reused to measure the nominator throughput.

The test requirements in clauses 9.3 and 9.5 are a ratio of 2 throughput tests according to $\gamma = \frac{t_{subband}}{t_{median}}$, $\gamma = \frac{t_{reported}}{t_{fix}}$ etc. Nominator and denominator are ordinary throughput tests

t_{ue}, t_{rnd}, $t_{reported}$, t_{fix}, $t_{subband}$, t_{median}, $t_{wideband}$ are throughputs, derived under different conditions and are defined in clause s 9.3, 9.4 and 9.5.

SNR_{rnd} is the signal noise ratio, derived together with t_{rnd} and is defined in clause 9.4.

G.5.2 Establishing t_{rnd}

Adjust SNR such that the measured throughput is $58\% \le t_{rnd} \le 62\%$.

The resulting SNR is declared SNR_{rnd}

To achieve statistical significance the final throughput measurement must be done with MNS samples, given table G.5.4-1

The approach, leading to t_{rnd} and SNR_{rnd} is not specified.

G.5.3 Measuring T-put

To achieve statistical significance the final throughput measurement must be done with MNS samples, given in table.G.5.4 -1. Number of samples due to statistical significance is not applicable.

For measuring $t_{subband}$, $t_{wideband}$, $t_{reported}$ and t_{fix}, the SS collects ACK, NACK and statDTX from the UE and records the time, elapsed from the beginning of the test. The payload size, received by the UE and acknowledged towards the SS, may vary within a test versus time (e.g. due to subband changes upon a UE report) Throughput is calculated in the SS by summing up the payload, associated to each ACK, from the start of the test and dividing the accumulated payload in kilobits by the time in seconds, elapsed from the beginning of the test. This is similar but not same as in G.2.2. (Main difference in bullet d, where the payload size is constant).

For measuring t_{median}, t_{ue}, and t_{rnd}, the SS collects ACK, NACK and statDTX from the UE and records the time, elapsed from the beginning of the test. The payload size, received by the UE and acknowledged towards the SS, is constant. Throughput can be calculated in the SS by multiplying the payload size with the number of ACKs and dividing the accumulated payload in kilobits by the time in seconds, elapsed from the beginning of the test, being associated to the following ratio: ACK/ (ACK+NACK + DTX).

G.5.4 Number of samples for throughput ratios

TT for γ and MNS are based on theoretical estimations.

Table G.5.4-1: Test time for testing throughput ratios

Test	Demodulation scenario: RMC (Bandwidth, allocated RBs, modulation, coding) [Antenna configuration, correlation] Propagation condition, Doppler	Γ	Minimum Number of Subframes (MNS) (MNS = active and inactive Subframes, more details in Annex G.3.5 and table G.3.5-1)		Γ including TT	BLER
			FDD	TDD		
9.3.1.1.1 9.3.1.1.2	(10 MHz, 6, variable modulation and coding) [1x2, full] Special propagation according to clause B. 2. 4, 5Hz	1.1	100000 For denominator- and nominator-measurement each	170000 For denominator- and nominator-measurement each	γ=1.09	BLER=0.05, no TT No of samples: subset of ACKs and NACKs in the MNS for throughput.
9.3.1.2.1_D	(10 MHz, 6, variable modulation and coding) [2x2, full] Special propagation according to clause B.2.4, 5Hz	1.1	100000 For denominator- and nominator-measurement each	170000 For denominator- and nominator-measurement each	γ=1.09	BLER=0.05, no TT No of samples: subset of ACKs and NACKs in the MNS for throughput.
9.3.1.2.2_D	(10 MHz, 6, variable modulation and coding) [2x2, full] Special propagation according to clause B.2.4, 5Hz	1.1	100000 For denominator- and nominator-measurement each	170000 For denominator- and nominator-measurement each	γ=1.09	BLER=0.05, no TT No of samples: subset of ACKs and NACKs in the MNS for throughput.
9.3.2.1.1 9.3.2.1.2	(10 MHz, full, variable modulation and coding) [1x2, high] EPA5	1.05	100000 For denominator- and nominator-measurement each	170000 For denominator- and nominator-measurement each	γ=1.04	BLER=0.02, no TT No of samples for FDD: subset of ACKs and NACKs in the MNS for throughput. No of samples for TDD: subset of *filtered* ACKs and NACKs in the MNS for throughput.
9.3.2.1.1_1 9.3.2.1.2_1	(10 MHz, partial, variable modulation and coding) [1x2, high] EPA5	1.05	100000 For denominator- and nominator-measurement each	170000 For denominator- and nominator-measurement each	γ=1.04	BLER=0.02, no TT No of samples for FDD: subset of ACKs and NACKs in the MNS for throughput. No of samples for TDD: subset of *filtered* ACKs and NACKs in the MNS for throughput.
9.3.2.2.1_D	(10 MHz, full, variable modulation and coding) [4x2, high] EPA5	1.05	100000 For denominator- and nominator-measurement each	170000 For denominator- and nominator-measurement each	γ=1.04	BLER=0.02, no TT No of samples for FDD: subset of ACKs and NACKs in the MNS for throughput.

9.3.2.2.2_D	(10 MHz, full, variable modulation and coding) [8x2, high] EPA5	1.05	100000 For denominator- and nominator-measurement each	170000 For denominator- and nominator-measurement each	γ =1.04	BLER=0.02, no TT No of samples for TDD: subset of *filtered* ACKs and NACKs in the MNS for throughput.
9.3.3.1.1 9.3.3.1.2	10 MHz, full(however unequal SNR), variable modulation and coding) [1x2, full] Special: propagation according to clause B.2.4, 5Hz	1.6	100000 For denominator- and nominator-measurement each	170000 For denominator- and nominator-measurement each	1.50	
9.3.4.1.1 9.3.4.1.2	Same as 9.3.3	1.2	100000	170000	1.19	
9.3.4.2.1 9.3.4.2.2	Same as 9.3.3	1.15	100000	170000	1.14	
9.4.1.1.1 9.4.1.1.2	R. 10 (10 MHz, full, QPSK, 1/3) (2x2 Low) EVA5	1.1	100000	170000	γ =1.09	
9.4.1.2.1 9.4.1.2.2	R.14-1 (10 MHz, partial, QPSK, 1/3) (4x2 Low) EVA,5	1.2	100000	170000	1.19	
9.4.2.1.1 9.4.2.1.2	R.30 (20 MHz, full, 16QAM, 1/2) (2x2 Low) EPA5	1.2	100000	170000	γ =1.19	
9.4.2.1.1_1 9.4.2.1.2_1	R.11-3 or R.11 (10 MHz, partial or full, 16QAM, 1/2) (2x2 Low) EPA5	1.2	100000	170000	γ =1.19	
9.4.2.2.1	R.14-2 FDD (10MHz, 3, 16 QAM, ½, 4x2low, EVA5)	1.2	100000	170000	1.19	
9.4.2.2.2	R.14-2 TDD (10MHz, 3, 16QAM, ½, 4x2low, EVA5)	1.15	100000	170000	1.14	
9.4.1.3.1_D	R.44 (10 MHz, partial, QPSK, 1/3) (4x2 Low) EPA5	1.2	100000	170000	γ =1.19	
9.4.1.3.2_D	R.45-1 or R.45 (10 MHz, partial or full, 16QAM, 1/2) (8x2 High) EVA5	1.2	100000	170000	γ =1.19	

9.4.2.3.1_D	R.45-1 or R.45 (10 MHz, partial or full, 16QAM, 1/2) (4x2 Low) EVA5	1.3	100000	170000	γ=1.29	
9.4.2.3.2_D	R.45-1 or R.45 (10 MHz, partial or full, 16QAM, 1/2) (8x2 High) EVA5	3.5	100000	170000	γ=3.49	
9.5.1.1 9.5.1.2	(10MHz, full, variable modulation and coding) (2x2, low or high according to test) (2x2, EPA5)	Test 2 γ_1=1.05 Test 1 γ_2=1 Test 3 γ_2=1.1	100000	170000	Test2 γ_1= 1.04 Test1 γ_2= 0.99 Test3 γ_2= 1.09	
9.5.1.1_1 9.5.1.2_1	(10MHz, full, variable modulation and coding) (2x2, low or high according to test) (2x2, EPA5)	Test 2 γ_1=1.05 Test 1 γ_2=1 Test 3: γ_1=0.90 γ_2=1.10	100000	170000	Test2 γ_1= 1.04 Test1 γ_2= 0.99 Test3: γ_1=0.89 γ_2=1.09	
9.5.1.1_2 9.5.1.2_2	(10MHz, full, variable modulation and coding) (2x2, low or high according to test) (2x2, EPA5)	Test 2 γ_1=1.05 Test 1 γ_2=1 Test 3: γ_1=0.90	100000	170000	Test2 γ_1= 1.04 Test1 γ_2= 0.99 Test3: γ_1=0.89	
9.5.2.1_D 9.5.2.2_D	(10MHz, full, variable modulation and coding) (2x2, low or high according to test) (2x2, EPA5)	Test 2 γ_1=1.05 Test 3 γ_1=0.9Test1 γ_2=1.00	100000	170000	Test2 γ_1= 1.04 Test3 γ_1= 0.89 Test1 γ_2= 0.99	

G.6 Statistical testing of MBMS Performance

G.6.1 General

The system simulator sends MBMS packets to the UE under test. The number of packets, the SS sends, is predefined by the test time in G.6.4. The UE under tests demodulates the MBMS packets and counts the successfully received number of MBMS packets into the UE internal MBMS packet counter. The SS reads out the counter and issues a pass fail decision.

G.6.2 Mapping of MBMS Packet ratio to BLER

The minimum requirements are designed in terms of BLER = 1%. 10 MBMS packets are included in one Transport block, constant throughout the test. The ratio of correct received MBMS packets (M_{ok}) to transmitted packets (M_{tot}) is assumed to be equal to the ratio of correct received transport blocks to transmitted transport blocks. This assumption ignores the unlikely case that payload and CRC for a transport block are consistent but wrong.

G.6.3 Design of the test

The minimum requirement for all MBMS tests is BLER = 1%. All MBMS tests are performed under a fading scenario: MBSFN channel model (Table B.2.6-1). It is obvious, that this fading scenario requires a minimum test time, greater than the time, required for statistical significance. In addition the test design with the MBMS packet counter in the UE suggest a fixed test time. Without simulation the test time is set to [200 000] active subframes (Transport blocks), leading to [333 333] subframes (333sec) for FDD and [400 000] subframes (400sec) for TDD. In order to avoid the fail of a good DUT due to statistical uncertainty the minimum requirement of BLER = 1% leads to a

Test limit = 1.2352 %. (refer Table G.4.4-1)

This means a DUT actually on the limit (1%) is measured and passed with a confidence level of greater than 95%.

G.6.4 Test time for MBMS performance tests

Table G.6.4-1: Minimum Test time for MBMS

Test No	Demodulation scenario (info only)	Min No of Sub Frames	
		FDD (6 of 10 subframes are active)	TDD (5 of 10 subframes are active)
1	R.37 (10 MHz, full, QPSK 1/3) (1x2 Low) MBSFN channel model	[333 333]	[400 000]
2	R.38 (10MHz, full, 16QAM 1/2) (1x2 Low) MBSFN channel model	[333 333]	[400 000]
3	R.39 (10 MHz, full, 64QAM 2/3) (1x2 Low) MBSFN channel model	[333 333]	[400 000
3	R.39-1 (5 MHz, full, 64QAM 2/3) (1x2 Low) MBSFN channel model	[333 333]	[400 000]
4	R.40 (1.4 MHz, full, QPSK 1/3) (1x2 Medium) MBSFN channel model	[333 333]	[400 000]

G.X Theory to derive the numbers in Table G.2.4-1 (Informative)

Editor's note: This clause of the Annex G is for information only and it described the background theory and information to derive the entries in the table G.2.4-1.

G.X.1 Error Ratio (ER)

The Error Ratio (ER) is defined as the ratio of number of errors (ne) to all results, number of samples (ns).

(1-ER is the success ratio).

G.X.2 Test Design

A statistical test is characterised by:

Test-time, Selectivity and Confidence level.

G.X.3 Confidence level

The outcome of a statistical test is a decision. This decision may be correct or in-correct. The Confidence Level CL describes the probability that the decision is a correct one. The complement is the wrong decision probability (risk) D = 1-CL

G.X.4 Introduction: Supplier Risk versus Customer Risk

There are two targets of decision:

(a) A measurement on the pass-limit shows, that the DUT has the specified quality or is better with probability CL (CL e.g.95%) This shall lead to a "pass decision"

The pass-limit is on the good side of the specified DUT-quality. A more stringent CL (CL e.g.99%) shifts the pass-limit farer into the good direction. Given the quality of the DUTs is distributed, a greater CL passes less and better DUTs.

A measurement on the bad side of the pass-limit is simply “not pass” (undecided or artificial fail).

(aa) Complementary:

A measurement on the fail-limit shows, that the DUT is worse than the specified quality with probability CL.

The fail-limit is on the bad side of the specified DUT-quality. A more stringent CL shifts the fail-limit farer into the bad direction. Given the quality of the DUTs is distributed, a greater CL fails less and worse DUTs.

A measurement on the good side of the fail-limit is simply “not fail”.

(b) A DUT, known to have the specified quality, shall be measured and decided pass with probability CL. This leads to the test limit.

For CL e.g. 95%, the test limit is on the bad side of the specified DUT-quality. CL e.g.99% shifts the pass-limit farer into the bad direction. Given the DUT-quality is distributed, a greater CL passes more and worse DUTs.

(bb) A DUT, known to be an ($\varepsilon \rightarrow 0$) beyond the specified quality, shall be measured and decided fail with probability CL.

For CL e.g.95%, the test limit is on the good side of the specified DUT-quality.

NOTE 1: The different sense for CL in (a), (aa) versus (b), (bb).

NOTE 2: For constant CL in all 4 bullets (a) is equivalent to (bb) and (aa) is equivalent to (b).

G.X.5 Supplier Risk versus Customer Risk

The table below summarizes the different targets of decision.

Table G.X.5-1 Equivalent statements

	Equivalent statements, using different cause-to-effect-directions, and assuming CL = constant >1/2	
cause-to-effect-directions	Known measurement result → estimation of the DUT's quality	Known DUT's quality → estimation of the measurement's outcome
Supplier Risk	A measurement on the pass-limit shows, that the DUT has the specified quality or is better (a)	A DUT, known to have an (ε→0) beyond the specified DUT-quality, shall be measured and decided fail (bb)
Customer Risk	A measurement on the fail-limit shall shows, that the DUT is worse than the specified quality (aa)	A DUT, known to have the specified quality, shall be measured and decided pass (b)

The shaded area shown the direct interpretation of Supplier Risk and Customer Risk.

The same statements can be based on other DUT-quality-definitions.

G.X.6 Introduction: Standard test versus early decision concept

In standard statistical tests, a certain number of results (ns) is predefined in advance to the test. After ns results the number of bad results (ne) is counted and the error ratio (ER) is calculated by ne/ns.

Applying statistical theory, a decision limit can be designed, against which the calculated ER is compared to derive the decision. Such a limit is one decision point and is characterised by:

- D: the wrong decision probability (a predefined parameter)
- ns: the number of results (a fixed predefined parameter)
- ne: the number of bad results (the limit based on just ns)

In the formula for the limit, D and ns can be understood as variable parameter and variable. However the standard test execution requires fixed ns and D. The property of such a test is: It discriminate between two states only, depending on the test design:

- pass (with CL) / undecided (undecided in the sense: finally undecided)
- fail (with CL) / undecided (undecided in the sense: finally undecided)
- pass(with CL) / fail (with CL) (however against two limits).

In contrast to the standard statistical tests, the early decision concept predefines a set of (ne,ns) co-ordinates, representing the limit-curve for decision. After each result a preliminary ER is calculated and compared against the limit-curve. After each result one may make the decision or not (undecided for later decision) The parameters and variables in the limit-curve for the early decision concept have a similar but not equal meaning:

- D: the wrong decision probability (a predefined parameter)
- ns: the number of results (a variable parameter)
- ne: the number of bad results (the limit. It varies together with ns)

To avoid a "final undecided" in the standard test, a second limit must be introduced and the single decision co-ordinate (ne,ns) needs a high ne, leading to a fixed (high) test time. In the early decision concept, having the same selectivity and the same confidence level an "undecided" need not to be avoided, as it can be decided later. A perfect DUT will hit the decision coordinate (ne,ns) with ne=0. This test time is short.

G.X.7 Standard test versus early decision concept

For Supplier Risk:

The wrong decision probability D in the standard test is the probability, to decide a DUT in-correct in the single decision point. In the early decision concept there is a probability of in-correct decisions d at each point of the limit-curve. The sum of all those wrong decision probabilities accumulate to D. Hence d<D

For Customer Risk:

The correct decision probability CL in the standard test is the probability, to decide a DUT correct in the single decision point. In the early decision concept there is a probability of correct decisions cl at each point of the limit-curve. The sum of all those correct decision probabilities accumulate to CL. Hence cl<CL or d>D

G.X.8 Selectivity

There is no statistical test which can discriminate between a limit DUT and a DUT which is an (ε→0) apart from the limit in finite time and high confidence level CL. Either the test discriminates against one limit with the results pass (with CL)/undecided or fail (with CL)/undecided, or the test ends in a result pass (with CL)/fail (with CL) but this requires a second limit.

For CL>1/2, a (measurement-result = specified-DUT-quality), generates undecided in test "supplier risk against pass limit" (a, from above) and also in the test "customer risk against the fail limit " (aa)

For CL>1/2, a DUT, known to be on the limit, will be decided pass for the test "customer risk against pass limit" (b) and also "supplier risk against fail limit" (bb).

This overlap or undecided area is not a fault or a contradiction, however it can be avoided by introducing a Bad or a Good DUT quality according to:

- Bad DUT quality: specified DUT-quality * M (M>1)
- Good DUT quality: specified DUT-quality * m (m<1)

Using e.g. M>1 and CL=95% the test for different DUT qualities yield different pass probabilities:

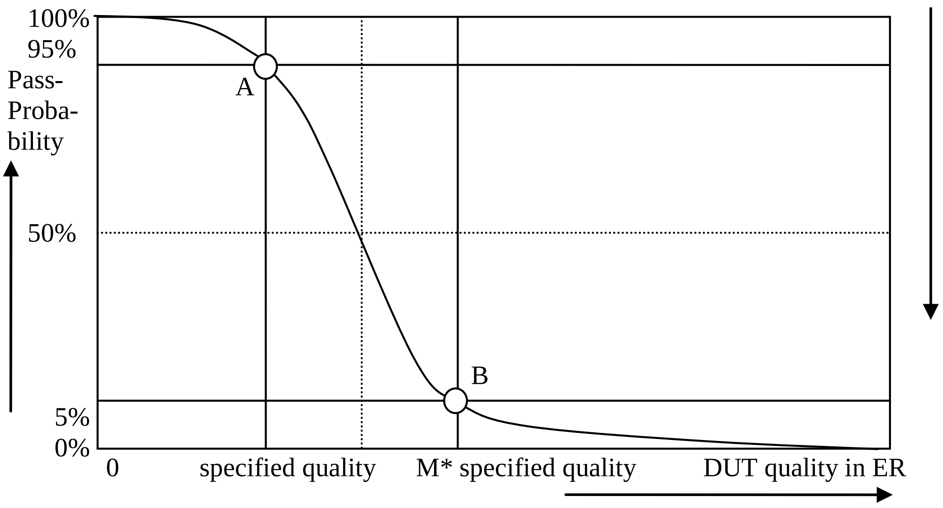


Figure G.X.8-1: Pass probability versus DUT quality

G.X.9 Design of the test

The receiver characteristic test are defined by the following design principles:

1. The early decision concept is applied.
2. A second limit is introduced: Bad DUT factor M>1
3. To decide the test pass:

   Supplier risk is applied based on the Bad DUT quality

   To decide the test fail

   Customer Risk is applied based on the specified DUT quality

The receiver characteristic test are defined by the following parameters:

1. Limit ER = 0.05
2. Bad DUT factor M=1.5 (selectivity)
3. Confidence level CL = 95% (for specified DUT and Bad DUT-quality)

This has the following consequences:

1. A measurement on the fail limit is connected with 2 equivalent statements:

A measurement on the fail-limit shows, that the DUT is worse than the specified DUT-quality	A DUT, known have the specified quality, shall be measured and decided pass

2. A measurement on the pass limit is connected with the complementary statements:

A measurement on the pass limit shows, that the DUT is better than the Bad DUT-quality.	A DUT, known to have the Bad DUT quality, shall be measured and decided fail

   The left column is used to decide the measurement.

   The right column is used to verify the design of the test by simulation.

   The simulation is based on the two fulcrums A and B only in Figure G.x.8-1

3. Test time

   The minimum and maximum test time is fixed.

   The average test time is a function of the DUT's quality.

   The individual test time is not predictable.

4. The number of decision co-ordinates (ne,ns) in the early decision concept is responsible for the selectivity of the test and the maximum test time. Having fixed the number of decision co-ordinates there is still freedom to select the individual decision co-ordinates in many combinations, all leading to the same confidence level.

G.X.10 Simulation to derive the pass fail limits in Table G.2.4-1

There is freedom to design the decision co-ordinates (ne,ns).

The binomial distribution and its inverse is used to design the pass and fail limits. Note that this method is not unique and that other methods exist.

$$\mathrm{fail}(ne, d_f) := \frac{ne}{(ne + \mathrm{qnbinom}(d_f, ne, ER))}$$

$$\mathrm{pass}(ne, cl_p, M) := \frac{ne}{(ne + \mathrm{qnbinom}(cl_p, ne, ER \cdot M))}$$

Where

- fail(..) is the error ratio for the fail limit
- pass(..) is the error ratio for the pass limit
- ER is the specified error ratio 0.05
- ne is the number of bad results. This is the variable in both equations
- M is the Bad DUT factor M=1.5
- d_f is the wrong decision probability of a single (ne,ns) co-ordinate for the fail limit.
  It is found by simulation to be $d_f = 0.004$
- cl_p is the confidence level of a single (ne,ns) co-ordinate for the pass limit.
  It is found by simulation to be $cl_p = 0.9975$
- qnbinom(..): The inverse cumulative function of the negative binomial distribution

The simulation works as follows:

- A large population of limit DUTs with true ER = 0.05 is decided against the pass and fail limits.
- cl_p and d_f are tuned such that CL (95%) of the population passes and D (5%) of the population fails.
- A population of Bad DUTs with true ER = M*0.05 is decided against the same pass and fail limits.
- cl_p and d_f are tuned such that CL (95%) of the population fails and D (5%) of the population passes.
- This procedure and the relationship to the measurement is justified in clause G.x.9. The number of DUTs decrease during the simulation, as the decided DUTs leave the population. That number decreases with an approximately exponential characteristics. After 169 bad results all DUTs of the population are decided.

NOTE: The exponential decrease of the population is an optimal design goal for the decision co-ordinates (ne,ns), which can be achieved with other formulas or methods as well.

Annex H (normative): Uplink Physical Channels

H.0 Uplink Signal Levels

Uplink signal power is a UE figure, which is configured by the Test System by means of:

RRC messages (IE-s), such as:

- UplinkPowerControlCommon (-v1020, SCell-r10),
- UplinkPowerControlDedicated (-v1020, SCell-r10),
- Other IE-s affecting directly or indirectly the uplink power,

and L1/2 Power control commands (TPC).

The uplink power settings are specified in the test case.

Otherwise, the uplink power settings result from the default RRC messages described in 3GPP TS 36.508 [7], and appropriate TPC-s, which are sent to the UE to transmit with an UL power level necessary for maintaining the call during the test.

H.1 General

This annex specifies the uplink physical channels that are needed for setting a connection and channels that are needed during a connection. Table H.1-1 describes the mapping of uplink physical channels and signals to physical resources for FDD. Table H.1-2 describes the mapping of uplink physical channels and signals to physical resources for TDD.

Table H.1-1: Mapping of uplink physical channels and signals to physical resources for FDD

Physical channel	Time Domain Location	Frequency Domain Location	Note
PRACH	Allowed for the parameter *prach-Configuration Index* provided by higher layers	Allowed for the parameter *prach-FrequencyOffset* provided by higher layers	Mapping rule is specified in TS36.211 [8] Section 5.7.1
DMRS	For PUCCH: Symbols 2 to 4 of each slot (PUCCH format: 1, 1a, 1b) Symbol 1 and 5 of each slot (PUCCH format: 2, 2a, 2b) For PUSCH: Symbol 3 of each slot	Uplink system bandwidth dependent.	Mapping rule of DMRS for PUCCH is specified in TS36.211 [8] 5.5.2.2.2 Mapping rule of DMRS for PUSCH is specified in TS36.211 [8] 5.5.2.1.2
PUCCH	Slot 0 and 1 of each subframe	Each 12 subcarriers of both ends of the bandwidth	Mapping rule is specified in TS36.211 [8] Section 5.4.3
PUSCH	All remaining SC-FDMA symbols of each subframe not allocated to DMRS	RBs allocated according to Reference Measurement channel in Annex A.2	Mapping rule is specified in TS36.211 [8] Section 5.4.2
SRS	Allowed for the cell-specific parameter *srs-BandwidthConfig* and the UE-specific parameter *srs-Bandwidth* provided by higher layers	Allowed for the cell-specific parameter *srsMaxUpPt* and the UE-specific parameter *transmissionComb* or *transmissionComb-ap* provided by higher layers	Mapping rule is specified in TS36.211 [8] Section 5.5.3.2

Table H.1-2: Mapping of uplink physical channels and signals to physical resources for TDD

Physical channel	Time Domain Location	Frequency Domain Location	Note
PRACH	Allowed for the parameters $(t_{RA}^0, t_{RA}^1, t_{RA}^2)$ in *prach-Configuration Index* provided by higher layers	For format 0-3, the frequency location allowed is by *prach-FrequencyOffset* and (f_{RA}) in *prach-Configuration Index* provided by higher layers. Preamble format 4 is mapped only on UpPTS, where the frequency location allowed is only by (f_{RA}) in *prach-Configuration Index* provided by higher layers.	Mapping rule is specified in TS36.211 [8] Section 5.7.1
DMRS	For PUCCH: Symbols 2 to 4 of each slot (PUCCH format: 1, 1a, 1b) Symbol 1 and 5 of each slot (PUCCH format: 2, 2a, 2b) For PUSCH: Symbol 3 of each slot	Uplink system bandwidth dependent.	Mapping rule of DMRS for PUCCH is specified in TS36.211 [8] 5.5.2.2.2 Mapping rule of DMRS for PUSCH is specified in TS36.211 [8] 5.5.2.1.2
PUCCH	Slot 0 and 1 of each subframe	Each 12 subcarriers of both ends of the bandwidth	Mapping rule is specified in TS36.211 [8] Section 5.4.3
PUSCH	All remaining SC-FDMA symbols of each subframe not allocated to DMRS	RBs allocated according to Reference Measurement channel in Annex A.2	Mapping rule is specified in TS36.211 [8] Section 5.4.2
SRS	Allowed for the cell-specific parameter *srs-BandwidthConfig* and the UE-specific parameter *srs-Bandwidth* provided by higher layers	Allowed for the cell-specific parameter *srsMaxUpPt* and the UE-specific parameter *transmissionComb* or *transmissionComb-ap* provided by higher layers	Mapping rule is specified in TS36.211 [8] Section 5.5.3.2

NOTE: PUSCH, PUCCH, DMRS are not present in UpPTS for TDD.

H.2 Set-up

Table H.2-1 describes the uplink physical channels that are required for connection set up.

Table H.2-1: Uplink Physical Channels required for connection set-up

Physical Channel
PRACH
DMRS
PUCCH
PUSCH

H.3 Connection

The following clauses describes the uplink physical channels that are transmitted during a connection i.e., when measurements are done.

H.3.0 Measurement of Transmitter Characteristics

As specified in the test case. Otherwise:

- PUSCH + DMRS for PUSCH (and DMRS) measurements.

- PUCCH + DMRS for PUCCH (and DMRS) measurements.
- PRACH for PRACH measurements.

SRS for SRS measurements.

H.3.1 Measurement of Receiver Characteristics

As specified in the test case. Otherwise:

- PUSCH + DMRS for measurements with uplink interference configured.
- PUCCH + DMRS for measurements without uplink interference configured.

H.3.2 Measurement of Performance Requirements

As specified in the test case. Otherwise:

- PUCCH + DMRS for measurements without CSI feedback, or with CSI feedback in PUCCH mode.
- PUSCH + DMRS for measurements with CSI feedback in PUSCH mode.

Annex I (informative): Handling requirements and tests for different releases and UE capabilities

This annex gives guidance on how minimum requirements in different releases of 3GPP TS 36.101 [2] and different UE capabilities are handled in the specification 3GPP TS 36.521-1.

I.1 General considerations

Conformance tests in TS 36.521-1 are derived and specified by RAN WG5 based on minimum requirements in TS 36.101 [2] defined by RAN WG4. The actual practice of RAN WG5 is to specify conformance tests only in a single release of TS 36.521-1, capturing requirements defined by RAN WG4 in all releases of TS 36.101 [2].

1) In general the structure of TS 36.521-1 follows the structure of TS 36.101 [2].

2) In general for minimum requirements specified in a single clause in TS 36.101 [2], a corresponding conformance test is specified in a single clause in TS 36.521-1.

3) Exceptions to rule 2) occur in the following cases:

   a) Coverage of minimum requirements is too wide, in term of different test environments required for verifying all of them.

   b) Coverage of minimum requirements is too wide, in term of different features which need to be tested for verifying all of them.

   c) Coverage of minimum requirements is too wide, in term of different UE capabilities required for verifying all of them.

A set of conformance tests is generated in TS 36.521-1 based on the same clause with minimum requirements in TS 36.101 [2]. This "test group" consists in several "individual tests".

4) Exceptions to rule 2) occur also in the case when minimum requirements (including test conditions, test points etc.) are not the same in different releases of TS 36.101 [2]. More in details the differences may consist in:

   a) Different requirement values / test conditions for the same test points.

   b) Exclusion / Replacement / Addition of test points without introduction of new features

   c) Addition of test points introducing new features.

A set of conformance tests is generated in TS 36.521-1 based on the same clause with minimum requirements in TS 36.101 [2]. This set consists in one "original test" and one or several "additional tests".

5) The clause-number and the title of the "test group" / "original test" is derived based on the number and title of the corresponding minimum requirements in TS 36.101 [2], while the clause-numbers and titles of the "individual tests" / "additional tests" are derived based on those of the "test group" / "original test". In any case it should be avoided to have in TS 36.521-1 specification tests with the same title, even though they have different clause-numbers.

6) In case of high similarity between "individual tests", or between "additional tests" and "original test", in order to reduce the standardization and maintenance work the content of clauses for "individual tests" / "additional tests" may be reduced to a minimum by referencing to the analogue clauses of other "individual tests" / the "original test" and specifying the exceptions (requirement-tables, test parameter tables etc). This method should be applied very carefully considering differences in core functionalities of different E-UTRAN releases.

Details how to apply the above principles to concrete scenarios are defined in Annex I.2.

I.2 Concrete scenarios

I.2.1 Tests for minimum requirements varying between releases, without introduction of new features

Different minimum requirement between different releases of 3GPP TS 36.101 [2] without introduction of new features represent scenarios according to Annex I.1 bullets 4) a) and b).

In TS 36.521-1 are specified one "original test" and several "additional tests" respectively applicable to the appropriate releases. This is shown graphically in Figure I.2.1-1.

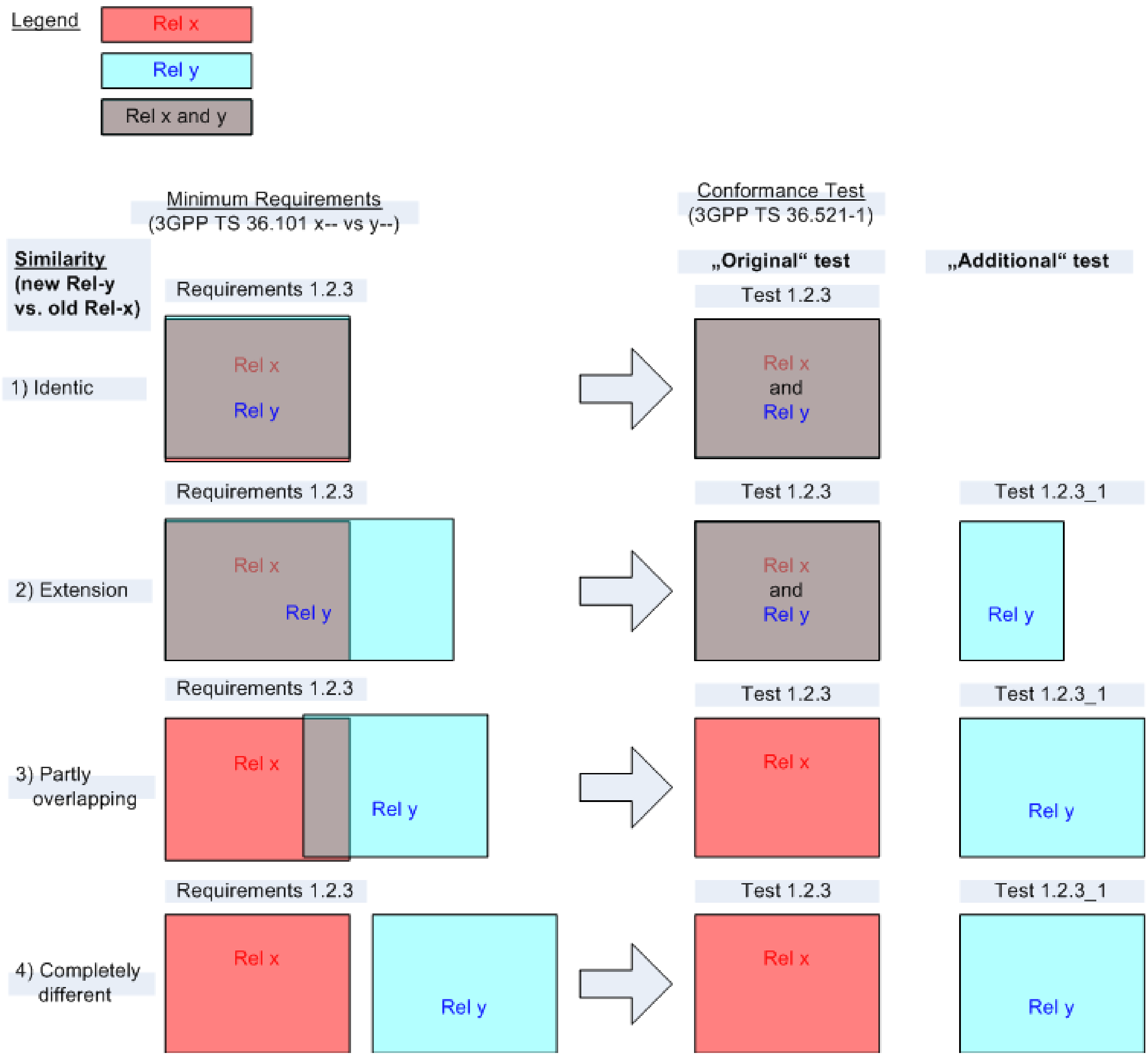


Figure I.2.1-1: Mapping of minimum requirements to conformance tests, when minimum requirements are specified in multiple releases

Rule:

Following tests and clauses are specified in TS 36.521-1:

Original tests:

<x.x.x> <Test>

Additional tests:

<x.x.x>_<y> <Test> (<Release> <UE capability>)

where:

<x.x.x> = number of the original test

<y> = incrementing clause number (Arabic numeral)

<Test> = title of the original test

<Release> = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases.

<UE capability> = optional identifier showing the UE capability, which leads to additional test. To be included only when there is already a test with the same title for the same release.

Examples:

1.2.3 Virtual test

1.2.3_1 Virtual test (Rel-9 and forward)

1.2.3_2 Virtual test (Rel-10 and forward)

I.2.2 Tests for CA (Carrier aggregation)

I.2.2.1 CA Tx tests (Chapter 6)

CA Transmitter minimum requirements in 3GPP TS 36.101 [2] are already specified in separate clauses from the legacy requirements, bearing the suffix "A" in the number and "for CA" in the title. However minimum requirements have a wide coverage in terms of Annex I.1 bullet 3).

In TS 36.521-1 are specified several separate "individual tests" for different CA scenarios and UE capabilities.

Rule:

Following tests and clauses are specified in TS 36.521-1:

Test group clause:

<x.x.x>A <Test> for CA

Individual tests:

<x.x.x>A.<y> <Test> for CA (<CA type> <DL/UL support> <BW Class> <Release>)

where:

<x.x.x> = number of the corresponding legacy test (if available), or number derived from TS 36.101 without potential suffix "A" (if no legacy test available)

<y> = incrementing clause number (Arabic numeral)

<Test> = title of the corresponding legacy test (if available), or title derived from TS 36.101 without potential suffix "for CA" (if no legacy test available)

<CA type> = mandatory identifier {intra-band contiguous; intra-band non-contiguous; inter-band}

<DL/UL support>= mandatory identifier {DL CA without UL CA; DL CA and UL CA}

<BW Class> = optional identifier showing UE CA Bandwidth class {Class B; Class C}. To be included only for intra-band contiguous scenarios, if there is already a test with the same title.

<Release> = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases.

Examples:

1.2.3 Virtual test

1.2.3A Virtual test for CA

1.2.3A.1 Virtual test for CA (intra-band contiguous DL CA and UL CA)

1.2.3A.2 Virtual test for CA (inter-band DL CA without UL CA)

1.2.3A.3 Virtual test for CA (intra-band contiguous DL CA and UL CA Class B)

I.2.2.2 CA Rx tests (Chapter 7)

Same as for Transmitter tests (Chapter 6) in Annex I.2.2.1.

I.2.2.3 CA Performance tests (Chapter 8)

CA Performance minimum requirements in 3GPP TS 36.101 [2] are specified mostly in the same clause with the legacy requirements, as additional test points marked with CA capability identifiers. CA introduces a new feature in terms of Annex I.1 bullet 4) c). Furthermore the set of CA test points has a wide coverage in terms of Annex I.1 bullet 3).

In TS 36.521-1 are specified several separate "individual tests" for different CA scenarios and UE capabilities.

Rule:

Following tests and clauses are specified in TS 36.521-1:

Test group clause:

<x.x.x>_A <Test> for CA

Individual tests:

<x.x.x>_A.<y> <Test> for CA (<CA type > <DL/UL support> <Release>)

where:

<x.x.x> = number of the corresponding legacy test (if available), or number derived from TS 36.101 without potential suffix "A" (if no legacy test available)

<y> = incrementing clause number (Arabic numeral)

<Test> = title of the corresponding legacy test (if available), or title derived from TS 36.101 without potential "for CA" (if no legacy test available)

<CA type> = mandatory identifier {intra-band contiguous; intra-band non-contiguous; inter-band}

<DL/UL support> = mandatory identifier {DL CA}

<Release> = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases.

Examples:

1.2.3	Virtual test
1.2.3_A	Virtual test for CA
1.2.3_A.1	Virtual test for CA (intra-band contiguous DL CA)
1.2.3_A.2	Virtual test for CA (inter-band DL CA)
1.2.3_A.3	Virtual test for CA (intra-band non-contiguous)
1.2.3_A.4	Virtual test for CA (intra-band contiguous DL CA Rel-11 and forward)

I.2.3 Tests for UL-MIMO (Uplink Multiple Antenna Transmission)

I.2.3.1 UL-MIMO Tx tests (Chapter 6)

UL-MIMO Transmitter minimum requirements in 3GPP TS 36.101 [2] are already specified in separate clauses from the legacy requirements, bearing the suffix "B" in the number and "for UL-MIMO" in the title.

Rule:

Following tests and clauses are specified in TS 36.521-1:

Test group clause:

<x.x.x>B <Test> for UL-MIMO

Individual tests:

<x.x.x>B.<y> <Test> for UL-MIMO (<Release>)

where:

<x.x.x>	= number of the corresponding legacy test (if available), or number derived from TS 36.101 without potential suffix "B" (if no legacy test available)
<y>	= incrementing clause number (Arabic numeral)
<Test>	= title of the corresponding legacy test (if available), or title derived from TS 36.101 without potential suffix "for UL-MIMO" (if no legacy test available)
<Release>	= optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases.

Examples:

1.2.3	Virtual test
1.2.3B	Virtual test for UL-MIMO

I.2.3.2 UL-MIMO Rx tests (Chapter 7)

Same as for Transmitter tests (Chapter 6) in Annex I.2.3.1.

I.2.4 Tests for eDL-MIMO (Enhanced Downlink Multiple Antenna Transmission)

I.2.4.1 eDL MIMO Performance tests (Chapter 8)

eDL MIMO Performance minimum requirements in 3GPP TS 36.101 [2] are specified in separate clauses from the legacy requirements. In some cases the minimum requirements have a wide coverage in terms of Annex I.1 bullet 3) a) with respect of the presence of a simultaneous interfering transmission a) with respect of the presence of a simultaneous interfering transmission.

In TS 36.521-1 are specified several separate "individual tests" for eDL-MIMO.

Rule:

Following tests and clauses are specified in TS 36.521-1:

Test group clause:

<x.x.x>_D <Test> for eDL-MIMO

Individual tests:

<x.x.x>_D.<y> <Test> for eDL-MIMO (<Release>)

where:

<x.x.x> = number of the corresponding legacy test (if available), or number derived from TS 36.101 without potential suffix (if no legacy test available).

<y> =optional incrementing clause number (Arabic numeral) (if many individual tests).

<Test> = title of the corresponding legacy test (if available), or title derived from TS 36.101 without potential suffix potential suffix (if no legacy test available).

<Release> = optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases.

Examples:

1.2.4 Virtual test

1.2.4_D Virtual test for eDL-MIMO

I.2.4.2 eDL MIMO CSI tests (Chapter 9)

eDL MIMO CSI minimum requirements in 3GPP TS 36.101 [2] are specified in separate clauses from legacy requirements.

Rule:

Following tests and clauses are specified in TS 36.521-1:

Test group clause:

<x.x.x>_D <Test> for eDL-MIMO

Individual tests:

<x.x.x>_D.<y> <Test> for eDL-MIMO (<Release>)

where:

<x.x.x> = number of the corresponding legacy test (if available), or number derived from TS 36.101 without potential suffix (if no legacy test available).

<y>	=optional incrementing clause number (Arabic numeral) (if many individual tests).
<Test>	= title of the corresponding legacy test (if available), or title derived from TS 36.101 without potential suffix (if no legacy test available).
<Release>	= optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases.

Examples:

1.2.4 Virtual test

1.2.4_D Virtual test for eDL-MIMO

I.2.5 Tests for eICIC (Enhanced Intercarrier Interference Cancellation / Coordination)

I.2.5.1 eICIC Performance tests (Chapter 8)

eICIC Performance minimum requirements in 3GPP TS 36.101 [2] are specified in separate clauses from the legacy requirements. The set of eICIC test points have a wide coverage in terms of Annex I.1 bullet 3)a) with respect of the ABS type (Non-MBSFN / MBSFN). In TS 36.521-1 are specified several separate "individual tests" for eICIC.

Rule:

Following tests and clauses are specified in TS 36.521-1:

Test group clause:

<x.x.x>_C <Test> for eICIC

Individual tests:

<x.x.x>_C.<y> <Test> for eICIC (<ABS-type> <Release>)

where:

<x.x.x>	= number of the corresponding legacy test (if available), or number derived from TS 36.101 without potential suffix (if no legacy test available).
<y>	=optional incrementing clause number (Arabic numeral) (if many individual tests).
<Test>	= title of the corresponding legacy test (if available), or title derived from TS 36.101 without potential suffix (if no legacy test available).
<ABS-Type>	= mandatory identifier {non-MBSFN ABS, MBSFN ABS}
<Release>	= optional identifier showing the release applicability of the test. To be included only when there is already a test with the same title for earlier releases.

Examples:

1.2.4 Virtual test

1.2.4_C Virtual test for eICIC

1.2.4_C.1 Virtual test for eICIC (non-MBSFN ABS)

1.2.4_C.2 Virtual test for eICIC (MBSFN ABS)

I.2.5.2 eICIC CSI tests (Chapter 9)

Same as for Performance tests (Chapter 8) in Annex I.2.5.1.

Annex J (informative): Change history

Change history							
Date	**TSG#**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2007-08	RAN5 #36	R5-072185			Skeleton proposed for RAN5#36Athens		0.0.1
2007-08	RAN5 #36	R5-072419			Update the skeleton base on R4-071234_TR36.803.0.4.0.doc	0.0.1	0.0.2
2007-08	RAN5 #36	R5-072424			Update with editorial changes	0.0.2	0.0.3
2007-11	RAN5 #37	R5-073043			Update document with some info as following: Section 5: Frequency band information Section 6.2: Maximum output power Section 6.5: Output RF spectrum emissions Section 6.5.1: Occupied bandwidth Section 6.5.2: Out of band emission Section 6.5.3: Spurious emissions	0.0.3	0.0.4
2007-11	RAN5 #37	R5-073360			Editorial change to split MOP and UE Power classes	0.0.4	0.0.5
2008-03	RAN5 #38	R5-080069			Editorial changes to sync up with 36.101 v1.0.0 as much as feasible for the moment: Update definitions, symbols and abbreviations Update frequency bands, channel bandwidth, channel numbers information. Restructure document to move "frequency error" sub-section inside Transmit signal quality. Add "additional spectrum Emission Mask" sub-test (mask A,B,C) section to address the regulatory requirements that are not met with the general mask (OOB and spurious emission). Add "Additional ACLR requirements" to address additional requirements that the network might indicate to the UE via signalling for a specific deployment scenario (in terms of additional requirements for UTRA/ACLR2 Restructure "Spurious Emission" to indicate we need to have 3 test cases to address: "E-UTRA Spurious Emission" requirements , "Spurious Emission band UE co-existence" requirements, and "Additional spurious emissions" requirements Separate wide band and narrow band intermodulation in the intermodulation characteristics	0.0.5	0.0.6
2008-03	RAN5 #38	R5-080408			LTE Reference Sensitivity test Text proposal		0.0.7
2008-03	RAN5 #38	R5-080409			LTE Maximum Rx input level test Text proposal		0.0.7
2008-03	RAN5 #38	R5-080410			LTE Adjacent Channel Selectivity test Text proposal		0.0.7
2008-03	RAN5 #38	R5-080064			LTE RF Receiver tests, General section Text proposal		0.0.7
2008-03	RAN5 #38	R5-080412			LTE RF: transmission modulation initial EVM test proposal		0.0.7
2008-03	RAN5 Workshop-UE LTE Test (9-11 April)	R5w 0800027			Modify styles and formats of tables and others according to drafting rules. Add some definitions and abbreviations Modified section 6.2 structure to be aligned with 36.101 v8.1.0 Modify tables of requirements to remove 1.6 MHz and 3.2MHz channel bandwidth according to new requirements 36.101 v8.1.0		0.0.9
2008-03	RAN5 Workshop-UE LTE Test (9-11 April)	R5w 0800028			Following TPs have been included: R5w 080013r1 R5w 080014r1 R5w 080008r2 R5w 080009r2 R5w 080040r1 R5w 080015r1 R5w 080016r1 R5w 080017r1 R5w 080018r2	0.0.9	0.1.0
2008-05	RAN5#39	R5-081046			36-521-1 alignment of measurement state for test cases	0.1.0	0.1.1

2008-05	RAN5#39	R5-081042			Following approved TPs have been included: R5-081040 36.521-1 after April LTE-RF workshop R5-081415 36-521-1 alignment of measurement state for test cases – also the measurement state for each test cases has been updated according to R5-081404 R5-081416 Cover for LTE E-UTRAN RRC_IDLE State Mobility text proposal R5-081417 Cover for LTE E-UTRAN RRC_CONNECTED State Mobility text proposal R5-081404 LTE Rx Intermodulation test case text proposal R5-081409 Annex structure for Measurement uncertainty & Test Tools R5-081405 Text Proposal for TS36.521-1 TC7.6 Blocking Characteristics R5-081406 Text Proposal for TS36.521-1 TC7.7 Spurious Response R5-081403 Text Proposal for TS36.521-1 TC7.9 Spurious Emissions R5-081410 Uncertainties and Test Tools for subset of UE tests R5-081331 Clarification of diversity characteristics section for multiple UE antennas R5-081335 36-521-1 update of nominal and additional channel bandwidths	0.1.1	0.2.0
2008-06	RAN5 #39bis	R5-082029			Following approved TPs have been included: R5-082129: Restructure of TS 36.521-1 and RRM proposal (Split of RRM from 36.521-1 v0.2.0 in its own specification 36.521-3.) R5-082166: Text Proposal for Annex C Downlink Physical Channels R5-082130: Text Proposal for Chan bandwidths in TS 36.521-1 R5-082155: Text Proposal for LTE Tx Minimum Output Power R5-082027: Text Proposal for Occupied bandwidth in TS 36.521-1 R5-082171: Text Proposal for LTE Adjacent Channel Leakage power Ratio R5-082134: Text Proposal for LTE Tx Spurious Emissions R5-082135: Text Proposal for LTE UE Maximum Output Power R5-082136: Text Proposal for LTE Spectrum Emission Mask R5-082138: UE Spurious Emissions Measurement uncertainty & Test Tolerances R5-082169: LTE Spectrum Emission Mask test uncertainties and TTs R5-082151: LTE UE Max Power and ACLR tests uncertainties and TTs R5-082152: Text proposal for LTE Transmit OFF Power R5-082153: LTE UE Max Rx Input and ACS test cases update R5-082082: LTE Rx Intermodulation test case uncertainties and TTs R5-082093: Text Proposal for TS36.521-1 TC7.6 Blocking Characteristics R5-082154: Text Proposal for TS36.521-1 TC7.7 Spurious Response R5-082167: OBW Measurement uncertainty & Test Tolerances R5-082158: Cover for LTE Performance Requirement text proposal R5-082159: Text Proposal for LTE Demodulation of PCFICH/PDCCH and PHICH R5-082156: Text proposal for LTE Tx Minimum Output Power Uncertainty R5-082157: Text proposal for LTE Tx Minimum Output Power Tolerance R5-082164: Statistical testing of receiver characteristics R5-082170: Cover for LTE Propagation Conditions Text Proposal Editorial changes to align tables and figures numbering with R5-082025	0.2.0	0.3.0

2008-08	RAN5 #40	R5-083163			Following approved TPs have been included: R5-083804: LTE Demodulation Performance text proposal R5-083159: LTE-RF Occupied bandwidth test case / measurement uncertainty and TT text proposal R5-083160: Transmission OFF power: TP, measurement uncertainty and test tolerances proposal R5-083805: Frequency Error test case / measurement uncertainty and TT test proposal R5-083162: Propagation conditions correction text proposal R5-083220:Text Proposal for LTE Tx Minimum Output Power R5-083806: TP of section 8 for E-UTRAN TDD in 36.521-1 R5-083344: Test Tolerance and System uncertainty for OBW test R5-083848:Test Tolerance and System uncertainty for Reference sensitivity test R5-083840: Test Tolerances for Spectrum Emission Mask R5-083808: Reference Measurement Channel for LTE UE Receiver tests R5-083350: Test Tolerance and System uncertainty for Blocking and Spurious response R5-083366: Text Proposal for LTE Reporting of CQI/PMI R5-083810: LTE PBCH Demodulation Performance Requirements R5-083482: LTE-RF TP for Test Case 7.6 Blocking Characteristics R5-083809: LTE-RF TP for Test Case 7.7 Spurious Response R5-083484: LTE-RF TP for Test Case 7.9 Spurious Emissions R5-083811: Annex E Global In-Channel TX-Test R5-083163: TS 36.521-1 after RAN5#40	0.3.0	1.0.0
2008-10	RAN5 #40Bis	R5-084072			Following approved TPs have been included: R5-084072 TS 36.521-1 after RAN5#40Bis R5-084300 LTE-RF TP for Definitions Symbols and Abbreviations R5-084304 LTE-RF-TP for general section R5-084036 Test Tolerances for additional SEM R5-084303 LTE-RF TP for Channel bandwidths and frequency range R5-084305 LTE-RF TP for new Absolute Power Tolerance test case R5-084067 LTE-RF TP for Transmission OFF test case R5-084318 LTE-RF TP for Transmission Modulation test cases R5-084069 LTE-RF Investigation of E-UTRA-TDD Frequency Error test case applicability R5-084319 LTE-RF TP for Frequency Error test case R5-084309 Text Proposal for LTE Tx Spurious Emissions R5-084111 Text Proposal for LTE Adjacent Channel Leakage power Ratio R5-084320 Text Proposal for LTE Additional Spectrum Emission Mask R5-084310 Test Tolerances for additional spurious emission R5-084311 Text Proposal for Occupied bandwidth R5-084321 Text Proposal for LTE Spectrum Emission Mask R5-084060 Modification to section 7.2 Diversity characteristics R5-084312 References in 36.521-1 tests initial conditions R5-084148 Update of Reference Measurement Channel for LTE UE Rx tests R5-084167 LTE-RF TP for TC7.9 Spurious Emissions R5-084075 LTE DL Reference Measurement Channel for PDSCH (FDD) text proposal R5-084077 LTE Measurement of Performance Requirements text proposal R5-084313 LTE Demodulation of PDSCH Test Requirements text proposal R5-084147 Specification of DL propagation conditions for LTE UE tests R5-084315 Text Proposal for LTE Demodulation of PCFICH/PDCCH R5-084323 Text Proposal for Annex E Global In-Channel	1.0.0	1.1.0
2008-12	RAN#42	RP-080863			Approval of version 2.0.0 at RAN#42, then put to version 8.0.0.	2.0.0	8.0.0
2008-01					Editorial corrections.	8.0.0	8.0.1
2009-03	RAN#43	R5-086011	0001	-	TP for In-band emissions	8.0.1	8.1.0
2009-03	RAN#43	R5-086012	0002	-	TP for Spectrum flatness	8.0.1	8.1.0
2009-03	RAN#43	R5-086013	0003	-	TP for IQ-component	8.0.1	8.1.0
2009-03	RAN#43	R5-086064	0004	-	LTE-RF: UE max output power	8.0.1	8.1.0

2009-03	RAN#43	R5-086093	0005	-	Clarification of measurement period in minimum output power test procedure	8.0.1	8.1.0
2009-03	RAN#43	R5-086094	0006	-	Clarification of measurement period in transmit OFF power test procedure	8.0.1	8.1.0
2009-03	RAN#43	R5-086120	0007	-	Update of Max.input level test	8.0.1	8.1.0
2009-03	RAN#43	R5-086125	0008	-	Addition of UL Reference Measurement Channels in Annex A2	8.0.1	8.1.0
2009-03	RAN#43	R5-086160	0009	-	correction for Maximum Power Reduction (MPR)	8.0.1	8.1.0
2009-03	RAN#43	R5-086167	0010	-	LTE-RF: TDD applicability and CR for Blocking Characteristics and Spurious Response	8.0.1	8.1.0
2009-03	RAN#43	R5-086168	0011	-	LTE-RF: TDD applicability and CR for Spurious Emissions	8.0.1	8.1.0
2009-03	RAN#43	R5-086239	0012	-	Update of Symbols	8.0.1	8.1.0
2009-03	RAN#43	R5-086401	0013	-	LTE-RF: TX-RX channel freq separation	8.0.1	8.1.0
2009-03	RAN#43	R5-086405	0014	-	Update of 6.7 Transmit intermodulation test	8.0.1	8.1.0
2009-03	RAN#43	R5-086406	0015	-	Update of initial conditions for Tx and Rx test cases	8.0.1	8.1.0
2009-03	RAN#43	R5-086408	0016	-	Update of Adjacent Channel Leakage power Ratio	8.0.1	8.1.0
2009-03	RAN#43	R5-086409	0017	-	Removal of [ ] from Clause 7 Receiver Characteristics	8.0.1	8.1.0
2009-03	RAN#43	R5-086413	0018	-	Updates to Demodulation of PCFICH/PDCCH test case	8.0.1	8.1.0
2009-03	RAN#43	R5-086414	0019	-	Text proposal for Reporting of Channel State Information	8.0.1	8.1.0
2009-03	RAN#43	R5-086415	0020	-	Correction of RS_EPRE powers for default DL signal levels	8.0.1	8.1.0
2009-03	RAN#43	R5-086416	0021	-	Update of DL Reference Measurement Channels in Annex A3	8.0.1	8.1.0
2009-03	RAN#43	R5-086417	0022	-	Update to Annex E	8.0.1	8.1.0
2009-03	RAN#43	R5-086425	0023	-	Update of General text in clause 6	8.0.1	8.1.0
2009-03	RAN#43	R5-086426	0024	-	Clarification of measurement bandwidth in spectrum emission mask test	8.0.1	8.1.0
2009-03	RAN#43	R5-086428	0025	-	Demodulation of TDD PHICH test requirements text proposal	8.0.1	8.1.0
2009-03	RAN#43	R5-086429	0026	-	Demodulation of TDD PCFICH/PDCCH test requirements text proposal	8.0.1	8.1.0
2009-03	RAN#43	R5-090306	0027	-	New Annex H for Uplink Physical Channels	8.0.1	8.1.0
2009-03	RAN#43	R5-090308	0028	-	Text proposal for Reporting of Channel State Information	8.0.1	8.1.0
2009-03	RAN#43	R5-090403	0029	-	CR to 36.521-1: Update of Spurious Emissions test cases	8.0.1	8.1.0
2009-03	RAN#43	R5-090404	0030	-	CR to 36.521-1: Update of ACLR test case	8.0.1	8.1.0
2009-03	RAN#43	R5-090443	0031	-	LTE-RF: Correction to 36.521-1 Frequency error test case	8.0.1	8.1.0
2009-03	RAN#43	R5-090488	0032	-	LTE TDD applicability for Transmit intermodulation test case	8.0.1	8.1.0
2009-03	RAN#43	R5-091002	0033	-	LTE Demodulation of PDSCH Test Requirements text proposal	8.0.1	8.1.0
2009-03	RAN#43	R5-091004	0034	-	LTE-RF: CR for UE max power test case	8.0.1	8.1.0
2009-03	RAN#43	R5-091007	0035	-	LTE-RF: TDD Applicability and CR for Spectrum Emission Mask and Additional Spectrum Emission Mask	8.0.1	8.1.0
2009-03	RAN#43	R5-091008	0036	-	LTE-RF Investigation of E-UTRA-TDD for Occupied bandwidth test case applicability	8.0.1	8.1.0
2009-03	RAN#43	R5-091009	0037	-	LTE-RF: Investigation of E-UTRA-TDD for Adjacent Channel Leakage power Ratio test case applicability	8.0.1	8.1.0
2009-03	RAN#43	R5-091011	0038	-	LTE-RF: TDD applicability and CR for Maximum Input Level	8.0.1	8.1.0
2009-03	RAN#43	R5-091012	0039	-	LTE-RF: TDD applicability and CR for Adjacent Channel Selectivity (ACS)	8.0.1	8.1.0
2009-03	RAN#43	R5-091017	0040	-	Removal of Rx Narrowband Intermod 7.8.2	8.0.1	8.1.0
2009-03	RAN#43	R5-091019	0041	-	Relocation of 36.521-1 Annex C DL mapping	8.0.1	8.1.0
2009-03	RAN#43	R5-091020	0042	-	Removal of "Out-of-synchronization handling of output power" heading	8.0.1	8.1.0
2009-03	RAN#43	R5-091023	0043	-	Test requirements of TDD PDSCH demodulation performance with user-specific reference symbols	8.0.1	8.1.0
2009-03	RAN#43	R5-091024	0044	-	CR to 36.521-1: Update of Annex F.3.2 Measurement of transmitter	8.0.1	8.1.0
2009-03	RAN#43	R5-091025	0045	-	CR to 36.521-1: Update of SEM and Additional SEM test cases	8.0.1	8.1.0
2009-03	RAN#43	R5-091077	0046	-	CR to 36.521-1: Addition of test combinations for test cases with MPR application	8.0.1	8.1.0
2009-03	RAN#43	R5-091082	0047	-	Spurious emission requirements on PHS band including the future plan in Japan	8.0.1	8.1.0
2009-03	RAN#43	R5-091101	0048	-	LTE-RF: CR for MPR test case	8.0.1	8.1.0
2009-03	RAN#43	R5-091106	0049	-	Update of Reference sensitivity test in 7.3	8.0.1	8.1.0
2009-03	RAN#43	R5-091111	0050	1	Update of initial conditions for Rx tests	8.0.1	8.1.0
2009-05	RAN#44	R5-092144	0051	-	LTE-RF: Resubmission of R5-086424 UE output power dynamics 36.521-1 v8.1.0 (re-submit no changes)	8.1.0	8.2.0
2009-05	RAN#44	R5-092146	0052	-	LTE-RF: CR for UE configured UE transmitted output power test case (re-submit no changes)	8.1.0	8.2.0
2009-05	RAN#44	R5-092147	0053	-	LTE-RF: CR for UE minimum output power test case (re-submit no change)	8.1.0	8.2.0
2009-05	RAN#44	R5-092149	0054	-	LTE-RF: CR for Power Control Absolute power tolerance test case (re-submit no changes)	8.1.0	8.2.0
2009-05	RAN#44	R5-092150	0055	-	LTE-RF: CR for Power Control Relative power tolerance test case (re-submit no changes)	8.1.0	8.2.0

2009-05	RAN#44	R5-092151	0056	-	LTE-RF: New test case for Aggregate power control tolerance (re-submit no changes)	8.1.0	8.2.0
2009-05	RAN#44	R5-092263	0057	-	Text proposal for Reporting of Channel State Information	8.1.0	8.2.0
2009-05	RAN#44	R5-092264	0058	-	Propagation conditions for CQI tests	8.1.0	8.2.0
2009-05	RAN#44	R5-092265	0059	-	Correction to Demodulation of PDCCH/PCFICH test cases	8.1.0	8.2.0
2009-05	RAN#44	R5-092273	0060	-	Mapping of downlink physical channels for TDD	8.1.0	8.2.0
2009-05	RAN#44	R5-092277	0061	-	Annex A RMC updates	8.1.0	8.2.0
2009-05	RAN#44	R5-092369	0062	-	Update of A.3.4.3 for RMC with UE-specific RS	8.1.0	8.2.0
2009-05	RAN#44	R5-092372	0063	-	Maintenance on Initial configurations for Perf TCs	8.1.0	8.2.0
2009-05	RAN#44	R5-092436	0064	-	CR to 36.521-1: Update of ACLR test case	8.1.0	8.2.0
2009-05	RAN#44	R5-092442	0065	-	CR to 36.521-1: Update of Spurious Emissions test case	8.1.0	8.2.0
2009-05	RAN#44	R5-092467	0066	-	LTE-RF: Transmit OFF Power update	8.1.0	8.2.0
2009-05	RAN#44	R5-092473	0067	-	LTE_RF - Update on TC 7.7 Spurious Response (re-submit with no changes)	8.1.0	8.2.0
2009-05	RAN#44	R5-092474	0068	-	LTE_RF - Update on TC 7.9 Spurious Emissions (re-submit with no changes)	8.1.0	8.2.0
2009-05	RAN#44	R5-092527	0069	-	Update of TDD PDSCH test cases	8.1.0	8.2.0
2009-05	RAN#44	R5-092602	0070	-	LTE-RF: CR for Maximum Power Reduction test case (re-submit no changes)	8.1.0	8.2.0
2009-05	RAN#44	R5-092603	0071	-	TP for Demodulation of TDD PDCCH/PCFICH	8.1.0	8.2.0
2009-05	RAN#44	R5-092605	0072	-	Mapping of uplink physical channels for FDD	8.1.0	8.2.0
2009-05	RAN#44	R5-092606	0073	-	Update of Annex C	8.1.0	8.2.0
2009-05	RAN#44	R5-092607	0074	-	CR to 36.521-1: Update of test parameters for Demodulation of PDSCH (FDD) tests	8.1.0	8.2.0
2009-05	RAN#44	R5-092614	0075	-	Update of SEM test case	8.1.0	8.2.0
2009-05	RAN#44	R5-092642	0076	-	Update of transmit quality test cases	8.1.0	8.2.0
2009-05	RAN#44	R5-092643	0077	-	Text proposal for TDD part of CQI Reporting under Fading conditions	8.1.0	8.2.0
2009-05	RAN#44	R5-092644	0078	-	Text proposal for TDD part of CQI Reporting under AWGN conditions	8.1.0	8.2.0
2009-05	RAN#44	R5-092645	0079	-	LTE-RF: Update of Additional Spectrum Emission mask Test case with TDD Uplink Test configuration	8.1.0	8.2.0
2009-05	RAN#44	R5-092649	0080	-	LTE-RF: CR for TDD DL RMC to be used in TX test cases	8.1.0	8.2.0
2009-05	RAN#44	R5-092653	0081	-	LTE-RF: CR for Additional Maximum Power Reduction test case	8.1.0	8.2.0
2009-05	RAN#44	R5-092661	0082	-	RMC update for PDCCH/PCFICH performance requirement	8.1.0	8.2.0
2009-05	RAN#44	RP-090444	1161	-	Test frequencies for Additional Spurious Emission test case	8.6.0	8.7.0
2009-05	RAN#44	R5-092366	0084	-	Update of 7.3.1	8.1.0	8.2.0
2009-05	RAN#44	R5-092440	0085	-	LTE-RF: CR for UE max output power test case	8.1.0	8.2.0
2009-05	RAN#44	R5-092472	0086	-	LTE_RF - Update on TC 7.6 Blocking Characteristics (re-submit with changes)	8.1.0	8.2.0
2009-05	RAN#44	R5-092636	0087	-	CR to 36.521-1 Addition of frequencies for band 18 and band 19	8.1.0	8.2.0
2009-05	RAN#44	R5-092652	0088	2	Improved stability of TC 7.8.5 Power Control in the DL fro F-DPCH to HSUPA TC 5.2D and 5.13.2B	8.1.0	8.2.0
-	-	-	-	-	Editorial corrections	8.2.0	8.2.1
2009-09	RAN#45	R5-094032	0089	-	Correction CR to 36.521-1: Update of Requirements for Demodulation of PDSCH (FDD) tests	8.2.1	8.3.0
2009-09	RAN#45	R5-094034	0090	-	Correction CR to 36.521-1: Update of General Requirements for Demodulation tests	8.2.1	8.3.0
2009-09	RAN#45	R5-094214	0091	-	Update of In-band emissions	8.2.1	8.3.0
2009-09	RAN#45	R5-094215	0092	-	TDD Initial downlink channel setting	8.2.1	8.3.0
2009-09	RAN#45	R5-094216	0093	-	Correction to Annex B	8.2.1	8.3.0
2009-09	RAN#45	R5-094248	0094	-	CR to 36.521-1: Update to ACLR test case	8.2.1	8.3.0
2009-09	RAN#45	R5-094250	0095	-	CR to 36.521-1: Update to UE max output power test case	8.2.1	8.3.0
2009-09	RAN#45	R5-094281	0096	-	Mapping of uplink physical channels for TDD	8.2.1	8.3.0
2009-09	RAN#45	R5-094282	0097	-	LTE-RF: CR for notes in TDD DL RMC to be used in TX test cases	8.2.1	8.3.0
2009-09	RAN#45	R5-094283	0098	-	LTE-RF: message update to keep Tx power constant for some Rx test cases	8.2.1	8.3.0
2009-09	RAN#45	R5-094313	0099	-	LTE-RF: CR to test case for Aggregate power control tolerance	8.2.1	8.3.0
2009-09	RAN#45	R5-094317	0100	-	LTE-RF: CR for UE minimum output power test case for TDD	8.2.1	8.3.0
2009-09	RAN#45	R5-094318	0101	-	LTE-RF: CR for Power Control Relative power tolerance test case	8.2.1	8.3.0
2009-09	RAN#45	R5-094319	0102	-	In band emission for non-allocated RB	8.2.1	8.3.0
2009-09	RAN#45	R5-094320	0103	-	LTE RF: correction for subclause 6.6.2.2.5 (A-SEM) supported band list	8.2.1	8.3.0
2009-09	RAN#45	R5-094362	0104	-	Correction of RMCs (36.521 Annex A)	8.2.1	8.3.0
2009-09	RAN#45	R5-094363	0105	-	Usage of the Global In-Channels TX-Test across different Signal Quality tests.	8.2.1	8.3.0
2009-09	RAN#45	R5-094365	0106	-	LTE TX: 1to2 RX antenna	8.2.1	8.3.0
2009-09	RAN#45	R5-094367	0107	-	Correction to 6.6.2.2 Additional Spectrum Emission Mask	8.2.1	8.3.0

2009-09	RAN#45	R5-094370	0108	-	Correction to 6.6.2.3 ACLR	8.2.1	8.3.0
2009-09	RAN#45	R5-094371	0109	-	Correction to 6.7 TX Intermodulation	8.2.1	8.3.0
2009-09	RAN#45	R5-094374	0110	-	Correction to 7.6.1 In-Band Blocking	8.2.1	8.3.0
2009-09	RAN#45	R5-094375	0111	-	UE category (36.521 clause 8)	8.2.1	8.3.0
2009-09	RAN#45	R5-094378	0112	-	Completion of Global in-Channel TX-Test (36.521 Annex E)	8.2.1	8.3.0
2009-09	RAN#45	R5-094379	0113	-	Completion of Global in-Channel TX-Test with PRACH (36.521 Annex E)	8.2.1	8.3.0
2009-09	RAN#45	R5-094380	0114	-	Completion of Statistical testing (36.521 Annex G)	8.2.1	8.3.0
2009-09	RAN#45	R5-094385	0115	-	Correction to Annex D.2 Interference signals	8.2.1	8.3.0
2009-09	RAN#45	R5-094439	0116	-	Update for ACS	8.2.1	8.3.0
2009-09	RAN#45	R5-094661	0117	-	LTE RF - Core update on TC7.6.2 Out-of-band Blocking	8.2.1	8.3.0
2009-09	RAN#45	R5-094663	0118	-	LTE RF - Symbols Update on UL transmission configurations	8.2.1	8.3.0
2009-09	RAN#45	R5-094665	0119	-	LTE RF - Clarification for Test Configurations in General Section	8.2.1	8.3.0
2009-09	RAN#45	R5-094668	0120	-	LTE RF - Applicability of 6.2.3 MPR	8.2.1	8.3.0
2009-09	RAN#45	R5-094671	0121	-	LTE RF - Verification of UE Output Power in Out of Band Emission tests	8.2.1	8.3.0
2009-09	RAN#45	R5-094684	0122	-	CR to 36.521-1: Update to UE max output power test case	8.2.1	8.3.0
2009-09	RAN#45	R5-094686	0123	-	LTE-RF CR to 36.521-1: Update the E-UTRA channel numbers	8.2.1	8.3.0
2009-09	RAN#45	R5-094687	0124	-	LTE-RF: CR for UE maximum power reduction(MPR) test case	8.2.1	8.3.0
2009-09	RAN#45	R5-094699	0125	-	Update to SEM and spurious emissions TC	8.2.1	8.3.0
2009-09	RAN#45	R5-094706	0126	-	Resubmission-Update to the Requirements for frequency-selective fading test	8.2.1	8.3.0
2009-09	RAN#45	R5-094717	0127	-	Update of SEM	8.2.1	8.3.0
2009-09	RAN#45	R5-094718	0128	-	Update of initial conditions with Annex references	8.2.1	8.3.0
2009-09	RAN#45	R5-094721	0129	-	Update of 6.7 Tx Inter Mod	8.2.1	8.3.0
2009-09	RAN#45	R5-094725	0130	-	Correction to E-UTRA channel numbers for Band 2	8.2.1	8.3.0
2009-09	RAN#45	R5-094726	0131	-	Correction to Tx spurious emissions	8.2.1	8.3.0
2009-09	RAN#45	R5-094757	0132	-	Update of TDD PHICH test cases	8.2.1	8.3.0
2009-09	RAN#45	R5-094874	0133	-	Correction to Demodulation of PDCCH/PCFICH test cases	8.2.1	8.3.0
2009-09	RAN#45	R5-094902	0134	-	Addition of 15 MHz and 20 MHz bandwidths and corresponding sensitivity requirements into band 38	8.2.1	8.3.0
2009-09	RAN#45	R5-094903	0135	-	Correction CR to 36.521-1: Update of Transmitter tests network signalled parameter value	8.2.1	8.3.0
2009-09	RAN#45	R5-094905	0136	-	Update of TDD PDSCH test cases	8.2.1	8.3.0
2009-09	RAN#45	R5-094908	0137	-	LTE-RF: CR for Power Control Absolute power tolerance test case	8.2.1	8.3.0
2009-09	RAN#45	R5-094909	0138	-	Update to Output Power dynamics test cases	8.2.1	8.3.0
2009-09	RAN#45	R5-094913	0139	-	Clarification for downlink signal setting in RX tests	8.2.1	8.3.0
2009-09	RAN#45	R5-094914	0140	-	UL RB allocation for receiver tests	8.2.1	8.3.0
2009-09	RAN#45	R5-094915	0141	-	Update of TDD PCFICH/PDCCH test cases	8.2.1	8.3.0
2009-09	RAN#45	R5-094921	0142	-	Correction to CQI performance test case	8.2.1	8.3.0
2009-09	RAN#45	R5-094922	0143	-	Test description for CQI test cases under AWGN conditions	8.2.1	8.3.0
2009-09	RAN#45	R5-094923	0144	-	Resubmission - Requirements for PMI reporting (Single and Multiple PMI)	8.2.1	8.3.0
2009-09	RAN#45	R5-094966	0145	-	CR to 36.521-1: Addition of A-MPR for band 19	8.2.1	8.3.0
2009-09	RAN#45	R5-094976	0146	-	Without loop back: 6.2.2 UE maximum output power	8.2.1	8.3.0
2009-09	RAN#45	R5-094977	0147	-	Without loop back: 6.3.2 Minimum output power	8.2.1	8.3.0
2009-09	RAN#45	R5-094979	0148	-	LTE-RF: CR for UE configured UE transmitted output power test case	8.2.1	8.3.0
2009-09	RAN#45	R5-094980	0149	-	CR to 36.521-1: Definition of Maximum Power state in TX/RX test cases	8.2.1	8.3.0
2009-09	RAN#45	R5-094982	0150	1	Correction of Tx general description	8.2.1	8.3.0
2009-09	RAN#45	R5-094986	0151	-	Update of 6.6.1OBW	8.2.1	8.3.0
2009-09	RAN#45	R5-094989	0152	-	Correction to 1PRB tests in Demodulation of PDSCH	8.2.1	8.3.0
2009-09	RAN#45	R5-094995	0153	-	Correction CR to 36.521-1: Update of Requirements for Additional Maximum Power Reduction (A-MPR) test	8.2.1	8.3.0
2009-09	RAN#45	R5-094996	0154	-	Correction to Demodulation of PHICH test cases	8.2.1	8.3.0
2009-09	RAN#45	R5-094997	0155	-	EVM TC update	8.2.1	8.3.0
2009-09	RAN#45	R5-095300	0156	-	LTE-RF: test description update	8.2.1	8.3.0
2009-09	RAN#45	R5-095301	0157	-	Correction CR to 36.521-1: Addition of measurement uncertainty and test tolerances for A-MPR	8.2.1	8.3.0
2009-09	RAN#45	R5-095304	0158	-	Sorting out Demodulation of PDSCH for FDD	8.2.1	8.3.0
2009-09	-	-	-	-	TOC update and Annexes' titles formattings	8.3.0	8.3.1
2009-12	RAN#46	R5-095515	0159	-	Correction CR to 36.521-1: Additional Spectrum Emission Mask test need to be updated to include the network signalled value "NS_07ö message contents exceptions	8.3.1	8.4.0
2009-12	RAN#46	R5-095589	0160	-	Update for test period description in the general section	8.3.1	8.4.0
2009-12	RAN#46	R5-095657	0161	-	LTE-RF: CR for Power Control Absolute power tolerance test case	8.3.1	8.4.0
2009-12	RAN#46	R5-095661	0162	-	LTE-RF: CR for UE minimum output power test case	8.3.1	8.4.0

2009-12	RAN#46	R5-095735	0163	-	Corrections to Annex A.4	8.3.1	8.4.0
2009-12	RAN#46	R5-095766	0164	-	LTE-RF: CR for In band emission for non-allocated RB	8.3.1	8.4.0
2009-12	RAN#46	R5-095790	0165	-	Completion of Statistical testing (36.521 Annex G)	8.3.1	8.4.0
2009-12	RAN#46	R5-095791	0166	-	Corrections to Annex E	8.3.1	8.4.0
2009-12	RAN#46	R5-096058	0167	-	Removal of [ ] from 7.6.1, 7.8.1, and 7.5 of Annex F3.3	8.3.1	8.4.0
2009-12	RAN#46	R5-096096	0168	-	Update on 8.2.1	8.3.1	8.4.0
2009-12	RAN#46	R5-096105	0169	-	LTE RF: Symbols Update on Configured UE Transmitted Power	8.3.1	8.4.0
2009-12	RAN#46	R5-096204	0170	-	LTE-RF: CR to Transmission signal quality	8.3.1	8.4.0
2009-12	RAN#46	R5-096208	0171	-	LTE-RF: CR for Power Control Relative power tolerance test case	8.3.1	8.4.0
2009-12	RAN#46	R5-096210	0172	-	LTE-RF: CR to ON/OFF Time mask test cases	8.3.1	8.4.0
2009-12	RAN#46	R5-096211	0173	-	Measurement period for TX-Tests	8.3.1	8.4.0
2009-12	RAN#46	R5-096213	0174	-	CR to 36.521-1: Update to Spurious Emissions test cases	8.3.1	8.4.0
2009-12	RAN#46	R5-096214	0175	-	CR to 36.521-1: Update to ACLR test case	8.3.1	8.4.0
2009-12	RAN#46	R5-096219	0176	-	LTE-RF: CR for UE configured UE transmitted output power test case	8.3.1	8.4.0
2009-12	RAN#46	R5-096222	0177	-	Test description for CQI test cases under AWGN conditions	8.3.1	8.4.0
2009-12	RAN#46	R5-096223	0178	-	LTE RF: Blocking Characteristics update	8.3.1	8.4.0
2009-12	RAN#46	R5-096224	0179	-	LTE RF: Spurious Response Update	8.3.1	8.4.0
2009-12	RAN#46	R5-096228	0180	-	LTE-RF: CR for MPR test case	8.3.1	8.4.0
2009-12	RAN#46	R5-096229	0204	2	CR to 36.521-1: Update to A-MPR test case	8.3.1	8.4.0
2009-12	RAN#46	R5-096230	0181	-	LTE RF: Applicability of 6.2.4 A-MPR	8.3.1	8.4.0
2009-12	RAN#46	R5-096231	0182	-	Correction to Demodulation of PHICH test cases	8.3.1	8.4.0
2009-12	RAN#46	R5-096235	0183	-	Introduction of CQI reporting test with frequency-selective interference	8.3.1	8.4.0
2009-12	RAN#46	R5-096239	0184	-	Update to the test procedure and message contents of TDD PMI reporting test cases	8.3.1	8.4.0
2009-12	RAN#46	R5-096240	0205	-	CR to 36.521-1: Update to Derivation of Test Requirements for A-MPR	8.3.1	8.4.0
2009-12	RAN#46	R5-096241	0185	-	Measurement uncertainties and Test Tolerances for transmit quality test cases	8.3.1	8.4.0
2009-12	RAN#46	R5-096242	0186	-	Update for 36.521-1 Annex A	8.3.1	8.4.0
2009-12	RAN#46	R5-096289	0187	-	CR on 36.521-1, 'Introduction of clause 8.2.1.1 test case uncertainties and Test Tolerances'	8.3.1	8.4.0
2009-12	RAN#46	R5-096306	0188	-	Update to the test procedure of SEM test cases of 36.521-1	8.3.1	8.4.0
2009-12	RAN#46	R5-096311	0189	-	Update of 6.6.1 OBW	8.3.1	8.4.0
2009-12	RAN#46	R5-096312	0190	-	Correction to SEM	8.3.1	8.4.0
2009-12	RAN#46	R5-096313	0191	-	Update of 6.7 Transmit intermodulation	8.3.1	8.4.0
2009-12	RAN#46	R5-096315	0192	-	CR to 36.521-1: Update to UE max output power test case	8.3.1	8.4.0
2009-12	RAN#46	R5-096316	0193	-	CR to 36.521-1: Update to Additional Spurious Emissions test case	8.3.1	8.4.0
2009-12	RAN#46	R5-096317	0194	-	CR to TDD PHICH demodulation test cases	8.3.1	8.4.0
2009-12	RAN#46	R5-096318	0195	-	Correction to FDD PMI reporting test cases	8.3.1	8.4.0
2009-12	RAN#46	R5-096320	0196	-	Tx power range and core update for Receiver tests	8.3.1	8.4.0
2009-12	RAN#46	R5-096322	0197	-	Update on 7.4, 7.5, and 7.8.1	8.3.1	8.4.0
2009-12	RAN#46	R5-096323	0198	-	Introduction of RI reporting test	8.3.1	8.4.0
2009-12	RAN#46	R5-096333	0199	-	Update to 6.5 Transmit signal quality test cases	8.3.1	8.4.0
2009-12	RAN#46	R5-096334	0200	-	LTE-RF: CR for Aggregate power control tolerance test case	8.3.1	8.4.0
2009-12	RAN#46	R5-096335	0201	-	Correction CR to 36.521-1: Update for Demodulation of PDSCH (FDD) tests to correct CR merges results from RAN5#44	8.3.1	8.4.0
2009-12	RAN#46	R5-096336	0206	1	Update TDD PDSCH test cases	8.3.1	8.4.0
2009-12	RAN#46	R5-096338	0202	-	Number of used HARQ processes in DL Performance tests	8.3.1	8.4.0
2009-12	RAN#46	R5-096342	0207	2	Minimum test time for performance tests	8.3.1	8.4.0
2009-12	RAN#46	R5-096718	0203	-	LTE RF: A-SEM update and A-MPR verification	8.3.1	8.4.0
2010-03	RAN#47	R5-100353	0208	-	LTE-RF CR to 36.521-1:TIME MASK test case updated	8.4.0	8.5.0
2010-03	RAN#47	R5-100354	0209	-	LTE-RF: CR for A-MPR notation in NS_07	8.4.0	8.5.0
2010-03	RAN#47	R5-100403	0210	-	LTE-RF: CR for Tx Intermodulation test case	8.4.0	8.5.0
2010-03	RAN#47	R5-100404	0211	-	LTE-RF: CR for OBW measurement period alignment	8.4.0	8.5.0
2010-03	RAN#47	R5-100408	0212	-	Reporting mode, Reporting Interval and Editorial corrections for demodulation	8.4.0	8.5.0
2010-03	RAN#47	R5-100456	0213	-	Misc update on MAC padding in Rx and performance sections	8.4.0	8.5.0
2010-03	RAN#47	R5-100566	0214	-	Missing Test limits in 36.521-1 Annex G	8.4.0	8.5.0
2010-03	RAN#47	R5-100567	0215	-	Wrong references from 36.521-1 clauses 8.4 and 8.5 into Annex G	8.4.0	8.5.0
2010-03	RAN#47	R5-100569	0216	-	Typos in 36.521-1, Annex E	8.4.0	8.5.0
2010-03	RAN#47	R5-100571	0217	-	Minimum test time for performance tests	8.4.0	8.5.0
2010-03	RAN#47	R5-100572	0218	-	Correction to 6.6.3.3 Additional spurious emissions	8.4.0	8.5.0
2010-03	RAN#47	R5-100790	0219	-	DL-RMC-s for transmitter tests: Corrections	8.4.0	8.5.0
2010-03	RAN#47	R5-100800	0220	-	Update of Test environment for RF test	8.4.0	8.5.0
2010-03	RAN#47	R5-100803	0221	-	Spectrum emission mask: Correction to uplink configuration	8.4.0	8.5.0

2010-03	RAN#47	R5-100807	0222	-	Performance tests: Scheduling of retransmissions	8.4.0	8.5.0
2010-03	RAN#47	R5-100810	0223	-	UL-RMC-s: Corrections and completion	8.4.0	8.5.0
2010-03	RAN#47	R5-100814	0224	-	Corrections to Cl 5.4.2.1 of TS 36.521-1	8.4.0	8.5.0
2010-03	RAN#47	R5-100815	0225	-	LTE-RF: CR for UE configured UE transmitted output power test case	8.4.0	8.5.0
2010-03	RAN#47	R5-100816	0226	-	LTE-RF: CR for Power Control Relative power tolerance test case	8.4.0	8.5.0
2010-03	RAN#47	R5-100822	0227	-	CR to 36.521-1: Update to Maximum output power	8.4.0	8.5.0
2010-03	RAN#47	R5-100823	0228	-	CR to 36.521-1: Update to ACLR test case	8.4.0	8.5.0
2010-03	RAN#47	R5-100825	0229	-	CR to 36.521-1: Update to Additional Tx spurious emissions test case	8.4.0	8.5.0
2010-03	RAN#47	R5-100826	0230	-	RMC-s and OCNG patterns: Update according 36.101 8.8.0	8.4.0	8.5.0
2010-03	RAN#47	R5-100827	0231	-	Receiver and performance tests: Update use of OCNG according 36.101 8.8.0	8.4.0	8.5.0
2010-03	RAN#47	R5-100828	0232	-	Update of PDSCH Demodulation Tests	8.4.0	8.5.0
2010-03	RAN#47	R5-100831	0233	-	Introduction of clause 8.2.1.2, 8.2.1.3, 8.2.1.4 test case uncertainties and Test Tolerances	8.4.0	8.5.0
2010-03	RAN#47	R5-100832	0234	-	Clarifications on DRS performance test case	8.4.0	8.5.0
2010-03	RAN#47	R5-100833	0235	-	Misc update on MAC padding in PDCCH, CSI test	8.4.0	8.5.0
2010-03	RAN#47	R5-100834	0236	-	Updates to the TDD portion of CQI reporting test cases under AWGN	8.4.0	8.5.0
2010-03	RAN#47	R5-100838	0237	-	Editorial Correction to 8.2.1.3	8.4.0	8.5.0
2010-03	RAN#47	R5-100839	0238	-	Update on Annex C for 36.521-1	8.4.0	8.5.0
2010-03	RAN#47	R5-100840	0239	-	Update on MAC padding in TDD PMI test case 9.4 of 36.521-1.	8.4.0	8.5.0
2010-03	RAN#47	R5-100841	0240	-	Correction to CQI test cases under AWGN conditions	8.4.0	8.5.0
2010-03	RAN#47	R5-100842	0241	-	Correction to CQI test cases under fading conditions	8.4.0	8.5.0
2010-03	RAN#47	R5-100843	0242	-	Correction to PMI reporting test cases	8.4.0	8.5.0
2010-03	RAN#47	R5-100845	0243	-	CSI: Corrections to tests titles and RI clause structure	8.4.0	8.5.0
2010-03	RAN#47	R5-100848	0244	-	CR to 36.521-1: Update LTE RF test cases with test requirements for extended LTE1500MHz	8.4.0	8.5.0
2010-03	RAN#47	R5-100886	0245	-	Transmitter characteristics: UE Categories and other corrections	8.4.0	8.5.0
2010-03	RAN#47	R5-100887	0246	-	CR to 36.521-1: Update to Tx spurious emissions and Spurious emission band UE co-existence	8.4.0	8.5.0
2010-03	RAN#47	R5-100888	0247	-	Clarification on notes in Max Power	8.4.0	8.5.0
2010-03	RAN#47	R5-100889	0248	-	Maximum input level: Corrections w.r.t. UE categories	8.4.0	8.5.0
2010-03	RAN#47	R5-100891	0249	-	Correction to PDCCH demodulation test cases	8.4.0	8.5.0
2010-03	RAN#47	R5-100892	0250	-	Correction to PHICH demodulation test cases	8.4.0	8.5.0
2010-03	RAN#47	R5-100907	0251	-	Update of RI reporting test case	8.4.0	8.5.0
2010-03	RAN#47	R5-100909	0252	-	Correction to set UL power in Rx TCs	8.4.0	8.5.0
2010-03	RAN#47	-	-	-	Moved to v9.0.0 with no change	8.5.0	9.0.0
2010-06	RAN#48	R5-103102	0253	-	CR to 36.521-1: Update of EARFCN for band 21	9.0.0	9.1.0
2010-06	RAN#48	R5-103103	0254	-	CR to 36.521-1: Update of A-MPR test case with band 21	9.0.0	9.1.0
2010-06	RAN#48	R5-103104	0255	-	CR to 36.521-1: Update of Additional Spurious test case with band 21	9.0.0	9.1.0
2010-06	RAN#48	R5-103106	0256	-	CR to 36.521-1: Update to ACLR test case	9.0.0	9.1.0
2010-06	RAN#48	R5-103108	0257	-	CR to 36.521-1: Update of Reference sensitivity level test case	9.0.0	9.1.0
2010-06	RAN#48	R5-103226	0258	-	CR to 36.521-1: Update of UE RF requirements for LTE, Band 20	9.0.0	9.1.0
2010-06	RAN#48	R5-103263	0259	-	LTE-RF: Updates of PDCCH demodulation test cases (FDD and TDD)	9.0.0	9.1.0
2010-06	RAN#48	R5-103265	0260	-	LTE-RF:CR for TDD ACK/NACK feedback mode in CQI BLER test cases	9.0.0	9.1.0
2010-06	RAN#48	R5-103288	0261	-	PDCCH Aggregation level for RF tests	9.0.0	9.1.0
2010-06	RAN#48	R5-103291	0262	-	Update and correction to UE maximum output power requirements	9.0.0	9.1.0
2010-06	RAN#48	R5-103293	0263	-	Editorial correction in In-band blocking test	9.0.0	9.1.0
2010-06	RAN#48	R5-103296	0264	-	Correction to additional spectrum emission mask test configuration	9.0.0	9.1.0
2010-06	RAN#48	R5-103300	0265	-	Corrections to Uplink RMC-s	9.0.0	9.1.0
2010-06	RAN#48	R5-103450	0266	-	LTE-RF: editorial CR for TC 7.6.2 and 7.7	9.0.0	9.1.0
2010-06	RAN#48	R5-103471	0267	-	Minimum test time for performance tests	9.0.0	9.1.0
2010-06	RAN#48	R5-103476	0268	-	EVM with exclusion period (annex)	9.0.0	9.1.0
2010-06	RAN#48	R5-103521	0269	-	CR on 36.521-1 for updating the "Reporting of Channel State Information"	9.0.0	9.1.0
2010-06	RAN#48	R5-103525	0270	-	CR on 36.521-1 for corrections in UE RF requirements	9.0.0	9.1.0
2010-06	RAN#48	R5-103598	0271	-	Correction to notes in Max Power	9.0.0	9.1.0
2010-06	RAN#48	R5-103602	0272	-	Clarification of measurement conditions for Rx spurious emission	9.0.0	9.1.0
2010-06	RAN#48	R5-103726	0273	-	CR to 36.521-1: Update of Spurious emission band UE co-existence test case	9.0.0	9.1.0
2010-06	RAN#48	R5-103727	0274	-	LTE-RF: CR for Prach time mask test case	9.0.0	9.1.0

2010-06	RAN#48	R5-103728	0275	-	LTE-RF: CR for General ON/OFF time mask test case	9.0.0	9.1.0
2010-06	RAN#48	R5-103729	0276	-	LTE-RF: Update to spectrum flatness test case and relevant annexes	9.0.0	9.1.0
2010-06	RAN#48	R5-103730	0277	-	LTE-RF:CR for test case of In-band emissions	9.0.0	9.1.0
2010-06	RAN#48	R5-103731	0278	-	EVM with exclusion period (test)	9.0.0	9.1.0
2010-06	RAN#48	R5-103732	0279	-	CR to 36.521-1 on Correction to Demodulation Requirements for PDSCH	9.0.0	9.1.0
2010-06	RAN#48	R5-103733	0280	-	CR to 36.521-1: Update PDCCH DCI Formats for Open Loop and Closed Loop Spatial Multiplexing Test Cases	9.0.0	9.1.0
2010-06	RAN#48	R5-103751	0281	-	Misc update in CSI tests	9.0.0	9.1.0
2010-06	RAN#48	R5-103752	0282	-	Correction of the statistical part in PMI and RI tests	9.0.0	9.1.0
2010-06	RAN#48	R5-103753	0283	-	LTE-RF:CR to downlink RMCs for TX characteristics	9.0.0	9.1.0
2010-06	RAN#48	R5-103754	0284	-	LTE-RF: Update of annex C	9.0.0	9.1.0
2010-06	RAN#48	R5-103756	0285	-	Measuring throughput ratios (Annex G)	9.0.0	9.1.0
2010-06	RAN#48	R5-103763	0286	-	LTE-RF: CR for Minimum output power test case	9.0.0	9.1.0
2010-06	RAN#48	R5-103764	0287	-	Performance, CSI reporting and uncertainties for UEs with multiple Rx antennas	9.0.0	9.1.0
2010-06	RAN#48	R5-103771	0288	-	Introduction of clause 8.4.1 and 8.5.1 test case uncertainties and Test Tolerances	9.0.0	9.1.0
2010-06	RAN#48	R5-103778	0291	-	Uplink power for receiver tests	9.0.0	9.1.0
2010-06	RAN#48	R5-103780	0292	1	Addition of the exceptional message for In-band emissions	9.0.0	9.1.0
2010-06	RAN#48	R5-103781	0289	-	Correction to 6.5.2.1 EVM	9.0.0	9.1.0
2010-06	RAN#48	R5-103782	0290	-	Correction to CQI reporting	9.0.0	9.1.0
2010-09	RAN#49	R5-104090	0294	-	Corrections to Spectrum emission mask test regarding UE category	9.1.0	9.2.0
2010-09	RAN#49	R5-104091	0295	-	Missing note in Additional spurious emission test with NS_07	9.1.0	9.2.0
2010-09	RAN#49	R5-104095	0296	-	PDCCH Aggregation level for CSI tests	9.1.0	9.2.0
2010-09	RAN#49	R5-104096	0297	-	Default initial and connection Uplink power for RF tests	9.1.0	9.2.0
2010-09	RAN#49	R5-104212	0298	-	Limits on Uplink power for Receiver tests	9.1.0	9.2.0
2010-09	RAN#49	R5-104244	0299	-	Correction to Demodulation Requirements	9.1.0	9.2.0
2010-09	RAN#49	R5-104461	0300	-	CR to 36.521-1: Editorial Corrections for Closed Loop Spatial Multiplexing Test Cases	9.1.0	9.2.0
2010-09	RAN#49	R5-104478	0301	-	Correction to Test requirements in 6.5.2.2	9.1.0	9.2.0
2010-09	RAN#49	R5-104482	0302	-	Correction to 8.2.1.1	9.1.0	9.2.0
2010-09	RAN#49	R5-104520	0303	-	36521-1 General update of sections 00 to 08: missing Introduction references formatting	9.1.0	9.2.0
2010-09	RAN#49	R5-104583	0304	-	No necessity to apply - consecutive time slots for EVM	9.1.0	9.2.0
2010-09	RAN#49	R5-104584	0305	-	Correction to E.4.4 EVM equalizer spectrum flatness	9.1.0	9.2.0
2010-09	RAN#49	R5-104630	0306	-	Correction of table reference in In-band emissions test	9.1.0	9.2.0
2010-09	RAN#49	R5-104808	0307	-	CR to 36.521-1: Update to Additional Spectrum Emission Mask test case	9.1.0	9.2.0
2010-09	RAN#49	R5-104809	0308	-	CR to 36.521-1: Update to Spurious emission band UE co-existence test case	9.1.0	9.2.0
2010-09	RAN#49	R5-104810	0309	-	LTE-RF: CR for Max Output Power	9.1.0	9.2.0
2010-09	RAN#49	R5-104811	0310	-	LTE-RF: CR for Freq Error	9.1.0	9.2.0
2010-09	RAN#49	R5-104812	0311	-	Introduction of exclusion period for PUCCH-EVM test in clause 6.5.3	9.1.0	9.2.0
2010-09	RAN#49	R5-104813	0312	-	Correction to Demodulation UE-Specific Reference Symbols	9.1.0	9.2.0
2010-09	RAN#49	R5-104814	0313	-	Uncertainties and Test Tolerances for CSI Test cases 9.2.1.1 and 9.2.1.2	9.1.0	9.2.0
2010-09	RAN#49	R5-104815	0314	-	Uncertainties and Test Tolerances for CSI Test cases 9.2.2.1 and 9.2.2.2	9.1.0	9.2.0
2010-09	RAN#49	R5-104816	0315	-	UE applicability for CSI test cases	9.1.0	9.2.0
2010-09	RAN#49	R5-104817	0316	-	Update of CQI reporting TCs under fading conditions	9.1.0	9.2.0
2010-09	RAN#49	R5-104818	0317	-	Update of Reporting of Precoding Matrix Indicator TCs	9.1.0	9.2.0
2010-09	RAN#49	R5-104819	0318	-	Correction of the statistical part 9.3.1.1.1 (CQI Reporting under fading conditions)	9.1.0	9.2.0
2010-09	RAN#49	R5-104820	0319	-	Correction of the statistical part 9.3.3.1.1 (CQI Reporting under fading conditions)	9.1.0	9.2.0
2010-09	RAN#49	R5-104821	0320	-	Correction of the statistical part 9.3.2.1.1 (CQI Reporting under fading conditions)	9.1.0	9.2.0
2010-09	RAN#49	R5-104822	0321	-	Update and new RMC-s for CQI tests	9.1.0	9.2.0
2010-09	RAN#49	R5-104823	0322	-	Correction of EVM calculation in annex	9.1.0	9.2.0
2010-09	RAN#49	R5-104824	0323	-	Introduction of exclusion period for PUCCH-EVM test in Annex E	9.1.0	9.2.0
2010-09	RAN#49	R5-104844	0324	-	Pcmax changes to Configured UE Transmitted Output Power	9.1.0	9.2.0
2010-09	RAN#49	R5-104845	0325	-	Clarification on the frequency range with network signal in 6.6.3.2	9.1.0	9.2.0
2010-09	RAN#49	R5-104846	0326	-	Update of editor's notes	9.1.0	9.2.0
2010-09	RAN#49	R5-104847	0327	-	Removal of Extreme Conditions in 6.2.3	9.1.0	9.2.0
2010-09	RAN#49	R5-104850	0328	-	Corrections to Test procedure loop in CSI tests	9.1.0	9.2.0
2010-09	RAN#49	R5-104851	0329	-	Introduction of TDD CQI Reporting under fading conditions and frequency-selective interference test case	9.1.0	9.2.0

2010-09	RAN#49	R5-104852	0330	-	Introduction of TDD RI Reporting test case	9.1.0	9.2.0
2010-09	RAN#49	R5-104853	0331	-	Update of CQI reporting TCs under AWGN conditions	9.1.0	9.2.0
2010-09	RAN#49	R5-104854	0332	-	Update of FDD RI Reporting TC	9.1.0	9.2.0
2010-09	RAN#49	R5-104857	0333	-	CR to 36.521-1 LTE UE Tx_RX test cases band 20	9.1.0	9.2.0
2010-09	RAN#49	R5-104861	0334	-	Corrections to Test requirements for MPR test	9.1.0	9.2.0
2010-09	RAN#49	R5-104863	0335	-	Clarification on notes in Max Pow er	9.1.0	9.2.0
2010-09	RAN#49	R5-104872	0336	-	Correction to 6.3.5.2	9.1.0	9.2.0
2010-09	RAN#49	R5-104873	0337	-	Numbering and alignment of TDD PHICH demod test cases	9.1.0	9.2.0
2010-09	RAN#49	R5-104874	0338	-	Correction to test numbering for exceptional messages in 8.2.x.x	9.1.0	9.2.0
2010-09	RAN#49	R5-104875	0339	-	Correction to 9.2.2	9.1.0	9.2.0
2010-09	RAN#49	R5-104876	0340	-	Correction to the test procedures of 9.3.x	9.1.0	9.2.0
2010-09	RAN#49	R5-104877	0341	-	Correction to 9.4.x	9.1.0	9.2.0
2010-09	RAN#49	R5-104878	0342	-	The new reference of connection diagram for 9.3.3	9.1.0	9.2.0
2010-09	RAN#49	R5-104879	0343	-	Correction to 6.3.4.1 and 6.3.5.1	9.1.0	9.2.0
2010-09	RAN#49	R5-104888	0344	-	Update of Annex C.2 for AG level	9.1.0	9.2.0
2010-09	RAN#49	R5-105055	0345	-	Introduction of a new RF test case (8.7) to verify downlink sustained data rate performance	9.1.0	9.2.0
2010-09	RAN#49	R5-105061	0347	-	CR to 36.521-1: Modification to Additional Maximum Pow er Reduction Test Case	9.1.0	9.2.0
2010-09	RAN#49	R5-105062	0348	-	Modification to Additional Spectrum Emission Mask	9.1.0	9.2.0
2010-09	RAN#49	R5-105063	0349	-	Modification to Additional Spurious Emissions	9.1.0	9.2.0
2010-09	RAN#49	R5-105064	0350	-	Modification to Maximum Pow er Reduction	9.1.0	9.2.0
2010-09	RAN#49	R5-105065	0351	-	Modification to Adjacent Channel Leakage Pow er Ratio	9.1.0	9.2.0
2010-09	RAN#49	RP-100987	0352	-	Correction of status for RF performance test case	9.1.0	9.2.0
2010-12	RAN#50	R5-106073	0353	-	Corrections to receiver spurious emissions test	9.2.0	9.3.0
2010-12	RAN#50	R5-106074	0354	-	Update of downlink power for receiver tests	9.2.0	9.3.0
2010-12	RAN#50	R5-106076	0355	-	CQI: Side condition w hen CQI median equals min or max CQI-values	9.2.0	9.3.0
2010-12	RAN#50	R5-106077	0356	-	Update of the throughput-definition for multi-data stream transmission	9.2.0	9.3.0
2010-12	RAN#50	R5-106078	0357	-	Update of RF OCNG patterns	9.2.0	9.3.0
2010-12	RAN#50	R5-106092	0358	-	Correction of DCI format used in PDSCH performance test 8.2.1.4.2	9.2.0	9.3.0
2010-12	RAN#50	R5-106249	0359	-	CR to 36.521-1: Correction to Spurious emission band UE co-existence test case	9.2.0	9.3.0
2010-12	RAN#50	R5-106250	0360	-	CR to 36.521-1: Correction to Additional Tx spurious emissions test case	9.2.0	9.3.0
2010-12	RAN#50	R5-106374	0361	-	Correction of FDD CQI reporting test under AWGN - PUCCH 1-1	9.2.0	9.3.0
2010-12	RAN#50	R5-106394	0362	-	Correction of clause 9.3.1 and 9.3.3	9.2.0	9.3.0
2010-12	RAN#50	R5-106399	0363	-	"Correction of G.2.5 Pass fail decision rules"	9.2.0	9.3.0
2010-12	RAN#50	R5-106420	0364	-	Introduction of test uncertainties and tolerances for TDD PDSCH DRS test cases	9.2.0	9.3.0
2010-12	RAN#50	R5-106440	0365	-	Correction to unsigned numbers in Annex F.1.2	9.2.0	9.3.0
2010-12	RAN#50	R5-106443	0366	-	Correction to the exceptional messages in 9.4 Reporting of PMI TCs	9.2.0	9.3.0
2010-12	RAN#50	R5-106491	0367	-	CR to 36.521-1: Correction to Table Numbering Error in TDD PDSCH Closed Loop Single/Multi Layer Spatial Multiplexing 2x2	9.2.0	9.3.0
2010-12	RAN#50	R5-106512	0368	-	Transport format table clarification in CSI test cases	9.2.0	9.3.0
2010-12	RAN#50	R5-106801	0369	-	HARQ scheduling in TDD performance tests using special subframes	9.2.0	9.3.0
2010-12	RAN#50	R5-106803	0370	-	Correction to Fading Profiles in TCs 8.4 and 8.5	9.2.0	9.3.0
2010-12	RAN#50	R5-106816	0372	-	CR to 36.521-1: Modification to Spectrum Emissions Mask	9.2.0	9.3.0
2010-12	RAN#50	R5-106817	0373	-	Introduction of test uncertainties and tolerances for TDD PCFICH/PDCCH and PHICH test cases	9.2.0	9.3.0
2010-12	RAN#50	R5-106818	0374	-	Update of TDD PDSCH CRS Demodulation test cases	9.2.0	9.3.0
2010-12	RAN#50	R5-106821	0375	-	PUSCH-EVM w ith exclusion period	9.2.0	9.3.0
2010-12	RAN#50	R5-106822	0376	-	Maintenance of Band 20 for receiver tests	9.2.0	9.3.0
2010-12	RAN#50	R5-106823	0377	-	Completion of clause 9.3.1 and 9.3.2	9.2.0	9.3.0
2010-12	RAN#50	R5-106824	0378	-	Update of FDD RI Reporting TC	9.2.0	9.3.0
2010-12	RAN#50	R5-106825	0379	-	Correction to 9.2.2 CQI TCs	9.2.0	9.3.0
2010-12	RAN#50	R5-106826	0380	-	G.3.5 on PDCCH&PHICH Minimum Test Times	9.2.0	9.3.0
2010-12	RAN#50	R5-106827	0381	-	Completion of test time and ╬│ -TT for clauses 9.3 to 9.5	9.2.0	9.3.0
2010-12	RAN#50	R5-106828	0382	-	EVM w indow length for PRACH	9.2.0	9.3.0
2010-12	RAN#50	R5-106842	0383	-	Modification of TC 8.3.2.1 - TDD PDSCH Single-layer SM Performance (UE-Specific Reference Symbols)	9.2.0	9.3.0
2010-12	RAN#50	R5-106843	0384	-	Pow er control relative power tolerance: Missing band edge relaxation	9.2.0	9.3.0
2010-12	RAN#50	R5-106844	0385	-	SRS time mask test procedure update	9.2.0	9.3.0
2010-12	RAN#50	R5-106845	0386	-	Correction of TC General ON/OFF time mask	9.2.0	9.3.0

2010-12	RAN#50	R5-106846	0387	-	Update of TDD CQI reporting test under frequency selective interference conditions	9.2.0	9.3.0
2010-12	RAN#50	R5-106847	0388	-	Update of TDD RI reporting test	9.2.0	9.3.0
2010-12	RAN#50	R5-106848	0389	-	Iot setting in CQI test clarification	9.2.0	9.3.0
2010-12	RAN#50	R5-106850	0390	-	Correction of Test Uncertainties and Test Tolerances for Reference Sensitivity-Band 4	9.2.0	9.3.0
2010-12	RAN#50	R5-106855	0391	-	Correction to DL and UL RMC configurations in 6.5.1 Frequency Error	9.2.0	9.3.0
2010-12	RAN#50	R5-106858	0392	-	CR to 36.521-1: Update LTE RF test cases with test requirements for EUTRA TDD LTE band 41.	9.2.0	9.3.0
2011-03	RAN#51	R5-110138	0393	-	Spurious emission band co-existence test: Remaining old test requirement table	9.3.0	9.4.0
2011-03	RAN#51	R5-110139	0394	-	Transmit intermodulation test: Interferer offset for Band 20, Bandwidth 20 MHz	9.3.0	9.4.0
2011-03	RAN#51	R5-110141	0395	-	PMI Performance tests: Corrections to test settings	9.3.0	9.4.0
2011-03	RAN#51	R5-110143	0396	-	PDCCH Performance test: Correction to TDD DL RMC-s	9.3.0	9.4.0
2011-03	RAN#51	R5-110144	0397	-	OCNG for RF tests: Updates	9.3.0	9.4.0
2011-03	RAN#51	R5-110158	0398	-	CQI Performance tests: Clarification on subbands used in the test	9.3.0	9.4.0
2011-03	RAN#51	R5-110302	0399	-	LTE RF: PCFICH/PDCCH Transmit Diversity Performance	9.3.0	9.4.0
2011-03	RAN#51	R5-110349	0401	-	Correction of OFF power measurements in 6.3.4 ON/OFF time mask	9.3.0	9.4.0
2011-03	RAN#51	R5-110354	0402	-	Correction of Annex E (Global In-Channel TX-Test)	9.3.0	9.4.0
2011-03	RAN#51	R5-110506	0403	-	Addition of 3500 MHz TDD bands into chapter 5 of 36.521-1	9.3.0	9.4.0
2011-03	RAN#51	R5-110747	0404	-	Updates to section 8.7 DL sustained data rate test case	9.3.0	9.4.0
2011-03	RAN#51	R5-110850	0405	-	Sustained data rate: Definition of UL RMC-s	9.3.0	9.4.0
2011-03	RAN#51	R5-110860	0400	-	Update measurement period from test procedure of 6.2.2	9.3.0	9.4.0
2011-03	RAN#51	R5-110861	0428	-	A-MPR Test requirement update	9.3.0	9.4.0
2011-03	RAN#51	R5-110862	0437	-	Measuring throughput with different payload size.	9.3.0	9.4.0
2011-03	RAN#51	R5-110900	0406	-	Correction to SNR reference in FDD PCFICH/PDCCH Single Antenna Port Performance Test	9.3.0	9.4.0
2011-03	RAN#51	R5-110901	0407	-	CR to 36.521-1: Correction of Additional Maximum Power Reduction (A-MPR) test case	9.3.0	9.4.0
2011-03	RAN#51	R5-110915	0408	-	Uncertainties and Test Tolerances for CSI Test cases 9.3.1.1.x and 9.3.2.1.x	9.3.0	9.4.0
2011-03	RAN#51	R5-110916	0409	-	Uncertainties and Test Tolerances for CSI Test cases 9.3.3.1.x	9.3.0	9.4.0
2011-03	RAN#51	R5-110917	0410	-	Uncertainties and Test Tolerances for CSI Test cases 9.4.1.1.x and 9.4.2.1.x	9.3.0	9.4.0
2011-03	RAN#51	R5-110918	0411	-	Uncertainties and Test Tolerances for CSI Test cases 9.5.1.x	9.3.0	9.4.0
2011-03	RAN#51	R5-110919	0412	-	Editorial errors in CSI test cases 9.2.1.x Test procedure	9.3.0	9.4.0
2011-03	RAN#51	R5-110933	0413	-	Handling of different releases in RAN5 LTE RF specification	9.3.0	9.4.0
2011-03	RAN#51	R5-110938	0414	-	PRACH Time mask and EVM tests: TDD Special subframe configuration	9.3.0	9.4.0
2011-03	RAN#51	R5-110939	0415	-	Update on PRACH time mask for TDD	9.3.0	9.4.0
2011-03	RAN#51	R5-110940	0416	-	Correction of the connection diagram reference in the initial conditions for Transmitter Characteristics	9.3.0	9.4.0
2011-03	RAN#51	R5-110941	0417	-	Update of the reference sensitivity requirement for the 1.4MHz and 3MHz bandwidths and note correction for Band 3 and Band 9	9.3.0	9.4.0
2011-03	RAN#51	R5-110942	0418	-	CR Removing brackets of band 41 reference sensitivity in 36.521-1	9.3.0	9.4.0
2011-03	RAN#51	R5-110949	0419	-	PDCCH and PHICH performance tests: Updates and corrections	9.3.0	9.4.0
2011-03	RAN#51	R5-110950	0420	-	Addition of CodeBookSubsetRestriction bitmap for Multi-Layer Spatial Multiplexing	9.3.0	9.4.0
2011-03	RAN#51	R5-110951	0421	-	Addition of exceptional message in 8.4.1.2.2	9.3.0	9.4.0
2011-03	RAN#51	R5-110952	0422	-	CQI test 9.2.2.2: Update acc TS 36.101	9.3.0	9.4.0
2011-03	RAN#51	R5-110953	0423	-	Maximum input level test: Correction to DL-RMC	9.3.0	9.4.0
2011-03	RAN#51	R5-110954	0424	-	Correction of E.7, EVM with exclusion period	9.3.0	9.4.0
2011-03	RAN#51	R5-110967	0425	-	Updates to Additional Spurious emissions and Spurious emission band UE co-existence test	9.3.0	9.4.0
2011-03	RAN#51	R5-110970	0426	-	LTE RF: references to state 3A in 36.521-1	9.3.0	9.4.0
2011-03	RAN#51	R5-110973	0429	-	RI Performance tests: Corrections	9.3.0	9.4.0
2011-03	RAN#51	R5-110975	0430	-	Completion of annex G.3.5 (Minimum test time, performance tests)	9.3.0	9.4.0
2011-03	RAN#51	R5-110978	0431	-	Correction to Band 12 frequency range	9.3.0	9.4.0
2011-03	RAN#51	R5-110979	0432	-	Additional in-band blocking requirement for Band 12	9.3.0	9.4.0
2011-03	RAN#51	R5-110989	0433	-	Completion of annex G.3.6 (test conditions, performance tests)	9.3.0	9.4.0
2011-03	RAN#51	R5-110990	0434	-	Addition of test cases of TDD PDSCH Single-layer and Dual-layer Spatial Multiplexing Performance	9.3.0	9.4.0
2011-03	RAN#51	R5-110991	0435	-	Correction to Times Mask and Power Control tests	9.3.0	9.4.0

2011-03	RAN#51	R5-110992	0436	-	Add requirement of QPSK with partial RB allocation into test requirement of 6.2.3	9.3.0	9.4.0
2011-04	-	-	-	-	Added approved R5-110967 which was missing.	9.4.0	9.4.1
2011-06	RAN#52	R5-112148	0438	-	ON/OFF time mask for PRACH: PRACH configuration index	9.4.1	9.5.0
2011-06	RAN#52	R5-112149	0439	-	CQI tests with frequency selective scheduling mode: Random selection of Sub-Bands	9.4.1	9.5.0
2011-06	RAN#52	R5-112150	0440	-	DL-RMC for receiver tests: Obsolete editors note	9.4.1	9.5.0
2011-06	RAN#52	R5-112211	0441	-	Adding Band 24 to TS 36.521-1	9.4.1	9.5.0
2011-06	RAN#52	R5-112311	0442	-	Correction to the sustained data rate tests	9.4.1	9.5.0
2011-06	RAN#52	R5-112312	0443	-	Correction to the multi-antenna transmission tests	9.4.1	9.5.0
2011-06	RAN#52	R5-112349	0444	-	Update Annex G.3.6 for spatial multiplexing test cases	9.4.1	9.5.0
2011-06	RAN#52	R5-112412	0445	-	Correction to DL RMC for Max input for UE category 2	9.4.1	9.5.0
2011-06	RAN#52	R5-112459	0446	-	EVM window length for PRACH	9.4.1	9.5.0
2011-06	RAN#52	R5-112460	0447	-	Removal of square brackets in Annex G.5.4	9.4.1	9.5.0
2011-06	RAN#52	R5-112462	0448	-	Test tolerances for EVM with exclusion period	9.4.1	9.5.0
2011-06	RAN#52	R5-112808	0449	-	LTE RF - UEs Demodulation and CSI Band applicability	9.4.1	9.5.0
2011-06	RAN#52	R5-112810	0450	-	Correction on test requirement of test case 6.5.2.3	9.4.1	9.5.0
2011-06	RAN#52	R5-112811	0451	-	LTE RF - TC6.3.5.2 Change in Minimum Requirements	9.4.1	9.5.0
2011-06	RAN#52	R5-112812	0452	-	Removable of NS values for TDD	9.4.1	9.5.0
2011-06	RAN#52	R5-112813	0453	-	Correction on initial condition for test cases of 9.3.3	9.4.1	9.5.0
2011-06	RAN#52	R5-112814	0454	-	Correction to 9.4 PMI test cases	9.4.1	9.5.0
2011-06	RAN#52	R5-112816	0455	-	Test procedure change on Tx spurious emissions test cases	9.4.1	9.5.0
2011-06	RAN#52	R5-112850	0456	-	Update of Initial conditions according to table 7.3.3-2 for the 5MHz and 10MHz bandwidths	9.4.1	9.5.0
2011-06	RAN#52	R5-112851	0457	-	Iot modelling in frequency-selective interference CQI tests	9.4.1	9.5.0
2011-06	RAN#52	R5-112852	0458	-	Correction to test procedure in 9.5.1	9.4.1	9.5.0
2011-06	RAN#52	R5-112859	0459	-	Introduction of additional PDCCH test cases for Rel-9	9.4.1	9.5.0
2011-06	RAN#52	R5-112860	0460	-	Introduction of additional PHICH test cases for Rel-9	9.4.1	9.5.0
2011-06	RAN#52	R5-112861	0461	-	Introducing UE-selected subband CQI tests for Rel-9	9.4.1	9.5.0
2011-06	RAN#52	R5-112862	0462	-	Introduction of new PMI test cases for UE-selected sub-band reporting for Rel-9	9.4.1	9.5.0
2011-06	RAN#52	R5-112863	0463	-	Addition of a new TC for FDD MBMS performance	9.4.1	9.5.0
2011-06	RAN#52	R5-112864	0464	-	Addition of a new TC for TDD MBMS performance	9.4.1	9.5.0
2011-06	RAN#52	R5-112866	0465	-	Addition of UE category 1 coverage for single-layer spatial multiplexing transmission on antenna port 7 or 8	9.4.1	9.5.0
2011-06	RAN#52	R5-112870	0466	-	Removal of square brackets in annex G.3.5 (Minimum test time, performance tests)	9.4.1	9.5.0
2011-06	RAN#52	R5-112871	0467	-	Update minimum requirements and test requirements for spatial multiplexing test cases	9.4.1	9.5.0
2011-06	RAN#52	R5-112873	0468	-	Test procedure change on few Rx test cases	9.4.1	9.5.0
2011-09	RAN#53	R5-113178	0506	-	RF TC 8.7.2: Correction of the ACK/NACK feedback mode	9.5.0	9.6.0
2011-09	RAN#53	R5-113179	0469	-	RF TC-s 9.3.4: Updates to minimum requirements and corrections to test procedures	9.5.0	9.6.0
2011-09	RAN#53	R5-113180	0470	-	RF: New UL RMC for 10 MHz 15RB-s	9.5.0	9.6.0
2011-09	RAN#53	R5-113181	0471	-	RF: Use of State 3A-RF	9.5.0	9.6.0
2011-09	RAN#53	R5-113233	0472	-	LTE RF: EVM Annex E correction	9.5.0	9.6.0
2011-09	RAN#53	R5-113238	0473	-	RF TC 6.3.4.2.2: Correction to SRS configuration	9.5.0	9.6.0
2011-09	RAN#53	R5-113368	0474	-	Correction in test cases of 8.2.2.1.2 and 8.5.1	9.5.0	9.6.0
2011-09	RAN#53	R5-113369	0475	-	Correction in test cases of 9.5	9.5.0	9.6.0
2011-09	RAN#53	R5-113380	0476	-	Update of minimum test time for PCFICH/PDCCH and PHICH tests	9.5.0	9.6.0
2011-09	RAN#53	R5-113383	0477	-	Correction of Table G.3.5-1 (minimum test time)	9.5.0	9.6.0
2011-09	RAN#53	R5-113419	0478	-	Correction for spurious emission band UE co-existence limits of Band 3	9.5.0	9.6.0
2011-09	RAN#53	R5-113454	0479	-	Correction to test procedure in 6.5.1	9.5.0	9.6.0
2011-09	RAN#53	R5-113455	0480	-	Correction to Minimum requirement in 6.6.2.2	9.5.0	9.6.0
2011-09	RAN#53	R5-113456	0481	-	Correction to RMC for PDCCH/PCFICH performance requirements	9.5.0	9.6.0
2011-09	RAN#53	R5-113458	0482	-	Correction to CSI TCs	9.5.0	9.6.0
2011-09	RAN#53	R5-113541	0483	-	Introduction of Expanded 1900MHz Band (Band 25) into section 5 of 36.521-1	9.5.0	9.6.0
2011-09	RAN#53	R5-113596	0506	-	Abbreviation update and Editorial corrections in TS36.521-1	9.5.0	9.6.0
2011-09	RAN#53	R5-114000	0484	-	Correction in 6.3.5.2 Power Control Relative power tolerance	9.5.0	9.6.0
2011-09	RAN#53	R5-114001	0485	-	Correction in 6.3.4.2.2 SRS time mask	9.5.0	9.6.0
2011-09	RAN#53	R5-114002	0486	-	Addition of PDSCH TDD performance tests for Low UE categories	9.5.0	9.6.0
2011-09	RAN#53	R5-114003	0487	-	Additional FDD scenarios	9.5.0	9.6.0
2011-09	RAN#53	R5-114004	0488	-	Addition of RMC-s for PDSCH performance tests for low UE categories	9.5.0	9.6.0
2011-09	RAN#53	R5-114032	0489	-	Introduction of Expanded 1900MHz Band (Band 25) into section 6 of 36.521-1	9.5.0	9.6.0

2011-09	RAN#53	R5-114033	0490	-	Correction on TDD MBMS performance requirements for 64QAM mode	9.5.0	9.6.0
2011-09	RAN#53	R5-114034	0491	-	Correction on FDD MDMS performance requirements for 64QAM mode	9.5.0	9.6.0
2011-09	RAN#53	R5-114038	0492	-	RF TC 6.3.5.2: Consideration of band edge relaxation in test requirements	9.5.0	9.6.0
2011-09	RAN#53	R5-114039	0493	-	Band 19 A-MPR refinement	9.5.0	9.6.0
2011-09	RAN#53	R5-114040	0494	-	Test system uncertainty and TT for 6.6.3.3 additional spurious emissions NS_07	9.5.0	9.6.0
2011-09	RAN#53	R5-114041	0495	-	Correction to Additional Maximum Power Reduction	9.5.0	9.6.0
2011-09	RAN#53	R5-114042	0496	-	Correction to 6.3.4.2.1 PRACH time mask	9.5.0	9.6.0
2011-09	RAN#53	R5-114043	0497	-	Correction to Receiver Characteristics Minimum Requirements	9.5.0	9.6.0
2011-09	RAN#53	R5-114044	0498	-	Addition of PDSCH FDD performance tests for Low UE categories	9.5.0	9.6.0
2011-09	RAN#53	R5-114045	0499	-	Additional Rel-9 TDD scenarios	9.5.0	9.6.0
2011-09	RAN#53	R5-114046	0500	-	Update of CQI/PMI test cases	9.5.0	9.6.0
2011-09	RAN#53	R5-114047	0501	-	Update of RI test cases	9.5.0	9.6.0
2011-09	RAN#53	R5-114048	0502	-	Release dependent RMCs in PCFICH/PDCCH and PHICH tests	9.5.0	9.6.0
2011-09	RAN#53	R5-114049	0503	-	Addition of tests scenarios in Annex	9.5.0	9.6.0
2011-09	RAN#53	R5-114073	0504	-	Introduction of Expanded 1900MHz Band (Band 25) into section 7 of 36.521-1	9.5.0	9.6.0
2011-09	RAN#53	R5-114091	0505	-	Correction to test cases 10.1 and 10.2	9.5.0	9.6.0
2011-12	RAN#54	R5-115112	0507	-	RF: Coverage of MPR and A-MPR requirements in emissions tests	9.6.0	9.7.0
2011-12	RAN#54	R5-115113	0508	-	RF: Update to names of some RMC-s used in different releases	9.6.0	9.7.0
2011-12	RAN#54	R5-115114	0509	-	RF TC 6.2.4, 6.6.2.2, 6.6.3.3: Corrections to A-MPR related tests	9.6.0	9.7.0
2011-12	RAN#54	R5-115115	0510	-	RF TC-s 9: Corrections to UL allocation for some CQI tests	9.6.0	9.7.0
2011-12	RAN#54	R5-115116	0511	-	RF TC 6.3.5.2: Missing extreme conditions in test requirements	9.6.0	9.7.0
2011-12	RAN#54	R5-115117	0512	-	RF TC 6.2.3: Missing test requirements for band 25	9.6.0	9.7.0
2011-12	RAN#54	R5-115118	0513	-	RF TC 6.5.2.1: Redundant conflicting IE-s in message contents	9.6.0	9.7.0
2011-12	RAN#54	R5-115119	0514	-	RF TC 6.6.3.1: Correction of reference to the connection diagram	9.6.0	9.7.0
2011-12	RAN#54	R5-115324	0517	-	LTE RF: CSI test case update	9.6.0	9.7.0
2011-12	RAN#54	R5-115472	0518	-	Corrections to the dual-layer beamforming demodulation requirements	9.6.0	9.7.0
2011-12	RAN#54	R5-115475	0519	-	Correction to Code Block Numbers	9.6.0	9.7.0
2011-12	RAN#54	R5-115800	0522	-	Delete note in PUSCH-EVM	9.6.0	9.7.0
2011-12	RAN#54	R5-115812	0526	-	RF: Corrections to tests with release dependent requirements	9.6.0	9.7.0
2011-12	RAN#54	R5-115815	0527	-	Test Frequency for Relative Power Tolerance	9.6.0	9.7.0
2011-12	RAN#54	R5-115821	0531	-	RF: General review of the reference measurement channels	9.6.0	9.7.0
2011-12	RAN#54	R5-115822	0532	-	Correction for codebook subset restriction in single-layer closed loop spatial multiplexing test	9.6.0	9.7.0
2011-12	RAN#54	R5-115830	0533	-	Uncertainties and Test Tolerances for 3000MHz to 4200MHz, Tx Test cases	9.6.0	9.7.0
2011-12	RAN#54	R5-115831	0534	-	Uncertainties and Test Tolerances for 3000MHz to 4200MHz, Rx Test cases	9.6.0	9.7.0
2011-12	RAN#54	R5-115832	0535	-	Support for band 22, 42 and 43	9.6.0	9.7.0
2011-12	RAN#54	R5-115837	0536	-	Update LTE RF test cases with test requirements for FDD LTE Band 23 in 36.521-1	9.6.0	9.7.0
2011-12	RAN#54	R5-115875	0537	-	Correction on FDD and TDD MBMS conformance requirements	9.6.0	9.7.0
2011-12	RAN#54	R5-115877	0538	-	Introduction of test system uncertainties and TT to new TCs in clauses 9.3.4 to 9.4.2.2.2	9.6.0	9.7.0
2011-12	RAN#54	R5-115879	0539	-	Uncertainties and Test Tolerances for Sustained data rate test cases	9.6.0	9.7.0
2011-12	RAN#54	R5-115891	0540	-	Requirement change in UE spurious emissions for Band 7 and 38 co-existence (Rel-8 only)	9.6.0	9.7.0
2011-12	RAN#54	R5-115162	0515	-	Definitions, symbols and abbreviations for CA RF	9.7.0	10.0.0
2011-12	RAN#54	R5-115565	0520	-	In-band blocking for CA (New)	9.7.0	10.0.0
2011-12	RAN#54	R5-115568	0521	-	Spurious Response for CA (New)	9.7.0	10.0.0
2011-12	RAN#54	R5-115801	0523	-	Out-of-Band blocking for CA (new)	9.7.0	10.0.0
2011-12	RAN#54	R5-115802	0524	-	Narrow band blocking for CA (new)	9.7.0	10.0.0
2011-12	RAN#54	R5-115803	0525	-	Addition of new RMCs for CA feature related Chapter8 test cases	9.7.0	10.0.0
2011-12	RAN#54	R5-115816	0528	-	General Section for CA RF	9.7.0	10.0.0
2011-12	RAN#54	R5-115817	0529	-	Frequency Band and Channel Assignments for CA RF	9.7.0	10.0.0
2011-12	RAN#54	R5-115818	0530	-	UE Maximum Output Power for intra-band contiguous CA (new)	9.7.0	10.0.0

2012-03	RAN#55	R5-120080	0587	-	Removal of technical content in 36.521-1 v9.7.0 and substitution with pointer to the next Release	10.0.0	10.1.0
2012-03	RAN#55	R5-120134	0541	-	RF: General clarification on the count of ACK / NACKs in throughput calculation in CQI tests	10.0.0	10.1.0
2012-03	RAN#55	R5-120137	0542	-	RF: Corrections to message contents in some MIMO demodulation performance tests	10.0.0	10.1.0
2012-03	RAN#55	R5-120138	0543	-	RF: Updates to handling requirements and tests for different releases	10.0.0	10.1.0
2012-03	RAN#55	R5-120140	0544	-	RF: Coverage of MPR and A-MPR requirements in Tx emissions tests	10.0.0	10.1.0
2012-03	RAN#55	R5-120243	0545	-	Tx Test cases Uplink pow er limit w indow for 3000MHz to 4200MHz	10.0.0	10.1.0
2012-03	RAN#55	R5-120244	0546	-	Rx Test cases Uplink pow er limit w indow for 3000MHz to 4200MHz	10.0.0	10.1.0
2012-03	RAN#55	R5-120252	0547	-	Global in-channel TX-test, delete note	10.0.0	10.1.0
2012-03	RAN#55	R5-120288	0548	-	LTE RF - Update of abbreviations and addition of RBstart	10.0.0	10.1.0
2012-03	RAN#55	R5-120314	0549	-	Clarification for the starting point of RB in 6.3.5.2 Relative Pow er test	10.0.0	10.1.0
2012-03	RAN#55	R5-120338	0550	-	Correction to MCS value in Table A.4-3	10.0.0	10.1.0
2012-03	RAN#55	R5-120343	0551	-	Introduction of new maximum input level test case for CA	10.0.0	10.1.0
2012-03	RAN#55	R5-120351	0552	-	CA RF - Changes in aggregated CC configurations	10.0.0	10.1.0
2012-03	RAN#55	R5-120355	0553	-	CA RF - updates to 7.7A Spurious response for CA	10.0.0	10.1.0
2012-03	RAN#55	R5-120370	0554	-	Test Tolerance for 6.6.3.3 additional spurious emissions NS_07	10.0.0	10.1.0
2012-03	RAN#55	R5-120426	0555	-	Correction to Frequency Range for Spurious Emission Requirements	10.0.0	10.1.0
2012-03	RAN#55	R5-120521	0556	-	Introduction to Maximum Pow er Reduction for CA	10.0.0	10.1.0
2012-03	RAN#55	R5-120524	0557	-	Introduction to Maximum Pow er Reduction for CA in Annex	10.0.0	10.1.0
2012-03	RAN#55	R5-120526	0558	-	Introduction to Adjacent Channel Leakage pow er Ratio (ACLR) for CA in Annex	10.0.0	10.1.0
2012-03	RAN#55	R5-120801	0559	-	Correction of TC 6.5.2.1 Error Vector Magnitude (EVM) for Test requirement	10.0.0	10.1.0
2012-03	RAN#55	R5-120802	0560	-	Correction of TC 8.2.1.3.1 FDD PDSCH Open Loop Spatial Multiplexing 2x2 for 8.2.1.3.1.4.1 Initial conditions	10.0.0	10.1.0
2012-03	RAN#55	R5-120803	0561	-	Correction of TC8.2.1.3.2 FDD PDSCH Open Loop Spatial Multiplexing 4x2 for 8.2.1.3.2.4.1 Initial conditions	10.0.0	10.1.0
2012-03	RAN#55	R5-120804	0562	-	Correction of TC 8.2.2.3.1 TDD PDSCH Open Loop Spatial Multiplexing 2x2 for 8.2.2.3.1.4.1 Initial conditions	10.0.0	10.1.0
2012-03	RAN#55	R5-120805	0563	-	Correction of TC 8.2.2.3.2 TDD PDSCH Open Loop Spatial Multiplexing 4x2 for 8.2.2.3.2.4.1 Initial conditions	10.0.0	10.1.0
2012-03	RAN#55	R5-120816	0564	-	Addition of frequency band and channel assignments for UL MIMO	10.0.0	10.1.0
2012-03	RAN#55	R5-120825	0565	-	Introduction of Chapter8 Single antenna port and Open loop spatial Multiplexing test cases for CA capable UE's.	10.0.0	10.1.0
2012-03	RAN#55	R5-120828	0566	-	LTE RF - UE Co-ex test point clarification for bands 7 and 38	10.0.0	10.1.0
2012-03	RAN#55	R5-120833	0567	-	Addition of receiver image section 7.10	10.0.0	10.1.0
2012-03	RAN#55	R5-120835	0568	-	Correction to Reporting of Rank Indicator (RI) FDD Test	10.0.0	10.1.0
2012-03	RAN#55	R5-120837	0569	-	Introduction to Adjacent Channel Leakage pow er Ratio (ACLR) for CA	10.0.0	10.1.0
2012-03	RAN#55	R5-120839	0570	-	Addition of a new TC 6.2.2B for UE Maximum Output Pow er for UL-MIMO	10.0.0	10.1.0
2012-03	RAN#55	R5-120842	0571	-	Harmonic exceptions in LTE UE to UE co-existence tests	10.0.0	10.1.0
2012-03	RAN#55	R5-120843	0572	-	Clarification for upper and lower interferers in 7.6.3 Narrow Band Blocking	10.0.0	10.1.0
2012-03	RAN#55	R5-120844	0573	-	RF: Correction of frequency range for out of band blocking test	10.0.0	10.1.0
2012-03	RAN#55	R5-120845	0574	-	Correction and completion to clause 10 MBMS performance	10.0.0	10.1.0
2012-03	RAN#55	R5-120874	0575	-	RF: New RMC-s and updates to the RMC-s overview tables	10.0.0	10.1.0
2012-03	RAN#55	R5-120875	0576	-	RF: Test frequencies for UE co-existence emissions under Note 13	10.0.0	10.1.0
2012-03	RAN#55	R5-120877	0577	-	UE Transmit OFF pow er for CA	10.0.0	10.1.0
2012-03	RAN#55	R5-120878	0578	-	Frequency error for Intraband CA	10.0.0	10.1.0
2012-03	RAN#55	R5-120879	0579	-	Occupied bandw idth for intra-band contiguous CA	10.0.0	10.1.0
2012-03	RAN#55	R5-120880	0580	-	Transmitter Spurious emissions for CA	10.0.0	10.1.0
2012-03	RAN#55	R5-120881	0581	-	Reference sensitivity level for CA	10.0.0	10.1.0
2012-03	RAN#55	R5-120882	0582	-	CA RF - Addition of test description to 6.2.2A MOP for intra-band CA	10.0.0	10.1.0
2012-03	RAN#55	R5-120884	0583	-	CA RF - updates to 7.6.2A OOB blocking for CA	10.0.0	10.1.0
2012-03	RAN#55	R5-120885	0584	-	CA RF - updates to 7.6.3A Narrow-band blocking for CA	10.0.0	10.1.0
2012-03	RAN#55	R5-120899	0585	-	CA RF - updates to 7.6.1A In-band Blocking for CA	10.0.0	10.1.0
2012-03	RAN#55	R5-120900	0586	-	Correction to UE Spurious Emissions	10.0.0	10.1.0
2012-06	RAN#56	R5-121138	0588	-	Correction of TC 6.3.5.2 Pow er Control Relative pow er tolerance	10.1.0	10.2.0
2012-06	RAN#56	R5-121155	0589	-	Correction in test configuration table of sections 7.4 and 7.5	10.1.0	10.2.0

2012-06	RAN#56	R5-121206	0590	-	Correction of test procedure for intermodulation	10.1.0	10.2.0
2012-06	RAN#56	R5-121208	0591	-	Correction of test procedure for out-of-band blocking	10.1.0	10.2.0
2012-06	RAN#56	R5-121221	0592	-	Relative frequency error for CA performance tests	10.1.0	10.2.0
2012-06	RAN#56	R5-121241	0593	-	RF: Corrections to derivation of test requirements for some test points of TC 6.2.4	10.1.0	10.2.0
2012-06	RAN#56	R5-121242	0594	-	RF: Updates to Annex I (Handling of different releases)	10.1.0	10.2.0
2012-06	RAN#56	R5-121253	0595	-	RF: Clarification of test frequencies for UE co-existence emissions under Note 13	10.1.0	10.2.0
2012-06	RAN#56	R5-121254	0596	-	RF: Minor correction to RMC reference in minimum test time annex for TC 8.3.2.1.3	10.1.0	10.2.0
2012-06	RAN#56	R5-121305	0597	-	Removal of test description from Transmit off power for CA and introducing ON/OFF time mask for CA	10.1.0	10.2.0
2012-06	RAN#56	R5-121322	0598	-	Update of 6.3.4.2.2	10.1.0	10.2.0
2012-06	RAN#56	R5-121337	0599	-	Clarifications to Maximum Power Reduction for CA	10.1.0	10.2.0
2012-06	RAN#56	R5-121438	0600	-	Modification to Configured UE transmitted Output Power	10.1.0	10.2.0
2012-06	RAN#56	R5-121451	0601	-	Correction of the Band 23 for UE coexistence requirements	10.1.0	10.2.0
2012-06	RAN#56	R5-121459	0602	-	Correction of RF Test case: 8.7.2.1 TDD sustained data rate performance	10.1.0	10.2.0
2012-06	RAN#56	R5-121463	0603	-	Introduction of Adjacent Channel Selectivity (ACS) for CA	10.1.0	10.2.0
2012-06	RAN#56	R5-121475	0604	-	LTE CA general updates to sections 3 - 5	10.1.0	10.2.0
2012-06	RAN#56	R5-121479	0605	-	CA RF - TC 6.2.2A MOP updates	10.1.0	10.2.0
2012-06	RAN#56	R5-121482	0606	-	CA RF - 7.6.1A In-band blocking updates	10.1.0	10.2.0
2012-06	RAN#56	R5-121483	0607	-	CA RF - 7.6.2A Out-of-band blocking updates	10.1.0	10.2.0
2012-06	RAN#56	R5-121484	0608	-	CA RF - 7.6.3A Narrow-band blocking updates	10.1.0	10.2.0
2012-06	RAN#56	R5-121485	0609	-	CA RF - 7.7A Spurious response updates	10.1.0	10.2.0
2012-06	RAN#56	R5-121488	0610	-	LTE RF - TC 6.6.3.2 UE co-existence requirements correction	10.1.0	10.2.0
2012-06	RAN#56	R5-121523	0611	-	Correction to downlink RB allocation in 7.5.4	10.1.0	10.2.0
2012-06	RAN#56	R5-121525	0612	-	Correction to test requirement in 9.2.2.2	10.1.0	10.2.0
2012-06	RAN#56	R5-121678	0613	-	TS 36.521-1: Spurious emission band UE co-existence alignment	10.1.0	10.2.0
2012-06	RAN#56	R5-121680	0614	-	TS 36.521-1: Applicability correction for 9.3.2.1.1 and 9.3.2.1.2	10.1.0	10.2.0
2012-06	RAN#56	R5-121700	0615	-	Suffix definition of Clause 5 for CA, UL-MIMO, and DL-MIMO for 36.521-1 R-10	10.1.0	10.2.0
2012-06	RAN#56	R5-121903	0616	-	Update of Band 41 RF requirements to align with recent core specification changes	10.1.0	10.2.0
2012-06	RAN#56	R5-121906	0617	-	TS 36.521-1: Introduction of Band 26/XXVI in section 5	10.1.0	10.2.0
2012-06	RAN#56	R5-121907	0618	-	TS 36.521-1: Band 26 Test points for A-MPR test	10.1.0	10.2.0
2012-06	RAN#56	R5-121909	0619	-	CA RF - Adding contents to TC 6.2.4A A-MPR for CA	10.1.0	10.2.0
2012-06	RAN#56	R5-121918	0620	-	TS 36.521-1: Introduction of Band 26/XXVI in section 6	10.1.0	10.2.0
2012-06	RAN#56	R5-121920	0621	-	Corrections of test parameters and test procedure for ACS	10.1.0	10.2.0
2012-06	RAN#56	R5-121921	0622	-	TS 36.521-1: Introduction of Band 26/XXVI in section 7	10.1.0	10.2.0
2012-06	RAN#56	R5-121925	0623	-	CA RF - addition of test case 8.7.2.1A TDD sustained data rate performance for CA	10.1.0	10.2.0
2012-06	RAN#56	R5-121937	0624	-	A-MPR: Band 20, NS_10 not tested	10.1.0	10.2.0
2012-06	RAN#56	R5-121938	0625	-	RF: Several corrections to sustained data rate TC-s 8.7.1 and 8.7.2	10.1.0	10.2.0
2012-06	RAN#56	R5-121939	0626	-	RF: Corrections to CSI tests	10.1.0	10.2.0
2012-06	RAN#56	R5-121944	0627	-	Addition of a new TC 6.3.3B	10.1.0	10.2.0
2012-06	RAN#56	R5-121945	0628	-	Addition of a new TC 6.3.2B for Minimum Output Power for UL-MIMO	10.1.0	10.2.0
2012-06	RAN#56	R5-121946	0629	-	Addition of a new TC 6.3.4B	10.1.0	10.2.0
2012-06	RAN#56	R5-121947	0630	-	Addition of a new TC 6.5.1B for Frequency Error for UL-MIMO	10.1.0	10.2.0
2012-06	RAN#56	R5-121948	0631	-	Addition of a new TC 6.6.1B	10.1.0	10.2.0
2012-06	RAN#56	R5-121949	0632	-	Addition of a new TC 6.7B	10.1.0	10.2.0
2012-06	RAN#56	R5-121950	0633	-	Addition of a new TC for Configured transmitted power for UL-MIMO	10.1.0	10.2.0
2012-06	RAN#56	R5-121951	0634	-	Addition of a new TC for Power Control Absolute Power Tolerance for UL-MIMO	10.1.0	10.2.0
2012-06	RAN#56	R5-121955	0635	-	SEM for CA	10.1.0	10.2.0
2012-06	RAN#56	R5-121956	0636	-	Addition of a new TC for Carrier leakage for UL-MIMO	10.1.0	10.2.0
2012-06	RAN#56	R5-121957	0637	-	Addition of a new TC for In-band emissions for non allocated RB for UL-MIMO	10.1.0	10.2.0
2012-06	RAN#56	R5-121958	0638	-	Addition of a new TC for EVM equalizer spectrum flatness for UL-MIMO	10.1.0	10.2.0
2012-06	RAN#56	R5-121959	0639	-	Addition of a new TC for Reference sensitivity level for UL-MIMO	10.1.0	10.2.0
2012-06	RAN#56	R5-121960	0640	-	Addition of a new TC for Maximum input level for UL-MIMO	10.1.0	10.2.0
2012-06	RAN#56	R5-121961	0641	-	Addition of a new TC for Adjacent Channel Selectivity (ACS) for UL-MIMO	10.1.0	10.2.0
2012-06	RAN#56	R5-121962	0642	-	Addition of a new TC for In-band blocking for UL-MIMO	10.1.0	10.2.0
2012-06	RAN#56	R5-121963	0643	-	Addition of a new TC for Narrow band blocking for UL-MIMO	10.1.0	10.2.0
2012-06	RAN#56	R5-121964	0644	-	Addition of a new TC for Wide band Intermodulation for UL-MIMO	10.1.0	10.2.0

2012-06	RAN#56	R5-121983	0645	-	Introduction of Chapter8 Single antenna port and Open loop spatial Multiplexing TDD test cases for CA capable UEs	10.1.0	10.2.0
2012-06	RAN#56	R5-121984	0646	-	EVM and Global In-Channel TX-Test for intra band CA	10.1.0	10.2.0
2012-06	RAN#56	R5-121985	0647	-	RF: Corrections to applicability of some CA tests	10.1.0	10.2.0
2012-06	RAN#56	R5-121986	0648	-	Addition of test description to Occupied bandwidth for CA	10.1.0	10.2.0
2012-06	RAN#56	R5-121987	0649	-	Addition of test description to ACLR for CA	10.1.0	10.2.0
2012-06	RAN#56	R5-121988	0650	-	Addition of test description to Transmitter Spurious emissions for CA	10.1.0	10.2.0
2012-06	RAN#56	R5-121989	0651	-	Addition of test description to Reference sensitivity level for CA	10.1.0	10.2.0
2012-06	RAN#56	R5-121994	0652	-	Addition of Codebook Subset Restriction in 8.3.2.x	10.1.0	10.2.0
2012-06	RAN#56	R5-121995	0653	-	Update of 6.3.5.2	10.1.0	10.2.0
2012-06	RAN#56	R5-121996	0654	-	TS 36.521-1: 9.4.1.2.1 and 9.4.1.2.2.1 test procedure correction	10.1.0	10.2.0
2012-06	RAN#56	R5-121997	0655	-	TS 36.521-1: Minimum conformance requirements alignments for section 9	10.1.0	10.2.0
2012-06	RAN#56	R5-122003	0656	-	Addition of a new TC for Out-of-band blocking for UL-MIMO	10.1.0	10.2.0
2012-06	RAN#56	R5-122004	0657	-	Addition of a new TC for Spurious response for UL-MIMO	10.1.0	10.2.0
2012-06	RAN#56	R5-122006	0658	-	Addition of a new TC for Error Vector Magnitude for UL-MIMO	10.1.0	10.2.0
2012-09	RAN#57	R5-123136	0659	-	Correction of TC 6.3.5.2	10.2.0	10.3.0
2012-09	RAN#57	R5-123146	0660	-	Corrections to Transmitter Characteristics Requirements	10.2.0	10.3.0
2012-09	RAN#57	R5-123148	0661	-	Correction to SNR definition	10.2.0	10.3.0
2012-09	RAN#57	R5-123150	0662	-	RF: Several editorial corrections	10.2.0	10.3.0
2012-09	RAN#57	R5-123161	0663	-	RF: PDCCH Padding in Rx spurious emissions test	10.2.0	10.3.0
2012-09	RAN#57	R5-123179	0664	-	Introduction of eDL-MIMO to Propagation Conditions	10.2.0	10.3.0
2012-09	RAN#57	R5-123209	0665	-	RF: Alignment of RMC references in test procedure of CSI tests	10.2.0	10.3.0
2012-09	RAN#57	R5-123234	0666	-	LTE RF - Correction to 7.4 and 7.5 UL allocations	10.2.0	10.3.0
2012-09	RAN#57	R5-123239	0667	-	Addition of test description to CA Maximum input level test case	10.2.0	10.3.0
2012-09	RAN#57	R5-123267	0668	-	Correction to Occupied bandwidth for CA	10.2.0	10.3.0
2012-09	RAN#57	R5-123268	0669	-	Correction to Reference sensitivity level for CA	10.2.0	10.3.0
2012-09	RAN#57	R5-123324	0670	-	New Annex for: Statistical testing of receiver performance with throughput for CA	10.2.0	10.3.0
2012-09	RAN#57	R5-123330	0671	-	Correction to test parameters in 6.6.3.2	10.2.0	10.3.0
2012-09	RAN#57	R5-123332	0672	-	Update of section 8 uncertainties and Test Tolerances for Rel-9 Tests	10.2.0	10.3.0
2012-09	RAN#57	R5-123333	0673	-	Clarification of RB allocation for DRS demodulation tests	10.2.0	10.3.0
2012-09	RAN#57	R5-123334	0674	-	Correction to uplink reference measurement channel	10.2.0	10.3.0
2012-09	RAN#57	R5-123386	0675	-	Addition of a new TC for power control relative power tolerance for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123387	0676	-	Addition of a new TC for aggregate power control tolerance for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123392	0677	-	Update carrier frequency and EARFCN	10.2.0	10.3.0
2012-09	RAN#57	R5-123394	0678	-	Update test case of UE maximum output power for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123395	0679	-	Update test case of configured UE transmitted output power for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123397	0680	-	Update test case of power control absolute power tolerance for UL- MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123507	0681	-	Editorial corrections to blocking characteristics for CA	10.2.0	10.3.0
2012-09	RAN#57	R5-123510	0682	-	ACLR for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123521	0683	-	TS 36.521-1: A-MPR and additional spurious corrections	10.2.0	10.3.0
2012-09	RAN#57	R5-123522	0684	-	TS 36.521-1: UL allocation clarification in PUSCH-EVM with exclusion period test	10.2.0	10.3.0
2012-09	RAN#57	R5-123523	0685	-	TS 36.521-1: Section 9 applicability revision (UE categories)	10.2.0	10.3.0
2012-09	RAN#57	R5-123534	0687	-	TS 36.521-1:A-MPR Test tolerances update for NS_12, NS_13, NS_14, NS_15	10.2.0	10.3.0
2012-09	RAN#57	R5-123547	0688	-	Correction to the content of reference table number for TC 7.8.1	10.2.0	10.3.0
2012-09	RAN#57	R5-123783	0689	-	Corrections to EVM and global in channel test for Intra-Band CA	10.2.0	10.3.0
2012-09	RAN#57	R5-123850	0690	-	Correction to ONOFF time mask for CA	10.2.0	10.3.0
2012-09	RAN#57	R5-123851	0691	-	Correction to Transmitter Spurious emissions for CA	10.2.0	10.3.0
2012-09	RAN#57	R5-123852	0692	-	New Annex for: Statistical testing of receiver characteristics with CA	10.2.0	10.3.0
2012-09	RAN#57	R5-123853	0693	-	Introduction of eDL-MIMO to measurement of performance requirements	10.2.0	10.3.0
2012-09	RAN#57	R5-123854	0694	-	Addition of a new TC for additional maximum power reduction (A-MPR) for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123855	0695	-	Additional texts for Note2 in Spurious emission test	10.2.0	10.3.0
2012-09	RAN#57	R5-123857	0696	-	Additions to test requirements for Maximum Power Reduction for CA	10.2.0	10.3.0
2012-09	RAN#57	R5-123859	0697	-	Addition of a new TC for time alignment between transmitter branches for UL-MIMO	10.2.0	10.3.0

2012-09	RAN#57	R5-123900	0698	-	Changes associatedw ith PHS band operation change for LTE	10.2.0	10.3.0
2012-09	RAN#57	R5-123901	0699	-	TS 36.521-1: PDSCH RMC for Rel-9 PCFICH test cases	10.2.0	10.3.0
2012-09	RAN#57	R5-123902	0700	-	TS 36.521-1:Adding missing UL RMCs for test 9.4.1.2.2	10.2.0	10.3.0
2012-09	RAN#57	R5-123910	0701	-	MPR for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123911	0702	-	SEM for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123912	0703	-	ADDITIONAL SEM for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123915	0704	-	RF: Update of Annex I	10.2.0	10.3.0
2012-09	RAN#57	R5-123917	0705	-	Correction of test procedure for 36.521-1 chapter 8 CA test cases	10.2.0	10.3.0
2012-09	RAN#57	R5-123919	0706	-	TS 36.521-1: New test cases for CQI reporting under fading conditions - PUCCH 1-0	10.2.0	10.3.0
2012-09	RAN#57	R5-123932	0707	-	RF: Updates to transmission mode 8 test cases	10.2.0	10.3.0
2012-09	RAN#57	R5-123933	0708	-	RF: Several corrections to MBMS performance tests	10.2.0	10.3.0
2012-09	RAN#57	R5-123934	0709	-	Addition of RF Test case: 8.7.2.1_1 TDD sustained data rate performance (Rel-10 and forward)	10.2.0	10.3.0
2012-09	RAN#57	R5-123943	0710	-	Introduction of FDD PMI Reporting - PUSCH 1-2 (Multiple PMI) for eDL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123944	0711	-	Introduction of TDD PMI Reporting - PUSCH 1-2 (Multiple PMI) for eDL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123945	0712	-	FDD RI Reporting for eDL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123946	0713	-	TDD RI Reporting for eDL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123947	0714	-	Introduction of eDL-MIMO to CSI Reference Measurement Channels	10.2.0	10.3.0
2012-09	RAN#57	R5-123948	0715	-	Introduction of eDL-MIMO to structure of subclauses	10.2.0	10.3.0
2012-09	RAN#57	R5-123950	0716	-	RF-CA: Introduction of new specification structure for Tx tests for CA	10.2.0	10.3.0
2012-09	RAN#57	R5-123951	0717	-	CA RF - TC 6.2.2A update	10.2.0	10.3.0
2012-09	RAN#57	R5-123952	0718	-	CA RF - Updates to Blocking Test Cases	10.2.0	10.3.0
2012-09	RAN#57	R5-123953	0719	-	CA RF - TC 7.7A Spurious Response update	10.2.0	10.3.0
2012-09	RAN#57	R5-123954	0720	-	New RF TC for 36.521-1 _ 6.3.5A.1 Pow er Control Absolute pow er tolerance for CA	10.2.0	10.3.0
2012-09	RAN#57	R5-123955	0721	-	New RF TC for 36.521-1 _ 6.3.5A.2 Pow er Control Relative pow er tolerance for CA	10.2.0	10.3.0
2012-09	RAN#57	R5-123956	0722	-	Correction to Transmit OFF pow er for CA	10.2.0	10.3.0
2012-09	RAN#57	R5-123957	0723	-	Adjusting test procedure and test requirements to new Annex G.3A	10.2.0	10.3.0
2012-09	RAN#57	R5-123958	0724	-	Update of Test case 8.7.2.1A TDD sustained data rate performance for CA	10.2.0	10.3.0
2012-09	RAN#57	R5-123961	0725	-	Corrections to A-MPR for CA	10.2.0	10.3.0
2012-09	RAN#57	R5-123962	0726	-	Additions to test description for Adjacent Channel Selectivity (ACS) for CA	10.2.0	10.3.0
2012-09	RAN#57	R5-123963	0727	-	Introduction to UE configured transmitted output power for CA	10.2.0	10.3.0
2012-09	RAN#57	R5-123964	0728	-	Introduction of ACS and UE configured Tx output power for CA in Annex	10.2.0	10.3.0
2012-09	RAN#57	R5-123969	0729	-	Introduction Single-Layer Spatial Multiplexing for eDL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123970	0730	-	updates to 6.6.2.1A SEM for CA	10.2.0	10.3.0
2012-09	RAN#57	R5-123977	0731	-	Addition of a new TC6.6.3B.1 for Transmitter Spurious emissions for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123978	0732	-	Addition of a new TC6.6.3B.2 for Spurious emission band UE co-existence for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123979	0733	-	Addition of a new TC6.6.3B.3 for Additional spurious emissions for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123980	0734	-	Addition of a new TC for narrow band blocking for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123981	0735	-	Update test case of general ON OFF time mask for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123982	0736	-	Update test case of frequency error for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123983	0737	-	Update test case of Error Vector Magnitude (EVM) for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123984	0738	-	Update test case of carrier leakage for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123985	0739	-	Update test case of in-band emissions for non allocated RB for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123986	0740	-	Update test case of EVM equalizer spectrum flatness for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123987	0741	-	Update test case of reference sensitivity level for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123988	0742	-	Update test case of maximum input level for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123989	0743	-	Update test case of in-band blocking for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123990	0744	-	Update test case of out-of-band blocking for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123991	0745	-	Update test case of spurious response for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123992	0746	-	Update test case of wide band Intermodulation for UL-MIMO	10.2.0	10.3.0
2012-09	RAN#57	R5-123994	0747	-	Update test case of Adjacent Channel Selectivity (ACS) for UL-MIMO	10.2.0	10.3.0
2012-12	RAN#58	R5-125109	0749	-	Update of TC6.6.3B.2 for Spurious emissions band UE co-existence for UL-MIMO	10.3.0	10.4.0

2012-12	RAN#58	R5-125110	0750	-	Update of TC6.6.3B.3 for Additional spurious emissions for UL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125146	0751	-	Corrections to Test Procedure of TC 6.6.2.3 ACLR	10.3.0	10.4.0
2012-12	RAN#58	R5-125147	0752	-	Updates for TC 6.2.3B MPR for UL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125148	0753	-	Updates for TC 6.6.2.1B SEM for UL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125149	0754	-	Updates for TC 6.6.2.2B A-SEM for UL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125150	0755	-	Updates for TC 6.6.2.3B ACLR for UL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125215	0756	-	Correction of TC 6.6.2.1	10.3.0	10.4.0
2012-12	RAN#58	R5-125252	0757	-	Adding normative reference for core requirements in TC 6.2.4	10.3.0	10.4.0
2012-12	RAN#58	R5-125253	0758	-	Adding normative reference for core requirements for many section 9 tests	10.3.0	10.4.0
2012-12	RAN#58	R5-125254	0759	-	Correction of table references in sub clause G.X	10.3.0	10.4.0
2012-12	RAN#58	R5-125260	0760	-	CR to TC 7.4A: Splitting the CA Maximum input level test case	10.3.0	10.4.0
2012-12	RAN#58	R5-125263	0761	-	RF CI G.3A: General corrections and completion of Annex G.3A with TDD tests	10.3.0	10.4.0
2012-12	RAN#58	R5-125304	0762	-	Updates for Minimum requirements of 6.2.5 Configured UE transmitted Output Power	10.3.0	10.4.0
2012-12	RAN#58	R5-125309	0763	-	Addition of Band 28 definition to Chap.5	10.3.0	10.4.0
2012-12	RAN#58	R5-125311	0764	-	Addition of Band 28 to 6.2.2 MOP	10.3.0	10.4.0
2012-12	RAN#58	R5-125314	0765	-	Addition of Band 28 to 7.3 Refsens	10.3.0	10.4.0
2012-12	RAN#58	R5-125321	0766	-	Updates for TC6.6.1A: Occupied bandwidth for CA	10.3.0	10.4.0
2012-12	RAN#58	R5-125322	0767	-	Updates for TC6.6.2.3A: ACLR for CA	10.3.0	10.4.0
2012-12	RAN#58	R5-125323	0768	-	Updates for TC6.6.3.1A: Transmitter Spurious emissions for CA	10.3.0	10.4.0
2012-12	RAN#58	R5-125346	0769	-	TC 6.2.4A.1 A-MPR for CA updates	10.3.0	10.4.0
2012-12	RAN#58	R5-125351	0770	-	Correction to LTE Rx TCs UL allocation location	10.3.0	10.4.0
2012-12	RAN#58	R5-125365	0771	-	Uncertainties and Test Tolerances for Rel-9 CQI Reporting under fading conditions, PUCCH 1-0 Tests	10.3.0	10.4.0
2012-12	RAN#58	R5-125374	0772	-	Clean up of Tx tests	10.3.0	10.4.0
2012-12	RAN#58	R5-125405	0773	-	Addition of 15MHz and 20MHz Bandwidths for Band 23	10.3.0	10.4.0
2012-12	RAN#58	R5-125407	0774	-	RF TC 6.6.3.2: Clarification and corrections	10.3.0	10.4.0
2012-12	RAN#58	R5-125417	0775	-	Additions to test description for TC 7.5A.1 Adjacent Channel Selectivity (ACS) for CA (intra-band contiguous DL CA and UL CA)	10.3.0	10.4.0
2012-12	RAN#58	R5-125422	0776	-	Introduction to CA_1 & CA_40 TC 7.5A.2 Adjacent Channel Selectivity (ACS) for CA (intra-band contiguous DL CA without UL CA)	10.3.0	10.4.0
2012-12	RAN#58	R5-125443	0777	-	Corrections of RMC for receiver characteristics	10.3.0	10.4.0
2012-12	RAN#58	R5-125445	0778	-	Corrections of FRC subframe allocations for performance requirements	10.3.0	10.4.0
2012-12	RAN#58	R5-125450	0779	-	Introduction of TC 9.2.2.1_D FDD CQI Reporting under AWGN conditions - PUCCH 1-1 for eDL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125451	0780	-	Introduction of TC 9.2.2.2_D TDD CQI Reporting under AWGN conditions - PUCCH 1-1 for eDL-MIMO	10.3.0	10.4.0

2012-12	RAN#58	R5-125452	0781	-	Introduction of TC 9.3.2.2.1_D FDD CQI Reporting under fading conditions - PUCCH 1-1 for eDL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125453	0782	-	Introduction of TC 9.3.2.2.2_D TDD CQI Reporting under fading conditions - PUCCH 1-1 for eDL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125454	0783	-	Additions of eDL-MIMO to Annex A	10.3.0	10.4.0
2012-12	RAN#58	R5-125455	0784	-	Additions of eDL-MIMO to Annex B Propagation Conditions for eDL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125456	0785	-	Additions of eDL-MIMO to Annex F	10.3.0	10.4.0
2012-12	RAN#58	R5-125463	0786	-	Additions to TC 9.4.2.1.1_D FDD PMI Reporting - PUSCH 1-2 (Multiple PMI) for eDL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125464	0787	-	Additions to TC 9.4.2.1.2_D TDD PMI Reporting - PUSCH 1-2 (Multiple PMI) for eDL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125465	0788	-	Additions to TC 9.5.1.1_D FDD RI Reporting for eDL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125466	0789	-	Additions to TC 9.5.1.2_D TDD RI Reporting for eDL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125593	0790	-	RF TC 6.2.4: Minor correction to test points for NS_15	10.3.0	10.4.0
2012-12	RAN#58	R5-125594	0791	-	RF TC 6.2.4B: Minor correction to test points for NS_15	10.3.0	10.4.0
2012-12	RAN#58	R5-125610	0792	-	TS 36-521-1: MPR correction for band 26	10.3.0	10.4.0
2012-12	RAN#58	R5-125801	0793	-	Updates of 6.3.3A UE Transmit OFF power for CA	10.3.0	10.4.0
2012-12	RAN#58	R5-125802	0794	-	Update of Annex F in 36.521-1	10.3.0	10.4.0
2012-12	RAN#58	R5-125803	0795	-	Updates for 6.3.4A ON/OFF time mask for CA	10.3.0	10.4.0
2012-12	RAN#58	R5-125804	0796	-	Addition of Transmitter test case - Transmit intermodulation for CA	10.3.0	10.4.0
2012-12	RAN#58	R5-125835	0797	-	Update of TC6.6.3B.1 for Transmitter Spurious emissions for UL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125851	0798	-	Introduction of TC 8.3.1.2.1_D FDD PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125852	0799	-	Introduction of TC 8.3.2.2.1_D TDD PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125853	0800	-	Additions to Annex G for eDL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125854	0801	-	Corrections to Annex H for eDL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125855	0802	-	Additions to TC 8.3.2.1.2_D TDD Single-Layer Spatial Multiplexing on antenna ports without a simultaneous transmission for eDL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125856	0803	-	Additions to TC 8.3.2.1.3_D TDD Single-Layer Spatial Multiplexing on antenna ports with a simultaneous transmission for eDL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125857	0804	-	Introduction of Band 27 to TS 36.521-1	10.3.0	10.4.0
2012-12	RAN#58	R5-125858	0805	-	Updates to TC 8.2.2.3.1_A.1 for CA	10.3.0	10.4.0
2012-12	RAN#58	R5-125859	0806	-	Addition of new test case 8.2.1.4.2_A.1 for CA	10.3.0	10.4.0
2012-12	RAN#58	R5-125860	0807	-	Addition of new test case 8.2.2.4.2_A.1 for CA	10.3.0	10.4.0
2012-12	RAN#58	R5-125861	0808	-	Addition of sustained downlink data rate TC 8.7.1.1_A.1 for CA	10.3.0	10.4.0
2012-12	RAN#58	R5-125862	0809	-	Addition of sustained downlink data rate TC 8.7.1.1_A.2 for CA	10.3.0	10.4.0
2012-12	RAN#58	R5-125866	0810	-	Update of RF TC for 36.521-1 _ 6.3.5A.2.1 Power Control Relative power tolerance for CA	10.3.0	10.4.0

2012-12	RAN#58	R5-125867	0811	-	Update TC 6.6.3.2_1 Spurious emission band UE co-existence(Release 9 and forward)	10.3.0	10.4.0
2012-12	RAN#58	R5-125868	0812	-	Correction to test applicability in 6.2.4 A-MPR test case	10.3.0	10.4.0
2012-12	RAN#58	R5-125869	0813	-	Correction to test parameter in Perf 8.2.1 of 36.521-1	10.3.0	10.4.0
2012-12	RAN#58	R5-125870	0814	-	Clarification of AG level for 8.7 sustained data rate test of 36.521-1	10.3.0	10.4.0
2012-12	RAN#58	R5-125871	0815	-	Correction to SNR test points in test procedure	10.3.0	10.4.0
2012-12	RAN#58	R5-125872	0816	-	Clarification of random precoding granularity	10.3.0	10.4.0
2012-12	RAN#58	R5-125873	0817	-	Update of General sections for CA	10.3.0	10.4.0
2012-12	RAN#58	R5-125874	0818	-	Introduction to CA_1-5 TC 7.5A.3 Adjacent Channel Selectivity (ACS) for CA (inter-band DL CA without UL CA)	10.3.0	10.4.0
2012-12	RAN#58	R5-125875	0819	-	Addition of a new TC 6.3.5A.3.1 Aggregate power control tolerance for CA(intra-band contiguous DL CA and UL CA)	10.3.0	10.4.0
2012-12	RAN#58	R5-125876	0820	-	Addition of a new TC 6.6.3.2A.1 Spurious emission band UE co-existence for CA(intra-band contiguous DL CA and UL CA)	10.3.0	10.4.0
2012-12	RAN#58	R5-125890	0821	-	Addition of Band 28 to 6.6.3.2 Spurious emission band UE co-existence	10.3.0	10.4.0
2012-12	RAN#58	R5-125891	0822	-	Addition of Band 28 to 6.6.3.3 Additional spurious emissions	10.3.0	10.4.0
2012-12	RAN#58	R5-125892	0823	-	UE output power definition for UL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125893	0824	-	Update TC 6.2.4B Additional maximum power reduction (A-MPR) for UL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125894	0825	-	Update TC 6.5.2B.1 Error vector magnitude (EVM) for UL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125895	0826	-	Update TC 6.2.5B Configured transmitted output power for UL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125896	0827	-	Update TC 7.3B Reference sensitivity level for UL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125897	0828	-	Update TC 7.4B Maximum input level for UL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125898	0829	-	Update TC 7.5B Adjacent Channel Selectivity (ACS) for UL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125899	0830	-	Update TC 7.6.1B In-band blocking for UL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125900	0831	-	Update TC 7.6.2B Out-of-band blocking for UL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125901	0832	-	Update TC 7.6.3B Narrow band blocking for UL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125902	0833	-	Update TC 7.7B Spurious response for UL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125903	0834	-	Update TC 7.8.1B Wide band intermodulation for UL-MIMO	10.3.0	10.4.0
2012-12	RAN#58	R5-125906	0835	-	New RF TC for 36.521-1_8.2.1.2.3_Enhanced ICIC for LTE	10.3.0	10.4.0
2012-12	RAN#58	R5-125907	0836	-	New RF TC for 36.521-1_8.4.1.2.3_Enhanced ICIC for LTE	10.3.0	10.4.0
2012-12	RAN#58	R5-125908	0837	-	TDD CQI Reporting under AWGN conditions-PUCCH 1-0-Demod subframe overlaps with aggressor cell ABS (eICIC)	10.3.0	10.4.0
2012-12	RAN#58	R5-125909	0838	-	TDD PHICH Transmit Diversity 2x2-Demod subframe overlaps with aggressor cell ABS (eICIC)	10.3.0	10.4.0
2012-12	RAN#58	R5-125910	0839	-	TDD PDSCH Open Loop Spatial Multiplexing 2x2 Demod subframe overlaps with aggressor cell ABS (eICIC)	10.3.0	10.4.0
2012-12	RAN#58	R5-125924	0841	-	CR to 8.2.1.1.1_A: Correction to an average throughput measurement	10.3.0	10.4.0

2012-12	RAN#58	R5-125925	0842	-	CR to 8.2.1.3.1_A: Correction to an average throughput measurement	10.3.0	10.4.0
2012-12	RAN#58	R5-125931	0844	-	Additions to test description TC 6.2.5A.1 and 6.2.5A.2 including CA_1A-19A and CA_1A-21A updates	10.3.0	10.4.0
2012-12	RAN#58	R5-125932	0845	-	Updates for TC7.3A: Reference sensitivity level for CA including CA_41C, CA_1-19 and CA_1-21	10.3.0	10.4.0
2012-12	RAN#58	R5-125934	0846	-	Update of RF TC for 36.521-1 _ 6.3.5A.1.1 Power Control Absolute power tolerance for CA	10.3.0	10.4.0
2012-12	RAN#58	R5-125935	0847	-	Updates for TC6.5.1A: Frequency error for CA	10.3.0	10.4.0
2012-12	RAN#58	R5-126043	0849	-	Updates for 5.2A operating bands for CA_7, CA_38, CA_41, CA_1-18, CA_1-19, CA_1-21, CA_2-17, CA_3-5, CA_3-7, CA_3-8, CA_3-20, CA_4-12, CA_4-13, CA_4-17, CA_4-20	10.3.0	10.4.0
2012-12	RAN#58	R5-126044	0850	-	Updates for 5.4.2A channel bandwidth for CA_7, CA_38, CA_41, CA_1-18, CA_1-19, CA_1-21, CA_2-17, CA_3-5, CA_3-7, CA_3-8, CA_3-20, CA_4-12, CA_4-13, CA_4-17, CA_4-20	10.3.0	10.4.0
2012-12	RAN#58	R5-126063	0840	-	Update of Perf 8.7.1.1 and 8.7.2.1 of 36.521-1	10.3.0	10.4.0
2012-12	RAN#58	R5-126065	0843	-	Clarification of RB position in 9.4.1 and 9.4.2	10.3.0	10.4.0
2012-12	RAN#58	R5-126066	0848	-	Update of minimum test time in Annex G.3.5	10.3.0	10.4.0
2012-12	RAN#58	R5-124010	0851	-	RF CI 8.1.1: Update of the CA capability table	10.3.0	10.4.0
2012-12	RAN#58	R5-124013	0852	-	RF CI 8.7.2.1A: Update of test structure according to the work plan	10.3.0	10.4.0
2012-12	RAN#58	R5-124082	0853	-	Correction to TC 7.5.1 Adjacent Channel Selectivity (ACS)	10.3.0	10.4.0
2012-12	RAN#58	R5-124116	0854	-	Addition to test description for SEM for CA	10.3.0	10.4.0
2012-12	RAN#58	R5-124123	0855	-	Addition to minimum requirement for TC 6.5.2A.3.1 in-band emissions for non allocated RB for CA	10.3.0	10.4.0
2012-12	RAN#58	R5-124125	0856	-	TC 6.2.2A.1 UE MOP for CA updates	10.3.0	10.4.0
2012-12	RAN#58	R5-124126	0857	-	CR to Annex G.3A.5: Minimum number of samples for CA performance tests	10.3.0	10.4.0
2012-12	RAN#58	R5-124131	0858	-	Additions to test case for TC 6.2.3A.1 Maximum Power Reduction (MPR) for CA (intra-band contiguous DL CA and UL CA)	10.3.0	10.4.0
2012-12	RAN#58	R5-124133	0859	-	Introduction to TC 6.6.3.3A.1 Additional spurious emissions for CA (intra-band contiguous DL CA and UL CA)	10.3.0	10.4.0
2012-12	RAN#58	R5-124139	0860	-	TC 6.3.2A.1 Minimum Output Power for CA introduction	10.3.0	10.4.0
2012-12	RAN#58	R5-124149	0861	-	RF TC 8.2.2.1.1_A: Adjusting test procedure and requirements to completed Annex G.3A	10.3.0	10.4.0
2012-12	RAN#58	R5-124160	0862	-	TC 7.6.1A.x In-band blocking for CA introduction	10.3.0	10.4.0
2012-12	RAN#58	R5-124163	0863	-	TC 7.6.2A.x Out-of-band blocking for CA introduction	10.3.0	10.4.0
2012-12	RAN#58	R5-124164	0864	-	TC 7.6.3A.x Narrow-band blocking for CA introduction	10.3.0	10.4.0
2012-12	RAN#58	R5-124165	0865	-	TC 7.7A.x Spurious response for CA introduction	10.3.0	10.4.0
2012-12	RAN#58	R5-124166	0866	-	Addition of Receiver test case - Wideband intermodulation for CA	10.3.0	10.4.0
2012-12	RAN#58	R5-124186	0867	-	RF: Addition of references to connection diagrams in CA tests	10.3.0	10.4.0
2013-03	RAN#59	R5-130092	0851	-	Updates of 6.6.3.3 - Addition of Low-channel Band 1 coexistence with PHS condition	10.4.0	10.5.0

2013-03	RAN#59	R5-130105	0854	-	Update of TC6.6.3B.2 for Spurious emissions band UE co-existence for UL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130125	0856	-	Update of TC6.6.3B.3 for Additional spurious emissions for UL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130128	0857	-	Update TC 6.2.4B Additional Maximum Power Reduction (A-MPR) for UL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130129	0858	-	Update TC 6.3.5B.1 Power control absolute power tolerance for UL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130130	0859	-	Update TC 6.3.5B.2 Power Control Relative power tolerance for UL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130131	0860	-	Update TC 6.3.5B.3 Aggregate power control tolerance for UL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130132	0861	-	Update TC 6.5.2B.2 Carrier leakage for UL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130133	0862	-	Update TC 6.3.2B Minimum Output Power for UL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130134	0863	-	Update TC 6.6.1B Occupied bandwidth for UL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130135	0864	-	Update TC 6.7B Transmit intermodulation for UL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130176	0869	-	Introduction of new rel-10 Reporting of RI test cases into annexes	10.4.0	10.5.0
2013-03	RAN#59	R5-130182	0870	-	CA RF: Correction to Annex I	10.4.0	10.5.0
2013-03	RAN#59	R5-130183	0871	-	UL-MIMO RF: Correction to Annex I	10.4.0	10.5.0
2013-03	RAN#59	R5-130184	0872	-	eICIC RF: Correction to Annex I	10.4.0	10.5.0
2013-03	RAN#59	R5-130185	0873	-	eDL-MIMO RF: Correction to Annex I	10.4.0	10.5.0
2013-03	RAN#59	R5-130188	0874	-	RF: Correction to TC 8.2.1.1.1 - Frequency range for partial allocation	10.4.0	10.5.0
2013-03	RAN#59	R5-130245	0877	-	Additions to TC 6.6.2.3A.1 Adjacent Channel Leakage power Ratio for CA (intra-band contiguous DL CA and UL CA)	10.4.0	10.5.0
2013-03	RAN#59	R5-130273	0880	-	Corrections to Annex A DL Reference Measurement and PMI Accuracy Measurements	10.4.0	10.5.0
2013-03	RAN#59	R5-130285	0881	-	Correction to TC 8.3.2.1.3 TDD PDSCH Single-layer Spatial Multiplexing on antenna port 7 or 8 with a simultaneous transmission	10.4.0	10.5.0
2013-03	RAN#59	R5-130288	0882	-	Addition to TC 9.2.2.2_D TDD CQI Reporting under AWGN conditions - PUCCH 1-1 for eDL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130291	0883	-	Addition to TC 9.3.2.2.2_D TDD CQI Reporting under fading conditions " PUCCH 1-1 for eDL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130292	0884	-	Additions to TC 9.4.2.1.1_D FDD PMI Reporting - PUSCH 1-2 (Multiple PMI) for eDL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130293	0885	-	Additions to TC 9.4.2.1.2_D TDD PMI Reporting - PUSCH 1-2 (Multiple PMI) for eDL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130298	0886	-	CA RF: Correction to TC 7.6.1A	10.4.0	10.5.0
2013-03	RAN#59	R5-130299	0887	-	Uncertainties and Test Tolerances for Test case 7.4A	10.4.0	10.5.0
2013-03	RAN#59	R5-130308	0888	-	Corrections to test procedure of TC 6.2.2 UE Maximum Output Power	10.4.0	10.5.0
2013-03	RAN#59	R5-130309	0889	-	Corrections to test purpose of TC 6.2.3 Maximum Power Reduction (MPR)	10.4.0	10.5.0
2013-03	RAN#59	R5-130310	0890	-	Correction to test procedure of TC 6.7A.1 Transmit Intermodulation for CA	10.4.0	10.5.0

2013-03	RAN#59	R5-130407	0894	-	Correction to test requirement of 6.2.4A	10.4.0	10.5.0
2013-03	RAN#59	R5-130408	0895	-	Correction to test procedure in 6.3.5A.1	10.4.0	10.5.0
2013-03	RAN#59	R5-130411	0896	-	Correction to test procedure in 6.6.2.3A	10.4.0	10.5.0
2013-03	RAN#59	R5-130413	0897	-	Correction to 7.6.3A.3 test procedure	10.4.0	10.5.0
2013-03	RAN#59	R5-130415	0898	-	Correction to 6.6.3.2A and 6.6.3.3A	10.4.0	10.5.0
2013-03	RAN#59	R5-130416	0899	-	Correction to 6.6.3B.2 and 6.6.3B.3	10.4.0	10.5.0
2013-03	RAN#59	R5-130419	0900	-	Correction to 9.3.4 UE-selected subband CQI	10.4.0	10.5.0
2013-03	RAN#59	R5-130421	0901	-	Correction to wideband CQI-samples	10.4.0	10.5.0
2013-03	RAN#59	R5-130427	0902	-	Update of minimum test time in Annex G.5.4	10.4.0	10.5.0
2013-03	RAN#59	R5-130471	0905	-	Update of spurious emission test cases for introduction of Japanese Regulatory Requirements for LTE Band 8	10.4.0	10.5.0
2013-03	RAN#59	R5-130779	0875	1	CA RF: Clarification on Cell ID	10.4.0	10.5.0
2013-03	RAN#59	R5-130780	0903	1	Correction to 941 and 942	10.4.0	10.5.0
2013-03	RAN#59	R5-130801	0908	-	Additions of CA RF test cases to Annex F	10.4.0	10.5.0
2013-03	RAN#59	R5-130804	0909	-	Correction to 6.6.3.2 and 6.6.3.3	10.4.0	10.5.0
2013-03	RAN#59	R5-130806	0911	-	Update TC 6.6.3.2 Spurious emission band UE co-existence	10.4.0	10.5.0
2013-03	RAN#59	R5-130808	0912	-	CA RF - SCC configuration references	10.4.0	10.5.0
2013-03	RAN#59	R5-130809	0913	-	CA RF Rx - Update of blocking characteristics	10.4.0	10.5.0
2013-03	RAN#59	R5-130811	0915	-	LTE RF - Correction to LTE Rx TCs UL allocation location	10.4.0	10.5.0
2013-03	RAN#59	R5-130901	0916	-	Update of TC 8.7.2.1_A.1 TDD sustained data rate performance for CA (intra-band contiguous DL CA)	10.4.0	10.5.0
2013-03	RAN#59	R5-130902	0917	-	Editorial correction for ON/OFF time mask for CA	10.4.0	10.5.0
2013-03	RAN#59	R5-130903	0918	-	Correction to Band 12 frequency for CA_4-12	10.4.0	10.5.0
2013-03	RAN#59	R5-130908	0920	-	Additions of eDL-MIMO to Annex A.4 CQI Reference Measurement Channels	10.4.0	10.5.0
2013-03	RAN#59	R5-130909	0921	-	Introduction of TC 8.3.1.1.1_D FDD Single-Layer Spatial Multiplexing on antenna ports without a simultaneous transmission for eDL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130910	0922	-	Introduction of FDD TC 8.3.1.1.2_D FDD Single-Layer Spatial Multiplexing on antenna ports with a simultaneous transmission for eDL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130911	0923	-	Additions to TC 8.3.1.2.1_D FDD PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130912	0924	-	Additions to TC 8.3.2.2.1_D TDD PDSCH Dual-layer Spatial Multiplexing for eDL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130913	0925	-	Additions to TC 8.3.2.1.2_D TDD Single-Layer Spatial Multiplexing on antenna ports without a simultaneous transmission for eDL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130914	0926	-	Additions to TC 8.3.2.1.3_D TDD Single-Layer Spatial Multiplexing on antenna ports with a simultaneous transmission for eDL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130924	0934	-	Update RF TC for 36.521-1_8.2.1.2.3_C FDD PDSCH Transmit div 2x2 Enhanced ICIC for LTE	10.4.0	10.5.0
2013-03	RAN#59	R5-130925	0935	-	Update RF TC for 36.521-1_8.4.1.2.3_C FDD PCFICH PDCCH Transmit div 2x2 Enhanced ICIC for LTE	10.4.0	10.5.0

2013-03	RAN#59	R5-130935	0937	-	SNR uncertainty	10.4.0	10.5.0
2013-03	RAN#59	R5-130936	0938	-	Introduction of new rel-10 Reporting of RI test cases	10.4.0	10.5.0
2013-03	RAN#59	R5-130937	0939	-	RF: Corrections to Annex H - Default uplink settings	10.4.0	10.5.0
2013-03	RAN#59	R5-130938	0940	-	Update of TC 8.7.2.1_1 TDD sustained data rate performance (Rel-10 and forward)	10.4.0	10.5.0
2013-03	RAN#59	R5-130939	0941	-	Clarification to Soft Channel Bit size used by SS and UE	10.4.0	10.5.0
2013-03	RAN#59	R5-130940	0942	-	Correction to sustained data rate performance test	10.4.0	10.5.0
2013-03	RAN#59	R5-130941	0943	-	Clean up on performance tests	10.4.0	10.5.0
2013-03	RAN#59	R5-130944	0944	-	Update TC 6.3.5A.3.1 Aggregate power control tolerance for CA (intra-band contiguous DL CA and UL CA)	10.4.0	10.5.0
2013-03	RAN#59	R5-130945	0945	-	Update TC 6.6.3.2A.1 Spurious emission band UE co-existence for CA (intra-band contiguous DL CA and UL CA)	10.4.0	10.5.0
2013-03	RAN#59	R5-130946	0946	-	Additions to TC 6.2.5A.1 Configured UE transmitted Power for CA (intra-band contiguous DL CA and UL CA)	10.4.0	10.5.0
2013-03	RAN#59	R5-130947	0947	-	Additions to TC 6.6.3.3A.1 Additional spurious emissions for CA (intra-band contiguous DL CA and UL CA)	10.4.0	10.5.0
2013-03	RAN#59	R5-130948	0948	-	Additions to TC 7.5A.1 Adjacent Channel Selectivity (ACS) for CA (intra-band contiguous DL CA and UL CA)	10.4.0	10.5.0
2013-03	RAN#59	R5-130949	0949	-	Additions to TC 7.5A.2 Adjacent Channel Selectivity (ACS) for CA (intra-band contiguous DL CA without UL CA)	10.4.0	10.5.0
2013-03	RAN#59	R5-130950	0950	-	Additions to TC 7.5A.3 Adjacent Channel Selectivity (ACS) for CA (inter-band contiguous DL CA without UL CA)	10.4.0	10.5.0
2013-03	RAN#59	R5-130951	0951	-	Correction to test point of Frequency Error for CA and addition of TC for intra-band contiguous DL CA without UL CA	10.4.0	10.5.0
2013-03	RAN#59	R5-130961	0955	-	Channel matrix impairments for eDL-MIMO CSI tests	10.4.0	10.5.0
2013-03	RAN#59	R5-130965	0957	-	TC 9.4.1.1.1_D FDD Reporting of PMI - PUSCH 3-1 (Single PMI) for eDL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130966	0958	-	TC 9.4.1.1.2_D TDD Reporting of PMI - PUSCH 3-1 (Single PMI) for eDL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130967	0959	-	Additions of eDL-MIMO to Annex C Measurement of Performance Requirements	10.4.0	10.5.0
2013-03	RAN#59	R5-130968	0960	-	Additions of eDL-MIMO test cases to Annex F	10.4.0	10.5.0
2013-03	RAN#59	R5-130969	0961	-	Additions to Annex G for eDL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130970	0962	-	Addition to TC 9.2.2.1_D FDD CQI Reporting under AWGN conditions - PUCCH 1-1 for eDL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130971	0963	-	Addition to TC 9.3.2.2.1_D FDD CQI Reporting under fading conditions - PUCCH 1-1 for eDL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130972	0964	-	Additions to TC 9.5.1.1_D FDD RI Reporting for eDL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130973	0965	-	Additions to TC 9.5.1.2_D TDD RI Reporting for eDL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130978	0966	-	Correcting TS 36.521-1 to reflect changes in 36.101	10.4.0	10.5.0
2013-03	RAN#59	R5-130979	0967	-	Correction of RF conformance Test case: 8.2.1.3.3	10.4.0	10.5.0
2013-03	RAN#59	R5-130980	0968	-	Addition new TC 8.2.2.3.3 TDD PDSCH Open Loop Spatial Multiplexing 2x2-Demod subframe overlaps with aggressor cell ABS (eICIC)	10.4.0	10.5.0
2013-03	RAN#59	R5-130994	0969	-	Corrections to 7.8.1A Wideband intermodulation for CA	10.4.0	10.5.0

2013-03	RAN#59	R5-130998	0970	-	TC 9.3.1.2.1_D FDD CQI Reporting under fading conditions - PUSCH 3-1 for eDL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130999	0971	-	TC 9.3.1.2.2_D TDD CQI Reporting under fading conditions - PUSCH 3-1 for eDL-MIMO	10.4.0	10.5.0
2013-03	RAN#59	R5-130093	0852	-	Updates of 5.2A Operating bands for CA_11-18	10.5.0	11.0.0
2013-03	RAN#59	R5-130094	0853	-	Updates of 5.4.2A Channel bandwidth combination for CA_11-18	10.5.0	11.0.0
2013-03	RAN#59	R5-130124	0855	-	Additions to the inter-band relaxation term for CA 3A-8A in Table 6.2.5A.1.3-3	10.5.0	11.0.0
2013-03	RAN#59	R5-130140	0865	-	Update TC 7.3A.3 Reference sensitivity level for CA_3-7 and CA_7-20 (inter-band DL CA without UL CA)	10.5.0	11.0.0
2013-03	RAN#59	R5-130141	0866	-	Update TC 7.6.2A.1 Out-of-band blocking for CA_38 (intra-band contiguous DL CA and UL CA)	10.5.0	11.0.0
2013-03	RAN#59	R5-130142	0867	-	Update TC 6.2.2A.1 UE Maximum Output Power for CA_38 (intra-band contiguous DL CA and UL CA)	10.5.0	11.0.0
2013-03	RAN#59	R5-130144	0868	-	Update TC 6.2.4A.1 Additional Maximum Power Reduction (A-MPR) for CA_38 (intra-band contiguous DL CA and UL CA)	10.5.0	11.0.0
2013-03	RAN#59	R5-130239	0876	-	Updates of 6.2.5A - inter-band relaxation term for CA_1A-18A and CA_11A-18A	10.5.0	11.0.0
2013-03	RAN#59	R5-130257	0878	-	Addition of TDD operating band 44 in receiver characteristic test cases	10.5.0	11.0.0
2013-03	RAN#59	R5-130258	0879	-	Addition of TDD operating band 44 in transmitter characteristic test cases	10.5.0	11.0.0
2013-03	RAN#59	R5-130329	0891	-	Updates for 7.6.1A.1 in-band blocking for CA_7 and CA_41	10.5.0	11.0.0
2013-03	RAN#59	R5-130330	0892	-	Updates for 7.6.2A.1 Out-of-band blocking for CA_7 and CA_41	10.5.0	11.0.0
2013-03	RAN#59	R5-130348	0972	-	Correction to Spurious emission band UE co-existence and Additional spurious emissions for Band 28	10.5.0	11.0.0
2013-03	RAN#59	R5-130349	0893	-	Addition of Band 28 to MPR and A-MPR	10.5.0	11.0.0
2013-03	RAN#59	R5-130769	0907	-	Updates of Refsens for inter-band CA test points for CA_1A-19A and CA_1A-21A	10.5.0	11.0.0
2013-03	RAN#59	R5-130783	0906	-	Update TC 6.2.3A.1 Maximum Power Reduction (MPR) for CA_38 (intra-band contiguous DL CA and UL CA)	10.5.0	11.0.0
2013-03	RAN#59	R5-130805	0910	-	Update TC 7.3A.1 Reference sensitivity level for CA_38, CA_3-7 and CA_7-20 (intra-band contiguous DL CA and UL CA)	10.5.0	11.0.0
2013-03	RAN#59	R5-130810	0914	-	CA_2-17 and CA_4-17 addition to 36.521-1 Rx characteristics	10.5.0	11.0.0
2013-03	RAN#59	R5-130905	0919	-	Addition of TDD operating band 44 in chapter 5	10.5.0	11.0.0
2013-03	RAN#59	R5-130915	0927	-	Addition of band 38 and band 41 in intra-band contiguous CA transmitter test cases	10.5.0	11.0.0
2013-03	RAN#59	R5-130916	0928	-	Update TC 7.6.1A.1 In-band blocking for CA_38 (intra-band contiguous DL CA and UL CA)	10.5.0	11.0.0
2013-03	RAN#59	R5-130917	0929	-	Addition of Inter Band CA combo CA_2A-29A	10.5.0	11.0.0
2013-03	RAN#59	R5-130918	0930	-	Update of 6.2.5A Configured transmitted power for CA	10.5.0	11.0.0
2013-03	RAN#59	R5-130919	0931	-	CA_2-17 and CA_4-17 addition to 36.521-1 Tx characteristics	10.5.0	11.0.0
2013-03	RAN#59	R5-130920	0932	-	Adding transmit power relaxation value for inter-band CA configurations CA_4A-5A and CA_4A-13A	10.5.0	11.0.0

2013-03	RAN#59	R5-130921	0933	-	Adding refsens relaxation value for inter-band CA configurations CA_4A-5A and CA_4A-13A	10.5.0	11.0.0
2013-03	RAN#59	R5-130926	0936	-	Updates for 6.6.2.1A Spectrum emission mask for CA for CA_7 and CA_41	10.5.0	11.0.0
2013-03	RAN#59	R5-130956	0952	-	Updates for 7.3A.1 Reference sensitivity level for CA_7C	10.5.0	11.0.0
2013-03	RAN#59	R5-130957	0953	-	Updates for 6.2.2A UE Maximum Output Power for CA_7 and CA_41	10.5.0	11.0.0
2013-03	RAN#59	R5-130958	0954	-	Updates of 7.3A - Reference sensitivity level for CA_11A-18A	10.5.0	11.0.0
2013-03	RAN#59	R5-130964	0956	-	Adding Band 27 to TS 36.521-1	10.5.0	11.0.0
2013-03	RAN#59	-	-	-	Correction of missing small changes of R5-130806 in Table 6.6.3.2.3-1, 6.6.3.2.5-1, 6.6.3.2_1.3-1 and 6.6.3.2_1.5-1.	11.0.0	11.0.1
2013-06	RAN#60	R5-131085	0973	-	Removal of technical content in 36.521-1 v10.5.0 and substitution with pointer to the next Release	11.0.1	11.1.0
2013-06	RAN#60	R5-131147	0974	-	Updates to Chapter7 for Inter Band CA combo CA_2A-29A	11.0.1	11.1.0
2013-06	RAN#60	R5-131149	0975	-	New chap8 TDD TC 8.2.2.2.3_C for eICIC	11.0.1	11.1.0
2013-06	RAN#60	R5-131150	0976	-	New chap 8 TDD TC 8.4.2.2.3_C for eICIC	11.0.1	11.1.0
2013-06	RAN#60	R5-131153	0977	-	Introduction of new rel-11 Reporting of RI test cases	11.0.1	11.1.0
2013-06	RAN#60	R5-131154	0978	-	Introduction of new rel-11 Reporting of RI test cases into annexes	11.0.1	11.1.0
2013-06	RAN#60	R5-131156	0979	-	Correction to TC 8.4.1.1 test procedure	11.0.1	11.1.0
2013-06	RAN#60	R5-131158	0980	-	Introduction of Maximum Input Level test case for CA (inter-band DL CA without UL CA) into annexes	11.0.1	11.1.0
2013-06	RAN#60	R5-131210	0981	-	Correction of test applicability for TC 8.2.1.1.1_1: TC 8.2.1.2.1_1 and TC 8.3.2.1.1_1 in 36.521-1	11.0.1	11.1.0
2013-06	RAN#60	R5-131222	0982	-	Update of TC6.6.3B.1 for Transmitter Spurious emissions for UL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131226	0983	-	Clarification to test procedure on applying timing offset between CCs for Chap8 inter-band CA test cases	11.0.1	11.1.0
2013-06	RAN#60	R5-131238	0984	-	Update TC 6.2.4A.1 Additional Maximum Power Reduction (A-MPR) for CA_38C (intra-band contiguous DL CA and UL CA)	11.0.1	11.1.0
2013-06	RAN#60	R5-131241	0985	-	Update TC 7.3A.1 Reference sensitivity level for CA_4A-12A (intra-band contiguous DL CA and UL CA)	11.0.1	11.1.0
2013-06	RAN#60	R5-131242	0986	-	Update TC 7.3A.3 Reference sensitivity level for CA_4A-12A (inter-band DL CA without UL CA)	11.0.1	11.1.0
2013-06	RAN#60	R5-131245	0987	-	Update TT of 6.3.5A.3.1 Aggregate power control tolerance for CA (intra-band contiguous DL CA and UL CA)	11.0.1	11.1.0
2013-06	RAN#60	R5-131289	0988	-	Uncertainties and Test Tolerances for CA spectrum emission mask	11.0.1	11.1.0
2013-06	RAN#60	R5-131358	0989	-	RF: Corrections to RMC-s for sustained data rate test	11.0.1	11.1.0
2013-06	RAN#60	R5-131379	0990	-	CA RF - Corrections to 6.2.4A.1 requirements	11.0.1	11.1.0
2013-06	RAN#60	R5-131381	0991	-	LTE RF - Editorial correction to 8.2.2.4.2_1	11.0.1	11.1.0
2013-06	RAN#60	R5-131415	0992	-	Updates for 6.6.1A Occupied bandwidth for CA_41C	11.0.1	11.1.0
2013-06	RAN#60	R5-131450	0993	-	Addition of band44 in MPR for UL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131473	0994	-	References to wrong section in TS 36.508	11.0.1	11.1.0
2013-06	RAN#60	R5-131518	0995	-	Corrections to Common Test Parameters User-Specific	11.0.1	11.1.0

2013-06	RAN#60	R5-131519	0996	-	Corrections to Beamforming Model Parameters	11.0.1	11.1.0
2013-06	RAN#60	R5-131521	0997	-	Corrections to Reporting of Channel State Requirements	11.0.1	11.1.0
2013-06	RAN#60	R5-131522	0998	-	Corrections to Reporting of Precoding Matrix Indicator Requirements	11.0.1	11.1.0
2013-06	RAN#60	R5-131527	0999	-	Additions to Annex G for eDL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131528	1000	-	Additions of eDL-MIMO test cases to Annex F	11.0.1	11.1.0
2013-06	RAN#60	R5-131539	1001	-	LTE RF: Minor changes to test case 7.5A.3	11.0.1	11.1.0
2013-06	RAN#60	R5-131540	1002	-	LTE-RF: Clarification to 7.6.1A.3 test procedure	11.0.1	11.1.0
2013-06	RAN#60	R5-131541	1003	-	Corrections to TC 6.6.2.3A.1 Adjacent Channel Leakage pow er Ratio for CA (intra-band contiguous DL CA and UL CA)	11.0.1	11.1.0
2013-06	RAN#60	R5-131545	1004	-	Additions to TC 9.2.3.1_D for FDD CQI reporting under AWGN conditions - PUCCH 1-1 for eDL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131546	1005	-	LTE-RF: Corrections to CA Open Loop Spatial Multiplexing Performance test cases	11.0.1	11.1.0
2013-06	RAN#60	R5-131553	1006	-	Additions to TC 9.2.3.2_D for TDD CQI reporting under AWGN conditions - PUCCH 1-1 for eDL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131555	1007	-	Additions to TC 9.3.1.2.2_D for TDD CQI reporting under fading conditions - PUSCH 3-1 for eDL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131559	1008	-	Additions to TC 9.3.2.2.2_D for TDD CQI reporting under fading conditions - PUCCH 1-1 for eDL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131561	1009	-	Update of 6.2.5A - Delta TIB for CA_11A-18A	11.0.1	11.1.0
2013-06	RAN#60	R5-131562	1010	-	Additions to TC 9.4.1.3.2_D for TDD reporting of PMI-PUSCH 3-1 (Single PMI) for eDL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131563	1011	-	Update of 7.3A - Delta RIB for CA_11A-18A	11.0.1	11.1.0
2013-06	RAN#60	R5-131567	1012	-	Additions to TC 9.4.2.3.2_D for TDD PMI reporting - PUSCH 1-2 (Multiple PMI) for eDL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131569	1013	-	Additions to TC 9.5.2.2_D for TDD RI reporting - PUCCH 1-1 for eDL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131634	1014	-	Removal of Spurious emission UE co-existence test case 6.6.3.2_1 from annex F	11.0.1	11.1.0
2013-06	RAN#60	R5-131649	1015	-	Adding Band28 in some Receiver test cases in section 7	11.0.1	11.1.0
2013-06	RAN#60	R5-131677	1016	-	Correction to the contents of the chapter 5.	11.0.1	11.1.0
2013-06	RAN#60	R5-131711	1017	-	Corrections to test procedure of TC 7.5B Adjacent Channel Selectivity (ACS) for UL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131900	1018	-	RF: Correction of Imcs for CQI index 10 (15 RBs)	11.0.1	11.1.0
2013-06	RAN#60	R5-131901	1019	-	Corrections to Frequency non-selective scheduling mode	11.0.1	11.1.0
2013-06	RAN#60	R5-131902	1020	-	Correction to the missing title of Rel 9 close loop tests	11.0.1	11.1.0
2013-06	RAN#60	R5-131903	1021	-	Correction to the references of connection diagrams	11.0.1	11.1.0
2013-06	RAN#60	R5-131904	1022	-	Maintenance of Band 23 additional regulatory requirements	11.0.1	11.1.0
2013-06	RAN#60	R5-131905	1023	-	Realignment of A-MPR Configuration Tables for Band 27 in TS 36.521-1	11.0.1	11.1.0
2013-06	RAN#60	R5-131906	1024	-	Update on General section of Tx and Rx for Cell IDs	11.0.1	11.1.0
2013-06	RAN#60	R5-131907	1025	-	LTE RF: Initial conditions update for test 6.2.5A.2	11.0.1	11.1.0

2013-06	RAN#60	R5-131908	1026	-	CA RF: Alignment for inter-band Rx tests with DL tested only as S-Cell	11.0.1	11.1.0
2013-06	RAN#60	R5-131909	1027	-	36.521-1: Inter-band CA operating bands update	11.0.1	11.1.0
2013-06	RAN#60	R5-131911	1028	-	Updates for 7.7A.1 Spurious response for CA	11.0.1	11.1.0
2013-06	RAN#60	R5-131915	1029	-	Additions to TC 9.3.1.2.1_D for FDD CQI reporting under fading conditions - PUSCH 3-1 for eDL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131916	1030	-	Additions to TC 9.3.2.2.1_D for FDD CQI reporting under fading conditions - PUCCH 1-1 for eDL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131917	1031	-	Additions to TC 9.4.1.3.1_D for FDD reporting of PMI - PUSCH 3-1 (Single PMI) for eDL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131918	1032	-	Additions to TC 9.4.2.3.1_D for FDD PMI reporting - PUSCH 1-2 (Multiple PMI) for eDL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131919	1033	-	Additions to TC 9.5.2.1_D for FDD RI reporting - PUCCH 1-1 for eDL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131920	1034	-	Adding Band28 in some Transmitter test cases in section 6	11.0.1	11.1.0
2013-06	RAN#60	R5-131921	1035	-	New RF TC for 36.521-1_8.5.1.2.3_C.1_Enhanced ICIC for LTE	11.0.1	11.1.0
2013-06	RAN#60	R5-131929	1036	-	Update TT of 6.2.2B_6.2.3B_6.2.4B and 6.2.5B for UL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131930	1037	-	Update TT of 6.3.2B_6.3.3B and 6.3.4B for UL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131931	1038	-	Update TT of 6.3.5B.1_6.3.5B.2 and 6.3.5B.3 for UL- MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131932	1039	-	Update TT of 6.5.1B_6.5.2B.1_6.5.2B.2_6.5.2B.3_6.5.2B.4 for UL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131933	1040	-	Update TT of 6.6.1B Occupied bandwidth for UL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131934	1041	-	Update TT of 6.6.2.1B_6.6.2.2B and 6.6.2.3B for UL- MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131935	1042	-	Update TT of 6.7B Transmit intermodulation for UL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131936	1043	-	Update TT of 6.8B Time alignment error for UL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131937	1044	-	Update TT of 7.3B Reference sensitivity level for UL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131952	1045	-	Corrections to TC 6.2.5A.1 Configured UE transmitted Power for CA (intra-band contiguous DL CA and UL CA)	11.0.1	11.1.0
2013-06	RAN#60	R5-131954	1046	-	Maintenance of Band 23 Spurious Emissions Requirements	11.0.1	11.1.0
2013-06	RAN#60	R5-131955	1047	-	Corrections to Demodulation Requirements	11.0.1	11.1.0
2013-06	RAN#60	R5-131956	1048	-	Updates to sustained data rate test case	11.0.1	11.1.0
2013-06	RAN#60	R5-131957	1049	-	New RF TC for 36.521-1_9.2.1.3_C.1_Enhanced ICIC for LTE	11.0.1	11.1.0
2013-06	RAN#60	R5-131958	1050	-	RF: Structure clean-up for chapter 9 (including eICIC and eDL-MIMO tests)	11.0.1	11.1.0
2013-06	RAN#60	R5-131959	1051	-	Update TT of 7.4B_7.5B_7.6.1B_7.6.2B_7.6.3B_7.7B and 7.8.1B for UL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131960	1052	-	Update of TC6.6.3B.3 for Additional spurious emissions for UL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131961	1053	-	Update of TC6.6.3B.2 for Spurious emissions band UE co-existence for UL-MIMO	11.0.1	11.1.0
2013-06	RAN#60	R5-131962	1054	-	Updates of 6.2.2.3 - maximum output power for UE that supports both Band 18 and 26	11.0.1	11.1.0
2013-06	RAN#60	R5-131963	1055	-	Update of 6.2.4 Test points for A-MPR when NS_05 is signalled	11.0.1	11.1.0

2013-06	RAN#60	R5-131964	1056	-	Updates of 7.3.3 - Refsens for UE that supports both Band 18 and Band 26	11.0.1	11.1.0
2013-06	RAN#60	R5-131969	1057	-	CA RF: Alignment for tests with PCC and SCC switching	11.0.1	11.1.0
2013-06	RAN#60	R5-131971	1059	-	Introduction of Maximum Input Level test case for CA (inter-band DL CA without UL CA)	11.0.1	11.1.0
2013-06	RAN#60	R5-131972	1060	-	Addition of Maximum input level for inter-band CA and updates to test configuration for some Rx TCs	11.0.1	11.1.0
2013-06	RAN#60	R5-131973	1061	-	Updates to FDD sustained data rate test case for CA	11.0.1	11.1.0
2013-06	RAN#60	R5-131974	1062	-	Clarification on Time offset between cells	11.0.1	11.1.0
2013-06	RAN#60	R5-131975	1063	-	Update TC 6.2.3A.1 Maximum Power Reduction (MPR) for CA (intra-band contiguous DL CA and UL CA)	11.0.1	11.1.0
2013-06	RAN#60	R5-131976	1064	-	Update of UE co-existence requirement for CA	11.0.1	11.1.0
2013-06	RAN#60	R5-131977	1065	-	Update TC 6.2.5A.1 Configured UE transmitted Output Power for CA_3A-7A, CA_4A-12A and CA_7A-20A (intra-band contiguous DL CA and UL CA)	11.0.1	11.1.0
2013-06	RAN#60	R5-131978	1066	-	Updates for 6.2.4A A-MPR for CA_41C	11.0.1	11.1.0
2013-06	RAN#60	R5-131979	1067	-	Updates for 7.5A.1 Adjacent Channel Selectivity (ACS) for CA_41C	11.0.1	11.1.0
2013-06	RAN#60	R5-131980	1068	-	Updates for 7.6.1A.1 in-band blocking for CA_41C	11.0.1	11.1.0
2013-06	RAN#60	R5-131981	1069	-	Updates for 7.6.2A.1 Out-of-band blocking for CA_41C	11.0.1	11.1.0
2013-06	RAN#60	R5-131982	1070	-	Updates for 7.6.3A.1 Narrow band blocking for CA_41C	11.0.1	11.1.0
2013-06	RAN#60	R5-131983	1071	-	Updates for 7.8.1A.1 Wideband intermodulation for CA_41C	11.0.1	11.1.0
2013-06	RAN#60	R5-131985	1072	-	Update of CA refsens test 7.3A for inter-band CA configurations CA_4A-5A and CA_4A-13A	11.0.1	11.1.0
2013-06	RAN#60	R5-131987	1073	-	Addition of band 44 in MPR	11.0.1	11.1.0
2013-06	RAN#60	R5-131990	1074	-	CA_1A-18A, CA_2A-17A, CA_3A-8A, CA_4A-5A, CA_4A-13A, CA_4A-17A, CA_11A-18A addition and corrections to Reference Sensitivity TC 7.3A	11.0.1	11.1.0
2013-06	RAN#60	R5-132079	1058	-	Corrections to TC 6.6.3.3A.1 Additional spurious emissions for CA (intra-band contiguous DL CA and UL CA)	11.0.1	11.1.0
2013-06	RAN#60	R5-132080	1075	-	CA RF - Corrections to Blocking Characteristics in 7.6	11.0.1	11.1.0
2013-06	RAN#60	R5-132103	1076	-	Change Spurious emission UE co-existence test cases to align with release independence rule	11.0.1	11.1.0
2013-06	RAN#60	R5-132105	1077	-	CA RF: Corrections to message contents with regard to transmission mode	11.0.1	11.1.0
2013-06	RAN#60	R5-132110	1078	-	Updated test points test case 6.2.3 A-MPR for NS_15 band26	11.0.1	11.1.0
2013-06	RAN#60	R5-132113	1079	-	New test cases for LTE B14 public safety high power UE	11.0.1	11.1.0
2013-09	RAN#61	R5-133070	1080	-	Correction to test points in Additional Spurious Emissions Coexistence test case	11.1.0	11.2.0
2013-09	RAN#61	R5-133073	1081	-	LTE Type A performance requirements - Changes to clause 3	11.1.0	11.2.0
2013-09	RAN#61	R5-133074	1082	-	LTE Type A performance requirements - Changes to clause 8.1.1	11.1.0	11.2.0
2013-09	RAN#61	R5-133075	1083	-	LTE Type A performance requirements - Changes to Annex A	11.1.0	11.2.0
2013-09	RAN#61	R5-133076	1084	-	LTE Type A performance requirements - Introduction of Annex B.5	11.1.0	11.2.0

2013-09	RAN#61	R5-133077	1085	-	LTE Type A performance requirements - Introduction of the new test case 9.3.5.1.1.	11.1.0	11.2.0
2013-09	RAN#61	R5-133232	1086	-	Corrections to CA TC 6.5.2A.3	11.1.0	11.2.0
2013-09	RAN#61	R5-133247	1087	-	Addition of Band 31 to 36.521-1 General s05	11.1.0	11.2.0
2013-09	RAN#61	R5-133248	1088	-	Addition of Band 31 to 36.521-1 RX s07	11.1.0	11.2.0
2013-09	RAN#61	R5-133249	1089	-	Addition of Band 31 to 36.521-1 TX s06	11.1.0	11.2.0
2013-09	RAN#61	R5-133252	1090	-	RF: Minor correction to test points for spurious emissions UE co-existence	11.1.0	11.2.0
2013-09	RAN#61	R5-133258	1091	-	Update TC 7.3A.3 Reference sensitivity level for CA_5A-12A (inter-band DL CA without UL CA)	11.1.0	11.2.0
2013-09	RAN#61	R5-133261	1092	-	Update the minimum requirements of TCs 7.6.3A.1, 7.7A.1 and 7.8.1A.1for CA	11.1.0	11.2.0
2013-09	RAN#61	R5-133262	1093	-	Update TC 6.6.3B.2 of Spurious emission band UE co-existence for UL-MIMO	11.1.0	11.2.0
2013-09	RAN#61	R5-133263	1094	-	Update TCs 6.2.2B and 6.2.5B for UL-MIMO	11.1.0	11.2.0
2013-09	RAN#61	R5-133265	1095	-	RF: Addition of missing UL-RMC-s for Tx testing	11.1.0	11.2.0
2013-09	RAN#61	R5-133266	1096	-	Correction of TCs 7.3 and 7.3B Reference sensitivity level for Band 27	11.1.0	11.2.0
2013-09	RAN#61	R5-133268	1097	-	CA RF: Addition of new CQI tests for CA	11.1.0	11.2.0
2013-09	RAN#61	R5-133298	1098	-	Correction to Spurious emission band UE co-existence	11.1.0	11.2.0
2013-09	RAN#61	R5-133415	1099	-	Correction to the repeat steps in 7.6.1A, 7.6.3A and 7.8.1A	11.1.0	11.2.0
2013-09	RAN#61	R5-133418	1100	-	Correction to CA sustained data rate performance test	11.1.0	11.2.0
2013-09	RAN#61	R5-133423	1101	-	Correction to eICIC Performance test cases	11.1.0	11.2.0
2013-09	RAN#61	R5-133425	1102	-	Correction to UE category in Tx test cases	11.1.0	11.2.0
2013-09	RAN#61	R5-133426	1103	-	Correction to Spurious emission band UE co-existence	11.1.0	11.2.0
2013-09	RAN#61	R5-133431	1104	-	Correction to MBMS Performance test cases	11.1.0	11.2.0
2013-09	RAN#61	R5-133474	1105	-	Update TC of 8.7.2.1_A.1 TDD sustained data rate performance for CA (intra-band contiguous DL CA)	11.1.0	11.2.0
2013-09	RAN#61	R5-133517	1106	-	Adding the minimum channel spacing for intra-band non-contiguous CA	11.1.0	11.2.0
2013-09	RAN#61	R5-133522	1107	-	Corrections to Annex F for Maintenance of Band 23	11.1.0	11.2.0
2013-09	RAN#61	R5-133523	1108	-	Corrections to description for definition of MIMO Correlation Matrices using cross polarized antennas	11.1.0	11.2.0
2013-09	RAN#61	R5-133524	1109	-	Corrections to UE maximum output power for CA	11.1.0	11.2.0
2013-09	RAN#61	R5-133525	1110	-	Corrections to General Maintenance of Operating Bands and Channel Arrangements	11.1.0	11.2.0
2013-09	RAN#61	R5-133532	1111	-	Introduction of eICIC_enh_LTE to Annex C	11.1.0	11.2.0
2013-09	RAN#61	R5-133534	1112	-	Corrections to TC 6.6.2.3A.1 Adjacent Channel Leakage power Ratio for CA (intra-band contiguous DL CA and UL CA)	11.1.0	11.2.0
2013-09	RAN#61	R5-133535	1113	-	Corrections to TC 7.5A.1 Adjacent Channel Selectivity (ACS) for CA (intra-band contiguous DL CA and UL CA)	11.1.0	11.2.0
2013-09	RAN#61	R5-133800	1114	-	Correction to test frequency in Additional Spurious Emissions test cases for NS_15	11.1.0	11.2.0
2013-09	RAN#61	R5-133801	1115	-	Update applicability of test cases 9.4.2.2.1 and 9.4.2.2.2	11.1.0	11.2.0

2013-09	RAN#61	R5-133802	1116	-	Correction to applicability for TDD-TM8 test cases	11.1.0	11.2.0
2013-09	RAN#61	R5-133803	1117	-	Editorial correction to 6.6.3.3 Additional spurious emissions	11.1.0	11.2.0
2013-09	RAN#61	R5-133804	1118	-	Correction the Minimum conformance requirements for test case 6.2.2B	11.1.0	11.2.0
2013-09	RAN#61	R5-133805	1119	-	CA RF: Adding missing DL-RMC-s	11.1.0	11.2.0
2013-09	RAN#61	R5-133806	1120	-	Update TC of 8.2.1.1 FDD PDSCH Single Antenna Port Performance (Cell-Specific Reference Symbols) for CA	11.1.0	11.2.0
2013-09	RAN#61	R5-133807	1121	-	Update TC of 8.2.1.4 FDD PDSCH Closed Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols) for CA	11.1.0	11.2.0
2013-09	RAN#61	R5-133808	1122	-	Addition of new TC 8.2.1.4.2_A.2 for FDD PDSCH Closed Loop Multi Layer Spatial Multiplexing 4x2 for CA (inter band DL CA)	11.1.0	11.2.0
2013-09	RAN#61	R5-133811	1123	-	Update of CA TC 7.3A.1	11.1.0	11.2.0
2013-09	RAN#61	R5-133812	1124	-	Update of CA TC 7.4A.1	11.1.0	11.2.0
2013-09	RAN#61	R5-133819	1125	-	Correction of applicability for FDD RF TCs 9.3.4.1.1, 9.3.4.2.1 & 9.4.1.2.1and TDD RF TCs 9.3.4.1.2, 9.3.4.2.2 & 9.4.1.2.2	11.1.0	11.2.0
2013-09	RAN#61	R5-133823	1126	-	Introduction of eICIC_enh_LTE to Annex A to reference measurement channels for PDCCH/PCFICH	11.1.0	11.2.0
2013-09	RAN#61	R5-133824	1127	-	Introduction of eICIC_enh_LTE to Annex A DL reference measurement channels	11.1.0	11.2.0
2013-09	RAN#61	R5-133828	1128	-	Corrections to 6.2.4 A-MPR for Maintenance of Band 23	11.1.0	11.2.0
2013-09	RAN#61	R5-133829	1129	-	Corrections to Transmitter Characteristics Maintenance	11.1.0	11.2.0
2013-09	RAN#61	R5-133830	1130	-	Alignment of test configuration tables (test frequencies) in Additional Spurious Emissions tests cases	11.1.0	11.2.0
2013-09	RAN#61	R5-133831	1131	-	Corrections to Receiver Characteristics Maintenance	11.1.0	11.2.0
2013-09	RAN#61	R5-133832	1132	-	Corrections to 6.6.2.2 Additional Spectrum Emission Mask for Maintenance of Band 23	11.1.0	11.2.0
2013-09	RAN#61	R5-133833	1133	-	Updates to Chapter7 for Inter Band CA combo CA_4A-29A	11.1.0	11.2.0
2013-09	RAN#61	R5-133838	1134	-	Update Minimum Requirements of TCs 6.2.4 and 6.2.5	11.1.0	11.2.0
2013-09	RAN#61	R5-133845	1135	-	Correction to Configured UE transmitted output power for CA	11.1.0	11.2.0
2013-09	RAN#61	R5-133846	1136	-	Corrections to TC 6.2.5A.2 Configured UE transmitted Power for CA (inter-band DL CA without UL CA)	11.1.0	11.2.0
2013-09	RAN#61	R5-133847	1137	-	Updates to Wideband intermodulation for CA test cases	11.1.0	11.2.0
2013-09	RAN#61	R5-133850	1138	-	Correction to measurement target of CA Rx test cases	11.1.0	11.2.0
2013-09	RAN#61	R5-133851	1139	-	Corrections to TC 7.5A.2 Adjacent Channel Selectivity (ACS) for CA (intra-band contiguous DL CA without UL CA)	11.1.0	11.2.0
2013-09	RAN#61	R5-133852	1140	-	Update TC of 8.7.1.1_A.1 FDD Sustained data rate performance for CA (intra band contiguous DL CA)	11.1.0	11.2.0
2013-09	RAN#61	R5-133853	1141	-	Update TC of 8.7.1.1_A.2 FDD Sustained data rate performance for CA (inter band DL CA)	11.1.0	11.2.0
2013-09	RAN#61	R5-133854	1142	-	Updates of Annex for CA test cases	11.1.0	11.2.0
2013-09	RAN#61	R5-133863	1143	-	Clarification on Bandwidth Combination Set for Carrier Aggregation Transmitter tests	11.1.0	11.2.0
2013-09	RAN#61	R5-133865	1144	-	Update TC 6.2.5A.1 Configured UE transmitted Output Power for CA_5A-12A (intra-band contiguous DL CA and UL CA)	11.1.0	11.2.0

2013-09	RAN#61	R5-133866	1145	-	Update the minimum requirements of TCs 7.5A.1, 7.6.1A.1 and 7.6.2A.1 for CA	11.1.0	11.2.0
2013-09	RAN#61	R5-133867	1146	-	Update TC 7.3A.1 Reference sensitivity level for CA (intra-band contiguous DL CA and UL CA)	11.1.0	11.2.0
2013-09	RAN#61	R5-133869	1147	-	Addition of Refsens for intra-band non-contiguous CA	11.1.0	11.2.0
2013-09	RAN#61	R5-133870	1148	-	Update TC 7.3A.3 reference sensitivity level for CA_3-8 (inter-band DL CA without UL CA)	11.1.0	11.2.0
2013-09	RAN#61	R5-133871	1149	-	Test cases and test system uncertainty for LTE B14 public safety highpower UE	11.1.0	11.2.0
2013-09	RAN#61	R5-133873	1150	-	Addition of new TC 8.3.1.1.3 for FDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM9 Interference Model	11.1.0	11.2.0
2013-09	RAN#61	R5-133874	1151	-	Addition of new TC 8.3.2.1.4 for TDD PDSCH Single-layer Spatial Multiplexing on antenna ports 7 or 8 with TM9 Interference Model	11.1.0	11.2.0
2013-09	RAN#61	R5-133886	1152	-	eICIC RF: Addition of new RI tests and OCNG patterns for eICIC	11.1.0	11.2.0
2013-09	RAN#61	R5-133887	1153	-	Update of CA TC 6.2.3A and TC 6.2.4A	11.1.0	11.2.0
2013-09	RAN#61	R5-133888	1154	-	CA RF: Corrections to reference sensitivity requirements for CA	11.1.0	11.2.0
2013-09	RAN#61	R5-133889	1155	-	Correction to Test Requirement in 7.3A.3	11.1.0	11.2.0
2013-09	RAN#61	R5-133890	1156	-	Update TC of 8.2.1.3 FDD PDSCH Open Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols)for CA	11.1.0	11.2.0
2013-09	RAN#61	R5-133898	1157	-	Clarification on Bandwidth Combination Set for Carrier Aggregation Receiver tests	11.1.0	11.2.0
2013-09	RAN#61	R5-133899	1158	-	Addition of CA TC 6.6.2.2A	11.1.0	11.2.0