TSG RAN Meeting #16 **RP-020296**
Marco Island, FL, USA, 4 - 7 June 2002

Title **CRs (Rel-4 and Rel-5 Category A) to TS 25.143**
Source **TSG RAN WG4**
Agenda Item **7.4.4**

RAN4 Tdoc	Spec	Curr Ver	New Ver	CR	R	Cat	Ph	Title	Acronym
R4-020675	25.143	4.3.0	4.4.0	8		F	Rel-4	Introduction of output intermodulation requirement	RInImp-REP
R4-020676	25.143	5.0.0	5.1.0	9		A	Rel-5	Introduction of output intermodulation requirement	RInImp-REP

3GPP TSG RAN WG4 Meeting #23 **R4-020675**

Gyeongju, Korea 13th -17th May, 2002

CR-Form-v5.1

CHANGE REQUEST

⌘ **25.143** **CR** **8** ⌘ **rev** **-** ⌘ Current version: **4.3.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network [X] Core Network ☐

Title:	⌘	**Introduction of output intermodulation requirement**
Source:	⌘	RAN WG4
Work item code:	⌘	RInImp-REP
Date:	⌘	17/5/2002
Category:	⌘	**F**
Release:	⌘	Rel-4

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	The requirement is missing in the specification
Summary of change:	⌘	Introduction of output intermodulation requirement in the specification. Editorial alignment to core specification structure
Consequences if not approved:	⌘	Output intermodulation requirement will be missing. Output intermodulation may cause extra unwanted emission when co-siting equipment. Structure in Core specification, section 9, and conformance specification, section 9, will differ.

Clauses affected:	⌘	5, 12, annex A, annex B
Other specs affected:	⌘	☐ Other core specifications ⌘ [X] Test specifications ☐ O&M Specifications
Other comments:	⌘	Equivalent CRs in other Releases: CR9 cat. A to 25.143 v5.0.0

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

…

5.1.2 Measurements of Repeater

Table 5.1: Maximum Test System Uncertainty

Subclause	Maximum Test System Uncertainty	Range over which Test System Uncertainty applies
6.1 Maximum output power	±0,7 dB	
7 Frequency error	±12 Hz	Measurement results of ± 500 Hz
8 Out of band gain	±0,5 dB Calibration of test set-up shall be made without D.U.T. in order to achieve the accuracy	
9.1 Spectrum emission mask	±1,5 dB Due to carrier leakage for measurements specified in a 1MHz bandwidth close to the carrier (4 MHz to 8 MHz), integration of the measurement using several narrower bandwidth measurements may be necessary in order to achieve the above accuracy. The interference from the signal generator ACLR shall be minimum 10 dB below that of a Base Station according toTS25.141	
9.2 Spurious emissions	In UTRA and coexistence receive bands: for results > -60 dBm ±2,0 dB for results < -60 dBm ±3,0 dB Outside above range: emission power f ≤ 2,2 GHz ±1,5 dB; 2,2 GHz < f ≤ 4 GHz ±2,0 dB; f > 4 GHz ±4,0 dB. The interference from the signal generator ACLR shall be minimum 10 dB below that of a Base Station according toTS25.141	
10.1 Error vector magnitude	± 2,5 % (single code applied) (±2,5 % measurement error for single code). 5,0 % EVM in the stimulus signal (single code) will shift the EVM maximum value 0,7% to 18,2%. (RSS repeater EVM and Stimulus EVM.)	Measurement results from 12,5% to 22,5% at signal power = P_max – 3dB to P_max – 18 dB
10.2 Peak code domain error	±1,1dB Formula: RSS measurement error and impedance mismatch error (using ±1,0 dB measurement error and ±0,5 dB impedance mismatch error (stimulus side) assuming 14 dB return loss)	Measurement results from – 36 dB to – 30 dB, at signal power = P_max – 3 dB to P_max – 18 dB
11 Input intermodulation Characteristics	±1,2 dB Formula: RSS CW1 level error, 2 x CW2 level error, and measurement error (using all errors = ±0,5 dB)	
12 Output Intermodulation	[±2,1 dB] Spectrum emission Formula: RSS 2x Interference signal level error and Spectrum emission measurement level error. (1 dB interference signal level error is assumed.)	

	Due to carrier leakage for measurements specified in a 1MHz bandwidth close to the carrier (4 MHz to 8 MHz), integration of the measurement using several narrower bandwidth measurements may be necessary in order to achieve the above accuracy. The interference from the signal generator ACLR shall be minimum 10 dB below that of a Base Station For spurious emission: In UTRA and coexistence receive bands: [for results > -60 dBm ±2,0 dB] [for results < -60 dBm ±3,0 dB] Outside above range: emission power [f ≤ 2,2 GHz ±1,5 dB;] [2,2 GHz < f ≤ 4 GHz ±2,0 dB;] [f > 4 GHz ±4,0 dB.] The interference signal must have a spurious emission level at least [10 dB] below the spurious levels required in 9.2.	

5.2 Repeater test tolerances (informative)

The Test Tolerances defined in this subclause have been used to relax the Minimum Requirements in this specification to derive the Test Requirements.

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.)

Table 5.2: Test Tolerance

Subclause	Test Tolerance	Notes
6.1 Maximum output power	0,7 dB	
9.1 Spectrum emission mask	1,5 dB	
9.2 Spurious emissions	0 dB	
7 Frequency error	12 Hz	
10.1 Error vector magnitude	0 %	Target value is shifted due to stimulus EVM
10.2 Peak code domain error	1,1 dB	
8 Out of band gain	0,5dB	
11 Input intermodulation Characteristics	1,2dB	
12 Output intermodulation	[1,5 dB] for spectrum emission [0 dB] for spurious emission	

…

9 Unwanted emission

9.1 Out of band emission

Out of band emissions are unwanted emissions immediately outside the channel bandwidth resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. This out of band emission limit is specified in terms of a spectrum emission mask.

9.1.1 Spectrum emission mask

~~Out of band emissions are unwanted emissions immediately outside the channel bandwidth resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. This out of band emission limit is specified in terms of a spectrum emission mask for the transmitter.~~

~~NOTE: This subclause may be mandatory in certain regions. In other regions this mask may not be applied.~~

9.1.1.1 Definitions and applicability

The masks defined in Table 9.1, Table 9.2, Table 9.3, and Table 9.4 below may be mandatory in certain regions. In other regions this mask may not be applied.

9.1.1.2 Minimum Requirements

For regions where this clause applies, the requirement shall be met by a repeater's RF-signal output at maximum gain with WCDMA signals in the operating band of the Repeater, at levels that produce the maximum rated output power per channel. In normal conditions as specified in section 5.4.1 emissions shall not exceed the maximum level specified in Table 9.1, Table 9.2, Table 9.3, and Table 9.4 for the appropriate Repeater maximum output power, in the frequency range from Δf = 2,5 MHz to Δf_{max} from the 5 MHz channel, where:

- Δf is the separation between the centre frequency of first or last 5 MHz channel used in the operating band and the nominal –3 dB point of the measuring filter closest to the carrier frequency.
- f_offset is the separation between the centre frequency of first or last 5 MHz channel in the operating band and the centre of the measuring filter.
- f_offset_{max} is either 12,5 MHz or the offset to the UTRA band edge at both up- and down-link as defined in section 4.1, whichever is the greater.
- Δf_{max} is equal to f_offset_{max} minus half of the bandwidth of the measurement filter.

If the operating band corresponds to three or more consecutive nominal 5 MHz channels, the requirement shall be met with any combination of two WCDMA modulated signals in the repeaters operating band.

Table 9.1: Spectrum emission mask values, maximum output power P ≥ 43 dBm

Frequency offset of measurement filter – 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
2,5 ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	-14 dBm	30 kHz
2,7 ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	-14 – 15·(f_offset- 2,715) dBm	30 kHz
	3,515MHz ≤ f_offset < 4,0MHz	-26 dBm	30 kHz
3,5 ≤ Δf < 7,5 MHz	4,0 MHz ≤ f_offset < 8,0MHz	-13 dBm	1 MHz
7,5 ≤ Δf MHz	8,0 MHz ≤ f_offset < f_offset_{max}	-13 dBm	1 MHz

Table 9.2: Spectrum emission mask values, maximum output power 39 ≤ P < 43 dBm

Frequency offset of measurement filter – 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
2,5 ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	-14 dBm	30 kHz
2,7 ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	-14 – 15·(f_offset - 2,715) dBm	30 kHz
	3,515MHz ≤ f_offset < 4,0MHz	-26 dBm	30 kHz
3,5 ≤ Δf < 7,5 MHz	4,0 MHz ≤ f_offset < 8,0MHz	-13 dBm	1 MHz
7,5 ≤ Δf MHz	8,0MHz ≤ f_offset < f_offset_{max}	P - 56 dBm	1 MHz

Table 9.3: Spectrum emission mask values, maximum output power 31 ≤ P < 39 dBm

Frequency offset of measurement filter – 3dB point,Δf	Frequency offset of measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
2,5 ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	P - 53 dBm	30 kHz
2,7 ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	P – 53 – 15·(f_offset – 2,715) dBm	30 kHz
	3,515MHz ≤ f_offset < 4,0MHz	P - 65 dBm	30 kHz
3,5 ≤ Δf < 7,5 MHz	4,0 MHz ≤ f_offset < 8,0MHz	P - 52 dBm	1 MHz
7,5 ≤ Δf MHz	8,0MHz ≤ f_offset < f_offset_{max}	P - 56 dBm	1 MHz

Table 9.4: Spectrum emission mask values, maximum output power P < 31 dBm

Frequency offset of measurement filter – 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
2,5 ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	-22 dBm	30 kHz
2,7 ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	-22 – 15·(f_offset - 2,715) dBm	30 kHz
	3,515MHz ≤ f_offset < 4,0MHz	-34 dBm	30 kHz
3,5 ≤ Δf < 7,5 MHz	4,0 MHz ≤ f_offset < 8,0MHz	-21 dBm	1 MHz
7,5 ≤ Δf MHz	8,0MHz ≤ f_offset < f_offset_{max}	-25 dBm	1 MHz

9.1.1.3 Test purpose

The purpose of this test is to verify that the Repeater meet the spectrum emission requirements as specified in TS 25.106.

9.1.1.4 Method of test

9.1.1.4.1 Initial conditions

1. Set-up the equipment as shown in annex A.

2. Connect a signal generator to the input port of the Repeater for tests of repeaters with an operating band corresponding to one 5 MHz channel. If the operating band corresponds to two or more 5 MHz carriers, two signal generators with a combining circuit or one signal generator with the ability to generate several WCDMA carriers is connected to the input.

3. Measurements with an offset from the carrier centre frequency between 2,515 MHz and 4,0 MHz shall use a 30 kHz measurement bandwidth.

4. Measurements with an offset from the carrier centre frequency between 4,0 MHz and (Δfmax – 500 kHz) shall use a 1 MHz measurement bandwidth. The 1MHz measurement bandwidth may be calculated by integrating multiple 50 kHz or narrower filter measurements.

5. Detection mode: True RMS.

9.1.1.4.2 Procedures

1. Set the Repeater to maximum gain.

2. Set the signal generator(s) to generate signal(s) in accordance to test model 1, TS 25.141 subclause 6.2.1.1.1, at level(s) which produce the manufacturer specified maximum output power at maximum gain.

3. Measure the emission at the specified frequencies with specified measurement bandwidth and note that the measured value does not exceed the specified value.

4. Increase the power with 10 dB compare to the level obtained in step 2.

5. Measure the emission at the specified frequencies with specified measurement bandwidth and note that the measured value does not exceed the specified value.

6. Repeat the test for the opposite path of the Repeater.

9.1.1.5 Test requirements

The measurement result of step 3 and 5 of 9.1.4.2 shall not exceed the maximum level specified in tables 9.5 to 9.8 for the appropriate Repeater maximum output power.

Table 9.5: Spectrum emission mask values, maximum output power P ≥ 43 dBm

Frequency offset of measurement filter – 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
2,5 ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	-12,5 dBm	30 kHz
2,7 ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	-12,5 – 15·(f_offset- 2,715) dBm	30 kHz
	3,515MHz ≤ f_offset < 4,0MHz	-24,5 dBm	30 kHz
3,5 ≤ Δf < 7,5 MHz	4,0 MHz ≤ f_offset < 8,0MHz	-11,5 dBm	1 MHz
7,5 ≤ Δf MHz	8,0 MHz ≤ f_offset < f_offset_{max}	-11,5 dBm	1 MHz

Table 9.6: Spectrum emission mask values, maximum output power 39 ≤ P < 43 dBm

Frequency offset of measurement filter – 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
2,5 ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	-12,5 dBm	30 kHz
2,7 ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	-12,5 – 15·(f_offset – 2,715) dBm	30 kHz
	3,515MHz ≤ f_offset < 4,0MHz	-24,5 dBm	30 kHz
3,5 ≤ Δf < 7,5 MHz	4,0 MHz ≤ f_offset < 8,0MHz	-11,5 dBm	1 MHz
7,5 ≤ Δf MHz	8,0MHz ≤ f_offset < f_offset_{max}	P – 54,5 dBm	1 MHz

Table 9.7: Spectrum emission mask values, maximum output power 31 ≤ P < 39 dBm

Frequency offset of measurement filter – 3dB point,Δf	Frequency offset of measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
2,5 ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	P – 51,5 dBm	30 kHz
2,7 ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	P – 51,5 – 15·(f_offset – 2,715) dBm	30 kHz
	3,515MHz ≤ f_offset < 4,0MHz	P – 63,5 dBm	30 kHz
3,5 ≤ Δf < 7,5 MHz	4,0 MHz ≤ f_offset < 8,0MHz	P – 50,5 dBm	1 MHz
7,5 ≤ Δf MHz	8,0MHz ≤ f_offset < f_offset_{max}	P – 54,5 dBm	1 MHz

Table 9.8: Spectrum emission mask values, maximum output power P < 31 dBm

Frequency offset of measurement filter – 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
2,5 ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	-20,5 dBm	30 kHz
2,7 ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	-20,5 – 15·(f_offset - 2,715) dBm	30 kHz
	3,515MHz ≤ f_offset < 4,0MHz	-32,5 dBm	30 kHz
3,5 ≤ Δf < 7,5 MHz	4,0 MHz ≤ f_offset < 8,0MHz	-19,5 dBm	1 MHz
7,5 ≤ Δf MHz	8,0MHz ≤ f_offset < f_offset_{max}	-23,5 dBm	1 MHz

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test is defined in subclause 5.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in Annex B.

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9.2.2.2 Spurious emission ~~Minimum requirement~~ (Category B)

The following requirements shall be met in cases where Category B limits for spurious emissions, as defined in ITU-R Recommendation SM.329-8 [4], are applied.

At maximum Repeater gain, with WCDMA signals in the operating band of the Repeater, at levels that produce the maximum rated power output per channel, the power of any spurious emission shall not exceed the limits specified in Table 9.10 and Table 9.11 for the down- and up-link, respectively.

When the power in all channels is increased by 10 dB the requirements shall still be met.

The measurements shall apply both with or without an input signal applied.

NOTE 1: If the operating band corresponds to three or more consecutive nominal 5 MHz channels, the requirement shall be met with any combination of two WCDMA modulated signals in the repeaters operating band.

Table 9.10: Down-link: General spurious emissions limits, Category B

Band	Maximum Level	Measurement Bandwidth	Note
9kHz ↔ 150kHz	-36 dBm	1 kHz	Bandwidth as in ITU-R SM.329-8 [4], s4.1
150kHz ↔ 30MHz	- 36 dBm	10 kHz	Bandwidth as in ITU-R SM.329-8 [4], s4.1
30MHz ↔ 1GHz	-36 dBm	100 kHz	Bandwidth as in ITU-R SM.329-8 [4], s4.1
1GHz ↔ Fc1 - 60 MHz or 2100 MHz *whichever is the higher*	-30 dBm	1 MHz	Bandwidth as in ITU-R SM.329-8 [4], s4.1
Fc1 – 60 MHz or 2100 MHz *whichever is the higher* ↔ Fc1 – 50 MHz or 2100 MHz *whichever is the higher*	-25 dBm	1 MHz	Specification in accordance with ITU-R SM.329-8 [4], s4.1
Fc1 – 50 MHz or 2100 MHz *whichever is the higher* ↔ Fc2 + 50 MHz or 2180 MHz *whichever is the lower*	-15 dBm	1 MHz	Specification in accordance with ITU-R SM.329-8 [4], s4.1
Fc2 + 50 MHz or 2180 MHz *whichever is the lower* ↔ Fc2 + 60 MHz or 2180 MHz *whichever is the lower*	-25 dBm	1 MHz	Specification in accordance with ITU-R SM.329-8 [4], s4.1
Fc2 + 60 MHz or 2180 MHz *whichever is the lower* ↔ 12,75 GHz	-30 dBm	1 MHz	Bandwidth as in ITU-R SM.329-8, s4.1. Upper frequency as in ITU-R SM.329-8 [4], s2.6

Table 9.11: Up-link: General spurious emissions limits, Category B

Band	Maximum Level	Measurement Bandwidth	Note
9kHz ↔ 150kHz	-36 dBm	1 kHz	Bandwidth as in ITU-R SM.329-8 [4], s4.1
150kHz ↔ 30MHz	- 36 dBm	10 kHz	Bandwidth as in ITU-R SM.329-8 [4], s4.1
30MHz ↔ 1GHz	-36 dBm	100 kHz	Bandwidth as in ITU-R SM.329-8 [4], s4.1
1GHz ↔ Fc1 - 60 MHz or 1910 MHz *whichever is the higher*	-30 dBm	1 MHz	Bandwidth as in ITU-R SM.329-8 [4], s4.1
Fc1 – 60 MHz or 1910 MHz *whichever is the higher* ↔ Fc1 – 50 MHz or 1910 MHz *whichever is the higher*	-25 dBm	1 MHz	Specification in accordance with ITU-R SM.329-8 [4], s4.1
Fc1 – 50 MHz or 1910 MHz *whichever is the higher* ↔ Fc2 + 50 MHz or 1990 MHz *whichever is the lower*	-15 dBm	1 MHz	Specification in accordance with ITU-R SM.329-8 [4], s4.1
Fc2 + 50 MHz or 1990 MHz *whichever is the lower* ↔ Fc2 + 60 MHz or 1990 MHz *whichever is the lower*	-25 dBm	1 MHz	Specification in accordance with ITU-R SM.329-8 [4], s4.1
Fc2 + 60 MHz or 1990 MHz *whichever is the lower* ↔ 12,75 GHz	-30 dBm	1 MHz	Bandwidth as in ITU-R SM.329-8, s4.1. Upper frequency as in ITU-R SM.329-8 [4], s2.6

Fc1: Centre frequency of emission of the first 5 MHz channel in an operating band.

Fc2: Centre frequency of emission of the last 5 MHz channel in an operating band.

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12 Output intermodulation

The output intermodulation requirement is a measure of the ability of the repeater to inhibit the generation of intermodulation products signals created by the presence of an interfering signal reaching the repeater via the output port.

12.1 Definition and applicability

The output intermodulation level is the power of the intermodulation products when a WCDMA modulated interference signal is injected into the output port at a level of 30 dB lower than that of the wanted signal. The frequency of the interference signal shall be ±5 MHz, ±10 MHz and ±15 MHz offset from the wanted signal, but within the frequency band allocated for UTRA FDD downlink as specified in subclause 4.1.

The requirement is applicable for downlink signals.

The normative reference for this requirement is in TS25.106 [12] section 12.

12.2 Minimum requirement

In normal conditions as specified in section 5.4.1, the output intermodulation level shall not exceed the out of band emission or the spurious emission requirements of section 9.1 and 9.2.

12.3 Test purpose

The test purpose is to verify the ability of the repeater to restrict the generation of intermodulation products in the presence of a subject signal on the repeater input and output ports, and an interfering signal applied at the repeater output port.

12.4 Method of test

12.4.1 Initial conditions

1) Set-up the equipment as shown in annex A.

2) Connect a signal generator to the input port of the Repeater for tests of repeaters with an operating band corresponding to one 5 MHz channel. Connect a signal generator to the circulator on the output port and make sure the signal generator power is directed to the repeater output port.

3) Measurements with an offset from the carrier centre frequency between 2,515 MHz and 4,0 MHz shall use a 30 kHz measurement bandwidth.

4) Measurements with an offset from the carrier centre frequency between 4,0 MHz and (Δfmax – 500 kHz) shall use a 1 MHz measurement bandwidth. The 1MHz measurement bandwidth may be calculated by integrating multiple 50 kHz or narrower filter measurements

5) Detection mode: True RMS.

12.4.2 Procedures

1) Set the Repeater to maximum gain.

2) Set the signal generator at the repeater input port (subject signal) to generate a signal in accordance to test model 1, TS 25.141 subclause 6.1.1.1, at the level which produce the manufacturer specified maximum output power at maximum gain.

3) Set the signal generator at the repeater output port (interference signal) to generate a signal in accordance to test model 1, TS 25.141 subclause 6.1.1.1, at the level producing signal power corresponding to 30 dB below the manufacturer specified maximum output power at the repeater output port with the specified frequency offset from the wanted signal.

4) Measure the emission at the specified frequencies with specified measurement bandwidth and note that the measured value does not exceed the specified value. Measurements in the band of the interfering signal shall be excluded. The measurements can be limited to the power of all third and fifth order intermodulation products.

5) Repeat from clause 3 until interference signals ±5 MHz, ±10 MHz and ±15 MHz frequency offset from the wanted signal has been tested. Note that interfering signals outside the UTRA-FDD allocated frequency band , as specifies in section 4.1. need not be tested.

12.5 Test requirements

In all measurements, the requirements according to sections 9.1.1.5 and the downlink requirements in section 9.2.2.1 or 9.2.2.2 shall be fulfilled.

Annex A (informative): Repeater measurement system set-up

Example of measurement system set-ups are attached below as an informative annex.

A.1 Maximum output power

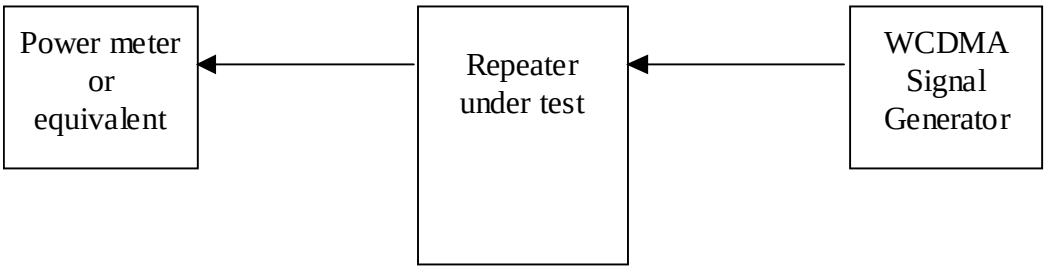

Figure A.1: Measuring system set-up for maximum output power.

Note that a repeater is a bi-directional device. The signal generator may need protection.

A.2 Frequency stability

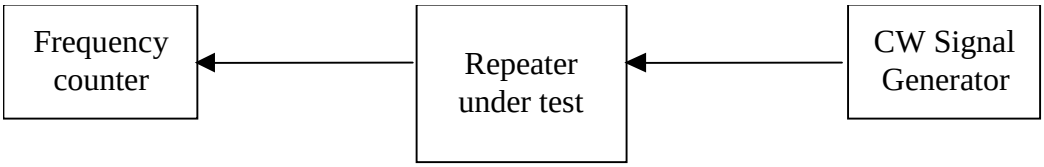

Figure A.2: Measurement system set-up for RF frequency stability.

Note that a repeater is a bi-directional device. The signal generator may need protection.

A.3 Out of band gain

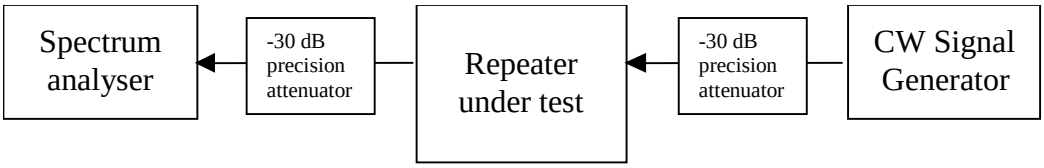

Figure A.3: Measuring system set-up for out of band gain.

Note that a repeater is a bi-directional device. The signal generator may need protection.

A.4 Unwanted emission: Spectrum emission mask

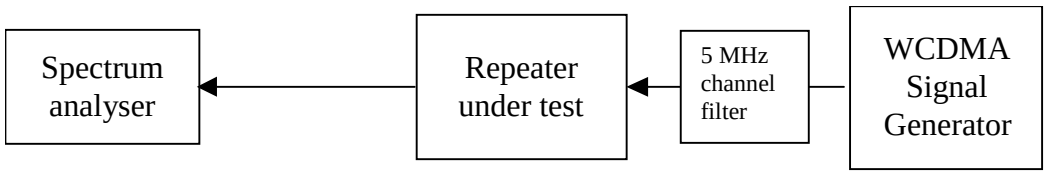

Figure A.4: Measuring system Set-up for unwanted emission: spectrum emission mask.

Note that a repeater is a bi-directional device. The signal generator may need protection.

A.5 Unwanted emission: Spurious emission

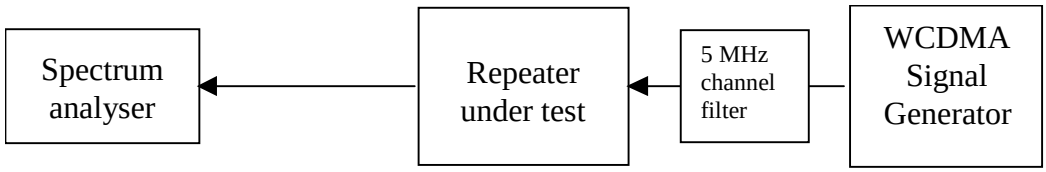

Figure A.5: Measuring system set-up for unwanted emission: spurious emission.

Note that a repeater is a bi-directional device. The signal generator may need protection.

A.6 Modulation Accuracy: Error Vector Magnitude

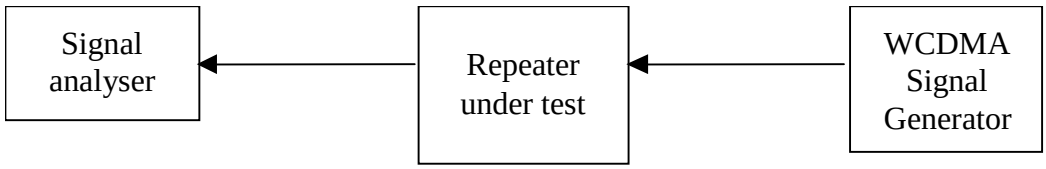

Figure A.6: Measuring system set-up for modulation accuracy: error vector magnitude.

Note that a repeater is a bi-directional device. The signal generator may need protection.

A.7 Modulation Accuracy: Peak Code Domain Error

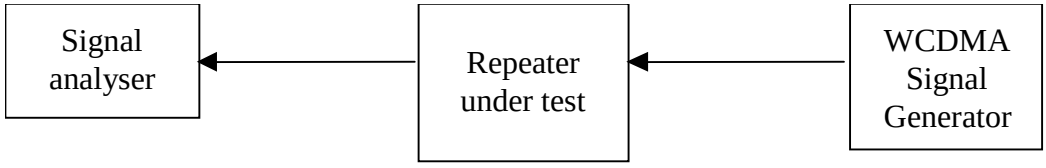

Figure A.7: Measuring system set-up for modulation accuracy: peak code domain error.

Note that a repeater is a bi-directional device. The signal generator may need protection.

A.8 Input intermodulation

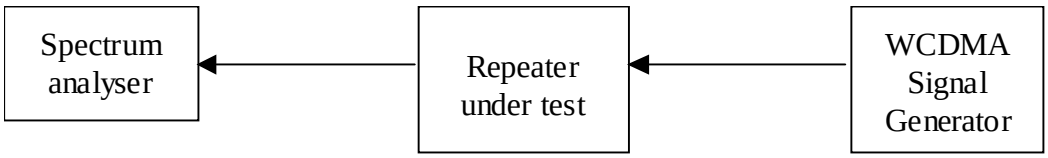

Figure A.8: Measuring system set-up for input intermodulation.

A.9 Output Intermodulation

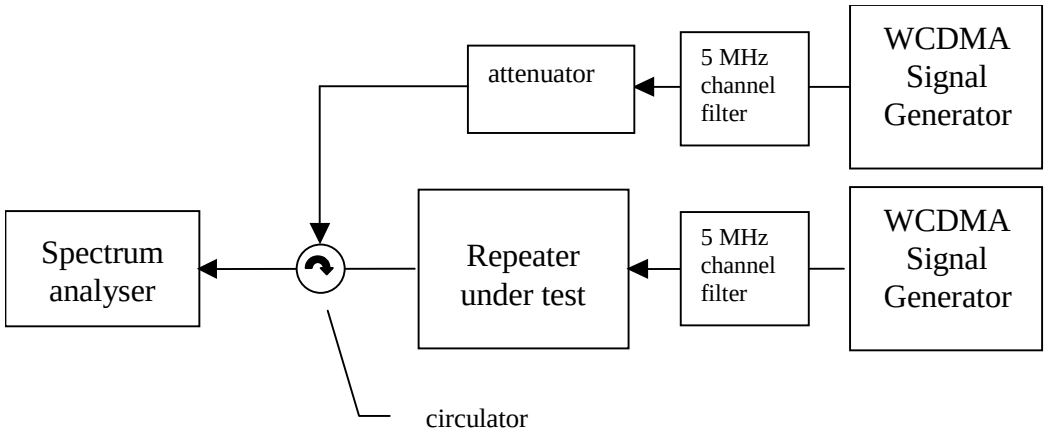

Figure A.9: Measuring system set-up for Output Intermodulation.

Note that a repeater is a bi-directional device. The signal generator may need protection.

The 5 MHz channel filter is only required if the WCDMA signal generator does not fulfil the unwanted emission requirement for base stations (TS25.141 [11], section 6.5) with at least 10 dB margin in the described set-up.

Annex B (informative): Derivation of Test Requirements

The Test Requirements in this specification have been calculated by relaxing the Minimum Requirements of the core specification using the Test Tolerances defined in subclause 5.2. 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 this relaxation is given in table B.1.

Table B.1: Derivation of Test Requirements

Clause number	Title	Minimum Requirement in TS 25.106	Test Tolerance (TT)	Test Requirement in TS 25.143
6.1	Maximum output power	In normal conditions Table 6.1	0,7 dB	Formula: Upper limit + TT Lower limit - TT In normal conditions refer to Table 6.3
		In extreme conditions Tabel 6.2		In extreme conditions refer to Table 6.4
9.1	Spectrum emission mask	Tables 9.1, 9.2, 9.3 and 9.4: "Maximum level" = X dB	1,5 dB	Formula: Maximum level + TT Refer to tables 9.5, 9.6, 9.7 and 9.8
7	Frequency stability	7.1 minimum requirement	12 Hz	Formula: Relative error + TT Refer to 7.5 Test requirements
8	Out of Band Gain	Table 8.1: Out of band gain limits	0,5 dB	Formula: Maximum level + TT Refer to table 8.2
9.2	Spurious emissions	Tables 9.5, to 9.15	0 dB	
10.1	Error Vector Magnitude	10.1.1 Minimum requirement	0 %	Formula: RSS Stimulus EVM and Repeater EVM to get target EVM Refer to 10.1.5 Test requirements
10.2	Peak code domain error	10.2.1 Minimum requirement	1,1 dB	Formula: Maximum error + TT Refer to 10.2.5 Test requirements
11	Input intermodulation	11.5 Minimum requirements, and Tables 11.1 and 11.2	1,2 dB	Maximum in-band power increase + TT Refer to 11.5 Test requirements.
12	Output intermodulation	12.1 Minimum requirements	[1,5 dB] for spectrum emission mask. [0 dB] for spurious emissions	Maximum level + TT Refer to tables 9.5 to 9.19

Annex C (informative): Acceptable uncertainty of Test Equipment

This informative annex specifies the critical parameters of the components of an overall Test System (e.g. signal generators, signal analysers etc.) which are necessary when assembling a Test System which complies with subclause5.1 Acceptable uncertainty of Test System. These Test Equipment parameters are fundamental to the accuracy of the overall Test System and are unlikely to be improved upon through System Calibration.

Table C.1: Equipment accuracy

Test	Equipment accuracy	Test condition
6.1 Maximum output power	Not critical	
9.1 Spectrum emission mask	Not critical	
9.2 Spurious emissions	Not critical	
11 Input intermodulation (interferer requirement)	Not critical	
7 Frequency error	±10 Hz + timebase = 12 Hz	Range 0 to 500 Hz. (This is to allow for UE range that at 0,1 PPM is larger than BTS).
10.1 Error vector magnitude	±2,5 % (for single code)	P_Max-3 to P_Max – 18 dB Applies for reading from 10% to 25%.
10.2 Peak code domain error		
8 Out of band gain		
11 Input intermodulation Characteristics		
12 Output intermodulation		

3GPP TSG RAN WG4 Meeting #23 **R4-020676**

Gyeongju, Korea 13th -17th May, 2002

CR-Form-v5.1

CHANGE REQUEST

⌘ **25.143** **CR** **9** ⌘ **rev** **-** ⌘ Current version: **5.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☒ Core Network ☐

Title:	⌘	**Introduction of output intermodulation requirement**
Source:	⌘	RAN WG4
Work item code:	⌘	RInImp-REP
Date:	⌘	17/5/2002
Category:	⌘	**A**
Release:	⌘	Rel-5

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	The requirement is missing in the specification
Summary of change:	⌘	Introduction of output intermodulation requirement in the specification. Editorial alignment to core specification structure.
Consequences if not approved:	⌘	Output intermodulation requirement will be missing. Output intermodulation may cause extra unwanted emission when co-siting equipment. Structure in Core specification, section 9, and conformance specification, section 9, will differ.

Clauses affected:	⌘	5, 12, annex A, annex B
Other specs affected:	⌘	☐ Other core specifications ⌘ ☒ Test specifications ☐ O&M Specifications
Other comments:	⌘	Equivalent CRs in other Releases: CR8 cat. F to 25.143 v4.3.0

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

…

5.1.2 Measurements of Repeater

Table 5.1: Maximum Test System Uncertainty

Subclause	Maximum Test System Uncertainty	Range over which Test System Uncertainty applies
6.1 Maximum output power	±0,7 dB	
7 Frequency error	±12 Hz	Measurement results of ± 500 Hz
8 Out of band gain	±0,5 dB Calibration of test set-up shall be made without D.U.T. in order to achieve the accuracy	
9.1 Spectrum emission mask	±1,5 dB Due to carrier leakage for measurements specified in a 1MHz bandwidth close to the carrier (4 MHz to 8 MHz), integration of the measurement using several narrower bandwidth measurements may be necessary in order to achieve the above accuracy. The interference from the signal generator ACLR shall be minimum 10 dB below that of a Base Station according toTS25.141	
9.2 Spurious emissions	In UTRA and coexistence receive bands: for results > -60 dBm ±2,0 dB for results < -60 dBm ±3,0 dB Outside above range: emission power f ≤ 2,2 GHz ±1,5 dB; 2,2 GHz < f ≤ 4 GHz ±2,0 dB; f > 4 GHz ±4,0 dB. The interference from the signal generator ACLR shall be minimum 10 dB below that of a Base Station according toTS25.141	
10.1 Error vector magnitude	± 2,5 % (single code applied) (±2,5 % measurement error for single code). 5,0 % EVM in the stimulus signal (single code) will shift the EVM maximum value 0,7% to 18,2%. (RSS repeater EVM and Stimulus EVM.)	Measurement results from 12,5% to 22,5% at signal power = P_max – 3dB to P_max – 18 dB
10.2 Peak code domain error	±1,1dB Formula: RSS measurement error and impedance mismatch error (using ±1,0 dB measurement error and ±0,5 dB impedance mismatch error (stimulus side) assuming 14 dB return loss)	Measurement results from – 36 dB to – 30 dB, at signal power = P_max – 3 dB to P_max – 18 dB
11 Input intermodulation Characteristics	±1,2 dB Formula: RSS CW1 level error, 2 x CW2 level error, and measurement error (using all errors = ±0,5 dB)	
12 Output Intermodulation	[±2,1 dB] Spectrum emission Formula: RSS 2x Interference signal level error and Spectrum emission measurement level error. (1 dB interference signal level error is assumed.) Due to carrier leakage for measurements specified in a 1MHz bandwidth close to the carrier (4 MHz to 8 MHz), integration of the measurement using	

	several narrower bandwidth measurements may be necessary in order to achieve the above accuracy. The interference from the signal generator ACLR shall be minimum 10 dB below that of a Base Station For spurious emission: In UTRA and coexistence receive bands: [for results > -60 dBm ±2,0 dB] [for results < -60 dBm ±3,0 dB] Outside above range: emission power [f ≤ 2,2 GHz ±1,5 dB;] [2,2 GHz < f ≤ 4 GHz ±2,0 dB;] [f > 4 GHz ±4,0 dB.] The interference signal must have a spurious emission level at least [10 dB] below the spurious levels required in 9.2.	

5.2 Repeater test tolerances (informative)

The Test Tolerances defined in this subclause have been used to relax the Minimum Requirements in this specification to derive the Test Requirements.

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.)

Table 5.2: Test Tolerance

Subclause	Test Tolerance	Notes
6.1 Maximum output power	0,7 dB	
9.1 Spectrum emission mask	1,5 dB	
9.2 Spurious emissions	0 dB	
7 Frequency error	12 Hz	
10.1 Error vector magnitude	0 %	Target value is shifted due to stimulus EVM
10.2 Peak code domain error	1,1 dB	
8 Out of band gain	0,5dB	
11 Input intermodulation Characteristics	1,2dB	
12 Output intermodulation	[1,5 dB] for spectrum emission [0 dB] for spurious emission	

…

9 Unwanted emission

9.1 Out of band emission

Out of band emissions are unwanted emissions immediately outside the channel bandwidth resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. This out of band emission limit is specified in terms of a spectrum emission mask.

9.1.1 Spectrum emission mask

~~Out of band emissions are unwanted emissions immediately outside the channel bandwidth resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. This out of band emission limit is specified in terms of a spectrum emission mask for the transmitter.~~

~~NOTE: This subclause may be mandatory in certain regions. In other regions this mask may not be applied.~~

9.1.1.1 Definitions and applicability

The masks defined in Table 9.1, Table 9.2, Table 9.3, and Table 9.4 below may be mandatory in certain regions. In other regions this mask may not be applied.

9.1.1.2 Minimum Requirements

For regions where this clause applies, the requirement shall be met by a repeater's RF-signal output at maximum gain with WCDMA signals in the operating band of the Repeater, at levels that produce the maximum rated output power per channel. In normal conditions as specified in section 5.4.1 emissions shall not exceed the maximum level specified in Table 9.1, Table 9.2, Table 9.3, and Table 9.4 for the appropriate Repeater maximum output power, in the frequency range from Δf = 2,5 MHz to Δf_{max} from the 5 MHz channel, where:

- Δf is the separation between the centre frequency of first or last 5 MHz channel used in the operating band and the nominal –3 dB point of the measuring filter closest to the carrier frequency.
- f_offset is the separation between the centre frequency of first or last 5 MHz channel in the operating band and the centre of the measuring filter.
- f_offset_{max} is either 12,5 MHz or the offset to the UTRA band edge at both up- and down-link as defined in section 4.1, whichever is the greater.
- Δf_{max} is equal to f_offset_{max} minus half of the bandwidth of the measurement filter.

If the operating band corresponds to three or more consecutive nominal 5 MHz channels, the requirement shall be met with any combination of two WCDMA modulated signals in the repeaters operating band.

Table 9.1: Spectrum emission mask values, maximum output power P ≥ 43 dBm

Frequency offset of measurement filter – 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
2,5 ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	-14 dBm	30 kHz
2,7 ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	-14 – 15·(f_offset- 2,715) dBm	30 kHz
	3,515MHz ≤ f_offset < 4,0MHz	-26 dBm	30 kHz
3,5 ≤ Δf < 7,5 MHz	4,0 MHz ≤ f_offset < 8,0MHz	-13 dBm	1 MHz
7,5 ≤ Δf MHz	8,0 MHz ≤ f_offset < f_offset_{max}	-13 dBm	1 MHz

Table 9.2: Spectrum emission mask values, maximum output power 39 ≤ P < 43 dBm

Frequency offset of measurement filter – 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
2,5 ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	-14 dBm	30 kHz
2,7 ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	-14 – 15·(f_offset - 2,715) dBm	30 kHz
	3,515MHz ≤ f_offset < 4,0MHz	-26 dBm	30 kHz
3,5 ≤ Δf < 7,5 MHz	4,0 MHz ≤ f_offset < 8,0MHz	-13 dBm	1 MHz
7,5 ≤ Δf MHz	8,0MHz ≤ f_offset < f_offset_{max}	P - 56 dBm	1 MHz

Table 9.3: Spectrum emission mask values, maximum output power 31 ≤ P < 39 dBm

Frequency offset of measurement filter – 3dB point,Δf	Frequency offset of measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
2,5 ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	P - 53 dBm	30 kHz
2,7 ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	P – 53 – 15·(f_offset – 2,715) dBm	30 kHz
	3,515MHz ≤ f_offset < 4,0MHz	P - 65 dBm	30 kHz
3,5 ≤ Δf < 7,5 MHz	4,0 MHz ≤ f_offset < 8,0MHz	P - 52 dBm	1 MHz
7,5 ≤ Δf MHz	8,0MHz ≤ f_offset < f_offset_{max}	P - 56 dBm	1 MHz

Table 9.4: Spectrum emission mask values, maximum output power P < 31 dBm

Frequency offset of measurement filter – 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
2,5 ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	-22 dBm	30 kHz
2,7 ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	-22 – 15·(f_offset - 2,715) dBm	30 kHz
	3,515MHz ≤ f_offset < 4,0MHz	-34 dBm	30 kHz
3,5 ≤ Δf < 7,5 MHz	4,0 MHz ≤ f_offset < 8,0MHz	-21 dBm	1 MHz
7,5 ≤ Δf MHz	8,0MHz ≤ f_offset < f_offset_{max}	-25 dBm	1 MHz

9.1.1.3 Test purpose

The purpose of this test is to verify that the Repeater meet the spectrum emission requirements as specified in TS 25.106.

9.1.1.4 Method of test

9.1.1.4.1 Initial conditions

1. Set-up the equipment as shown in annex A.
2. Connect a signal generator to the input port of the Repeater for tests of repeaters with an operating band corresponding to one 5 MHz channel. If the operating band corresponds to two or more 5 MHz carriers, two signal generators with a combining circuit or one signal generator with the ability to generate several WCDMA carriers is connected to the input.
3. Measurements with an offset from the carrier centre frequency between 2,515 MHz and 4,0 MHz shall use a 30 kHz measurement bandwidth.
4. Measurements with an offset from the carrier centre frequency between 4,0 MHz and (Δfmax – 500 kHz) shall use a 1 MHz measurement bandwidth. The 1MHz measurement bandwidth may be calculated by integrating multiple 50 kHz or narrower filter measurements.
5. Detection mode: True RMS.

9.1.1.4.2 Procedures

1. Set the Repeater to maximum gain.
2. Set the signal generator(s) to generate signal(s) in accordance to test model 1, TS 25.141 subclause 6.2.1.1.1, at level(s) which produce the manufacturer specified maximum output power at maximum gain.
3. Measure the emission at the specified frequencies with specified measurement bandwidth and note that the measured value does not exceed the specified value.
4. Increase the power with 10 dB compare to the level obtained in step 2.

5. Measure the emission at the specified frequencies with specified measurement bandwidth and note that the measured value does not exceed the specified value.

6. Repeat the test for the opposite path of the Repeater.

9.1.1.5 Test requirements

The measurement result of step 3 and 5 of 9.1.4.2 shall not exceed the maximum level specified in tables 9.5 to 9.8 for the appropriate Repeater maximum output power.

Table 9.5: Spectrum emission mask values, maximum output power P ≥ 43 dBm

Frequency offset of measurement filter – 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
2,5 ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	-12,5 dBm	30 kHz
2,7 ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	-12,5 – 15·(f_offset- 2,715) dBm	30 kHz
	3,515MHz ≤ f_offset < 4,0MHz	-24,5 dBm	30 kHz
3,5 ≤ Δf < 7,5 MHz	4,0 MHz ≤ f_offset < 8,0MHz	-11,5 dBm	1 MHz
7,5 ≤ Δf MHz	8,0 MHz ≤ f_offset < f_offset_{max}	-11,5 dBm	1 MHz

Table 9.6: Spectrum emission mask values, maximum output power 39 ≤ P < 43 dBm

Frequency offset of measurement filter – 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
2,5 ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	-12,5 dBm	30 kHz
2,7 ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	-12,5 – 15·(f_offset – 2,715) dBm	30 kHz
	3,515MHz ≤ f_offset < 4,0MHz	-24,5 dBm	30 kHz
3,5 ≤ Δf < 7,5 MHz	4,0 MHz ≤ f_offset < 8,0MHz	-11,5 dBm	1 MHz
7,5 ≤ Δf MHz	8,0MHz ≤ f_offset < f_offset_{max}	P – 54,5 dBm	1 MHz

Table 9.7: Spectrum emission mask values, maximum output power 31 ≤ P < 39 dBm

Frequency offset of measurement filter – 3dB point,Δf	Frequency offset of measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
2,5 ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	P – 51,5 dBm	30 kHz
2,7 ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	P – 51,5 – 15·(f_offset – 2,715) dBm	30 kHz
	3,515MHz ≤ f_offset < 4,0MHz	P – 63,5 dBm	30 kHz
3,5 ≤ Δf < 7,5 MHz	4,0 MHz ≤ f_offset < 8,0MHz	P – 50,5 dBm	1 MHz
7,5 ≤ Δf MHz	8,0MHz ≤ f_offset < f_offset_{max}	P – 54,5 dBm	1 MHz

Table 9.8: Spectrum emission mask values, maximum output power P < 31 dBm

Frequency offset of measurement filter – 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Maximum level	Measurement bandwidth
2,5 ≤ Δf < 2,7 MHz	2,515MHz ≤ f_offset < 2,715MHz	-20,5 dBm	30 kHz
2,7 ≤ Δf < 3,5 MHz	2,715MHz ≤ f_offset < 3,515MHz	-20,5 – 15·(f_offset - 2,715) dBm	30 kHz
	3,515MHz ≤ f_offset < 4,0MHz	-32,5 dBm	30 kHz
3,5 ≤ Δf < 7,5 MHz	4,0 MHz ≤ f_offset < 8,0MHz	-19,5 dBm	1 MHz
7,5 ≤ Δf MHz	8,0MHz ≤ f_offset < f_offset_{max}	-23,5 dBm	1 MHz

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test is defined in subclause 5.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in Annex B.

…

9.2.2.2 Spurious emission ~~Minimum requirement~~ (Category B)

The following requirements shall be met in cases where Category B limits for spurious emissions, as defined in ITU-R Recommendation SM.329-8 [4], are applied.

At maximum Repeater gain, with WCDMA signals in the operating band of the Repeater, at levels that produce the maximum rated power output per channel, the power of any spurious emission shall not exceed the limits specified in Table 9.10 and Table 9.11 for the down- and up-link, respectively.

When the power in all channels is increased by 10 dB the requirements shall still be met.

The measurements shall apply both with or without an input signal applied.

NOTE 1: If the operating band corresponds to three or more consecutive nominal 5 MHz channels, the requirement shall be met with any combination of two WCDMA modulated signals in the repeaters operating band.

Table 9.10: Down-link: General spurious emissions limits, Category B

Band	Maximum Level	Measurement Bandwidth	Note
9kHz ↔ 150kHz	-36 dBm	1 kHz	Bandwidth as in ITU-R SM.329-8 [4], s4.1
150kHz ↔ 30MHz	- 36 dBm	10 kHz	Bandwidth as in ITU-R SM.329-8 [4], s4.1
30MHz ↔ 1GHz	-36 dBm	100 kHz	Bandwidth as in ITU-R SM.329-8 [4], s4.1
1GHz ↔ Fc1 - 60 MHz or 2100 MHz *whichever is the higher*	-30 dBm	1 MHz	Bandwidth as in ITU-R SM.329-8 [4], s4.1
Fc1 – 60 MHz or 2100 MHz *whichever is the higher* ↔ Fc1 – 50 MHz or 2100 MHz *whichever is the higher*	-25 dBm	1 MHz	Specification in accordance with ITU-R SM.329-8 [4], s4.1
Fc1 – 50 MHz or 2100 MHz *whichever is the higher* ↔ Fc2 + 50 MHz or 2180 MHz *whichever is the lower*	-15 dBm	1 MHz	Specification in accordance with ITU-R SM.329-8 [4], s4.1
Fc2 + 50 MHz or 2180 MHz *whichever is the lower* ↔ Fc2 + 60 MHz or 2180 MHz *whichever is the lower*	-25 dBm	1 MHz	Specification in accordance with ITU-R SM.329-8 [4], s4.1
Fc2 + 60 MHz or 2180 MHz *whichever is the lower* ↔ 12,75 GHz	-30 dBm	1 MHz	Bandwidth as in ITU-R SM.329-8, s4.1. Upper frequency as in ITU-R SM.329-8 [4], s2.6

Table 9.11: Up-link: General spurious emissions limits, Category B

Band	Maximum Level	Measurement Bandwidth	Note
9kHz ↔ 150kHz	-36 dBm	1 kHz	Bandwidth as in ITU-R SM.329-8 [4], s4.1
150kHz ↔ 30MHz	- 36 dBm	10 kHz	Bandwidth as in ITU-R SM.329-8 [4], s4.1
30MHz ↔ 1GHz	-36 dBm	100 kHz	Bandwidth as in ITU-R SM.329-8 [4], s4.1
1GHz ↔ Fc1 - 60 MHz or 1910 MHz *whichever is the higher*	-30 dBm	1 MHz	Bandwidth as in ITU-R SM.329-8 [4], s4.1
Fc1 – 60 MHz or 1910 MHz *whichever is the higher* ↔ Fc1 – 50 MHz or 1910 MHz *whichever is the higher*	-25 dBm	1 MHz	Specification in accordance with ITU-R SM.329-8 [4], s4.1
Fc1 – 50 MHz or 1910 MHz *whichever is the higher* ↔ Fc2 + 50 MHz or 1990 MHz *whichever is the lower*	-15 dBm	1 MHz	Specification in accordance with ITU-R SM.329-8 [4], s4.1
Fc2 + 50 MHz or 1990 MHz *whichever is the lower* ↔ Fc2 + 60 MHz or 1990 MHz *whichever is the lower*	-25 dBm	1 MHz	Specification in accordance with ITU-R SM.329-8 [4], s4.1
Fc2 + 60 MHz or 1990 MHz *whichever is the lower* ↔ 12,75 GHz	-30 dBm	1 MHz	Bandwidth as in ITU-R SM.329-8, s4.1. Upper frequency as in ITU-R SM.329-8 [4], s2.6

Fc1: Centre frequency of emission of the first 5 MHz channel in an operating band.

Fc2: Centre frequency of emission of the last 5 MHz channel in an operating band.

…

12 Output intermodulation

The output intermodulation requirement is a measure of the ability of the repeater to inhibit the generation of intermodulation products signals created by the presence of an interfering signal reaching the repeater via the output port.

12.1 Definition and applicability

The output intermodulation level is the power of the intermodulation products when a WCDMA modulated interference signal is injected into the output port at a level of 30 dB lower than that of the wanted signal. The frequency of the interference signal shall be ±5 MHz, ±10 MHz and ±15 MHz offset from the wanted signal, but within the frequency band allocated for UTRA FDD downlink as specified in subclause 4.1.

The requirement is applicable for downlink signals.

The normative reference for this requirement is in TS25.106 [12] section 12.

12.2 Minimum requirement

In normal conditions as specified in section 5.4.1, the output intermodulation level shall not exceed the out of band emission or the spurious emission requirements of section 9.1 and 9.2.

12.3 Test purpose

The test purpose is to verify the ability of the repeater to restrict the generation of intermodulation products in the presence of a subject signal on the repeater input and output ports, and an interfering signal applied at the repeater output port.

12.4 Method of test

12.4.1 Initial conditions

1) Set-up the equipment as shown in annex A.

2) Connect a signal generator to the input port of the Repeater for tests of repeaters with an operating band corresponding to one 5 MHz channel. Connect a signal generator to the circulator on the output port and make sure the signal generator power is directed to the repeater output port.

3) Measurements with an offset from the carrier centre frequency between 2,515 MHz and 4,0 MHz shall use a 30 kHz measurement bandwidth.

4) Measurements with an offset from the carrier centre frequency between 4,0 MHz and (Δfmax – 500 kHz) shall use a 1 MHz measurement bandwidth. The 1MHz measurement bandwidth may be calculated by integrating multiple 50 kHz or narrower filter measurements

5) Detection mode: True RMS.

12.4.2 Procedures

1) Set the Repeater to maximum gain.

2) Set the signal generator at the repeater input port (subject signal) to generate a signal in accordance to test model 1, TS 25.141 subclause 6.1.1.1, at the level which produce the manufacturer specified maximum output power at maximum gain.

3) Set the signal generator at the repeater output port (interference signal) to generate a signal in accordance to test model 1, TS 25.141 subclause 6.1.1.1, at the level producing signal power corresponding to 30 dB below the manufacturer specified maximum output power at the repeater output port with the specified frequency offset from the wanted signal.

4) Measure the emission at the specified frequencies with specified measurement bandwidth and note that the measured value does not exceed the specified value. Measurements in the band of the interfering signal shall be excluded. The measurements can be limited to the power of all third and fifth order intermodulation products.

5) Repeat from clause 3 until interference signals ±5 MHz, ±10 MHz and ±15 MHz frequency offset from the wanted signal has been tested. Note that interfering signals outside the UTRA-FDD allocated frequency band , as specifies in section 4.1. need not be tested.

12.5 Test requirements

In all measurements, the requirements according to sections 9.1.1.5 and the downlink requirements in section 9.2.2.1 or 9.2.2.2 shall be fulfilled.

Annex A (informative): Repeater measurement system set-up

Example of measurement system set-ups are attached below as an informative annex.

A.1 Maximum output power

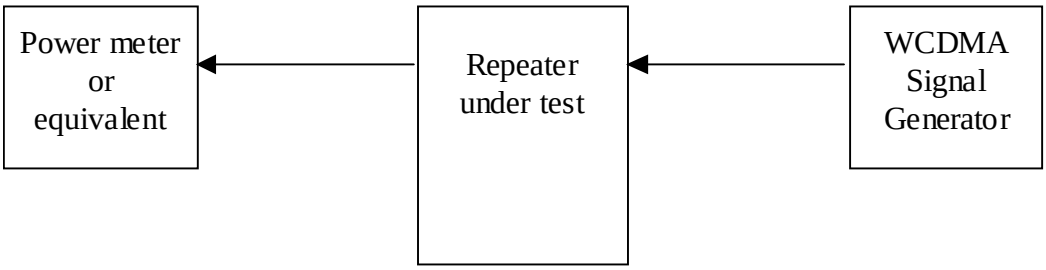

Figure A.1: Measuring system set-up for maximum output power.

Note that a repeater is a bi-directional device. The signal generator may need protection.

A.2 Frequency stability

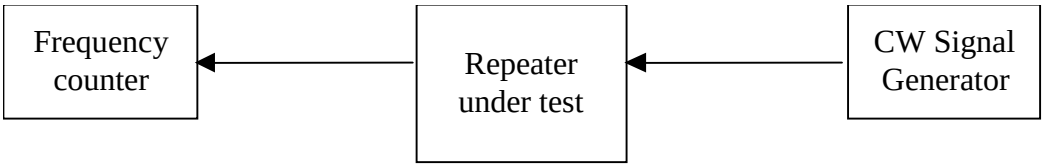

Figure A.2: Measurement system set-up for RF frequency stability.

Note that a repeater is a bi-directional device. The signal generator may need protection.

A.3 Out of band gain

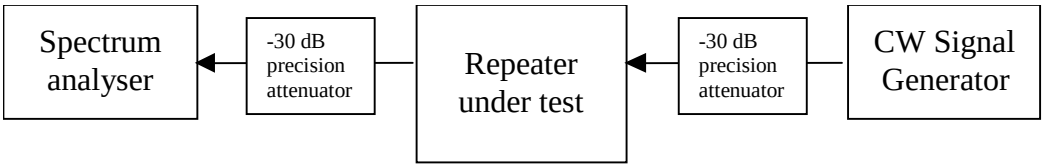

Figure A.3: Measuring system set-up for out of band gain.

Note that a repeater is a bi-directional device. The signal generator may need protection.

A.4 Unwanted emission: Spectrum emission mask

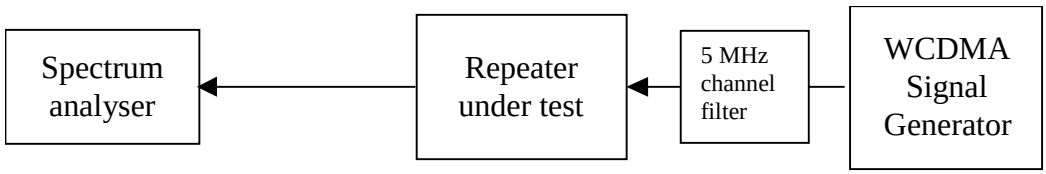

Figure A.4: Measuring system Set-up for unwanted emission: spectrum emission mask.

Note that a repeater is a bi-directional device. The signal generator may need protection.

A.5 Unwanted emission: Spurious emission

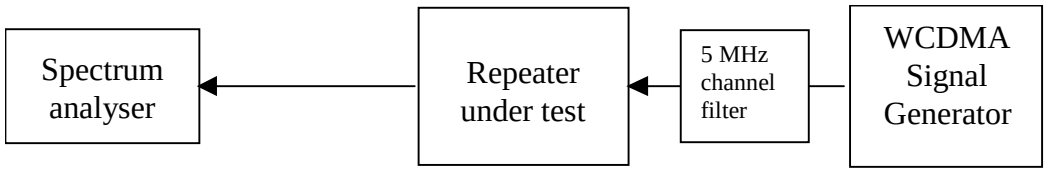

Figure A.5: Measuring system set-up for unwanted emission: spurious emission.

Note that a repeater is a bi-directional device. The signal generator may need protection.

A.6 Modulation Accuracy: Error Vector Magnitude

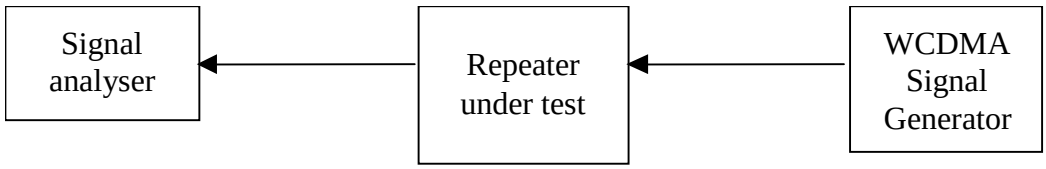

Figure A.6: Measuring system set-up for modulation accuracy: error vector magnitude.

Note that a repeater is a bi-directional device. The signal generator may need protection.

A.7 Modulation Accuracy: Peak Code Domain Error

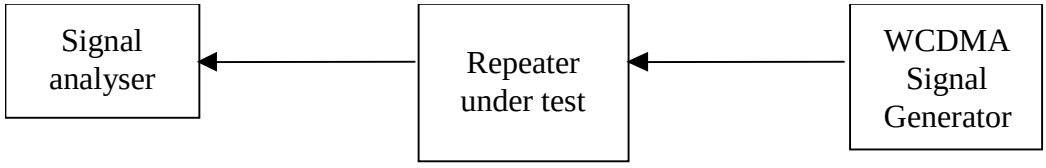

Figure A.7: Measuring system set-up for modulation accuracy: peak code domain error.

Note that a repeater is a bi-directional device. The signal generator may need protection.

A.8 Input intermodulation

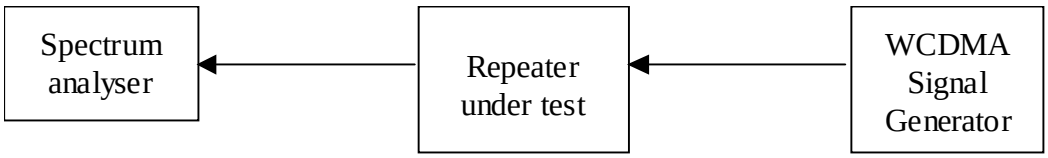

Figure A.8: Measuring system set-up for input intermodulation.

A.9 Output Intermodulation

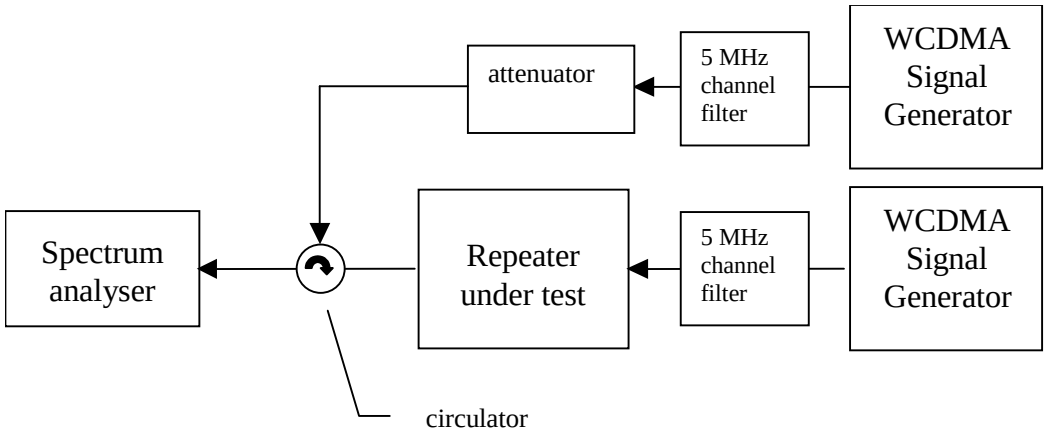

Figure A.9: Measuring system set-up for Output Intermodulation.

Note that a repeater is a bi-directional device. The signal generator may need protection.

The 5 MHz channel filter is only required if the WCDMA signal generator does not fulfil the unwanted emission requirement for base stations (TS25.141 [11], section 6.5) with at least 10 dB margin in the described set-up.

Annex B (informative): Derivation of Test Requirements

The Test Requirements in this specification have been calculated by relaxing the Minimum Requirements of the core specification using the Test Tolerances defined in subclause 5.2. 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 this relaxation is given in table B.1.

Table B.1: Derivation of Test Requirements

Clause number	Title	Minimum Requirement in TS 25.106	Test Tolerance (TT)	Test Requirement in TS 25.143
6.1	Maximum output power	In normal conditions Table 6.1	0,7 dB	Formula: Upper limit + TT Lower limit - TT In normal conditions refer to Table 6.3
		In extreme conditions Tabel 6.2		In extreme conditions refer to Table 6.4
9.1	Spectrum emission mask	Tables 9.1, 9.2, 9.3 and 9.4: "Maximum level" = X dB	1,5 dB	Formula: Maximum level + TT Refer to tables 9.5, 9.6, 9.7 and 9.8
7	Frequency stability	7.1 minimum requirement	12 Hz	Formula: Relative error + TT Refer to 7.5 Test requirements
8	Out of Band Gain	Table 8.1: Out of band gain limits	0,5 dB	Formula: Maximum level + TT Refer to table 8.2
9.2	Spurious emissions	Tables 9.5, to 9.15	0 dB	
10.1	Error Vector Magnitude	10.1.1 Minimum requirement	0 %	Formula: RSS Stimulus EVM and Repeater EVM to get target EVM Refer to 10.1.5 Test requirements
10.2	Peak code domain error	10.2.1 Minimum requirement	1,1 dB	Formula: Maximum error + TT Refer to 10.2.5 Test requirements
11	Input intermodulation	11.5 Minimum requirements, and Tables 11.1 and 11.2	1,2 dB	Maximum in-band power increase + TT Refer to 11.5 Test requirements.
12	Output intermodulation	12.1 Minimum requirements	[1,5 dB] for spectrum emission mask. [0 dB] for spurious emissions	Maximum level + TT Refer to tables 9.5 to 9.19

Annex C (informative): Acceptable uncertainty of Test Equipment

This informative annex specifies the critical parameters of the components of an overall Test System (e.g. signal generators, signal analysers etc.) which are necessary when assembling a Test System which complies with subclause5.1 Acceptable uncertainty of Test System. These Test Equipment parameters are fundamental to the accuracy of the overall Test System and are unlikely to be improved upon through System Calibration.

Table C.1: Equipment accuracy

Test	Equipment accuracy	Test condition
6.1 Maximum output power	Not critical	
9.1 Spectrum emission mask	Not critical	
9.2 Spurious emissions	Not critical	
11 Input intermodulation (interferer requirement)	Not critical	
7 Frequency error	±10 Hz + timebase = 12 Hz	Range 0 to 500 Hz. (This is to allow for UE range that at 0,1 PPM is larger than BTS).
10.1 Error vector magnitude	±2,5 % (for single code)	P_Max-3 to P_Max – 18 dB Applies for reading from 10% to 25%.
10.2 Peak code domain error		
8 Out of band gain		
11 Input intermodulation Characteristics		
12 Output intermodulation		