TSG RAN Meeting #15 **RP-020023**

Cheju, Korea, 5 - 8 March 2002

Title: **CRs (R'99 and Rel-4/Rel-5 Category A) to TS 25.141 (1)**

Source: **TSG RAN WG4**

Agenda Item: **7.4.3**

RAN4 Tdoc	Spec	CR	Rev	Phase	Title	Cat	Curr Ver	New Ver
R4-020097	25.141	147		R99	Frequency error and Test model 4	F	3.8.0	3.9.0
R4-020098	25.141	148		Rel-4	Frequency error and Test model 4	A	4.3.0	4.4.0
R4-020099	25.141	149		Rel-5	Frequency error and Test model 4	A	5.1.0	5.2.0
R4-020100	25.141	150		R99	The definition of AWGN interferer	F	3.8.0	3.9.0
R4-020101	25.141	151		Rel-4	The definition of AWGN interferer	A	4.3.0	4.4.0
R4-020102	25.141	152		Rel-5	The definition of AWGN interferer	A	5.1.0	5.2.0
R4-020164	25.141	153		R99	Single and Multicarrier in spurious emission requirements	F	3.8.0	3.9.0
R4-020165	25.141	154		Rel-4	Single and Multicarrier in spurious emission requirements	A	4.3.0	4.4.0
R4-020166	25.141	155		Rel-5	Single and Multicarrier in spurious emission requirements	A	5.1.0	5.2.0
R4-020301	25.141	177		R99	Maintenance of annex E, Global In-Channel TX-Test	F	3.8.0	3.9.0
R4-020302	25.141	178		Rel-4	Maintenance of annex E, Global In-Channel TX-Test	A	4.3.0	4.4.0
R4-020303	25.141	179		Rel-5	Maintenance of annex E, Global In-Channel TX-Test	A	5.1.0	5.2.0
R4-020328	25.141	190		R99	Correction of EVM test procedure	F	3.8.0	3.9.0
R4-020329	25.141	191		Rel-4	Correction of EVM test procedure	A	4.3.0	4.4.0
R4-020330	25.141	192		Rel-5	Correction of EVM test procedure	A	5.1.0	5.2.0
R4-020424	25.141	159	1	R99	Correction for FCC emission mask and frequency raster for band b (UMTS1900)	F	3.8.0	3.9.0
R4-020425	25.141	160	1	Rel-4	Correction for FCC emission mask and frequency raster for band b (UMTS1900)	A	4.3.0	4.4.0

3GPP TSG RAN WG4 Meeting #21 **R4-020097**

Sophia Antipolis, France 28th January - 1st February 2002

CR-Form-v4

CHANGE REQUEST

⌘ **25.141**	**CR** **147**	⌘ ev **-**	⌘ Current version: **3.8.0** ⌘

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: ⌘	Frequency error and Test model 4		
Source: ⌘	RAN WG4		
Work item code: ⌘		***Date:*** ⌘	1/2/2002
Category: ⌘	**F** *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.	***Release:*** ⌘	R99 *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: ⌘	In current specification it is not stated what test model should be used for Frequency error measurement. Test model 4 is correct model for this. It is used also with EVM and Total power dynamic range which both need to be tested with Pmax-3dB and Pmax-18dB. Obviously there is also a bug in Test model 4. The Primary CPICH channel is optional and if it is enabled the Total output power can vary between Pmax-2.2 dB to Pmax-9.4 dB. Therefore the power level settings in Test model 4 should be changed in order to achieve the whole Total power dynamic range with Primary CPICH enabled and/or disabled.
Summary of change: ⌘	Use of Test model 4 added to Frequency error measurement. Power level settings changed in Test model 4. Isolated Impact Analysis: This CR is correcting the test method used for Frequency error measurement. Would not affect implementations where Primary CPICH is disabled, would affect implementations where Primary CPICH is enabled.
Consequences if not approved: ⌘	Definition for the Test model used in Frequency error measurement will be missing. When Primary CPICH is enabled, required Total power dynamic range Pmax-3dB and Pmax-18dB can't be achieved with this test.

Clauses affected: ⌘		
Other specs affected: ⌘	[ ] Other core specifications ⌘ [ ] Test specifications	

	☐ O&M Specifications	
Other comments:	⌘	

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.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.

Table 6.5: DPCH Spreading Code, Toffset and Power for Test Model 3

Code	T_{offset}	Level settings (dB) (16 codes)	Level settings dB) (32 codes)
64	86	-14	-16
69	134	-14	-16
74	52	-14	-16
78	45	-14	-16
83	143	-14	-16
89	112	-14	-16
93	59	-14	-16
96	23	-14	-16
100	1	-14	-16
105	88	-14	-16
109	30	-14	-16
111	18	-14	-16
115	30	-14	-16
118	61	-14	-16
122	128	-14	-16
125	143	-14	-16
67	83		-16
71	25		-16
76	103		-16
81	97		-16
86	56		-16
90	104		-16
95	51		-16
98	26		-16
103	137		-16
108	65		-16
110	37		-16
112	125		-16
117	149		-16
119	123		-16
123	83		-16
126	5		-16

NOTE: The figures for code power are nominal and have tolerance of ±1 dB.

6.1.1.4 Test Model 4

This model shall be used for tests on:

- ~~-~~EVM measurement.
- Total power dynamic range
- Frequency error

Table 6.6: Test Model 4 Active Channels

Type	Number of Channels	Fraction of Power (%)	Level setting (dB)	Channelization Code	Timing offset
PCCPCH+SCH when Primary CPICH is disabled	1	50 to 1.6	-3 to -18	1	0
PCCPCH+SCH when Primary CPICH is enabled	1	25 to 0.8	-6 to -21	1	0
Primary CPICH[1]	1	~~10~~25 to 0.8	~~-10~~-6 to -21	0	0
Note 1: The CPICH channel is optional.					

================= NEXT MODIFIED SECTION ==============

6.2.2.4 Method of test

6.2.2.4.1 Initial conditions

Test environment: normal; see subclause 4.4.1.

RF channels to be tested: B, M and T; see subclause 4.8

1) Connect BS to code domain analyser as shown in annex B.
2) Disable inner loop power control.
3) Set-up BS transmission at maximum total power as specified by the supplier. Channel set-up shall be according to subclause 6.1.1.2.

6.2.2.4.2 Procedure

- Measure the power in the PCCPCH and PCPICH according to annex E.

6.2.2.5 Test Requirement

The measured CPICH power shall be within ±2.9dB of the ordered absolute value.

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 4.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in Annex F.

6.3 Frequency error

6.3.1 Definition and applicability

Frequency error is the measure of the difference between the actual BS transmit frequency and the assigned frequency. The same source shall be used for RF frequency and data clock generation.

It is not possible to verify by testing that the data clock is derived from the same frequency source as used for RF generation. This may be confirmed by a manufacturers declaration

6.3.2 Minimum Requirement

The Frequency Error shall be within ± 0.05 PPM.

The normative reference for this requirement is in TS 25.104 [1] subclause 6.3

6.3.3 Test purpose

To verify that the Frecuency Error is within the limit specified in 6.3.2

6.3.4 Method of test

6.3.4.1 Initial Conditions

Test environment: normal; see subclause 4.4.1

RF channels to be tested: B, M and T; see subclause 4.8.

The following additional tests shall be performed:

a) On each of B, M and T, the test shall be performed under extreme power supply as defined in subclause 4.4.2

NOTE: Tests under extreme power supply also test extreme temperature.

1) Connect the base station RF output port to the test equipment. Refer to annex B.1.2 for a functional block diagram of the test set-up.

2) Set the base station to transmit a signal~~ modulated with PCCPCH~~according to 6.1.1.4 (test model 4). Total power at the RF output port shall be Pmax-3dB and Pmax-18dB.

6.3.4.2 Procedure

1) Measure the Frequency Error according to annex E.

6.3.5 Test requirement

The Frequency Error shall be within the range (–0.05 PPM – 12 Hz) to (+0.05 PPM + 12 Hz).

6.4 Output power dynamics

Power control is used to limit the interference level. The BS transmitter uses a quality-based power control on the downlink. The physical channels for the following test(s) shall be set-up according to subclause 6.1.1.2.

6.4.1 Inner loop power control

Inner loop power control in the downlink is the ability of the BS transmitter to adjust the transmitter output power of a code channel in accordance with the corresponding TPC symbols received in the uplink.

6.4.2 Power control steps

The power control step is the required step change in the DL transmitter output power of a code channel in response to the corresponding power control command. The combined output power change is the required total change in the DL transmitter output power of a code channel in response to multiple consecutive power control commands corresponding to that code channel.

6.4.2.1 Definition and applicability

Inner loop power control in the downlink is the ability of the BS transmitter to adjust the transmitter output power of a code channel in accordance with the corresponding TPC symbols received in the uplink.

The power control step is the required step change in the DL transmitter output power of a code channel in response to the corresponding power control command. The combined output power change is the required total change in the DL transmitter output power of a code channel in response to multiple consecutive power control commands corresponding to that code channel.

6.4.2.2 Minimum Requirement

The BS transmitter shall have the capability of setting the inner loop output power with a step sizes of 1 dB mandatory and 0,5 dB optional.

a) The tolerance of the power control step due to inner loop power control shall be within the range shown in table 6.9.

b) The tolerance of the combined output power change due to inner loop power control shall be within the range shown in table 6.10.

3GPP TSG RAN WG4 Meeting #21 **R4-020330**

Sophia Antipolis, France 28th January - 1st February 2002

CR-Form-v4

CHANGE REQUEST

⌘ **25.141**	**CR 192**	⌘ ev **-**	⌘ Current version:	**5.1.0** ⌘

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: ⌘	Correction of EVM test procedure		
Source: ⌘	RAN WG4		
Work item code: ⌘	TEI	***Date:*** ⌘	1/2/2002
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 EVM test procedure is not correct
Summary of change: ⌘	Repeat only step 2) when the total output power is set to Pmax-18 dB
Consequences if not approved: ⌘	The EVM test procedure will not be correct, the EVM for Pmax-18 dB will not be measured with the actual test procedure. Isolated Impact Analysis: • This CR has no impact on the implementation. Modification is the correction of the EVM test procedure.

Clauses affected: ⌘	6.7.1
Other specs affected: ⌘	[ ] Other core specifications ⌘ [ ] Test specifications [ ] O&M Specifications
Other comments: ⌘	

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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.

6.7.1 Error Vector Magnitude

6.7.1.1 Definition and applicability

The Error Vector Magnitude is a measure of the difference between the reference waveform and the measured waveform. This difference is called the error vector. Both waveforms pass through a matched Root Raised Cosine filter with bandwidth 3.84 MHz and roll-off α =0.22. Both waveforms are then further modified by selecting the frequency, absolute phase, absolute amplitude and chip clock timing so as to minimise the error vector. The EVM result is defined as the square root of the ratio of the mean error vector power to the mean reference power expressed as a %. The measurement interval is one timeslot as defined by the C-PICH (when present) otherwise the measurement interval is one timeslot starting with the beginning of the SCH. The requirement is valid over the total power dynamic range as specified in 25.104 subclause 6.4.3. See Annex E of this specification for further details

6.7.1.2 Minimum Requirement

The Error Vector Magnitude shall be less than 17.5%

The normative reference for this requirement is in TS 25.104 [1] subclause 6.8.2

6.7.1.3 Test Purpose

To verify that the Error Vector Magnitude is within the limit specified in 6.7.1.2

6.7.1.4 Method of Test

6.7.1.4.1 Initial Conditions

Test environment: normal; see subclause 4.4.1.

RF channels to be tested: B, M and T; see subclause 4.8

Refer to annex B for a functional block diagram of the test set-up.

1) Connect the base station RF output port to the measurement equipment.

2) Set the base station to transmit a signal according to 6.1.1.4 (test model 4)

3) Set BS frequency

6.7.1.4.2 Procedure

1) Start BS transmission at Pmax-3dB

2) Measure the Error Vector Magnitude as defined in annex E. If the base station supports STTD or closed loop transmit diversity, EVM shall be measured on both main and diversity RF output ports.

3) Set the total output power to Pmax-18dB and repeat step~~s 1) and~~ 2)

6.7.1.5 Test Requirement

The Error Vector Magnitude shall be less than 17.5%

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 4.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in Annex F.

3GPP TSG RAN WG4 Meeting #21 **R4-020329**

Sophia Antipolis, France 28th January - 1st February 2002

CR-Form-v4

CHANGE REQUEST

⌘	**25.141**	**CR**	**191**	⌘ ev	**-**	⌘	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:	⌘	Correction of EVM test procedure
Source:	⌘	RAN WG4
Work item code:	⌘	TEI
Date:	⌘	1/2/2002
Category:	⌘	**A**
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 EVM test procedure is not correct
Summary of change:	⌘	Repeat only step 2) when the total output power is set to Pmax-18 dB
Consequences if not approved:	⌘	The EVM test procedure will not be correct, the EVM for Pmax-18 dB will not be measured with the actual test procedure. Isolated Impact Analysis: • This CR has no impact on the implementation. Modification is the correction of the EVM test procedure.

Clauses affected:	⌘	6.7.1
Other specs affected:	⌘	[ ] Other core specifications ⌘ [ ] Test specifications [ ] O&M Specifications
Other comments:	⌘	

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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.

6.7.1 Error Vector Magnitude

6.7.1.1 Definition and applicability

The Error Vector Magnitude is a measure of the difference between the reference waveform and the measured waveform. This difference is called the error vector. Both waveforms pass through a matched Root Raised Cosine filter with bandwidth 3.84 MHz and roll-off α =0.22. Both waveforms are then further modified by selecting the frequency, absolute phase, absolute amplitude and chip clock timing so as to minimise the error vector. The EVM result is defined as the square root of the ratio of the mean error vector power to the mean reference power expressed as a %. The measurement interval is one timeslot as defined by the C-PICH (when present) otherwise the measurement interval is one timeslot starting with the beginning of the SCH._ The requirement is valid over the total power dynamic range as specified in 25.104 subclause 6.4.3. See Annex E of this specification for further details

6.7.1.2 Minimum Requirement

The Error Vector Magnitude shall be less than 17.5%

The normative reference for this requirement is in TS 25.104 [1] subclause 6.8.2

6.7.1.3 Test Purpose

To verify that the Error Vector Magnitude is within the limit specified in 6.7.1.2

6.7.1.4 Method of Test

6.7.1.4.1 Initial Conditions

Test environment: normal; see subclause 4.4.1.

RF channels to be tested: B, M and T; see subclause 4.8

Refer to annex B for a functional block diagram of the test set-up.

1) Connect the base station RF output port to the measurement equipment.

2) Set the base station to transmit a signal according to 6.1.1.4 (test model 4)

3) Set BS frequency

6.7.1.4.2 Procedure

1) Start BS transmission at Pmax-3dB

2) Measure the Error Vector Magnitude as defined in annex E. If the base station supports STTD or closed loop transmit diversity, EVM shall be measured on both main and diversity RF output ports.

3) Set the total output power to Pmax-18dB and repeat step~~s 1) and~~ 2)

6.7.1.5 Test Requirement

The Error Vector Magnitude shall be less than 17.5%

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 4.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in Annex F.

3GPP TSG RAN WG4 Meeting #21 R4-020328
Sophia Antipolis, France 28th January - 1st February 2002

CR-Form-v4

CHANGE REQUEST

⌘	**25.141**	**CR**	**190**	⌘	ev	**-**	⌘	Current version:	**3.8.0** ⌘

*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:	⌘	Correction of EVM test procedure
Source:	⌘	RAN WG4
Work item code:	⌘	
Date:	⌘	1/2/2002
Category:	⌘	**F**
Release:	⌘	R99

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 EVM test procedure is not correct
Summary of change:	⌘	Repeat only step 2) when the total output power is set to Pmax-18 dB
Consequences if not approved:	⌘	The EVM test procedure will not be correct, the EVM for Pmax-18 dB will not be measured with the actual test procedure. Isolated Impact Analysis: • This CR has no impact on the implementation. Modification is the correction of the EVM test procedure.

Clauses affected:	⌘	6.7.1
Other specs affected:	⌘	[ ] Other core specifications ⌘ [ ] Test specifications [ ] O&M Specifications
Other comments:	⌘	

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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.

6.7.1 Error Vector Magnitude

6.7.1.1 Definition and applicability

The Error Vector Magnitude is a measure of the difference between the reference waveform and the measured waveform. This difference is called the error vector. Both waveforms pass through a matched Root Raised Cosine filter with bandwidth 3.84 MHz and roll-off α =0.22. Both waveforms are then further modified by selecting the frequency, absolute phase, absolute amplitude and chip clock timing so as to minimise the error vector. The EVM result is defined as the square root of the ratio of the mean error vector power to the mean reference power expressed as a %. The measurement interval is one timeslot as defined by the C-PICH (when present) otherwise the measurement interval is one timeslot starting with the beginning of the SCH._ The requirement is valid over the total power dynamic range as specified in 25.104 subclause 6.4.3. See Annex E of this specification for further details

6.7.1.2 Minimum Requirement

The Error Vector Magnitude shall be less than 17.5%

The normative reference for this requirement is in TS 25.104 [1] subclause 6.8.2

6.7.1.3 Test Purpose

To verify that the Error Vector Magnitude is within the limit specified in 6.7.1.2

6.7.1.4 Method of Test

6.7.1.4.1 Initial Conditions

Test environment: normal; see subclause 4.4.1.

RF channels to be tested: B, M and T; see subclause 4.8

Refer to annex B for a functional block diagram of the test set-up.

1) Connect the base station RF output port to the measurement equipment.

2) Set the base station to transmit a signal according to 6.1.1.4 (test model 4)

3) Set BS frequency

6.7.1.4.2 Procedure

1) Start BS transmission at Pmax-3dB

2) Measure the Error Vector Magnitude as defined in annex E. If the base station supports STTD or closed loop transmit diversity, EVM shall be measured on both main and diversity RF output ports.

3) Set the total output power to Pmax-18dB and repeat step~~s 1) and~~ 2)

6.7.1.5 Test Requirement

The Error Vector Magnitude shall be less than 17.5%

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 4.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in Annex F.

3GPP TSG RAN WG4 Meeting #21 **R4-020303**

Sophia Antipolis, France 28th January - 1st February 2002

CR-Form-v6.1

CHANGE REQUEST

⌘	**25.141**	**CR 179**	⌘ **rev**	**-**	⌘	Current version: **5.1.0**	⌘

*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:	⌘	Maintenance of annex E: Global In-Channel TX-Test.
Source:	⌘	RAN WG4
Work item code:	⌘	TEI
Date:	⌘	1/2/2002
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:	⌘	Progress of 25.141 concerning different power and modulation measurements stipulates maintenance of the Global In-Channel TX-Test.
Summary of change:	⌘	1) Algorithmic support for the overall test implementation added 2) Algorithmic definition of decision point power added 3) Algorithmic definition of code domain power added 4) Error corrections Isolated Impact Analysis: Changes in the test specification does not affect the function of Node B,
Consequences if not approved:	⌘	Implementation of all in-channel TX test parameters may be ambiguous leading to inconsistent measurements and system performance

Clauses affected:	⌘	Annex E
Other specs affected:	⌘	[ ] Other core specifications ⌘ [ ] Test specifications [ ] O&M Specifications
Other comments:	⌘	

Annex E (normative): Global In-Channel TX-Test

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. Any other algorithm (e.g. having better computational efficiency) may be applied, as long as the results are the same within the acceptable uncertainty of the test system as defined in subclause 4.1~~accuracy limits~~.

E.2 Definition of the process

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. The reference signal shall be composed of the same number of codes at the correct spreading factors as contained I~~-~~n the test signal. Note, for simplification, the notation below assumes only codes of~~and~~ one spreading factor although the algorithm is valid for signals containing multiple spreading factors. All signals are represented as equivalent (generally complex) baseband signals.

E.2.2 Output signal of the TX under test

The output signal of the TX under test is acquired by the measuring equipment, filtered by a matched filter (RRC 0.22, correct in shape and in position on the frequency axis) and stored for further processing ~~at one sample per chip at the Inter-Symbol-Interference free instants.~~

The following form represents the physical signal in the entire measurement interval:

one vector **Z**, containing N = ns x sf ~~+ ma~~ complex samples;

with

ns: number of symbols in the measurement interval;

sf: number of chips per symbol. (sf: spreading factor) (see Note: Symbol length)

~~ma: number of midamble chips (only in TDD)~~

E.2.3 Reference signal

The reference signal is constructed by the measuring equipment according to the relevant TX specifications.
It is filtered by the same matched filter, mentioned in E.2.2., and stored at the Inter-Symbol-Interference free instants.
The following form represents the ~~-~~reference signal in the entire measurement interval:
one vector **R**, containing N = ns x sf ~~+ ma~~ complex samples

where

ns: number of symbols in the measurement interval;

sf: number of chips per symbol. (see Note: Symbol length)

~~ma: number of midamble chips (only in TDD)~~

E.2.4 Classification of measurement results

The measurement results achieved by the global in-channel TX test can be classified into two types:

- Results of type “deviation”, where the error-free parameter has a non-zero magnitude. (These are the parameters that quantify the integral physical characteristic of the signal). These parameters are:

  RF Frequency

  Power (in case of single code)

  Code Domain Power (in case of multi code)

  Timing (only for UE) (see Note: Deviation)

  (Additional parameters: see Note: Deviation)

- Results of type “residual”, where the error-free parameter has value zero. (These are the parameters that quantify the error values of the measured signal, whose ideal magnitude is zero). These parameters are:

  Error Vector Magnitude (EVM);

  Peak Code Domain Error (PCDE).

  (Additional parameters: see Note: ~~r~~Residual)

E.2.5 Process definition to achieve results of type “deviation”

The reference signal (**R**; see subclause E.2.3) and the signal under Test (Z; see subclause E.2.2) are ~~is~~ varied with respect to the parameters mentioned in subclause E.2.4 under "results of type deviation" in order to achieve best fit ~~with the recorded signal under test (**Z**; see subclause E.2.2)~~. Best fit is achieved when the RMS difference value between the varied signal under test and the varied reference signal is an absolute minimum.

Overview:

$$FCT\left[\,Z(\tilde{f},\tilde{t},\tilde{\varphi},g_1,g_2,\ldots,g_{synch}) - R(f,t,\varphi,\tilde{g}_1,\tilde{g}_2,\ldots,\tilde{g}_{synch})\,\right] = Minimum\ !$$

Z : Signal under test.

R: Reference signal,

with frequency f, the timing t, the phase φ, gain of code1 (g_1), gain of code2 (g_2) etc, and the gain of the synch channel g_{synch} See Note: Power Step

The parameters marked with a tilde in Z and R are varied in order to achieve a best fit.

Detailed formula: see Note: Formula for the minimum process

The varied reference signal, after the best fit process, will be called **R’.**
The varied signal under test, after the best fit process, will be called **Z’.**
The varying parameters, leading to **R’** **and Z’** represent directly the wanted results of type “deviation”. These measurement parameters are expressed as deviation from the reference value with the same units ~~same~~ as the reference value.

In the case of multi code, the type-“deviation”-parameters (frequency, timing and (RF-phase)) are varied commonly for all codes such that the process returns one frequency-deviation, one timing deviation, (one RF-phase –deviation).

(These parameters are not varied on the individual code~~s~~ signals such that the process would return~~s~~ kr frequency errors... . (kr: number of codes in the reference signal)).

The only type-“deviation”-parameters varied individually are the code domain gain factors (g1, g2, …)

See Note: Power Step

~~code powers such that the process returns k code power deviations (k: number of codes). (see Note: Code Domain Power Meter)~~

E.2.5.1 Decision Point Power

The mean-square value of the signal-under-test, sampled at the best estimate of the of Intersymbol-Interference-free points using the process defined in subclause 2.5, is referred to the *Decision Point Power* (DPP):

$$DPP = mean\left(|Z'|^2\right)$$

E.2.5.2 Code-Domain Power

The samples, Z’, are separated into symbol intervals to create ns time-sequential vectors **z** with sf complex samples comprising one symbol interval. The *Code Domain Power* is calculated according to the following steps:

(1) Take the vectors **z** defined above.

(2) To achieve meaningful results it is necessary to descramble **z**, leading to **z’** (see Note: Scrambling code)

(3) Take the orthogonal vectors of the channelization code set **C** (all codes belonging to one spreading factor) as defined in TS 25.213 and TS 25.223 (range +1, -1), and normalize by the norm of the vectors to produce **C**norm=**C**/sqrt(sf). (see Note: Symbol length)

(4) Calculate the inner product of **z’** with **C**norm.. Do this for all symbols of the measurement interval and for all codes in the code space.
This gives an array of format k x ns, each value representing a specific symbol and a specific code, which can be exploited in a variety of ways.

k: total number of codes in the code space
ns: number of symbols in the measurement interval

(5) Calculate k mean-square values, each mean-square value unifying ns symbols within one code.
(These values can be called "*Absolute CodeDomainPower* (CDP)" [Volt^2].) The sum of the k values of CDP is equal to DPP.

(6) Normalize by the decision point power to obtain

$$Relative\ CodeDomain\ Power = \frac{Absolute\ CodeDomainPower}{DecisionPointPower}$$

E.2.6 Process definition to achieve results of type “residual”

The difference between the varied reference signal (**R’**; see subclauseE.2.5.) and the varied TX signal under test (**Z’**; see subclauseE.2.5~~2~~) is the error vector **E** versus time:

$$\mathbf{E} = \mathbf{Z'} - \mathbf{R'}$$

Depending on the parameter to be evaluated, it is appropriate to represent **E** in one of the following two different forms:

Form EVM (representing the physical error signal in the entire measurement interval)

One vector **E**, containing N = ns x sf ~~+ ma~~ complex samples;

with

ns: number of symbols in the measurement interval

sf: number of chips per symbol (see Note: Symbol length)

~~ma: number of midamble chips (only in TDD)~~

Form PCDE (derived from Form EVM by separating the samples into symbol intervals)

ns time-sequential vectors **e** with sf complex samples comprising one symbol interval.

E and **e** give results of type "residual" applying the two algorithms defined in subclauses E~~N~~ 2.6.1 and E~~N~~ 2.6.2.

E.2.6.1 Error Vector Magnitude (EVM)

The Error Vector Magnitude (EVM) is calculated according to the following steps:

(1) Take the error vector **E** defined in subclause E.2.6 (Form EVM) and calculate the RMS value of **E**; the result will be called RMS(**E**).

(2) Take the varied reference vector **R'** defined in subclause E.2.5 and calculate the RMS value of **R'**; the result will be called RMS(**R'**).

(3) Calculate EVM according to:

$$\mathrm{EVM} = \frac{\mathrm{RMS}(\mathbf{E})}{\mathrm{RMS}(\mathbf{R}')} \times 100\% \text{ — (here, EVM is relative and expressed in \%)}$$

~~(see note TDD)~~(see Note: Formula for EVM)

E.2.6.2 Peak Code Domain Error (PCDE)

The Peak Code Domain Error is calculated according to the following steps:

1. Take the error vectors **e** defined in subclause E.2.6 (Form PCDE)
2. To achieve meaningful results it is necessary to descramble **e,** leading to **e'** (see Note: Scrambling code)
3. Take the orthogonal vectors of the channelization code set **C** (all codes belonging to one spreading factor) as defined in TS 25.213 and TS 25.223 (range +1, -1). (see Note: Symbol length) and normalize by the norm of the vectors to produce **C**norm= **C**/sqrt(sf). (see Note: Symbol length)
4. Calculate the inner product of **e'** with **C**norm. Do this for all symbols of the measurement interval and for all codes in the code space.
   This gives an array of~~-~~ format k x ns, each value representing an error-vector representing a specific symbol and a specific code, which can be exploited in a variety of ways.

   k: total number of codes in the code space
   ns: number of symbols in the measurement interval
5. Calculate k RMS values, each RMS value unifying ns symbols within one code.
   (These values can be called "*Absolute CodeEVMs*" [Volt].)
6. Find the peak value among the k "*Absolute CodeEVMs*".
   (This value can be called "*Absolute PeakCodeEVM*" [Volt].)
7. Calculate PCDE according to:

$$10 * \lg \frac{("AbsolutePeakCodeEVM")^2}{(RMS(R'))^2} dB$$ (a relative value in dB).

~~(see Note: Denominator)~~

(see Note IQ)

~~(see Note TDD)~~

(see Note Synch channel)

E.3 Notes

Note: **Symbol length** A general code multiplexed signal is multi code and multi rate. In order to avoid unnecessary complexity, the measurement applications use a unique symbol-length, corresponding to a spreading factor, regardless of the really intended spreading factor. Nevertheless the complexity with a multi code / multi rate signal can be mastered by introducing appropriate definitions.

Note: **Deviation** It is conceivable to regard more parameters as type ~~„~~"deviation"~~"~~ e.g. Chip frequency and RF-phase.

As chip-frequency and~~-~~ RF-frequency are linked together by a statement in the core specifications [1] it is sufficient to process RF frequency only.

A parameter RF-phase must be varied within the best fit process (E~~N~~ 2.5.). Although necessary, ~~-~~this parameter~~-~~ variation doesn't describe any error, as the modulation schemes used in the system don't depend on an absolute RF-phase.

The parameter Timing must be varied within the best fit process (E.2.5.) This parameter variation does not describe any error, when applied to the Node B test. However when applied to the UE test, it describes the error of the UE's Timing Advance.

Note: **R~~r~~esidual** It is conceivable to regard more parameters as type ~~„~~"residual"~~"~~ e.g. IQ origin offset. As it is not the intention of the test to separate for different error sources, but to quantify the quality of the signal, all such parameters are not extracted by ~~-~~the best fit process, instead remain part of EVM and PCDE.

~~Note: **Denominator** If the denominator stems from mutual time shifted signals of different code powers, (e.g. BS, FDD) the measurement result PCDE should be expressed absolutely instead.~~

Note: **Scrambling Code** In general a~~ TX~~ signal under test can use more than one scrambling code. Note that PCDE is primarily ~~-~~processed to investigate the unused channelization codes. In order to know which scrambling code shall be applied on unused channelization codes, it is necessary to restrict the test conditions: The~~X~~ signal under test shall use exactly one scrambling code.

Note: **IQ** As in FDD/uplink each channelization code can be used twice, on the I and on the Q channel, the measurement result may indicate separate values of CDP or PCDE for I and Q on which channel (I or Q) they occur.

~~on which channel (I or Q) PCDE occurs.~~

~~Note: **TDD** EVM covers the midamble part as well as the data part; however PCDE disregards the midamble part.~~

Note: **Synch Channel** A Node B~~BS~~ signal contains a physical synch channel, which is non~~-~~orthogonal, related to the other channels. In this context note: The code channel bearing the result of PCDE is exactly one of the other physical channels (never the synch channel). The origin of PCDE (erroneous code power) can be any channel (including synch channel). This means that the error due to the synch channel is projected onto the other (orthogonal) codes that make up the code domain.

~~Note: **Code Domain Power Meter** The minimum process described in E.2.5 returns k code-power-deviations each based on the relevant reference-code-power. (k = number of codes) In order to avoid unnecessary complexity it is necessary to select a measurement interval, where all reference-code-powers remain constant. In case code power steps are tested (e.g. subclause 6.4.2.4.2.), a suitable measurement interval shall be chosen by proper triggering or a search strategy inside a longer interval of the acquired data.~~

~~However the process is not dependent on this restriction. It stands non-constant power or code power as well.~~

Note: **Fomula for the minimum process**

$$L(\Delta\tilde{f}, \Delta\tilde{t}, \Delta\tilde{\varphi}, \Delta\tilde{g}_c, \ldots, \Delta\tilde{g}_{prim}, \Delta\tilde{g}_{sec}) = \sum_{\nu=0}^{N-1} \left| Z(\nu) - R(\nu) \right|^2$$

Legend:

L : the function to be minimised

The parameters to be varied in order to minimize are:

$\Delta\tilde{f}$: the RF frequency offset

$\Delta\tilde{t}$: the timing offset

$\Delta\tilde{\varphi}$: the phase offset

$\Delta\tilde{g}_c \ldots$ code power offsets (one offset for each code)

$\Delta\tilde{g}_{prim}$: the code power offset of the primary SCH

$\Delta\tilde{g}_{sec}$: the code power offset of the secondary SCH

Z(ν): Samples of the signal under Test

R(ν): Samples of the reference signal

$\sum_{\nu=0}^{N-1}$: counting index ν starting at the beginning of the measurement interval and ending at its end.

N = No of chips during the measurement interval.

Z(ν): Samples of the signal under Test. It is modelled as a sequence of complex baseband samples Z(γ) with a time-shift Δt, a frequency offset Δf, a phase offset Δφ, the latter three with respect to the reference signal.

$$Z(\nu) = Z(\nu - \Delta\tilde{t}) * e^{-j2\pi\Delta\tilde{f}\nu} * e^{-j\Delta\tilde{\varphi}}$$

R(ν): Samples of the reference signal:

$$R(\nu)=\sum_{c=1}^{\substack{No.of\\codes}}(g_c+\Delta\tilde{g}_c)*Chip_c(\nu)+(g_{prim}+\Delta\tilde{g}_{prim})*Chip_{prim}(\nu)+(g_{\sec}+\Delta\tilde{g}_{\sec})*Chip_{\sec}(\nu)$$

g : nominal gain of the code channel

$\Delta\tilde{g}$: The gain offset to be varied in the minimum process

Chip(ν) is the chipsequence of the code channel

Indices at g, Δg and Chip:

The index indicates the code channel: c = 1,2,... No of code channels

prim = primary SCH

sec = secondary SCH

Range for $Chip_c$: +1,-1

Note: **Power Step** If the measurement period for any code contains a power step due to power control, it is necessary to model the reference signal for that code using two gain factors.

Note: **Formula for EVM**

$$EVM=\sqrt{\frac{\sum_{\nu=0}^{N-1}\left|Z'(\gamma)-R'(\gamma)\right|^2}{\sum_{\nu=0}^{N-1}\left|R'(\gamma)\right|^2}}*100\ \%$$

Z'(γ), R'(γ) are the varied measured and reference signals.

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CHANGE REQUEST

⌘ **25.141**	**CR 178**	⌘ **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:	⌘	Maintenance of annex E: Global In-Channel TX-Test.		
Source:	⌘	RAN WG4		
Work item code:	⌘	TEI	***Date:*** ⌘	1/2/2002
Category:	⌘	**A**	***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:	⌘	Progress of 25.141 concerning different power and modulation measurements stipulates maintenance of the Global In-Channel TX-Test.
Summary of change:	⌘	1) Algorithmic support for the overall test implementation added 2) Algorithmic definition of decision point power added 3) Algorithmic definition of code domain power added 4) Error corrections Isolated Impact Analysis: Changes in the test specification does not affect the function of Node B,
Consequences if not approved:	⌘	Implementation of all in-channel TX test parameters may be ambiguous leading to inconsistent measurements and system performance

Clauses affected:	⌘	Annex E		
Other specs affected:	⌘	[ ] Other core specifications [ ] Test specifications [ ] O&M Specifications	⌘	
Other comments:	⌘			

Annex E (normative): Global In-Channel TX-Test

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. Any other algorithm (e.g. having better computational efficiency) may be applied, as long as the results are the same within the acceptable uncertainty of the test system as defined in subclause 4.1~~accuracy limits~~.

E.2 Definition of the process

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. The reference signal shall be composed of the same number of codes at the correct spreading factors as contained I~~-~~n the test signal. Note, for simplification, the notation below assumes only codes of~~and~~ one spreading factor although the algorithm is valid for signals containing multiple spreading factors. All signals are represented as equivalent (generally complex) baseband signals.

E.2.2 Output signal of the TX under test

The output signal of the TX under test is acquired by the measuring equipment, filtered by a matched filter (RRC 0.22, correct in shape and in position on the frequency axis) and stored for further processing ~~at one sample per chip at the Inter-Symbol-Interference free instants.~~

The following form represents the physical signal in the entire measurement interval:

one vector **Z**, containing N = ns x sf ~~+ ma~~ complex samples;

with

ns: number of symbols in the measurement interval;

sf: number of chips per symbol. (sf: spreading factor) (see Note: Symbol length)

~~ma: number of midamble chips (only in TDD)~~

E.2.3 Reference signal

The reference signal is constructed by the measuring equipment according to the relevant TX specifications.
It is filtered by the same matched filter, mentioned in E.2.2., and stored at the Inter-Symbol-Interference free instants.
The following form represents the ~~-~~reference signal in the entire measurement interval:
one vector **R**, containing N = ns x sf ~~+ ma~~ complex samples

where

ns: number of symbols in the measurement interval;

sf: number of chips per symbol. (see Note: Symbol length)

~~ma: number of midamble chips (only in TDD)~~

E.2.4 Classification of measurement results

The measurement results achieved by the global in-channel TX test can be classified into two types:

- Results of type "deviation", where the error-free parameter has a non-zero magnitude. (These are the parameters that quantify the integral physical characteristic of~~-~~ the signal). These parameters are:

  RF Frequency

  Power (in case of single code)

  Code Domain Power (in case of multi code)

  Timing (only for UE) (see Note: Deviation)

  (Additional parameters: see Note: Deviation)

- Results of type "residual", where the error-free parameter has value zero. (These are the parameters that quantify the error values of the measured signal, whose ideal magnitude is zero). These parameters are:

  Error Vector Magnitude (EVM);

  Peak Code Domain Error (PCDE).

  (Additional parameters: see Note: ~~r~~Residual)

E.2.5 Process definition to achieve results of type "deviation"

The reference signal (**R**; see subclause E.2.3) and the signal under Test (Z; see subclause E.2.2) are ~~is~~ varied with respect to the parameters mentioned in subclause E.2.4 under "results of type deviation" in order to achieve best fit~~ with the recorded signal under test (Z; see subclause E.2.2)~~. Best fit is achieved when the RMS difference value between the varied signal under test and the varied reference signal is an absolute minimum.

Overview:

$$FCT\left[\,Z(\tilde{f},\tilde{t},\tilde{\varphi},g_1,g_2,\ldots,g_{synch}) - R(f,t,\varphi,\tilde{g}_1,\tilde{g}_2,\ldots,\tilde{g}_{synch})\,\right] = Minimum\ !$$

Z : Signal under test.

R: Reference signal,

with frequency f, the timing t, the phase φ, gain of code1 (g_1), gain of code2 (g_2) etc, and the gain of the synch channel g_{synch} See Note: Power Step

The parameters marked with a tilde in Z and R are varied in order to achieve a best fit.

Detailed formula: see Note: Formula for the minimum process

The varied reference signal, after the best fit process, will be called **R'.**
The varied signal under test, after the best fit process, will be called **Z'.**
The varying parameters, leading to **R' and Z'** represent directly the wanted results of type "deviation". These measurement parameters are expressed as deviation from the reference value with the same units ~~same~~ as the reference value.

In the case of multi code, the type-"deviation"-parameters (frequency, -timing and (RF-phase)) are varied commonly for all codes such that the process returns one frequency-deviation, one timing deviation, (one RF-phase –deviation).

(These parameters are not varied on the individual codes signals such that the process would returns kr frequency errors... . (kr: number of codes in the reference signal)).

The only type-“deviation”-parameters varied individually are the code domain gain factors (g1, g2, …)

See Note: Power Step

~~code powers such that the process returns k code power deviations (k: number of codes). (see Note: Code Domain Power Meter)~~

E.2.5.1 Decision Point Power

The mean-square value of the signal-under-test, sampled at the best estimate of the of Intersymbol-Interference-free points using the process defined in subclause 2.5, is referred to the *Decision Point Power* (DPP):

$$DPP = mean\left(\left|Z'\right|^2\right)$$

E.2.5.2 Code-Domain Power

The samples, Z’, are separated into symbol intervals to create ns time-sequential vectors **z** with sf complex samples comprising one symbol interval. The *Code Domain Power* is calculated according to the following steps:

(1) Take the vectors **z** defined above.

(2) To achieve meaningful results it is necessary to descramble **z**, leading to **z’** (see Note: Scrambling code)

(3) Take the orthogonal vectors of the channelization code set **C** (all codes belonging to one spreading factor) as defined in TS 25.213 and TS 25.223 (range +1, -1), and normalize by the norm of the vectors to produce **C**norm=**C**/sqrt(sf). (see Note: Symbol length)

(4) Calculate the inner product of **z’** with **C**norm.. Do this for all symbols of the measurement interval and for all codes in the code space.
This gives an array of format k x ns, each value representing a specific symbol and a specific code, which can be exploited in a variety of ways.

k: total number of codes in the code space
ns: number of symbols in the measurement interval

(5) Calculate k mean-square values, each mean-square value unifying ns symbols within one code.
(These values can be called "*Absolute CodeDomainPower* (CDP)" [Volt^2].) The sum of the k values of CDP is equal to DPP.

(6) Normalize by the decision point power to obtain

$$Relative\ CodeDomain\,Power = \frac{Absolute\ CodeDomainPower}{DecisionPointPower}$$

E.2.6 Process definition to achieve results of type “residual”

The difference between the varied reference signal (**R’**; see subclauseE.2.5.) and the varied TX signal under test (**Z’**; see subclauseE.2.5~~2~~) is the error vector **E** versus time:

$$\mathbf{E} = \mathbf{Z'} - \mathbf{R'}$$

Depending on the parameter to be evaluated, it is appropriate to represent **E** in one of the following two different forms:

Form EVM (representing the physical error signal in the entire measurement interval)

One vector **E**, containing N = ns x sf ~~+ ma~~ complex samples;

with

ns: number of symbols in the measurement interval

sf: number of chips per symbol (see Note: Symbol length)

~~ma: number of midamble chips (only in TDD)~~

Form PCDE (derived from Form EVM by separating the samples into symbol intervals)

ns time-sequential vectors **e** with sf complex samples comprising one symbol interval.

E and **e** give results of type "residual" applying the two algorithms defined in subclauses E~~N~~ 2.6.1 and E~~N~~ 2.6.2.

E.2.6.1 Error Vector Magnitude (EVM)

The Error Vector Magnitude (EVM) is calculated according to the following steps:

(1) Take the error vector **E** defined in subclause E.2.6 (Form EVM) and calculate the RMS value of **E**; the result will be called RMS(**E**).

(2) Take the varied reference vector **R'** defined in subclause E.2.5 and calculate the RMS value of **R'**; the result will be called RMS(**R'**).

(3) Calculate EVM according to:

$$\mathrm{EVM} = \frac{\mathrm{RMS}(\mathbf{E})}{\mathrm{RMS}(\mathbf{R}')} \,\mathrm{x}\, 100\% - \text{(here, EVM is relative and expressed in \%)}$$

~~(see note TDD)~~(see Note: Formula for EVM)

E.2.6.2 Peak Code Domain Error (PCDE)

The Peak Code Domain Error is calculated according to the following steps:

1. Take the error vectors **e** defined in subclause E.2.6 (Form PCDE)
2. To achieve meaningful results it is necessary to descramble **e**, leading to **e'** (see Note: Scrambling code)
3. Take the orthogonal vectors of the channelization code set **C** (all codes belonging to one spreading factor) as defined in TS 25.213 and TS 25.223 (range +1, -1). (see Note: Symbol length) and normalize by the norm of the vectors to produce **C**norm= **C**/sqrt(sf). (see Note: Symbol length)
4. Calculate the inner product of **e'** with **C**norm. Do this for all symbols of the measurement interval and for all codes in the code space.
   This gives an array of~~-~~ format k x ns, each value representing an error-vector representing a specific symbol and a specific code, which can be exploited in a variety of ways.

   k: total number of codes in the code space
   ns: number of symbols in the measurement interval

5. Calculate k RMS values, each RMS value unifying ns symbols within one code.
   (These values can be called "*Absolute CodeEVMs*" [Volt].)
6. Find the peak value among the k "*Absolute CodeEVMs*".
   (This value can be called "*Absolute PeakCodeEVM*" [Volt].)
7. Calculate PCDE according to:

$$10 * \lg \frac{("AbsolutePeakCodeEVM")^2}{(RMS(R'))^2} dB$$ (a relative value in dB).

~~(see Note: Denominator)~~

(see Note IQ)

~~(see Note TDD)~~

(see Note Synch channel)

E.3 Notes

Note: **Symbol length** A general code multiplexed signal is multi code and multi rate. In order to avoid unnecessary complexity, the measurement applications use a unique symbol-length, corresponding to a spreading factor, regardless of the really intended spreading factor. Nevertheless the complexity with a multi code / multi rate signal can be mastered by introducing appropriate definitions.

Note: **Deviation** It is conceivable to regard more parameters as type "deviation" e.g. Chip frequency and RF-phase.

As chip-frequency and RF-frequency are linked together by a statement in the core specifications [1] it is sufficient to process RF frequency only.

A parameter RF-phase must be varied within the best fit process (E~~N~~ 2.5.). Although necessary, this parameter variation doesn't describe any error, as the modulation schemes used in the system don't depend on an absolute RF-phase.

The parameter Timing must be varied within the best fit process (E.2.5.) This parameter variation does not describe any error, when applied to the Node B test. However when applied to the UE test, it describes the error of the UE's Timing Advance.

Note: **R~~r~~esidual** It is conceivable to regard more parameters as type "residual" e.g. IQ origin offset. As it is not the intention of the test to separate for different error sources, but to quantify the quality of the signal, all such parameters are not extracted by the best fit process, instead remain part of EVM and PCDE.

~~Note: **Denominator** If the denominator stems from mutual time shifted signals of different code powers, (e.g. BS, FDD) the measurement result PCDE should be expressed absolutely instead.~~

Note: **Scrambling Code** In general a ~~TX~~ signal under test can use more than one scrambling code. Note that PCDE is primarily processed to investigate the unused channelization codes. In order to know which scrambling code shall be applied on unused channelization codes, it is necessary to restrict the test conditions: The~~X~~ signal under test shall use exactly one scrambling code.

Note: **IQ** As in FDD/uplink each channelization code can be used twice, on the I and on the Q channel, the measurement result may indicate separate values of CDP or PCDE for I and Q on which channel (I or Q) they occur.

~~on which channel (I or Q) PCDE occurs.~~

~~Note: **TDD** EVM covers the midamble part as well as the data part; however PCDE disregards the midamble part.~~

Note: **Synch Channel** A Node B~~BS~~ signal contains a physical synch channel, which is non-orthogonal, related to the other channels. In this context note: The code channel bearing the result of PCDE is exactly one of the other physical channels (never the synch channel). The origin of PCDE (erroneous code power) can be any channel (including synch channel). This means that the error due to the synch channel is projected onto the other (orthogonal) codes that make up the code domain.

~~Note: **Code Domain Power Meter** The minimum process described in E.2.5 returns k code-power-deviations each based on the relevant reference-code-power. (k = number of codes) In order to avoid unnecessary complexity it is necessary to select a measurement interval, where all reference-code-powers remain constant. In case code power steps are tested (e.g. subclause 6.4.2.4.2.), a suitable measurement interval shall be chosen by proper triggering or a search strategy inside a longer interval of the acquired data.~~

~~However the process is not dependent on this restriction. It stands non-constant power or code power as well.~~

Note: **Fomula for the minimum process**

$$L(\Delta\tilde{f}, \Delta\tilde{t}, \Delta\tilde{\varphi}, \Delta\tilde{g}_c, \ldots, \Delta\tilde{g}_{prim}, \Delta\tilde{g}_{\sec}) = \sum_{\nu=0}^{N-1} \left| Z(\nu) - R(\nu) \right|^2$$

Legend:

L : the function to be minimised

The parameters to be varied in order to minimize are:

$\Delta\tilde{f}$: the RF frequency offset

$\Delta\tilde{t}$: the timing offset

$\Delta\tilde{\varphi}$: the phase offset

$\Delta\tilde{g}_c \ldots$ code power offsets (one offset for each code)

$\Delta\tilde{g}_{prim}$: the code power offset of the primary SCH

$\Delta\tilde{g}_{\sec}$: the code power offset of the secondary SCH

Z(ν): Samples of the signal under Test

R(ν): Samples of the reference signal

$\sum_{\nu=0}^{N-1}$: counting index ν starting at the beginning of the measurement interval and ending at its end.

N = No of chips during the measurement interval.

Z(ν): Samples of the signal under Test. It is modelled as a sequence of complex baseband samples Z(γ) with a time-shift Δt, a frequency offset Δf, a phase offset Δφ, the latter three with respect to the reference signal.

$$Z(\nu) = Z(\nu - \Delta\tilde{t}) * e^{-j2\pi\Delta\tilde{f}\nu} * e^{-j\Delta\tilde{\varphi}}$$

R(v): Samples of the reference signal:

$$R(v)=\sum_{c=1}^{\substack{No.of\\codes}}(g_c+\Delta\tilde{g}_c)*Chip_c(v)+(g_{prim}+\Delta\tilde{g}_{prim})*Chip_{prim}(v)+(g_{\sec}+\Delta\tilde{g}_{\sec})*Chip_{\sec}(v)$$

g : nominal gain of the code channel

$\Delta\tilde{g}$: The gain offset to be varied in the minimum process

Chip(v) is the chipsequence of the code channel

Indices at g, Δg and Chip:

The index indicates the code channel: c = 1,2,... No of code channels

prim = primary SCH

sec = secondary SCH

Range for $Chip_c$: +1,-1

Note: **Power Step** If the measurement period for any code contains a power step due to power control, it is necessary to model the reference signal for that code using two gain factors.

Note: **Formula for EVM**

$$EVM=\sqrt{\frac{\sum_{v=0}^{N-1}\left|Z'(\gamma)-R'(\gamma)\right|^2}{\sum_{v=0}^{N-1}\left|R'(\gamma)\right|^2}}*100\ \%$$

Z'(γ), R'(γ) are the varied measured and reference signals.

3GPP TSG RAN WG4 Meeting #21 **R4-020301**

Sophia Antipolis, France 28th January - 1st February 2002

CR-Form-v6.1

CHANGE REQUEST

⌘ **25.141**	**CR 177**	⌘ **rev** **-** ⌘	Current version: **3.8.0** ⌘

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:	⌘	Maintenance of annex E: Global In-Channel TX-Test.
Source:	⌘	RAN WG4
Work item code:	⌘	
Date:	⌘	1/2/2002
Category:	⌘	F
Release:	⌘	R99

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:	⌘	Progress of 25.141 concerning different power and modulation measurements stipulates maintenance of the Global In-Channel TX-Test.
Summary of change:	⌘	1) Algorithmic support for the overall test implementation added 2) Algorithmic definition of decision point power added 3) Algorithmic definition of code domain power added 4) Error corrections Isolated Impact Analysis: Changes in the test specification does not affect the function of Node B,
Consequences if not approved:	⌘	Implementation of all in-channel TX test parameters may be ambiguous leading to inconsistent measurements and system performance

Clauses affected:	⌘	Annex E
Other specs affected:	⌘	[ ] Other core specifications ⌘ [ ] Test specifications [ ] O&M Specifications
Other comments:	⌘	

Annex E (normative): Global In-Channel TX-Test

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. Any other algorithm (e.g. having better computational efficiency) may be applied, as long as the results are the same within the acceptable uncertainty of the test system as defined in subclause 4.1~~accuracy limits~~.

E.2 Definition of the process

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. The reference signal shall be composed of the same number of codes at the correct spreading factors as contained I~~-~~n the test signal. Note, for simplification, the notation below assumes only codes of~~and~~ one spreading factor although the algorithm is valid for signals containing multiple spreading factors. All signals are represented as equivalent (generally complex) baseband signals.

E.2.2 Output signal of the TX under test

The output signal of the TX under test is acquired by the measuring equipment, filtered by a matched filter (RRC 0.22, correct in shape and in position on the frequency axis) and stored for further processing ~~at one sample per chip at the Inter-Symbol-Interference free instants.~~

The following form represents the physical signal in the entire measurement interval:

one vector **Z**, containing N = ns x sf ~~+ ma~~ complex samples;

with

ns: number of symbols in the measurement interval;

sf: number of chips per symbol. (sf: spreading factor) (see Note: Symbol length)

~~ma: number of midamble chips (only in TDD)~~

E.2.3 Reference signal

The reference signal is constructed by the measuring equipment according to the relevant TX specifications.
It is filtered by the same matched filter, mentioned in E.2.2., and stored at the Inter-Symbol-Interference free instants.
The following form represents the ~~-~~reference signal in the entire measurement interval:
one vector **R**, containing N = ns x sf ~~+ ma~~ complex samples

where

ns: number of symbols in the measurement interval;

sf: number of chips per symbol. (see Note: Symbol length)

~~ma: number of midamble chips (only in TDD)~~

E.2.4 Classification of measurement results

The measurement results achieved by the global in-channel TX test can be classified into two types:

- Results of type "deviation", where the error-free parameter has a non-zero magnitude. (These are the parameters that quantify the integral physical characteristic of~~-~~ the signal). These parameters are:

  RF Frequency

  Power (in case of single code)

  Code Domain Power (in case of multi code)

  Timing (only for UE) (see Note: Deviation)

  (Additional parameters: see Note: Deviation)

- Results of type "residual", where the error-free parameter has value zero. (These are the parameters that quantify the error values of the measured signal, whose ideal magnitude is zero). These parameters are:

  Error Vector Magnitude (EVM);

  Peak Code Domain Error (PCDE).

  (Additional parameters: see Note: ~~r~~Residual)

E.2.5 Process definition to achieve results of type "deviation"

The reference signal (**R**; see subclause E.2.3) and the signal under Test (Z; see subclause E.2.2) are ~~is~~ varied with respect to the parameters mentioned in subclause E.2.4 under "results of type deviation" in order to achieve best fit~~ with the recorded signal under test (**Z**; see subclause E.2.2)~~. Best fit is achieved when the RMS difference value between the varied signal under test and the varied reference signal is an absolute minimum.

Overview:

$$FCT\left[\,Z(\tilde{f},\tilde{t},\tilde{\varphi},g_1,g_2,\ldots,g_{synch}) - R(f,t,\varphi,\tilde{g}_1,\tilde{g}_2,\ldots,\tilde{g}_{synch})\,\right] = Minimum\ !$$

Z : Signal under test.

R: Reference signal,

with frequency f, the timing t, the phase φ, gain of code1 (g_1), gain of code2 (g_2) etc, and the gain of the synch channel g_{synch} See Note: Power Step

The parameters marked with a tilde in Z and R are varied in order to achieve a best fit.

Detailed formula: see Note: Formula for the minimum process

The varied reference signal, after the best fit process, will be called **R'.**
The varied signal under test, after the best fit process, will be called **Z'.**
The varying parameters, leading to **R'** **and Z'** represent directly the wanted results of type "deviation". These measurement parameters are expressed as deviation from the reference value with the same units ~~same~~ as the reference value.

In the case of multi code, the type-"deviation"-parameters (frequency, ~~-~~timing and (RF-phase)) are varied commonly for all codes such that the process returns one frequency-deviation, one timing deviation, (one RF-phase –deviation).

(These parameters are not varied on the individual code~~s~~ signals such that the process would return~~s~~ kr frequency errors... . (kr: number of codes in the reference signal)).

The only type-"deviation"-parameters varied individually are the code domain gain factors (g1, g2, …)

See Note: Power Step

~~code powers such that the process returns k code power deviations (k: number of codes). (see Note: Code Domain Power Meter)~~

E.2.5.1 Decision Point Power

The mean-square value of the signal-under-test, sampled at the best estimate of the of Intersymbol-Interference-free points using the process defined in subclause 2.5, is referred to the *Decision Point Power* (DPP):

$$DPP = mean\left(\left|Z'\right|^2\right)$$

E.2.5.2 Code-Domain Power

The samples, Z', are separated into symbol intervals to create ns time-sequential vectors **z** with sf complex samples comprising one symbol interval. The *Code Domain Power* is calculated according to the following steps:

(1) Take the vectors **z** defined above.

(2) To achieve meaningful results it is necessary to descramble **z,** leading to **z'** (see Note: Scrambling code)

(3) Take the orthogonal vectors of the channelization code set **C** (all codes belonging to one spreading factor) as defined in TS 25.213 and TS 25.223 (range +1, -1), and normalize by the norm of the vectors to produce **C**norm=**C**/sqrt(sf). (see Note: Symbol length)

(4) Calculate the inner product of **z'** with **C**norm**.**. Do this for all symbols of the measurement interval and for all codes in the code space.
This gives an array of format k x ns, each value representing a specific symbol and a specific code, which can be exploited in a variety of ways.

k: total number of codes in the code space
ns: number of symbols in the measurement interval

(5) Calculate k mean-square values, each mean-square value unifying ns symbols within one code.
(These values can be called "*Absolute CodeDomainPower* (CDP)" [Volt^2].) The sum of the k values of CDP is equal to DPP.

(6) Normalize by the decision point power to obtain

$$Relative\ CodeDomain\,Power = \frac{Absolute\ CodeDomainPower}{DecisionPointPower}$$

E.2.6 Process definition to achieve results of type "residual"

The difference between the varied reference signal (**R'**; see subclauseE.2.5.) and the varied TX signal under test (**Z'**; see subclauseE.2.5~~2~~) is the error vector **E** versus time:

$$\mathbf{E} = \mathbf{Z'} - \mathbf{R'}$$

Depending on the parameter to be evaluated, it is appropriate to represent **E** in one of the following two different forms:

Form EVM (representing the physical error signal in the entire measurement interval)

One vector **E**, containing N = ns x sf ~~+ ma~~ complex samples;

with

ns: number of symbols in the measurement interval

sf: number of chips per symbol (see Note: Symbol length)

~~ma: number of midamble chips (only in TDD)~~

Form PCDE (derived from Form EVM by separating the samples into symbol intervals)

ns time-sequential vectors **e** with sf complex samples comprising one symbol interval.

E and **e** give results of type "residual" applying the two algorithms defined in subclauses E~~N~~ 2.6.1 and E~~N~~ 2.6.2.

E.2.6.1 Error Vector Magnitude (EVM)

The Error Vector Magnitude (EVM) is calculated according to the following steps:

(1) Take the error vector **E** defined in subclause E.2.6 (Form EVM) and calculate the RMS value of **E**; the result will be called RMS(**E**).

(2) Take the varied reference vector **R'** defined in subclause E.2.5 and calculate the RMS value of **R'**; the result will be called RMS(**R'**).

(3) Calculate EVM according to:

$$\mathrm{EVM} = \frac{\mathrm{RMS}(\mathbf{E})}{\mathrm{RMS}(\mathbf{R}')} \text{ x } 100\% - \text{(here, EVM is relative and expressed in \%)}$$

~~(see note TDD)~~(see Note: Formula for EVM)

E.2.6.2 Peak Code Domain Error (PCDE)

The Peak Code Domain Error is calculated according to the following steps:

1. Take the error vectors **e** defined in subclause E.2.6 (Form PCDE)
2. To achieve meaningful results it is necessary to descramble **e,** leading to **e'** (see Note: Scrambling code)
3. Take the orthogonal vectors of the channelization code set **C** (all codes belonging to one spreading factor) as defined in TS 25.213 and TS 25.223 (range +1, -1). (see Note: Symbol length) and normalize by the norm of the vectors to produce **C**norm= **C**/sqrt(sf). (see Note: Symbol length)
4. Calculate the inner product of **e'** with **C**norm. Do this for all symbols of the measurement interval and for all codes in the code space.
   This gives an array of~~-~~ format k x ns, each value representing an error-vector representing a specific symbol and a specific code, which can be exploited in a variety of ways.

   k: total number of codes in the code space
   ns: number of symbols in the measurement interval
5. Calculate k RMS values, each RMS value unifying ns symbols within one code.
   (These values can be called "*Absolute CodeEVMs*" [Volt].)
6. Find the peak value among the k "*Absolute CodeEVMs*".
   (This value can be called "*Absolute PeakCodeEVM*" [Volt].)
7. Calculate PCDE according to:

$$10 * \lg \frac{("AbsolutePeakCodeEVM")^2}{(RMS(R'))^2} dB$$ (a relative value in dB).

~~(see Note: Denominator)~~

(see Note IQ)

~~(see Note TDD)~~

(see Note Synch channel)

E.3 Notes

Note: **Symbol length** A general code multiplexed signal is multi code and multi rate. In order to avoid unnecessary complexity, the measurement applications use a unique symbol-length, corresponding to a spreading factor, regardless of the really intended spreading factor. Nevertheless the complexity with a multi code / multi rate signal can be mastered by introducing appropriate definitions.

Note: **Deviation** It is conceivable to regard more parameters as type ~~„~~"deviation"~~“~~ e.g. Chip frequency and RF-phase.

As chip-frequency and~~-~~ RF-frequency are linked together by a statement in the core specifications [1] it is sufficient to process RF frequency only.

A parameter RF-phase must be varied within the best fit process (E~~N~~ 2.5.). Although necessary, ~~-~~this parameter~~-~~ variation doesn't describe any error, as the modulation schemes used in the system don't depend on an absolute RF-phase.

The parameter Timing must be varied within the best fit process (E.2.5.) This parameter variation does not describe any error, when applied to the Node B test. However when applied to the UE test, it describes the error of the UE's Timing Advance.

Note: **R~~r~~esidual** It is conceivable to regard more parameters as type ~~„~~"residual"~~“~~ e.g. IQ origin offset. As it is not the intention of the test to separate for different error sources, but to quantify the quality of the signal, all such parameters are not extracted by ~~-~~the best fit process, instead remain part of EVM and PCDE.

~~Note: **Denominator** If the denominator stems from mutual time shifted signals of different code powers, (e.g. BS, FDD) the measurement result PCDE should be expressed absolutely instead.~~

Note: **Scrambling Code** In general a~~ TX~~ signal under test can use more than one scrambling code. Note that PCDE is primarily ~~-~~processed to investigate the unused channelization codes. In order to know which scrambling code shall be applied on unused channelization codes, it is necessary to restrict the test conditions: The~~X~~ signal under test shall use exactly one scrambling code.

Note: **IQ** As in FDD/uplink each channelization code can be used twice, on the I and on the Q channel, the measurement result may indicate separate values of CDP or PCDE for I and Q on which channel (I or Q) they occur.

~~on which channel (I or Q) PCDE occurs.~~

~~Note: **TDD** EVM covers the midamble part as well as the data part; however PCDE disregards the midamble part.~~

Note: **Synch Channel** A Node B~~BS~~ signal contains a physical synch channel, which is non~~-~~-orthogonal, related to the other channels. In this context note: The code channel bearing the result of PCDE is exactly one of the other physical channels (never the synch channel). The origin of PCDE (erroneous code power) can be any channel (including synch channel). This means that the error due to the synch channel is projected onto the other (orthogonal) codes that make up the code domain.

~~Note: **Code Domain Power Meter** The minimum process described in E.2.5 returns k code-power-deviations each based on the relevant reference-code-power. (k = number of codes) In order to avoid unnecessary complexity it is necessary to select a measurement interval, where all reference-code-powers remain constant. In case code power steps are tested (e.g. subclause 6.4.2.4.2.), a suitable measurement interval shall be chosen by proper triggering or a search strategy inside a longer interval of the acquired data.~~

~~However the process is not dependent on this restriction. It stands non-constant power or code power as well.~~

Note: **Fomula for the minimum process**

$$L(\Delta\tilde{f}, \Delta\tilde{t}, \Delta\tilde{\varphi}, \Delta\tilde{g}_c, \ldots, \Delta\tilde{g}_{prim}, \Delta\tilde{g}_{\sec}) = \sum_{v=0}^{N-1} |Z(v) - R(v)|^2$$

Legend:

L : the function to be minimised

The parameters to be varied in order to minimize are:

$\Delta\tilde{f}$: the RF frequency offset

$\Delta\tilde{t}$: the timing offset

$\Delta\tilde{\varphi}$: the phase offset

$\Delta\tilde{g}_c \ldots$ code power offsets (one offset for each code)

$\Delta\tilde{g}_{prim}$: the code power offset of the primary SCH

$\Delta\tilde{g}_{\sec}$: the code power offset of the secondary SCH

Z(v): Samples of the signal under Test

R(v): Samples of the reference signal

$\sum_{v=0}^{N-1}$: counting index v starting at the beginning of the measurement interval and ending at its end.

N = No of chips during the measurement interval.

Z(v): Samples of the signal under Test. It is modelled as a sequence of complex baseband samples Z(γ) with a time-shift Δt, a frequency offset Δf, a phase offset Δφ, the latter three with respect to the reference signal.

$$Z(v) = Z(v - \Delta\tilde{t}) * e^{-j2\pi\Delta\tilde{f}v} * e^{-j\Delta\tilde{\varphi}}$$

R(v): Samples of the reference signal:

$$R(v) = \sum_{c=1}^{\substack{No.of\\codes}} (g_c + \Delta\tilde{g}_c) * Chip_c(v) + (g_{prim} + \Delta\tilde{g}_{prim}) * Chip_{prim}(v) + (g_{\sec} + \Delta\tilde{g}_{\sec}) * Chip_{\sec}(v)$$

g : nominal gain of the code channel

$\Delta\tilde{g}$: The gain offset to be varied in the minimum process

Chip(v) is the chipsequence of the code channel

Indices at g, Δg and Chip:

The index indicates the code channel: c = 1,2,... No of code channels

prim = primary SCH

sec = secondary SCH

Range for $Chip_c$: +1,-1

Note: **Power Step** If the measurement period for any code contains a power step due to power control, it is necessary to model the reference signal for that code using two gain factors.

Note: **Formula for EVM**

$$EVM = \sqrt{\frac{\sum_{v=0}^{N-1} |Z'(\gamma) - R'(\gamma)|^2}{\sum_{v=0}^{N-1} |R'(\gamma)|^2}} * 100 \%$$

Z'(γ), R'(γ) are the varied measured and reference signals.

3GPP TSG RAN WG4 Meeting #21 **R4-020425**

Sophia Antipolis, France 28th January - 1st February 2002

CR-Form-v5

CHANGE REQUEST

⌘	**25.141**	**CR**	**160**	⌘ **rev**	**1**	⌘	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:	⌘	Correction for FCC emission mask and frequency raster for Band b (UMTS1900)		
Source:	⌘	RAN WG4		
Work item code:	⌘	TEI	***Date:*** ⌘	1/2/2002
Category:	⌘	**A**	***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:	⌘	During the UMTS1900/1800 WI for release 5 it has been identified issues that need to be corrected also in earlier releases to avoid discontinuities between different releases (Between Rel-5 and R99/Rel-4). The following topics have been identified: FCC emission mask clarification and channel raster corrections for band b.
Summary of change:	⌘	1. Channel raster 12 new carriers have been added to support FCC band allocation and single 5 MHz deployment. Mapping table of UARFCN table updated accordingly. 2. FCC mask correction Mask includes also an absolute emission limit –13 dBm adjusted with different measurement BW. 3. The zero test tolerance for the –15 dBm regulatory value is reflected in Subclause 4.2 and Annex F. **Isolated Impact Analysis**: Correction of a requirement. Would not affect implementations behaving like indicated in the CR. A Rel-4 BS operating in Band b which does not have the CR implemented would not be able to use the additional Band b channels that are necessary for operation in a 2x5 MHz allocation and would potentially not fulfil the FCC Part 24 limits for emissions outside a licensee's frequency block.
Consequences if not approved:	⌘	Channel raster description and Spectrum mask would be inconsistent with the Release independent UMTS1900 requirements in Rel-5.

Clauses affected:	⌘	3.5.3, 4.2.1, 6.5.2.1, Annex F		
Other specs	⌘	[X] Other core specifications	⌘	TS 25.104 (CR in R4-011649)

affected:	☐ Test specifications ☐ O&M Specifications	
Other comments:	⌘	

3.5.3 Channel number

The carrier frequency is designated by the UTRA Absolute Radio Frequency Channel Number (UARFCN). The value of the UARFCN in the IMT2000 band is defined as follows.

Table 3.1: UTRA Absolute Radio Frequency Channel Number

Uplink	$N_u = 5 * (F_{uplink}$ ~~MHz)~~	0.0 MHz ≤ F_{uplink} ≤ 3276.6 MHz where F_{uplink} is the uplink frequency in MHz
Downlink	$N_d = 5 * (F_{downlink}$ ~~MHz)~~	0.0 MHz ≤ $F_{downlink}$ ≤ 3276.6 MHz where $F_{downlink}$ is the downlink frequency in MHz

Table 3.1b: UARFCN definition (Band b, region 2, Additional Channels)

Uplink	$N_u = 5 * (F_{uplink} – 1850.1\ MHz)$	1852.5, 1857.5, 1862.5, 1867.5, 1872.5, 1877.5, 1882.5, 1887.5, 1892.5, 1897.5, 1902.5, 1907.5
Downlink	$N_d = 5 * (F_{downlink} – 1850.1\ MHz)$	1932.5, 1937.5, 1942.5, 1947.5, 1952.5, 1957.5, 1962.5, 1967.5, 1972.5, 1977.5, 1982.5, 1987.5

4.2 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.)

4.2.1 Transmitter

Table 4.1C: Test Tolerances for transmitter tests.

Subclause	Test Tolerance[1]
6.2.1 Maximum Output Power	0.7 dB
6.2.2 CPICH Power accuracy	0.8 dB
6.3.4 Frequency error	12 Hz
6.4.2 Power control steps	0.1 dB
6.4.3 Power dynamic range	0.2 dB
6.4.4 Total power dynamic range	0.3 dB
6.5.1 Occupied Bandwidth	0 kHz
6.5.2.1 Spectrum emission mask	1.5 dB[3]
6.5.2.2 ACLR	0.8 dB
6.5.3 Spurious emissions	0 dB
6.6 Transmit intermodulation (interferer requirements)	0 dB[2]
6.7.1 Frequency error	12 Hz
6.7.12 EVM	0 %
6.7.23 Peak code Domain error	1.0dB
Note 1: Unless otherwise stated, The Test Tolerances are applied to the DUT Minimum Requirement. See Annex F. Note 2: The Test Tolerance is applied to the stimulus signal(s). See Annex F. Note 3: 0 dB test tolerance for the additional Band b requirements.	

6.5.2.1 Spectrum emission mask

6.5.2.1.1 Definitions and applicability

The mask defined in Tables 6.14 to 6.17 below may be mandatory in certain regions. In other regions this mask may not be applied.

6.5.2.1.2 Minimum Requirements

For regions where this clause applies, the requirement shall be met by a base station transmitting on a single RF carrier configured in accordance with the manufacturer's specification. Emissions shall not exceed the maximum level specified in tables 6.14 to 6.17 for the appropriate BS maximum output power, in the frequency range from Δf =2.5 MHz to Δf_{max} from the carrier frequency, where:

- Δf is the separation between the carrier frequency and the nominal –3dB point of the measuring filter closest to the carrier frequency.
- f_offset is the separation between the carrier frequency and the centre of the measurement filter;
- f_offset_{max} is either 12.5 MHz or the offset to the UMTS Tx band edge as defined in subclause 3.4.1, whichever is the greater.
- Δf_{max} is equal to f_offset_{max} minus half of the bandwidth of the measuring filter.

Table 6.14: Spectrum emission mask values, BS 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~~ Minimum requirement	Additional Minimum Requirement for Band b	Measurement bandwidth
2.5 ≤ Δf < 2.7 MHz	2.515MHz ≤ f_offset < 2.715MHz	-14 dBm	-15 dBm	30 kHz
2.7 ≤ Δf < 3.5 MHz	2.715MHz ≤ f_offset < 3.515MHz	- 14 dBm – 15·(f_offset-2.715) dB	-15 dBm	30 kHz
	3.515MHz ≤ f_offset < 4.0MHz	-26 dBm	NA	30 kHz
3.5 ≤ Δf < 7.5 MHz	4.0 MHz ≤ f_offset < 8.0MHz	-13 dBm	NA	1 MHz
7.5 ≤ Δf MHz	8.0 MHz ≤ f_offset < f_offset_{max}	-13 dBm	NA	1 MHz

Table 6.15: Spectrum emission mask values, BS 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~~ Minimum requirement	Additional Minimum Requirement for Band b	Measurement bandwidth
2.5 ≤ Δf < 2.7 MHz	2.515MHz ≤ f_offset < 2.715MHz	-14 dBm	-15 dBm	30 kHz
2.7 ≤ Δf < 3.5 MHz	2.715MHz ≤ f_offset < 3.515MHz	-14dBm – 15·(f_offset - 2.715) dB	-15 dBm	30 kHz
	3.515MHz ≤ f_offset < 4.0MHz	-26 dBm	NA	30 kHz
3.5 ≤ Δf < 7.5 MHz	4.0 MHz ≤ f_offset < 8.0MHz	-13 dBm	NA	1 MHz
7.5 ≤ Δf MHz	8.0MHz ≤ f_offset < f_offset_{max}	P – 56 dB	NA	1 MHz

Table 6.16: Spectrum emission mask values, BS 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~~ Minimum requirement	Additional Minimum Requirement for Band b	Measurement bandwidth
2.5 ≤ Δf < 2.7 MHz	2.515MHz ≤ f_offset < 2.715MHz	P – 53 dB	-15 dBm	30 kHz
2.7 ≤ Δf < 3.5 MHz	2.715MHz ≤ f_offset < 3.515MHz	P – 53 dB – 15·(f_offset – 2.715) dB	-15 dBm	30 kHz
	3.515MHz ≤ f_offset < 4.0MHz	P – 65 dB	NA	30 kHz
3.5 ≤ Δf < 7.5 MHz	4.0 MHz ≤ f_offset < 8.0MHz	P – 52 dB	NA	1 MHz
7.5 ≤ Δf MHz	8.0MHz ≤ f_offset < f_offset_{max}	P – 56 dB	NA	1 MHz

Table 6.17: Spectrum emission mask values, BS 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~~ Minimum requirement	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 dBm– 15·(f_offset - 2.715) dB	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

The normative reference for this requirement is in TS 25.104 [1] subclause 6.6.2.1

6.5.2.1.3 Test purpose

This test measures the emissions of the BS, close to the assigned channel bandwidth of the wanted signal, while the transmitter is in operation.

6.5.2.1.4 Method of test

6.5.2.1.4.1 Initial conditions

Test environment: normal; see subclause 4.4.1.

RF channels to be tested: B, M and T; see subclause 4.8

1) Set-up the equipment as shown in annex B.
2) Measurements with an offset from the carrier centre frequency between 2,515 MHz and 4.0 MHz shall use a 30 kHz measurement bandwidth.
3) Measurements with an offset from the carrier centre frequency between 4.0 MHz and (f_offset_{max} – 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
4) Detection mode: True RMS.

6.5.2.1.4.2 Procedures

1) Set the BS to transmit a signal in accordance to test model 1, subclause 6.2.1.1.1 at the manufacturer's specified maximum output power.
2) Measure the emission at the specified frequencies with specified measurement bandwidth and note that the measured value does not exceed the specified value.

6.5.2.1.5 Test requirements

The measurement result in step 2 of 6.5.2.1.4.2 shall not exceed the maximum level specified in tables 6.18 to 6.21 for the appropriate BS maximum output power.

Table 6.18: Spectrum emission mask values, BS 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~~ Test Requirement	Additional Test Requirement for Band b	Measurement bandwidth
2.5 ≤ Δf < 2.7 MHz	2.515MHz ≤ f_offset < 2.715MHz	-12.5 dBm	-15 dBm	30 kHz
2.7 ≤ Δf < 3.5 MHz	2.715MHz ≤ f_offset < 3.515MHz	- 12.5 dBm – 15·(f_offset-2.715) dB	-15 dBm	30 kHz
	3.515MHz ≤ f_offset < 4.0MHz	-24.5 dBm	NA	30 kHz
3.5 ≤ Δf < 7.5 MHz	4.0 MHz ≤ f_offset < 8.0MHz	-11.5 dBm	NA	1 MHz
7.5 ≤ Δf MHz	8.0 MHz ≤ f_offset < f_offset_{max}	-11.5 dBm	NA	1 MHz

Table 6.19: Spectrum emission mask values, BS 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~~ Test Requirement	Additional Test Requirement for Band b	Measurement bandwidth
2.5 ≤ Δf < 2.7 MHz	2.515MHz ≤ f_offset < 2.715MHz	-12.5 dBm	-15 dBm	30 kHz
2.7 ≤ Δf < 3.5 MHz	2.715MHz ≤ f_offset < 3.515MHz	-12.5 dBm – 15·(f_offset - 2.715) dB	-15 dBm	30 kHz
	3.515MHz ≤ f_offset < 4.0MHz	-24.5 dBm	NA	30 kHz
3.5 ≤ Δf < 7.5 MHz	4.0 MHz ≤ f_offset < 8.0MHz	-11.5 dBm	NA	1 MHz
7.5 ≤ Δf MHz	8.0MHz ≤ f_offset < f_offset_{max}	P – 54.5 dB	NA	1 MHz

Table 6.20: Spectrum emission mask values, BS 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~~ Test Requirement	Additional Test Requirement for Band b	Measurement bandwidth
2.5 ≤ Δf < 2.7 MHz	2.515MHz ≤ f_offset < 2.715MHz	P – 51.5 dB	-15 dBm	30 kHz
2.7 ≤ Δf < 3.5 MHz	2.715MHz ≤ f_offset < 3.515MHz	P – 51.5 dB – 15·(f_offset – 2.715) dB	-15 dBm	30 kHz
	3.515MHz ≤ f_offset < 4.0MHz	P – 63.5 dB	NA	30 kHz
3.5 ≤ Δf < 7.5 MHz	4.0 MHz ≤ f_offset < 8.0MHz	P – 50.5 dB	NA	1 MHz
7.5 ≤ Δf MHz	8.0MHz ≤ f_offset < f_offset_{max}	P – 54.5 dB	NA	1 MHz

Table 6.21: Spectrum emission mask values, BS 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~~ Test Requirement	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 dBm– 15·(f_offset - 2.715) dB	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 4.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in Annex F.

Annex F (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 4.2. 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 tables F.1, F.2 and F.3

Note that a formula for applying Test Tolerances is provided for all tests, even those with a test tolerance of zero. This is necessary in the case that the Test System uncertainty is greater than that allowed in subclause 4.1. In this event, the excess error shall be subtracted from the defined test tolerance in order to generate the correct tightened Test Requirements as defined in subclause 4.3.

For example, a Test System having 0.9 dB accuracy for test 6.2.1 Base Station maximum output power (which is 0.2 dB above the limit specified in subclause 4.) would subtract 0.2 dB from the Test Tolerance of 0.7 dB defined in subclause 4.2. This new test tolerance of 0.5 dB would then be applied to the Minimum Requirement using the formula defined in Table F.1 to give a new range of ±2.5 dB of the manufacturer's rated output power.

Using this same approach for the case where a test had a test tolerance of 0 dB, an excess error of 0.2 dB would result in a modified test tolerance of –0.2 dB.

Table F.1: Derivation of Test Requirements (Transmitter tests)

Test	Minimum Requirement in TS 25.104	Test Tolerance (TT)	Test Requirement in TS 25.141
6.2.1 Base station maximum output power	In normal conditions … within +2 dB and -2 dB of the manufacturer's rated output power In extreme conditions… within +2.5 dB and –2.5 dB of the manufacturer's rated output power	0.7 dB	Formula: Upper limit + TT Lower limit – TT In normal conditions … within +2.7 dB and –2.7 dB of the manufacturer's rated output power In extreme conditions… within +3.2 dB and –3.2 dB of the manufacturer's rated output power
6.2.2 CPICH Power accuracy	CPICH power shall be within ±2.1dB	0.8 dB	Formula: Upper limit + TT Lower limit – TT CPICH power shall be within ±2.9dB
6.3.4 Frequency error	Frequency error limit = 0.05 ppm	12 Hz	Formula: Frequency Error limit + TT Frequency Error limit = 0.05 ppm + 12 Hz
6.4.2 Power control steps	Lower and upper limits as specified in tables 6.9 and 6.10a	0.1 dB	Formula: Upper limits + TT Lower limits – TT 0.1 dB applied as above to tables 6.9 and 6.10a
6.4.3 Power dynamic range	maximum power limit = BS maximum output power -3 dB minimum power limit = BS maximum output power –28 dB	0.2 dB	Formula: maximum power limit – TT minimum power limit + TT maximum power limit = BS maximum output power –3.2 dB minimum power limit = BS maximum output power –27.8 dB
6.4.4 Total power dynamic range	total power dynamic range limit = 18 dB	0.3 dB	Formula: total power dynamic range limit – TT total power dynamic range limit = 17.7 dB
6.5.1 Occupied Bandwidth	occupied bandwidth limit = 5 MHz	0 kHz	Formula: Occupied bandwidth limit + TT Occupied bandwidth limit = 5 MHz
6.5.2.1 Spectrum emission mask	Maximum level defined in tables 6.11, 6.12, 6.13 and 6.14:	1.5 dB (0 dB for the additional Band b requirements)	Formula: Maximum level + TT Add 1.5 to Maximum level entries in tables 6.11, 6.12, 6.13 and 6.14.
6.5.2.2 Adjacent Channel Leakage power Ratio (ACLR)	ACLR limit = 45 dB at 5 MHz ACLR limit = 50 dB at 10 MHz	0.8 dB	Formula: ACLR limit – TT ACLR limit = 44.2 dB at 5 MHz ACLR limit = 49.2 dB at 10 MHz
6.5.3 Spurious emissions	Maximum level defined in tables 6.16 to 6.26	0 dB	Formula: Maximum limit + TT Add 0 to Maximum level in tables 6.16 to 6.26
6.6 Transmit intermodulation (interferer requirements) This tolerance applies to the stimulus and not the measurements defined in 6.5.2.1, 6.5.2.2 and 6.5.3.	Wanted signal level – interferer level = 30 dB	0 dB	Formula: Ratio + TT Wanted signal level – interferer level = 30 + 0 dB
6.7.1 EVM	EVM limit =17.5 %	0 %	Formula: EVM limit + TT EVM limit = 17.5%

3GPP TSG RAN WG4 Meeting #21 R4-020424

Sophia Antipolis, France 28th January - 1st February 2002

CR-Form-v5

CHANGE REQUEST

⌘	**25.141**	**CR 159**	⌘ **rev**	**1** ⌘	Current version:	**3.8.0** ⌘

*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:	⌘	Correction for FCC emission mask and frequency raster for Band b (UMTS1900)		
Source:	⌘	RAN WG4		
Work item code:	⌘		***Date:*** ⌘	1/2/2002
Category:	⌘	**F** *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.	***Release:*** ⌘	R99 *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:	⌘	During the UMTS1900/1800 WI for release 5 it has been identified issues that need to be corrected also in earlier releases to avoid discontinuities between different releases (Between Rel-5 and R99/Rel-4). The following topics have been identified: FCC emission mask clarification and channel raster corrections for band b.
Summary of change:	⌘	1. Channel raster 12 new carriers have been added to support FCC band allocation and single 5 MHz deployment. Mapping table of UARFCN table updated accordingly. 2. FCC mask correction Mask includes also an absolute emission limit –13 dBm adjusted with different measurement BW. 3. The zero test tolerance for the –15 dBm regulatory value is reflected in Subclause 4.2 and Annex F. **Isolated Impact Analysis**: Correction of a requirement. Would not affect implementations behaving like indicated in the CR. A R99 BS operating in Band b which does not have the CR implemented would not be able to use the additional Band b channels that are necessary for operation in a 2x5 MHz allocation and would potentially not fulfil the FCC Part 24 limits for emissions outside a licensee's frequency block.
Consequences if not approved:	⌘	Channel raster description and Spectrum mask would be inconsistent with the Release independent UMTS1900 requirements in Rel-5.

Clauses affected:	⌘	3.5.3, 4.2.1, 6.5.2.1, Annex F	
Other specs	⌘ [X]	Other core specifications	⌘ TS 25.104 (CR in R4-011595)

affected:	☐ Test specifications ☐ O&M Specifications	
Other comments:	⌘	

3.5.3 Channel number

The carrier frequency is designated by the UTRA Absolute Radio Frequency Channel Number (UARFCN). The value of the UARFCN in the IMT2000 band is defined as follows.

Table 3.1: UTRA Absolute Radio Frequency Channel Number

Uplink	$N_u = 5 *$ ~~(~~F_{uplink} ~~MHz)~~	$0.0 \text{ MHz} \leq F_{uplink} \leq 3276.6 \text{ MHz}$ where F_{uplink} is the uplink frequency in MHz
Downlink	$N_d = 5 *$ ~~(~~$F_{downlink}$ ~~MHz)~~	$0.0 \text{ MHz} \leq F_{downlink} \leq 3276.6 \text{ MHz}$ where $F_{downlink}$ is the downlink frequency in MHz

Table 3.1b: UARFCN definition (Band b, region 2, Additional Channels)

Uplink	$N_u = 5 * (F_{uplink} - 1850.1 \text{ MHz})$	1852.5, 1857.5, 1862.5, 1867.5, 1872.5, 1877.5, 1882.5, 1887.5, 1892.5, 1897.5, 1902.5, 1907.5
Downlink	$N_d = 5 * (F_{downlink} - 1850.1 \text{ MHz})$	1932.5, 1937.5, 1942.5, 1947.5, 1952.5, 1957.5, 1962.5, 1967.5, 1972.5, 1977.5, 1982.5, 1987.5

4.2 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.)

4.2.1 Transmitter

Table 4.1C: Test Tolerances for transmitter tests.

Subclause	Test Tolerance[1]
6.2.1 Maximum Output Power	0.7 dB
6.2.2 CPICH Power accuracy	0.8 dB
6.3.4 Frequency error	12 Hz
6.4.2 Power control steps	0.1 dB
6.4.3 Power dynamic range	0.2 dB
6.4.4 Total power dynamic range	0.3 dB
6.5.1 Occupied Bandwidth	0 kHz
6.5.2.1 Spectrum emission mask	1.5 dB[3]
6.5.2.2 ACLR	0.8 dB
6.5.3 Spurious emissions	0 dB
6.6 Transmit intermodulation (interferer requirements)	0 dB[2]
6.7.1 Frequency error	12 Hz
6.7.12 EVM	0 %
6.7.23 Peak code Domain error	1.0dB
Note 1: Unless otherwise stated, The Test Tolerances are applied to the DUT Minimum Requirement. See Annex F. Note 2: The Test Tolerance is applied to the stimulus signal(s). See Annex F. Note 3: 0 dB test tolerance for the additional Band b requirements.	

6.5.2.1 Spectrum emission mask

6.5.2.1.1 Definitions and applicability

The mask defined in Tables 6.14 to 6.17 below may be mandatory in certain regions. In other regions this mask may not be applied.

6.5.2.1.2 Minimum Requirements

For regions where this clause applies, the requirement shall be met by a base station transmitting on a single RF carrier configured in accordance with the manufacturer's specification. Emissions shall not exceed the maximum level specified in tables 6.14 to 6.17 for the appropriate BS maximum output power, in the frequency range from Δf =2.5 MHz to Δf_{max} from the carrier frequency, where:

- Δf is the separation between the carrier frequency and the nominal –3dB point of the measuring filter closest to the carrier frequency.
- f_offset is the separation between the carrier frequency and the centre of the measurement filter;
- f_offset_{max} is either 12.5 MHz or the offset to the UMTS Tx band edge as defined in subclause 3.4.1, whichever is the greater.
- Δf_{max} is equal to f_offset_{max} minus half of the bandwidth of the measuring filter.

Table 6.14: Spectrum emission mask values, BS 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~~ Minimum requirement	Additional Minimum Requirement for Band b	Measurement bandwidth
2.5 ≤ Δf < 2.7 MHz	2.515MHz ≤ f_offset < 2.715MHz	-14 dBm	-15 dBm	30 kHz
2.7 ≤ Δf < 3.5 MHz	2.715MHz ≤ f_offset < 3.515MHz	- 14 dBm – 15·(f_offset-2.715) dB	-15 dBm	30 kHz
	3.515MHz ≤ f_offset < 4.0MHz	-26 dBm	NA	30 kHz
3.5 ≤ Δf < 7.5 MHz	4.0 MHz ≤ f_offset < 8.0MHz	-13 dBm	NA	1 MHz
7.5 ≤ Δf MHz	8.0 MHz ≤ f_offset < f_offset_{max}	-13 dBm	NA	1 MHz

Table 6.15: Spectrum emission mask values, BS 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~~ Minimum requirement	Additional Minimum Requirement for Band b	Measurement bandwidth
2.5 ≤ Δf < 2.7 MHz	2.515MHz ≤ f_offset < 2.715MHz	-14 dBm	-15 dBm	30 kHz
2.7 ≤ Δf < 3.5 MHz	2.715MHz ≤ f_offset < 3.515MHz	-14 dBm – 15·(f_offset - 2.715) dB	-15 dBm	30 kHz
	3.515MHz ≤ f_offset < 4.0MHz	-26 dBm	NA	30 kHz
3.5 ≤ Δf < 7.5 MHz	4.0 MHz ≤ f_offset < 8.0MHz	-13 dBm	NA	1 MHz
7.5 ≤ Δf MHz	8.0MHz ≤ f_offset < f_offset_{max}	P – 56 dB	NA	1 MHz

Table 6.16: Spectrum emission mask values, BS 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~~ Minimum requirement	Additional Minimum Requirement for Band b	Measurement bandwidth
2.5 ≤ Δf < 2.7 MHz	2.515MHz ≤ f_offset < 2.715MHz	P – 53 dB	-15 dBm	30 kHz
2.7 ≤ Δf < 3.5 MHz	2.715MHz ≤ f_offset < 3.515MHz	P – 53 dB – 15·(f_offset – 2.715) dB	-15 dBm	30 kHz
	3.515MHz ≤ f_offset < 4.0MHz	P – 65 dB	NA	30 kHz
3.5 ≤ Δf < 7.5 MHz	4.0 MHz ≤ f_offset < 8.0MHz	P – 52 dB	NA	1 MHz
7.5 ≤ Δf MHz	8.0MHz ≤ f_offset < f_offset_{max}	P – 56 dB	NA	1 MHz

Table 6.17: Spectrum emission mask values, BS 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~~ Minimum requirement	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 dBm – 15·(f_offset - 2.715) dB	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

The normative reference for this requirement is in TS 25.104 [1] subclause 6.6.2.1

6.5.2.1.3 Test purpose

This test measures the emissions of the BS, close to the assigned channel bandwidth of the wanted signal, while the transmitter is in operation.

6.5.2.1.4 Method of test

6.5.2.1.4.1 Initial conditions

Test environment: normal; see subclause 4.4.1.

RF channels to be tested: B, M and T; see subclause 4.8

1) Set-up the equipment as shown in annex B.
2) Measurements with an offset from the carrier centre frequency between 2,515 MHz and 4.0 MHz shall use a 30 kHz measurement bandwidth.
3) Measurements with an offset from the carrier centre frequency between 4.0 MHz and (f_offset_{max} – 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
4) Detection mode: True RMS.

6.5.2.1.4.2 Procedures

1) Set the BS to transmit a signal in accordance to test model 1, subclause 6.2.1.1.1 at the manufacturer's specified maximum output power.
2) Measure the emission at the specified frequencies with specified measurement bandwidth and note that the measured value does not exceed the specified value.

6.5.2.1.5 Test requirements

The measurement result in step 2 of 6.5.2.1.4.2 shall not exceed the maximum level specified in tables 6.18 to 6.21 for the appropriate BS maximum output power.

Table 6.18: Spectrum emission mask values, BS 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~~ Test Requirement	Additional Test Requirement for Band b	Measurement bandwidth
2.5 ≤ Δf < 2.7 MHz	2.515MHz ≤ f_offset < 2.715MHz	-12.5 dBm	-15 dBm	30 kHz
2.7 ≤ Δf < 3.5 MHz	2.715MHz ≤ f_offset < 3.515MHz	- 12.5 dBm – 15·(f_offset- 2.715) dB	-15 dBm	30 kHz
	3.515MHz ≤ f_offset < 4.0MHz	-24.5 dBm	NA	30 kHz
3.5 ≤ Δf < 7.5 MHz	4.0 MHz ≤ f_offset < 8.0MHz	-11.5 dBm	NA	1 MHz
7.5 ≤ Δf MHz	8.0 MHz ≤ f_offset < f_offset_{max}	-11.5 dBm	NA	1 MHz

Table 6.19: Spectrum emission mask values, BS 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~~ Test Requirement	Additional Test Requirement for Band b	Measurement bandwidth
2.5 ≤ Δf < 2.7 MHz	2.515MHz ≤ f_offset < 2.715MHz	-12.5 dBm	-15 dBm	30 kHz
2.7 ≤ Δf < 3.5 MHz	2.715MHz ≤ f_offset < 3.515MHz	-12.5 dBm– 15·(f_offset - 2.715) dB	-15 dBm	30 kHz
	3.515MHz ≤ f_offset < 4.0MHz	-24.5 dBm	NA	30 kHz
3.5 ≤ Δf < 7.5 MHz	4.0 MHz ≤ f_offset < 8.0MHz	-11.5 dBm	NA	1 MHz
7.5 ≤ Δf MHz	8.0MHz ≤ f_offset < f_offset_{max}	P – 54.5 dB	NA	1 MHz

Table 6.20: Spectrum emission mask values, BS 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~~ Test Requirement	Additional Test Requirement for Band b	Measurement bandwidth
2.5 ≤ Δf < 2.7 MHz	2.515MHz ≤ f_offset < 2.715MHz	P – 51.5 dB	-15 dBm	30 kHz
2.7 ≤ Δf < 3.5 MHz	2.715MHz ≤ f_offset < 3.515MHz	P – 51.5dB – 15·(f_offset – 2.715) dB	-15 dBm	30 kHz
	3.515MHz ≤ f_offset < 4.0MHz	P – 63.5 dB	NA	30 kHz
3.5 ≤ Δf < 7.5 MHz	4.0 MHz ≤ f_offset < 8.0MHz	P – 50.5 dB	NA	1 MHz
7.5 ≤ Δf MHz	8.0MHz ≤ f_offset < f_offset_{max}	P – 54.5 dB	NA	1 MHz

Table 6.21: Spectrum emission mask values, BS 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~~ Test Requirement	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 dBm – 15·(f_offset - 2.715) dB	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 4.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in Annex F.

Annex F (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 4.2. 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 tables F.1, F.2 and F.3

Note that a formula for applying Test Tolerances is provided for all tests, even those with a test tolerance of zero. This is necessary in the case that the Test System uncertainty is greater than that allowed in subclause 4.1. In this event, the excess error shall be subtracted from the defined test tolerance in order to generate the correct tightened Test Requirements as defined in subclause 4.3.

For example, a Test System having 0.9 dB accuracy for test 6.2.1 Base Station maximum output power (which is 0.2 dB above the limit specified in subclause 4.) would subtract 0.2 dB from the Test Tolerance of 0.7 dB defined in subclause 4.2. This new test tolerance of 0.5 dB would then be applied to the Minimum Requirement using the formula defined in Table F.1 to give a new range of ±2.5 dB of the manufacturer's rated output power.

Using this same approach for the case where a test had a test tolerance of 0 dB, an excess error of 0.2 dB would result in a modified test tolerance of –0.2 dB.

Table F.1: Derivation of Test Requirements (Transmitter tests)

Test	Minimum Requirement in TS 25.104	Test Tolerance (TT)	Test Requirement in TS 25.141
6.2.1 Base station maximum output power	In normal conditions … within +2 dB and -2 dB of the manufacturer's rated output power In extreme conditions… within +2.5 dB and –2.5 dB of the manufacturer's rated output power	0.7 dB	Formula: Upper limit + TT Lower limit – TT In normal conditions … within +2.7 dB and –2.7 dB of the manufacturer's rated output power In extreme conditions… within +3.2 dB and –3.2 dB of the manufacturer's rated output power
6.2.2 CPICH Power accuracy	CPICH power shall be within ±2.1dB	0.8 dB	Formula: Upper limit + TT Lower limit – TT CPICH power shall be within ±2.9dB
6.3.4 Frequency error	Frequency error limit = 0.05 ppm	12 Hz	Formula: Frequency Error limit + TT Frequency Error limit = 0.05 ppm + 12 Hz
6.4.2 Power control steps	Lower and upper limits as specified in tables 6.9 and 6.10a	0.1 dB	Formula: Upper limits + TT Lower limits – TT 0.1 dB applied as above to tables 6.9 and 6.10a
6.4.3 Power dynamic range	maximum power limit = BS maximum output power -3 dB minimum power limit = BS maximum output power –28 dB	0.2 dB	Formula: maximum power limit – TT minimum power limit + TT maximum power limit = BS maximum output power –3.2 dB minimum power limit = BS maximum output power –27.8 dB
6.4.4 Total power dynamic range	total power dynamic range limit = 18 dB	0.3 dB	Formula: total power dynamic range limit – TT total power dynamic range limit = 17.7 dB
6.5.1 Occupied Bandwidth	occupied bandwidth limit = 5 MHz	0 kHz	Formula: Occupied bandwidth limit + TT Occupied bandwidth limit = 5 MHz
6.5.2.1 Spectrum emission mask	Maximum level defined in tables 6.11, 6.12, 6.13 and 6.14:	1.5 dB (0 dB for the additional Band b requirements)	Formula: Maximum level + TT Add 1.5 to Maximum level entries in tables 6.11, 6.12, 6.13 and 6.14.
6.5.2.2 Adjacent Channel Leakage power Ratio (ACLR)	ACLR limit = 45 dB at 5 MHz ACLR limit = 50 dB at 10 MHz	0.8 dB	Formula: ACLR limit – TT ACLR limit = 44.2 dB at 5 MHz ACLR limit = 49.2 dB at 10 MHz
6.5.3 Spurious emissions	Maximum level defined in tables 6.16 to 6.26	0 dB	Formula: Maximum limit + TT Add 0 to Maximum level in tables 6.16 to 6.26
6.6 Transmit intermodulation (interferer requirements) This tolerance applies to the stimulus and not the measurements defined in 6.5.2.1, 6.5.2.2 and 6.5.3.	Wanted signal level – interferer level = 30 dB	0 dB	Formula: Ratio + TT Wanted signal level – interferer level = 30 + 0 dB
6.7.1 EVM	EVM limit =17.5 %	0 %	Formula: EVM limit + TT EVM limit = 17.5%
6.7.2 Peak code Domain error	Peak code domain error limit = -33 dB	1.0 dB	Formula: Peak code domain error limit + TT Peak code domain error limit = -32 dB

3GPP TSG RAN WG4 Meeting #21 **R4-020166**

Sophia Antipolis, France 28th January - 1st February 2002

	CR-Form-v5
CHANGE REQUEST	
⌘ **25.141 CR 155** ⌘ **rev** **-** ⌘ Current version: **5.1.0** ⌘	

*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:	⌘	Single and Multi carrier in Spurious Emissions Requirements		
Source:	⌘	RAN WG4		
Work item code:	⌘	TEI	***Date:*** ⌘	1/2/2002
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 current spurious emissions requirements are defined (6.5.3.1) to cover single and multicarrier BS for Category A and B requirements, but not for the co-existence and co-location requirements. This is in conflict with the wording in the Method of test (6.5.3.6) and also with the requirement as stated in EN 301 908-3 (European Harmonised Standard) and ITU-R M.[IMT.UNWANT-BS], where all spurious emission requirements are for both single and multicarrier.
Summary of change:	⌘	The provision for single and multicarrier is changed to reference all requirements, not just Category A and B.
Consequences if not approved:	⌘	There would be a conflict between the spurious emission requirements in the test specification and the ones in the European harmonised standard and in ITU-R M.[IMT.UNWANT-BS].

Clauses affected:	⌘	6.5.3.1		
Other specs affected:	⌘	[ ] Other core specifications [ ] Test specifications [ ] O&M Specifications	⌘	
Other comments:	⌘	The corresponding change to 25.104 Rel-5 is in R4-011586.		

6.5.3 Spurious emissions

6.5.3.1 Definition and applicability

Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emission, intermodulation products and frequency conversion products, but exclude out of band emissions. This is measured at the base station RF output port.

The requirement applies at frequencies within the specified frequency ranges, which are more than 12.5 MHz under the first carrier frequency used or more than 12.5 MHz above the last carrier frequency used.

The requirements ~~of either subclause 6.5.3.4.1 or subclause 6.5.3.4.2~~ shall apply whatever the type of transmitter considered (single carrier or multi-carrier). It applies for all transmission modes foreseen by the manufacturer's specification.

Unless otherwise stated, all requirements are measured as mean power (RMS).

3GPP TSG RAN WG4 Meeting #21 **R4-020165**

Sophia Antipolis, France 28th January - 1st February 2002

CR-Form-v5

CHANGE REQUEST

⌘ 25.141	CR 154	⌘ 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:	⌘ Single and Multi carrier in Spurious Emissions Requirements		
Source:	⌘ RAN WG4		
Work item code:	⌘ TEI	***Date:***	⌘ 1/2/2002
Category:	⌘ **A** *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.	***Release:***	⌘ Rel-4 *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 current spurious emissions requirements are defined (6.5.3.1) to cover single and multicarrier BS for Category A and B requirements, but not for the co-existence and co-location requirements. This is in conflict with the wording in the Method of test (6.5.3.6) and also with the requirement as stated in EN 301 908-3 (European Harmonised Standard) and ITU-R M.[IMT.UNWANT-BS], where all spurious emission requirements are for both single and multicarrier.
Summary of change: ⌘	The provision for single and multicarrier is changed to reference all requirements, not just Category A and B.
Consequences if not approved: ⌘	There would be a conflict between the spurious emission requirements in the test specification and the ones in the European harmonised standard and in ITU-R M.[IMT.UNWANT-BS]. Isolated Impact Analysis: Correction of a requirement. Would not affect implementations behaving like indicated in the CR, would affect implementations that do not behave like indicated in the CR.

Clauses affected: ⌘	6.5.3.1	
Other specs affected: ⌘	[ ] Other core specifications [ ] Test specifications [ ] O&M Specifications	⌘
Other comments: ⌘	The corresponding change to 25.104 Rel-4 is in R4-011585.	

6.5.3 Spurious emissions

6.5.3.1 Definition and applicability

Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emission, intermodulation products and frequency conversion products, but exclude out of band emissions. This is measured at the base station RF output port.

The requirement applies at frequencies within the specified frequency ranges, which are more than 12.5 MHz under the first carrier frequency used or more than 12.5 MHz above the last carrier frequency used.

The requirements ~~of either subclause 6.5.3.4.1 or subclause 6.5.3.4.2~~ shall apply whatever the type of transmitter considered (single carrier or multi-carrier). It applies for all transmission modes foreseen by the manufacturer's specification.

Unless otherwise stated, all requirements are measured as mean power (RMS).

3GPP TSG RAN WG4 Meeting #21 **R4-020164**
Sophia Antipolis, France 28th January - 1st February 2002

CR-Form-v5

CHANGE REQUEST

⌘ **25.141**	**CR 153**	⌘ **rev**	**-**	⌘ Current version:	**3.8.0** ⌘

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

Title:	⌘ Single and Multi carrier in Spurious Emissions Requirements		
Source:	⌘ RAN WG4		
Work item code:	⌘	***Date:*** ⌘	1/2/2002
Category:	⌘ **F**	***Release:*** ⌘	R99
	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 current spurious emissions requirements are defined (6.5.3.1) to cover single and multicarrier BS for Category A and B requirements, but not for the co-existence and co-location requirements. This is in conflict with the wording in the Method of test (6.5.3.6) and also with the requirement as stated in EN 301 908-3 (European Harmonised Standard) and ITU-R M.[IMT.UNWANT-BS], where all spurious emission requirements are for both single and multicarrier.
Summary of change: ⌘	The provision for single and multicarrier is changed to reference all requirements, not just Category A and B.
Consequences if not approved: ⌘	There would be a conflict between the spurious emission requirements in the test specification and the ones in the European harmonised standard and in ITU-R M.[IMT.UNWANT-BS]. Isolated Impact Analysis: Correction of a requirement. Would not affect implementations behaving like indicated in the CR, would affect implementations that do not behave like indicated in the CR.

Clauses affected: ⌘	6.5.3.1	
Other specs affected: ⌘	[ ] Other core specifications [ ] Test specifications [ ] O&M Specifications	⌘
Other comments: ⌘	The corresponding change to 25.104 R99 is in R4-011517.	

6.5.3 Spurious emissions

6.5.3.1 Definition and applicability

Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emission, intermodulation products and frequency conversion products, but exclude out of band emissions. This is measured at the base station RF output port.

The requirement applies at frequencies within the specified frequency ranges, which are more than 12.5 MHz under the first carrier frequency used or more than 12.5 MHz above the last carrier frequency used.

The requirements ~~of either subclause 6.5.3.4.1 or subclause 6.5.3.4.2~~ shall apply whatever the type of transmitter considered (single carrier or multi-carrier). It applies for all transmission modes foreseen by the manufacturer's specification.

Unless otherwise stated, all requirements are measured as mean power (RMS).

3GPP TSG RAN WG4 Meeting #21 **R4-020102**
Sophia Antipolis, France 28th January - 1st February 2002

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CHANGE REQUEST

⌘ **25.141 CR 152** ⌘ ev **-** ⌘ Current version: **5.1.0** ⌘

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

Title: ⌘	The definition of AWGN interferer		
Source: ⌘	RAN WG4		
Work item code: ⌘	TEI	***Date:*** ⌘	1/2/2002
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: ⌘	In current specification the AWGN definition is accidentally placed inside the chapter 6.1.2. Because the definition is now in the chapter 6.1.2 one may read that this is valid only in transmitter tests. According to tdoc R4-010762 the definition is meant to apply to the whole specification. Therefore the better place for the definition should be in general chapter. Sub-section 4.4 is describing Test environments so the better place would be there. It's mentioned in the first sentence in clause 4 that The requirement of this clause apply to all tests in this specification.
Summary of change: ⌘	Chapter 6.1.2 is removed. The definition of AWGN interferer is moved into the new chapter 4.4.5 with a same content.
Consequences if not approved: ⌘	One may read that AWGN definition is valid only in transmitter tests. Other tests could be performed improper way.

Clauses affected: ⌘			
Other specs affected: ⌘	[ ]	Other core specifications ⌘	
	[ ]	Test specifications	
	[ ]	O&M Specifications	
Other comments: ⌘			

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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.

NOTE: It is recommended that the equipment is made fully operational prior to the equipment being taken to its lower operating temperature.

4.4.3 Vibration

When vibration conditions are specified for a test, the test shall be performed while the equipment is subjected to a vibration sequence as defined by the manufacturer’s declaration for the equipment under test. This shall use the environmental test equipment and methods of inducing the required environmental phenomena in to the equipment, conforming to the test procedure of IEC 60 068-2-6 [10]. Other environmental conditions shall be within the ranges specified in subclause 4.4.1.

NOTE: The higher levels of vibration may induce undue physical stress in to equipment after a prolonged series of tests. The testing body should only vibrate the equipment during the RF measurement process.

4.4.4 Power supply

When extreme power supply conditions are specified for a test, the test shall be performed at the standard upper and lower limits of operating voltage defined by manufacturer's declaration for the equipment under test.

Upper voltage limit:

The equipment shall be supplied with a voltage equal to the upper limit declared by the manufacturer (as measured at the input terminals to the equipment). The tests shall be carried out at the steady state minimum and maximum temperature limits declared by the manufacturer for the equipment, to the methods described in IEC 60 068-2-1 [8] Test Ab/Ad and IEC 60 068-2-2 [9] Test Bb/Bd: Dry Heat.

Lower voltage limit:

The equipment shall be supplied with a voltage equal to the lower limit declared by the manufacturer (as measured at the input terminals to the equipment). The tests shall be carried out at the steady state minimum and maximum temperature limits declared by the manufacturer for the equipment, to the methods described in IEC 60 068-2-1 [8] Test Ab/Ad and IEC 60 068-2-2 [9] Test Bb/Bd: Dry Heat.

4.4.5 Definition of Additive White Gaussian Noise (AWGN) Interferer

The minimum bandwidth of the AWGN interferer shall be 1.5 times chip rate of the radio access mode. (e.g. 5.76 MHz for a chip rate of 3.84 Mcps). The flatness across this minimum bandwidth shall be less than ±0.5 dB and the peak to average ratio at a probability of 0.001% shall exceed 10 dB.

================= NEXT MODIFIED SECTION ===============

6.1.1.6.2 PICH

PICH carries 18 Paging Indicators (Pq) sent in the following sequence from left to right [1 0 1 1 0 0 0 1 0 1 1 0 0 0 1 0 1 0]. This defines the 288 first bits of the PICH. No power is transmitted for the 12 remaining unused bits.

6.1.1.6.3 Primary scrambling code and SCH

The scrambling code should be 0.

Where multiple repetitions of the Test Model signals are being used to simulate a multi-carrier signal the scrambling code for the lower frequency is 0. Carriers added at successively higher frequencies use codes 1, 2,... and their frame structures are time offset by 1/5, 2/5... of a time slot duration.

The scrambling code defines the SSC sequence of the secondary SCH. In their active part, primary and secondary SCH share equally the power level defined for "PCCPCH+SCH".

6.1.1.6.4 S-CCPCH containing PCH

The aggregate 15 x 20 = 300 S-CCPCH bits per frame are used. Data bits are filled with a PN9 sequence generated using the primitive trinomial $x^9 + x^4 + 1$. In case there are less data bits/frame needed then the first bits of the aggregate shall be selected.. Channelization code of the S-CCPCH is used as the seed for the PN sequence at the start of each frame. For test purposes, any one of the four possible slot formats 0,1, 2 and 3 can be supported. The support for all four slot formats is not needed.

The generator shall be seeded so that the sequence begins with the 8 bit channelization code starting from the LSB, and followed by a ONE. The test on S-CCPCH has a frame structure so that the pilot bits are defined over 15 timeslots to the relevant columns of TS 25.211. The TFCI bits are filled with ONEs whenever needed.

6.1.2 ~~Definition of Additive White Gaussian Noise (AWGN) Interferer~~Void

~~The minimum bandwidth of the AWGN interferer shall be 1.5 times chip rate of the radio access mode. (e.g. 5.76 MHz for a chip rate of 3.84 Mcps). The flatness across this minimum bandwidth shall be less than ±0.5 dB and the peak to average ratio at a probability of 0.001% shall exceed 10 dB.~~

6.2 Base station output power

Output power, Pout, of the base station is the mean power of one carrier delivered to a load with resistance equal to the nominal load impedance of the transmitter.

Rated output power, PRAT, of the base station is the mean power level per carrier that the manufacturer has declared to be available at the antenna connector.

6.2.1 Base station maximum output power

6.2.1.1 Definition and applicability

Maximum output power, Pmax, of the base station is the mean power level per carrier measured at the antenna connector in specified reference condition.

In certain regions, the minimum requirement for normal conditions may apply also for some conditions outside the ranges defined for the Normal test environment in subclause 4.4.1.

6.2.1.2 Minimum Requirement

In normal conditions, the Base station maximum output power shall remain within +2.0 dB and –2.0 dB of the manufacturer's rated output power.

In extreme conditions, the Base station maximum output power shall remain within +2.5 dB and –2.5 dB of the manufacturer's rated output power.

3GPP TSG RAN WG4 Meeting #21 R4-020101

Sophia Antipolis, France 28th January - 1st February 2002

CR-Form-v4

CHANGE REQUEST

⌘ **25.141**	**CR 151**	⌘ ev **-** ⌘	Current version: **4.3.0** ⌘

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

Title: ⌘	The definition of AWGN interferer		
Source: ⌘	RAN WG4		
Work item code: ⌘	TEI	***Date:*** ⌘	1/2/2002
Category: ⌘	**A**	***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: ⌘	In current specification the AWGN definition is accidentally placed inside the chapter 6.1.2. Because the definition is now in the chapter 6.1.2 one may read that this is valid only in transmitter tests. According to tdoc R4-010762 the definition is meant to apply to the whole specification. Therefore the better place for the definition should be in general chapter. Sub-section 4.4 is describing Test environments so the better place would be there. It's mentioned in the first sentence in clause 4 that The requirement of this clause apply to all tests in this specification.
Summary of change: ⌘	Chapter 6.1.2 is removed. The definition of AWGN interferer is moved into the new chapter 4.4.5 with a same content. Isolated Impact Analysis: This CR has no impact with the previous version of the implementation. This CR is changing the AWGN definition to be valid over the whole specification. It is removing possibility of misinterpretations during conformance testing.
Consequences if not approved: ⌘	One may read that AWGN definition is valid only in transmitter tests. Other tests could be performed improper way.

Clauses affected: ⌘		
Other specs affected: ⌘	[ ] Other core specifications [ ] Test specifications [ ] O&M Specifications	⌘
Other comments: ⌘		

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NOTE: It is recommended that the equipment is made fully operational prior to the equipment being taken to its lower operating temperature.

4.4.3 Vibration

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NOTE: The higher levels of vibration may induce undue physical stress in to equipment after a prolonged series of tests. The testing body should only vibrate the equipment during the RF measurement process.

4.4.4 Power supply

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4.4.5 Definition of Additive White Gaussian Noise (AWGN) Interferer

The minimum bandwidth of the AWGN interferer shall be 1.5 times chip rate of the radio access mode. (e.g. 5.76 MHz for a chip rate of 3.84 Mcps). The flatness across this minimum bandwidth shall be less than ±0.5 dB and the peak to average ratio at a probability of 0.001% shall exceed 10 dB.

================= NEXT MODIFIED SECTION ===============

6.1.1.6.2 PICH

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6.1.1.6.3 Primary scrambling code and SCH

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The scrambling code defines the SSC sequence of the secondary SCH. In their active part, primary and secondary SCH share equally the power level defined for "PCCPCH+SCH".

6.1.1.6.4 S-CCPCH containing PCH

The aggregate 15 x 20 = 300 S-CCPCH bits per frame are used. Data bits are filled with a PN9 sequence generated using the primitive trinomial $x^9 + x^4 + 1$. In case there are less data bits/frame needed then the first bits of the aggregate shall be selected.. Channelization code of the S-CCPCH is used as the seed for the PN sequence at the start of each frame. For test purposes, any one of the four possible slot formats 0,1, 2 and 3 can be supported. The support for all four slot formats is not needed.

The generator shall be seeded so that the sequence begins with the 8 bit channelization code starting from the LSB, and followed by a ONE. The test on S-CCPCH has a frame structure so that the pilot bits are defined over 15 timeslots to the relevant columns of TS 25.211. The TFCI bits are filled with ONEs whenever needed.

6.1.2 ~~Definition of Additive White Gaussian Noise (AWGN) Interferer~~Void

~~The minimum bandwidth of the AWGN interferer shall be 1.5 times chip rate of the radio access mode. (e.g. 5.76 MHz for a chip rate of 3.84 Mcps). The flatness across this minimum bandwidth shall be less than ±0.5 dB and the peak to average ratio at a probability of 0.001% shall exceed 10 dB.~~

6.2 Base station output power

Output power, Pout, of the base station is the mean power of one carrier delivered to a load with resistance equal to the nominal load impedance of the transmitter.

Rated output power, PRAT, of the base station is the mean power level per carrier that the manufacturer has declared to be available at the antenna connector.

6.2.1 Base station maximum output power

6.2.1.1 Definition and applicability

Maximum output power, Pmax, of the base station is the mean power level per carrier measured at the antenna connector in specified reference condition.

In certain regions, the minimum requirement for normal conditions may apply also for some conditions outside the ranges defined for the Normal test environment in subclause 4.4.1.

6.2.1.2 Minimum Requirement

In normal conditions, the Base station maximum output power shall remain within +2.0 dB and –2.0 dB of the manufacturer's rated output power.

In extreme conditions, the Base station maximum output power shall remain within +2.5 dB and –2.5 dB of the manufacturer's rated output power.

3GPP TSG RAN WG4 Meeting #21 R4-020100

Sophia Antipolis, France 28th January - 1st February 2002

CR-Form-v4

CHANGE REQUEST

⌘ **25.141 CR 150** ⌘	ev **-** ⌘	Current version: **3.8.0** ⌘

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: ⌘	The definition of AWGN interferer		
Source: ⌘	RAN WG4		
Work item code: ⌘		***Date:*** ⌘	1/2/2002
Category: ⌘	**F**	***Release:*** ⌘	R99
	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: ⌘	In current specification the AWGN definition is accidentally placed inside the chapter 6.1.2. Because the definition is now in the chapter 6.1.2 one may read that this is valid only in transmitter tests. According to tdoc R4-010762 the definition is meant to apply to the whole specification. Therefore the better place for the definition should be in general chapter. Sub-section 4.4 is describing Test environments so the better place would be there. It's mentioned in the first sentence in clause 4 that The requirement of this clause apply to all tests in this specification.
Summary of change: ⌘	Chapter 6.1.2 is removed. The definition of AWGN interferer is moved into the new chapter 4.4.5 with a same content. Isolated Impact Analysis: This CR has no impact with the previous version of the implementation. This CR is changing the AWGN definition to be valid over the whole specification. It is removing possibility of misinterpretations during conformance testing.
Consequences if not approved: ⌘	One may read that AWGN definition is valid only in transmitter tests. Other tests could be performed improper way.

Clauses affected: ⌘		
Other specs affected: ⌘	[ ] Other core specifications ⌘ [ ] Test specifications [ ] O&M Specifications	
Other comments: ⌘		

How to create CRs using this form:

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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.

NOTE: It is recommended that the equipment is made fully operational prior to the equipment being taken to its lower operating temperature.

4.4.3 Vibration

When vibration conditions are specified for a test, the test shall be performed while the equipment is subjected to a vibration sequence as defined by the manufacturer's declaration for the equipment under test. This shall use the environmental test equipment and methods of inducing the required environmental phenomena in to the equipment, conforming to the test procedure of IEC 60 068-2-6 [10]. Other environmental conditions shall be within the ranges specified in subclause 4.4.1.

NOTE: The higher levels of vibration may induce undue physical stress in to equipment after a prolonged series of tests. The testing body should only vibrate the equipment during the RF measurement process.

4.4.4 Power supply

When extreme power supply conditions are specified for a test, the test shall be performed at the standard upper and lower limits of operating voltage defined by manufacturer's declaration for the equipment under test.

Upper voltage limit:

The equipment shall be supplied with a voltage equal to the upper limit declared by the manufacturer (as measured at the input terminals to the equipment). The tests shall be carried out at the steady state minimum and maximum temperature limits declared by the manufacturer for the equipment, to the methods described in IEC 60 068-2-1 [8] Test Ab/Ad and IEC 60 068-2-2 [9] Test Bb/Bd: Dry Heat.

Lower voltage limit:

The equipment shall be supplied with a voltage equal to the lower limit declared by the manufacturer (as measured at the input terminals to the equipment). The tests shall be carried out at the steady state minimum and maximum temperature limits declared by the manufacturer for the equipment, to the methods described in IEC 60 068-2-1 [8] Test Ab/Ad and IEC 60 068-2-2 [9] Test Bb/Bd: Dry Heat.

4.4.5 Definition of Additive White Gaussian Noise (AWGN) Interferer

The minimum bandwidth of the AWGN interferer shall be 1.5 times chip rate of the radio access mode. (e.g. 5.76 MHz for a chip rate of 3.84 Mcps). The flatness across this minimum bandwidth shall be less than ±0.5 dB and the peak to average ratio at a probability of 0.001% shall exceed 10 dB.

================= NEXT MODIFIED SECTION ===============

6.1.1.6.2 PICH

PICH carries 18 Paging Indicators (Pq) sent in the following sequence from left to right [1 0 1 1 0 0 0 1 0 1 1 0 0 0 1 0 1 0]. This defines the 288 first bits of the PICH. No power is transmitted for the 12 remaining unused bits.

6.1.1.6.3 Primary scrambling code and SCH

The scrambling code should be 0.

Where multiple repetitions of the Test Model signals are being used to simulate a multi-carrier signal the scrambling code for the lower frequency is 0. Carriers added at successively higher frequencies use codes 1, 2,... and their frame structures are time offset by 1/5, 2/5... of a time slot duration.

The scrambling code defines the SSC sequence of the secondary SCH. In their active part, primary and secondary SCH share equally the power level defined for "PCCPCH+SCH".

6.1.1.6.4 S-CCPCH containing PCH

The aggregate 15 x 20 = 300 S-CCPCH bits per frame are used. Data bits are filled with a PN9 sequence generated using the primitive trinomial $x^9 + x^4 + 1$. In case there are less data bits/frame needed then the first bits of the aggregate shall be selected.. Channelization code of the S-CCPCH is used as the seed for the PN sequence at the start of each frame. For test purposes, any one of the four possible slot formats 0,1, 2 and 3 can be supported. The support for all four slot formats is not needed.

The generator shall be seeded so that the sequence begins with the 8 bit channelization code starting from the LSB, and followed by a ONE. The test on S-CCPCH has a frame structure so that the pilot bits are defined over 15 timeslots to the relevant columns of TS 25.211. The TFCI bits are filled with ONEs whenever needed.

6.1.2 ~~Definition of Additive White Gaussian Noise (AWGN) Interferer~~Void

~~The minimum bandwidth of the AWGN interferer shall be 1.5 times chip rate of the radio access mode. (e.g. 5.76 MHz for a chip rate of 3.84 Mcps). The flatness across this minimum bandwidth shall be less than ±0.5 dB and the peak to average ratio at a probability of 0.001% shall exceed 10 dB.~~

6.2 Base station output power

Output power, Pout, of the base station is the mean power of one carrier delivered to a load with resistance equal to the nominal load impedance of the transmitter.

Rated output power, PRAT, of the base station is the mean power level per carrier that the manufacturer has declared to be available at the antenna connector.

6.2.1 Base station maximum output power

6.2.1.1 Definition and applicability

Maximum output power, Pmax, of the base station is the mean power level per carrier measured at the antenna connector in specified reference condition.

In certain regions, the minimum requirement for normal conditions may apply also for some conditions outside the ranges defined for the Normal test environment in subclause 4.4.1.

6.2.1.2 Minimum Requirement

In normal conditions, the Base station maximum output power shall remain within +2.0 dB and –2.0 dB of the manufacturer's rated output power.

In extreme conditions, the Base station maximum output power shall remain within +2.5 dB and –2.5 dB of the manufacturer's rated output power.

3GPP TSG RAN WG4 Meeting #21 R4-020099

Sophia Antipolis, France 28th January - 1st February 2002

CR-Form-v4

CHANGE REQUEST

⌘	**25.141**	**CR**	**149**	⌘	ev	**-**	⌘ Current version:	**5.1.0** ⌘

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: ⌘	Frequency error and Test model 4			
Source: ⌘	RAN WG4			
Work item code: ⌘	TEI		***Date:*** ⌘	1/2/2002
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: ⌘	In current specification it is not stated what test model should be used for Frequency error measurement. Test model 4 is correct model for this. It is used also with EVM and Total power dynamic range which both need to be tested with Pmax-3dB and Pmax-18dB. Obviously there is also a bug in Test model 4. The Primary CPICH channel is optional and if it is enabled the Total output power can vary between Pmax-2.2 dB to Pmax-9.4 dB. Therefore the power level settings in Test model 4 should be changed in order to achieve the whole Total power dynamic range with Primary CPICH enabled and/or disabled.
Summary of change: ⌘	Use of Test model 4 added to Frequency error measurement. Power level settings changed in Test model 4.
Consequences if not approved: ⌘	Definition for the Test model used in Frequency error measurement will be missing. When Primary CPICH is enabled, required Total power dynamic range Pmax-3dB and Pmax-18dB can't be achieved with this test.

Clauses affected: ⌘		
Other specs affected: ⌘	[ ] Other core specifications ⌘ [ ] Test specifications [ ] O&M Specifications	
Other comments: ⌘		

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.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.

Table 6.5: DPCH Spreading Code, Toffset and Power for Test Model 3

Code	T_{offset}	Level settings (dB) (16 codes)	Level settings dB) (32 codes)
64	86	-14	-16
69	134	-14	-16
74	52	-14	-16
78	45	-14	-16
83	143	-14	-16
89	112	-14	-16
93	59	-14	-16
96	23	-14	-16
100	1	-14	-16
105	88	-14	-16
109	30	-14	-16
111	18	-14	-16
115	30	-14	-16
118	61	-14	-16
122	128	-14	-16
125	143	-14	-16
67	83		-16
71	25		-16
76	103		-16
81	97		-16
86	56		-16
90	104		-16
95	51		-16
98	26		-16
103	137		-16
108	65		-16
110	37		-16
112	125		-16
117	149		-16
119	123		-16
123	83		-16
126	5		-16

NOTE: The figures for code power are nominal and have tolerance of ±1 dB.

6.1.1.4 Test Model 4

This model shall be used for tests on:

- EVM measurement.
- Total power dynamic range
- Frequency error

Table 6.6: Test Model 4 Active Channels

Type	Number of Channels	Fraction of Power (%)	Level setting (dB)	Channelization Code	Timing offset
PCCPCH+SCH when Primary CPICH is disabled	1	50 to 1.6	-3 to -18	1	0
PCCPCH+SCH when Primary CPICH is enabled	1	25 to 0.8	-6 to -21	1	0
Primary CPICH[1]	1	~~10~~25 to 0.8	~~-10~~-6 to -21	0	0
Note 1: The CPICH channel is optional.					

================= NEXT MODIFIED SECTION ===============

6.2.2.4 Method of test

6.2.2.4.1 Initial conditions

Test environment: normal; see subclause 4.4.1.

RF channels to be tested: B, M and T; see subclause 4.8

1) Connect BS to code domain analyser as shown in annex B.
2) Disable inner loop power control.
3) Set-up BS transmission at maximum total power as specified by the supplier. Channel set-up shall be according to subclause 6.1.1.2.

6.2.2.4.2 Procedure

- Measure the power in the PCCPCH and PCPICH according to annex E.

6.2.2.5 Test Requirement

The measured CPICH power shall be within ±2.9dB of the ordered absolute value.

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 4.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in Annex F.

6.3 Frequency error

6.3.1 Definition and applicability

Frequency error is the measure of the difference between the actual BS transmit frequency and the assigned frequency. The same source shall be used for RF frequency and data clock generation.

It is not possible to verify by testing that the data clock is derived from the same frequency source as used for RF generation. This may be confirmed by a manufacturers declaration

6.3.2 Minimum Requirement

The Frequency Error shall be within ± 0.05 PPM.

The normative reference for this requirement is in TS 25.104 [1] subclause 6.3

6.3.3 Test purpose

To verify that the Frecuency Error is within the limit specified in 6.3.2

6.3.4 Method of test

6.3.4.1 Initial Conditions

Test environment: normal; see subclause 4.4.1

RF channels to be tested: B, M and T; see subclause 4.8.

The following additional tests shall be performed:

a) On each of B, M and T, the test shall be performed under extreme power supply as defined in subclause 4.4.2

NOTE: Tests under extreme power supply also test extreme temperature.

1) Connect the base station RF output port to the test equipment. Refer to annex B.1.2 for a functional block diagram of the test set-up.

2) Set the base station to transmit a signal~~ modulated with PCCPCH~~according to 6.1.1.4 (test model 4). Total power at the RF output port shall be Pmax-3dB and Pmax-18dB.

6.3.4.2 Procedure

1) Measure the Frequency Error according to annex E.

6.3.5 Test requirement

The Frequency Error shall be within the range (–0.05 PPM – 12 Hz) to (+0.05 PPM + 12 Hz).

6.4 Output power dynamics

Power control is used to limit the interference level. The BS transmitter uses a quality-based power control on the downlink. The physical channels for the following test(s) shall be set-up according to subclause 6.1.1.2.

6.4.1 Inner loop power control

Inner loop power control in the downlink is the ability of the BS transmitter to adjust the transmitter output power of a code channel in accordance with the corresponding TPC symbols received in the uplink.

6.4.2 Power control steps

The power control step is the required step change in the DL transmitter output power of a code channel in response to the corresponding power control command. The combined output power change is the required total change in the DL transmitter output power of a code channel in response to multiple consecutive power control commands corresponding to that code channel.

6.4.2.1 Definition and applicability

Inner loop power control in the downlink is the ability of the BS transmitter to adjust the transmitter output power of a code channel in accordance with the corresponding TPC symbols received in the uplink.

The power control step is the required step change in the DL transmitter output power of a code channel in response to the corresponding power control command. The combined output power change is the required total change in the DL transmitter output power of a code channel in response to multiple consecutive power control commands corresponding to that code channel.

6.4.2.2 Minimum Requirement

The BS transmitter shall have the capability of setting the inner loop output power with a step sizes of 1 dB mandatory and 0,5 dB optional.

a) The tolerance of the power control step due to inner loop power control shall be within the range shown in table 6.9.

b) The tolerance of the combined output power change due to inner loop power control shall be within the range shown in table 6.10.

3GPP TSG RAN WG4 Meeting #21 **R4-020098**

Sophia Antipolis, France 28th January - 1st February 2002

CR-Form-v4

CHANGE REQUEST

⌘	**25.141**	**CR**	**148**	⌘	ev	**-**	⌘	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: ⌘	Frequency error and Test model 4		
Source: ⌘	RAN WG4		
Work item code: ⌘	TEI	***Date:*** ⌘	1/2/2002
Category: ⌘	**A**	***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: ⌘	In current specification it is not stated what test model should be used for Frequency error measurement. Test model 4 is correct model for this. It is used also with EVM and Total power dynamic range which both need to be tested with Pmax-3dB and Pmax-18dB. Obviously there is also a bug in Test model 4. The Primary CPICH channel is optional and if it is enabled the Total output power can vary between Pmax-2.2 dB to Pmax-9.4 dB. Therefore the power level settings in Test model 4 should be changed in order to achieve the whole Total power dynamic range with Primary CPICH enabled and/or disabled.
Summary of change: ⌘	Use of Test model 4 added to Frequency error measurement. Power level settings changed in Test model 4. Isolated Impact Analysis: This CR is correcting the test method used for Frequency error measurement. Would not affect implementations where Primary CPICH is disabled, would affect implementations where Primary CPICH is enabled.
Consequences if not approved: ⌘	Definition for the Test model used in Frequency error measurement will be missing. When Primary CPICH is enabled, required Total power dynamic range Pmax-3dB and Pmax-18dB can't be achieved with this test.

Clauses affected: ⌘		
Other specs affected: ⌘	[ ] Other core specifications [ ] Test specifications	⌘

	☐ O&M Specifications	
Other comments: ⌘		

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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.

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83	143	-14	-16
89	112	-14	-16
93	59	-14	-16
96	23	-14	-16
100	1	-14	-16
105	88	-14	-16
109	30	-14	-16
111	18	-14	-16
115	30	-14	-16
118	61	-14	-16
122	128	-14	-16
125	143	-14	-16
67	83		-16
71	25		-16
76	103		-16
81	97		-16
86	56		-16
90	104		-16
95	51		-16
98	26		-16
103	137		-16
108	65		-16
110	37		-16
112	125		-16
117	149		-16
119	123		-16
123	83		-16
126	5		-16

NOTE: The figures for code power are nominal and have tolerance of ±1 dB.

6.1.1.4 Test Model 4

This model shall be used for tests on:

- —EVM measurement.
- Total power dynamic range
- Frequency error

Table 6.6: Test Model 4 Active Channels

Type	Number of Channels	Fraction of Power (%)	Level setting (dB)	Channelization Code	Timing offset
PCCPCH+SCH when Primary CPICH is disabled	1	50 to 1.6	-3 to -18	1	0
PCCPCH+SCH when Primary CPICH is enabled	1	25 to 0.8	-6 to -21	1	0
Primary CPICH[1]	1	~~10~~25 to 0.8	~~-10~~-6 to -21	0	0
Note 1: The CPICH channel is optional.					

================= NEXT MODIFIED SECTION ==============

6.2.2.4 Method of test

6.2.2.4.1 Initial conditions

Test environment: normal; see subclause 4.4.1.

RF channels to be tested: B, M and T; see subclause 4.8

1) Connect BS to code domain analyser as shown in annex B.
2) Disable inner loop power control.
3) Set-up BS transmission at maximum total power as specified by the supplier. Channel set-up shall be according to subclause 6.1.1.2.

6.2.2.4.2 Procedure

- Measure the power in the PCCPCH and PCPICH according to annex E.

6.2.2.5 Test Requirement

The measured CPICH power shall be within ±2.9dB of the ordered absolute value.

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 4.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in Annex F.

6.3 Frequency error

6.3.1 Definition and applicability

Frequency error is the measure of the difference between the actual BS transmit frequency and the assigned frequency. The same source shall be used for RF frequency and data clock generation.

It is not possible to verify by testing that the data clock is derived from the same frequency source as used for RF generation. This may be confirmed by a manufacturers declaration

6.3.2 Minimum Requirement

The Frequency Error shall be within ± 0.05 PPM.

The normative reference for this requirement is in TS 25.104 [1] subclause 6.3

6.3.3 Test purpose

To verify that the Frecuency Error is within the limit specified in 6.3.2

6.3.4 Method of test

6.3.4.1 Initial Conditions

Test environment: normal; see subclause 4.4.1

RF channels to be tested: B, M and T; see subclause 4.8.

The following additional tests shall be performed:

a) On each of B, M and T, the test shall be performed under extreme power supply as defined in subclause 4.4.2

NOTE: Tests under extreme power supply also test extreme temperature.

1) Connect the base station RF output port to the test equipment. Refer to annex B.1.2 for a functional block diagram of the test set-up.

2) Set the base station to transmit a signal~~ modulated with PCCPCH~~according to 6.1.1.4 (test model 4). Total power at the RF output port shall be Pmax-3dB and Pmax-18dB.

6.3.4.2 Procedure

1) Measure the Frequency Error according to annex E.

6.3.5 Test requirement

The Frequency Error shall be within the range (–0.05 PPM – 12 Hz) to (+0.05 PPM + 12 Hz).

6.4 Output power dynamics

Power control is used to limit the interference level. The BS transmitter uses a quality-based power control on the downlink. The physical channels for the following test(s) shall be set-up according to subclause 6.1.1.2.

6.4.1 Inner loop power control

Inner loop power control in the downlink is the ability of the BS transmitter to adjust the transmitter output power of a code channel in accordance with the corresponding TPC symbols received in the uplink.

6.4.2 Power control steps

The power control step is the required step change in the DL transmitter output power of a code channel in response to the corresponding power control command. The combined output power change is the required total change in the DL transmitter output power of a code channel in response to multiple consecutive power control commands corresponding to that code channel.

6.4.2.1 Definition and applicability

Inner loop power control in the downlink is the ability of the BS transmitter to adjust the transmitter output power of a code channel in accordance with the corresponding TPC symbols received in the uplink.

The power control step is the required step change in the DL transmitter output power of a code channel in response to the corresponding power control command. The combined output power change is the required total change in the DL transmitter output power of a code channel in response to multiple consecutive power control commands corresponding to that code channel.

6.4.2.2 Minimum Requirement

The BS transmitter shall have the capability of setting the inner loop output power with a step sizes of 1 dB mandatory and 0,5 dB optional.

a) The tolerance of the power control step due to inner loop power control shall be within the range shown in table 6.9.

b) The tolerance of the combined output power change due to inner loop power control shall be within the range shown in table 6.10.