### **RP-020294**

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

# TitleCRs (Rel-4 and Rel-5 Category A) to TS 25.141SourceTSG RAN WG4Agenda Item7.4.4

RAN4 Tdoc	Spec	Curr Ver	New Ver	CR	R	Cat	Ph	Title	Acronym
R4-020777	25.141	4.4.0	4.5.0	207		F	Rel-4	Reference measurement channels for UL RACH Ratio of preamble power and total message power	TEI4
R4-020778	25.141	5.2.0	5.3.0	208		A	Rel-5	Reference measurement channels for UL RACH Ratio of preamble power and total message power	TEI4
R4-020817	25.141	4.4.0	4.5.0	219		F	Rel-4	Test system uncertainties and test tolerances for RACH tests (Rel-4)	TEI4
R4-020818	25.141	5.2.0	5.3.0	220		A	Rel-5	Test system uncertainties and test tolerances for RACH tests (Rel-5)	TEI4

R4-020777

# 3GPP TSG RAN WG4 Meeting #23 Gyeongju, Korea 13th -17th May, 2002

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Consequences if<br/>not approved:#Since the requirements have been decided under these 0 dB power ratio<br/>conditions it is important to measure them under the same conditions to get<br/>relevant results. If the RACH performance is measured with other power ratio<br/>values than 0 dB the results will most likely look different.Clauses affected:#8.8.3.1, 8.8.4.1, Annex A7

Other specs affected:	ж	Other core specifications#Test specificationsO&M Specifications
Other comments:	ж	Equivalent CRs in other Releases: CR208 cat. A to 25.141 v5.2.0

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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.

# 8.8.3 Demodulation of RACH message in static propagation conditions

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### 8.8.3.1 Definition and applicability

The performance requirement of RACH in static propagation conditions is determined by the maximum Block Error Ratio (BLER) allowed when the receiver input signal is at a specified  $E_b/N_0$  limit. The BLER is calculated for each of the measurement channels supported by the base station.

The power on the preamble is set to meet or exceed the requirements on Pfa and Pd in subclauses 8.8.1 and 8.8.2. The preamble threshold factor is chosen to fulfil the requirements on Pfa and Pd in subclauses 8.8.1 and 8.8.2. Only one signature is used and it is known by the receiver.

The requirement in this subclause shall apply to base stations intended for general-purpose applications.

# 8.8.4 Demodulation of RACH message in multipath fading case 3

### 8.8.4.1 Definition and applicability

The performance requirement of RACH in multipath fading case 3 is determined by the maximum Block Error Ratio (BLER) allowed when the receiver input signal is at a specified  $E_b/N_0$  limit. The BLER is calculated for each of the measurement channels supported by the base station.

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The power on the preamble is set to meet or exceed the requirements on Pfa and Pd in subclauses 8.8.1 and 8.8.2 The preamble threshold factor is chosen to fulfil the requirements on Pfa and Pd in subclauses 8.8.1 and 8.8.2. Only one signature is used and it is known by the receiver.

The requirement in this subclause shall apply to base stations intended for general-purpose applications.

# A.7 Reference measurement channels for UL RACH

The parameters for the UL RACH reference measurement channels are specified in Table A.7.

	Paramete	er	Unit
RACH	CRC	16	bits
	Channel Coding	Rate 1/2 conv. coding	
	ТТІ	20	ms
	TB size	168, 360	bits
	Rate Matching	Repetition	
	Number of diversity antennas	2	
	Preamble detection window size	256	Chips
	Ratio of preamble power and total message power (*)	<u>0</u>	<u>dB</u>
Power ra Control/I	atio of RACH Data TB = 168	-2.69	dB
Power ra TB = 360	atio of Control/Data	-3.52	dB

Table A.7: Reference measurement	channels for	<b>UL RACH</b>
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(\*) NOTE: If Delta Pp-m is used to adjust the power offset, Delta Pp-m shall be equal to -5 dB.

R4-020778

# 3GPP TSG RAN WG4 Meeting #23 Gyeongju, Korea 13th -17th May, 2002

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Clauses affected:	# 8.8.3.1, 8.8.4.1, Annex A7
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Other comments:	# Equivalent CRs in other Releases: CR207 cat. F to 25.141 v4.4.0

#### How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: <u>http://www.3gpp.org/3G\_Specs/CRs.htm</u>. 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 <u>ftp://ftp.3gpp.org/specs/</u> 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.

# 8.8.3 Demodulation of RACH message in static propagation conditions

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# 8.8.3.1 Definition and applicability

The performance requirement of RACH in static propagation conditions is determined by the maximum Block Error Ratio (BLER) allowed when the receiver input signal is at a specified  $E_b/N_0$  limit. The BLER is calculated for each of the measurement channels supported by the base station.

The power on the preamble is set to meet or exceed the requirements on Pfa and Pd in subclauses 8.8.1 and 8.8.2. The preamble threshold factor is chosen to fulfil the requirements on Pfa and Pd in subclauses 8.8.1 and 8.8.2. Only one signature is used and it is known by the receiver.

The requirement in this subclause shall apply to base stations intended for general-purpose applications.

# 8.8.4 Demodulation of RACH message in multipath fading case 3

# 8.8.4.1 Definition and applicability

The performance requirement of RACH in multipath fading case 3 is determined by the maximum Block Error Ratio (BLER) allowed when the receiver input signal is at a specified  $E_b/N_0$  limit. The BLER is calculated for each of the measurement channels supported by the base station.

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The power on the preamble is set to meet or exceed the requirements on Pfa and Pd in subclauses 8.8.1 and 8.8.2 The preamble threshold factor is chosen to fulfil the requirements on Pfa and Pd in subclauses 8.8.1 and 8.8.2. Only one signature is used and it is known by the receiver.

The requirement in this subclause shall apply to base stations intended for general-purpose applications.

# A.7 Reference measurement channels for UL RACH

The parameters for the UL RACH reference measurement channels are specified in Table A.7.

	Paramete	er	Unit
RACH	CRC	16	bits
	Channel Coding	Rate 1/2 conv. coding	
	TTI	20	ms
	TB size	168, 360	bits
	Rate Matching	Repetition	
	Number of diversity antennas	2	
	Preamble detection window size	256	Chips
	Ratio of preamble power and total message power (*)	<u>0</u>	<u>dB</u>
Power ra Control/E	tio of RACH Data TB = 168	-2.69	dB
Power ra TB = 360	tio of Control/Data	-3.52	dB

	Table A.7:	Reference	measurement	channels for	<b>UL RACH</b>
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(\*) NOTE: If Delta Pp-m is used to adjust the power offset, Delta Pp-m shall be equal to -5 dB.

# R4-020817

# 3GPP TSG RAN WG4 Meeting #23 Gyeongju, Korea 13th -17th May, 2002

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# 4.1.4 Measurement of performance requirement

#### Table 4.1B: Maximum Test System Uncertainty for Performance Requirements

Subclause	Maximum Test System Uncertainty <sup>1</sup>	Derivation of Test System Uncertainty
8.2, Demodulation in static	± 0.4dB	Wanted/AWGN: ± 0.4dB (relative uncertainty
propagation condition		for E <sub>b</sub> /N <sub>0</sub> )
-		(AWGN: ±1dB)
8.3, Demodulation of DCH	± 0.6dB	Fader: ± 0.5dB
in multipath fading		Wanted/AWGN: ± 0.4dB (relative)
conditions		Combined relative uncertainty for $E_b/N_0$ : ±
		0.6dB
8.4 Demodulation of DCH	± 0.6dB	Fader: ± 0.5dB
in moving propagation		Wanted/AWGN: ± 0.4dB (relative)
conditions		Combined relative uncertainty for E <sub>b</sub> /N <sub>0</sub> : ±
		0.6dB
8.5 Demodulation of DCH	± 0.6dB	Fader: ± 0.5dB
in birth/death propagation		Wanted/AWGN: ± 0.4dB (relative)
conditions		Combined relative uncertainty for E <sub>b</sub> /N <sub>0</sub> : ±
		0.6dB
8.8.1 RACH preamble	<u>± 0.4dB</u>	Wanted/AWGN: ± 0.4dB (relative uncertainty
detection in static		for E <sub>c</sub> /N <sub>0</sub> )
propagation conditions		(AWGN: ±1dB)
8.8.2 RACH preamble	<u>± 0.6dB</u>	Fader: ± 0.5dB
detection in multipath		Wanted/AWGN: ± 0.4dB (relative)
fading case 3		Combined relative uncertainty for E <sub>c</sub> /N <sub>0</sub> : ±
		<u>0.6dB</u>
8.8.3 Demodulation of	<u>± 0.4dB</u>	Wanted/AWGN: ± 0.4dB (relative uncertainty
RACH message in static		$\frac{\text{for } E_{b}/N_{0}}{1}$
propagation conditions		(AWGN: ±1dB)
8.8.4 Demodulation of	<u>± 0.6dB</u>	Fader: $\pm 0.5$ dB
RACH message in		Wanted/AWGN: ± 0.4dB (relative)
multipath fading case 3		Combined relative uncertainty for $E_b/N_0$ : ±
	<u> </u>	0.60B
Note 1: Only the overall s	timulus error is considered here. The effect	ct of errors in the BER/FER measurements
due to finite test d	luration is not considered.	

# 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

Subclause	Test Tolerance <sup>1</sup>					
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 <sup>3</sup>					
6.5.2.2 ACLR	0.8 dB					
6.5.3 Spurious emissions	0 dB					
6.6 Transmit intermodulation (interferer requirements)	$0 \text{ dB}^2$					
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 stimulu	s signal(s). See Annex F.					
Note 3: 0 dB test tolerance for the additional Band b requirements.						

Table 4.1C: Test Tolerances for transmitter tests.

# 4.2.2 Receiver

#### Table 4.1D: Test Tolerances for receiver tests.

Subclause	Test Tolerance <sup>1</sup>
7.2 Reference sensitivity level	0.7 dB
7.3 Dynamic range	1.2 dB
7.4 Adjacent channel selectivity	0 dB
7.5 Blocking characteristics	0 dB
7.6 Intermod Characteristics	0 dB
7.7 Spurious Emissions	0 dB <sup>2</sup>
Note 1: Unless otherwise stated, the Test Tolerances are applied to the stimulus signal(s). See Annex F.	
Note 2: The Test Tolerance is applied to the DUT Minimum Requirement. See Annex F.	

# 4.2.3 Performance requirement

#### Table 4.1E: Test Tolerances for Performance Requirements.

Subclause	Test Tolerance <sup>1</sup>
8.2, Demodulation in static propagation condtion	0.4dB
8.3, Demodulation of DCH in multiplath fading conditons	0.6dB
8.4 Demodulation of DCH in moving propagation conditions	0.6dB
8.5 Demodulation of DCH in birth/death propagation conditions	0.6dB
8.8.1 RACH preamble detection in static propagation conditions	<u>0.4dB</u>
8.8.2 RACH preamble detection in multipath fading case 3	<u>0.6dB</u>
8.8.3 Demodulation of RACH message in static propagation	0.4dB
conditions	
8.8.4 Demodulation of RACH message in multipath fading case 3	<u>0.6dB</u>
Note 1: Unless otherwise stated, the Test Tolerances are applied to	o the stimulus signal(s). See
Annex F.	-

# 8.8 RACH performance

# 8.8.1 RACH preamble detection in static propagation conditions

### 8.8.1.1 Definition and applicability

The performance requirement of RACH for preamble detection in static propagation conditions is determined by the two parameters probability of false detection of the preamble (Pfa) and the probability of detection of preamble (Pd). The performance is measured by the required  $E_c/N_0$  at probability of detection, Pd of 0.99 and 0.999. Pfa is defined as a conditional probability of erroneous detection of the preamble when input is only noise (+interference). Pd is defined as conditional probability of detection of the preamble when the signal is present. Pfa shall be  $10^{-3}$  or less. Only one signature is used and it is known by the receiver.

The requirement in this subclause shall apply to base stations intended for general-purpose applications.

### 8.8.1.2 Conformance Minimum requirement

The  $P_d$  shall be above or equal to the limits for the  $E_c/N_0$  specified in table 8.16.

#### Table 8.16: Preamble detection requirements in AWGN channel

	E <sub>c</sub> /N <sub>0</sub> for required	E <sub>c</sub> /N <sub>0</sub> for required
	Pd ≥ 0.99	Pd ≥ 0.999
	<del>Pd = 0.99</del>	<del>Pd = 0.999</del>
Required E <sub>c</sub> /N <sub>0</sub>	-20.5 dB	-20.1 dB

The reference for this requirement is TS 25.104 subclause 8.7.1.

### 8.8.1.3 Test purpose

The test shall verify the receiver's ability to detect RACH preambles under static propagation conditions.

#### 8.8.1.4 Method of test

#### 8.8.1.4.1 Initial conditions

Test environment: normal; see subclause 4.4.1.

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

1) Connect the BS tester generating the wanted signal and AWGN generators to both BS antenna connectors for diversity reception via a combining network as shown in annex B.

#### 8.8.1.4.2 Procedure

- 1) Adjust the AWGN generator to -84 dBm/3.84 MHz at the BS input.
- 2) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A.
- 3) Adjust the equipment so that required  $E_c/N_0$  specified in table 8.178.16 is achieved. To achieve the specified  $E_c/N_0$ , the ratio of the wanted signal level (of the preamble part) relative to the AWGN signal at the BS input should be adjusted to: -84+ $E_c/N_0$  [dBm]. The wanted signal levels during transmission (of the preamble part) at the BS input for the specified  $E_c/N_0$  levels in table 8.16 is found in table 8.17.

#### Table 8.17: Wanted signal levels (of the preamble part) during transmission in AWGN channel

	<del>Pd = 0.99</del>	<del>Pd = 0.999</del>
Wanted signal level during transmission	<del>-104.5 dBm.</del>	<del>-104.1 dBm</del>

4) The test signal generator sends a preamble and the receiver tries to detect the preamble. This pattern is repeated. Preamble detection should be made only on those access slots a preamble has been sent in.

Preamble

Preamble

...

#### Figure 8.2: RACH test signal pattern

#### 8.8.1.5 Test requirements

The  $P_d$  shall be above or equal to the <u>Pd</u> limits for the  $E_c/N_0$  levels specified in table 8.178.16.

#### Table 8.17: Preamble detection test requirements in AWGN channel

<u>E<sub>c</sub>/N₀ for</u>	required	<u>E<sub>c</sub>/N₀ for</u>	required
<u>Pd ≥</u>	0.99	Pd ≥ 0	0.999
-20.1	dB	-19.7	7 dB

NOTE:If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance appliedfor this test is non-zero. The Test Tolerance for this test is defined in subclause 4.2 and the explanation of<br/>how the Minimum Requirement has been relaxed by the Test Tolerance is given in Annex F.

# 8.8.2 RACH preamble detection in multipath fading case 3

#### 8.8.2.1 Definition and applicability

The performance requirement of RACH for preamble detection in in multipath fading case 3 is determined by the two parameters probability of false detection of the preamble (Pfa) and the probability of detection of preamble (Pd). The performance is measured by the required  $E_c/N_0$  at probability of detection, Pd of 0.99 and 0.999. Pfa is defined as a conditional probability of erroneous detection of the preamble when input is only noise (+interference). Pd is defined as conditional probability of detection of the preamble when the signal is present. Pfa shall be  $10^{-3}$  or less. Only one signature is used and it is known by the receiver.

The requirement in this subclause shall apply to base stations intended for general-purpose applications.

#### 8.8.2.2 Conformance minimum requirement

The  $P_d$  shall be above or equal to the limits for the  $E_c/N_0$  specified in table 8.18.

#### Table 8.18: Preamble detection requirements in fading case 3 channel

	E <sub>c</sub> /N <sub>0</sub> for required	E <sub>c</sub> /N₀ for required
	<b>Pd</b> ≥ 0.99	<b>Pd</b> ≥ 0.999
	<del>Pd = 0.99</del>	<del>Pd = 0.999</del>
Required E <sub>c</sub> /N <sub>0</sub>	-15.5 dB	-13.4 dB

The reference for this requirement is TS 25.104 subclause 8.7.1.

#### Release 4

#### 8.8.2.3 Test purpose

The test shall verify the receiver's ability to detect RACH preambles under multipath fading case 3 propagation conditions.

#### 8.8.2.4 Method of test

#### 8.8.2.4.1 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 the BS tester generating the wanted signal, multipath fading simulators and AWGN generators to both BS antenna connectors for diversity reception via a combining network as shown in annex B.

#### 8.8.2.4.2 Procedure

- 1) Adjust the AWGN generator to -84 dBm/3.84 MHz at the BS input.
- 2) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A.
- 3) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex D.
- 4) Adjust the equipment so that required  $E_c/N_0$  specified in table 8.198.18 is achieved. To achieve the specified  $E_c/N_0$ , the ratio of the wanted signal level (of the preamble part) relative to the AWGN signal at the BS input should be adjusted to: -84+ $E_c/N_0$  [dBm]. The wanted signal levels during transmission (of the preamble part) at the BS input for the specified  $E_c/N_0$  levels in table 8.18 is found in table 8.19.

#### Table 8.19: Wanted signal levels (of the preamble part) during transmission in fading case 3 channels

	<del>Pd = 0.99</del>	<del>Pd = 0.999</del>
Wanted signal level during transmission	<del>-99.5 dBm</del>	<del>-97,4 dBm</del>

5) The test signal generator sends a preamble and the receiver tries to detect the preamble. This pattern is repeated. Preamble detection should be made only on those access slots a preamble has been sent in.

Preamble

 $\bullet \bullet \bullet$ 

#### Figure 8.3: RACH test signal pattern

#### 8.8.2.5 Test requirements

The  $P_d$  shall be above or equal to the <u>Pd</u> limits for the  $E_c/N_0$  levels specified in table 8.198.18.

Table 8.19: Preamble detection test requirements in fading case 3 channel

$\frac{E_{c}/N_{0} \text{ for required}}{Pd \ge 0.99}$	<u>E<sub>c</sub>/N₀ for required</u> Pd ≥ 0.999	
<u>-14.9 dB</u>	-12.8 dB	

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.

# 8.8.3 Demodulation of RACH message in static propagation conditions

### 8.8.3.1 Definition and applicability

The performance requirement of RACH in static propagation conditions is determined by the maximum Block Error Ratio (BLER) allowed when the receiver input signal is at a specified  $E_b/N_0$  limit. The BLER is calculated for each of the measurement channels supported by the base station.

The power on the preamble is set to meet or exceed the requirements on Pfa and Pd in subclauses 8.8.1 and 8.8.2. Only one signature is used and it is known by the receiver.

The requirement in this subclause shall apply to base stations intended for general-purpose applications.

#### 8.8.3.2 Conformance Minimum requirement

The BLER shall not exceed the limit for the  $E_b/N_0$  specified in table 8.20.

#### Table 8.20: Performance requirements in AWGN channel

Transport Block size TB and TTI in frames	E <sub>b</sub> /N₀ for required BLER < 10 <sup>-1</sup>	E <sub>b</sub> /N₀ for required BLER < 10 <sup>-2</sup>
168 bits, TTI = 20 ms	4.1 dB	5.0 dB
360 bits, TTI = 20 ms	3.9 dB	4.8 dB

The reference for this requirement is TS 25.104 subclause 8.7.2.

#### 8.8.3.3 Test purpose

The test shall verify the receiver's ability to receive the test signal under static propagation conditions with a BLER not exceeding a specified limit.

#### 8.8.3.4 Method of test

8.8.3.4.1 Initial conditions

Test environment: normal; see subclause 4.4.1.

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

Preamble threshold factor: chosen to fulfil the requirements on Pfa and Pd in subclauses 8.8.1 and 8.8.2

1) Connect the BS tester generating the wanted signal and AWGN generators to both BS antenna connectors for diversity reception via a combining network as shown in annex B.

#### 8.8.3.4.2 Procedure

- 1) Adjust the AWGN generator to -84 dBm/3.84 MHz at the BS input.
- 2) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A.
- 3) Adjust the equipment so that required E<sub>b</sub>/N<sub>0</sub> specified in table <u>8.21</u>8.20 is achieved. To achieve the specified E<sub>b</sub>/N<sub>0</sub>, the ratio of the wanted signal level (of the message part) relative to the AWGN signal at the BS input should be adjusted to: -84+10\*Log10(TB/(TTI\*3.84\*10<sup>6</sup>))+E<sub>b</sub>/N<sub>0</sub> [dBm]. The wanted signal levels during transmission (of the message part) at the BS input for the specified E<sub>b</sub>/N<sub>0</sub> levels in table 8.20 is found in table 8.21.

#### Table 8.21: Wanted signal levels (of the message part) during transmission in AWGN channel

Transport Block size TB and TTI in frames	Wanted signal level during transmission for required BLER<10 <sup>-1</sup>	Wanted signal level during transmission for required BLER<10 <sup>-2</sup>
<del>168 bits, TTI = 20 ms</del>	<del>-106.5 dBm</del>	<del>-105.6 dBm</del>
<del>360 bits, TTI = 20 ms</del>	<del>-103.4 dBm</del>	<del>-102.5 dBm</del>

4) The test signal generator sends a preamble followed by the actual RACH message. This pattern is repeated (see figure 8.4). The receiver tries to detect the preamble and the message. The block error rate is calculated for the messages that have been decoded. Messages following undetected preambles shall not be taken into account in the BLER measurement.



Figure 8.4: RACH test signal pattern

#### 8.8.3.5 Test requirements

The BLER measured according the subclause 8.8.3.4.2 shall not exceed the <u>BLER</u> limits for the  $E_{b}/N_{0}$  levels specified in table 8.218.20.

#### Table 8.21: Test requirements in AWGN channel

Transport Block size TB and TTI in frames	<u>E<sub>b</sub>/N₀ for required</u> BLER < 10 <sup>-1</sup>	<u>E<sub>b</sub>/N₀ for required</u> BLER < 10 <sup>-2</sup>
<u>168 bits, TTI = 20 ms</u>	4.5 dB	<u>5.4 dB</u>
<u>360 bits, TTI = 20 ms</u>	<u>4.3 dB</u>	<u>5.2 dB</u>

<u>NOTE:</u> 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.

# 8.8.4 Demodulation of RACH message in multipath fading case 3

#### 8.8.4.1 Definition and applicability

The performance requirement of RACH in multipath fading case 3 is determined by the maximum Block Error Ratio (BLER) allowed when the receiver input signal is at a specified  $E_b/N_0$  limit. The BLER is calculated for each of the measurement channels supported by the base station.

The power on the preamble is set to meet or exceed the requirements on Pfa and Pd in subclauses 8.8.1 and 8.8.2. Only one signature is used and it is known by the receiver.

The requirement in this subclause shall apply to base stations intended for general-purpose applications.

### 8.8.4.2 Conformance Minimum requirement

The BLER shall not exceed the limit for the  $E_b/N_0$  specified in table 8.22.

#### Table 8.22: Performance requirements in fading case 3 channel

Transport Block size TB and TTI in frames	E <sub>b</sub> /N₀ for required BLER < 10 <sup>-1</sup>	E <sub>b</sub> /N₀ for required BLER < 10 <sup>-2</sup>
168 bits, TTI = 20 ms	7.4 dB	8.5 dB
360 bits, TTI = 20 ms	7.3 dB	8.3 dB

The reference for this requirement is TS 25.104 subclause 8.7.2.

#### 8.8.4.3 Test purpose

The test shall verify the receiver's ability to receive the test signal under multipath fading case 3 propagation conditions with a BLER not exceeding a specified limit.

#### 8.8.4.4 Method of test

8.8.4.4.1 Initial conditions

Test environment: normal; see subclause 4.4.1.

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

Preamble threshold factor: chosen to fulfil the requirements on Pfa and Pd in subclauses 8.8.1 and 8.8.2

1) Connect the BS tester generating the wanted signal, multipath fading simulators and AWGN generators to both BS antenna connectors for diversity reception via a combining network as shown in annex B.

#### 8.8.4.4.2 Procedure

- 1) Adjust the AWGN generator to -84 dBm/3.84 MHz at the BS input.
- 2) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A.
- 3) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex D.
- 4) Adjust the equipment so that required  $E_b/N_0$  specified in table 8.238.22 is achieved. To achieve the specified  $E_b/N_0$ , the ratio of the wanted signal level (of the message part) relative to the AWGN signal at the BS input should be adjusted to:

 $-84+10*Log10(TB/(TTI*3.84*10^6))+E_b/N_0$  [dBm]. The wanted signal levels during transmission (of the message part) at the BS input for the specified  $E_b/N_0$  levels in table 8.22 is found in table 8.23.

#### Table 8.23: Wanted signal levels (of the message part) during transmission in fading case 3 channel

Transport Block size TB and TTI in frames	Wanted signal level during transmission for required BLER<10 <sup>-1</sup>	Wanted signal level during transmission for required BLER<10 <sup>-2</sup>
<del>168 bits, TTI = 20 ms</del>	<del>-103.2 dBm</del>	<del>-102.1 dBm</del>
<del>360 bits, TTI = 20 ms</del>	<del>-100 dBm</del>	<del>-99 dBm</del>

5) The test signal generator sends a preamble followed by the actual RACH message. This pattern is repeated (see figure 8.5). The receiver tries to detect the preamble and the message. The block error rate is calculated for the messages that have been decoded. Messages following undetected preambles shall not be taken into account in the BLER measurement.

Preamble     Message     Preamble     Message	Preamble	Message	Preamble	Message	•••
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Figure 8.5: RACH test signal pattern

#### 8.8.4.5 Test requirements

The BLER measured according to subclause 8.8.4.4.2 shall not exceed the <u>BLER limits for the  $E_{b}/N_{0}$  levels specified in table 8.238.22.</u>

Transport Block size TB and TTI in frames	<u>E<sub>b</sub>/N₀ for required</u> BLER < 10 <sup>-1</sup>	<u>E<sub>b</sub>/N₀ for required</u> BLER < 10 <sup>-2</sup>
<u>168 bits, TTI = 20 ms</u>	<u>8.0 dB</u>	<u>9.1 dB</u>
<u>360 bits, TTI = 20 ms</u>	<u>7.9 dB</u>	<u>8.9 dB</u>

Table 8.23: Test requirements in fading case 3 channel

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  $\pm 2.5$  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.

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 requirement s)	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

Test	Minimum Requirement in TS 25.104	Test Tolerance (TT)	Test Requirement in TS 25.141
7.2 Reference sensitivity	Reference sensitivity level = - 121 dBm	0.7 dB	Formula: Reference sensitivity level + TT
	FER/BER limit = 0.001		Reference sensitivity level = -120.3 dBm
			FER/BER limit is not changed
7.3 Dynamic range	Wanted signal level = -91 dBm AWGN level = -73 dBm/3.84 MHz	1.2 dB	Formula: Wanted signal level + TT AWGN level unchanged
			Wanted signal level = -89.8 dBm
7.4 Adjacent channel selectivity	Wanted signal level = -115 dBm W-CDMA interferer level = -52 dBm	0 dB	Formula: Wanted signal level + TT W-CDMA interferer level unchanged
			Wanted signal level = -115 dBm
7.5 Blocking characteristics	Wanted signal level = -115 dBm Interferer level See table 7.4a / 7.4b	0 dB	Formula: Wanted signal level + TT Interferer level unchanged Wanted signal level = -115 dBm
7.6 Intermod Characteristics	Wanted signal level = -115 dBm Interferer1 level (10 MHz offset CW) = -48 dBm Interferer2 level (20 MHz offset	0 dB	Formula: Wanted signal level + TT Interferer1 level unchanged Interferer2 level unchanged
	W-CDMA Modulated) = -48 dBm		Wanted signal level = -115 dBm
7.7 Spurious Emissions	Maximum level defined in Table 7.7	0 dB	Formula: Maximum level + TT
			Aud TT to Maximum level in table 7.7

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Test	Minimum Requirement in TS 25.104	Test Tolerance (TT)	Test Requirement in TS 25.141
8.2, Demodulation in static propagation condition	Received E <sub>b</sub> /N <sub>0</sub> values	0.4 dB	Minimum requirement + TT
8.3, Demodulation of DCH in multipath fading conditions	Received E <sub>b</sub> /N <sub>0</sub> values	0.6 dB	Minimum requirement + TT
8.4 Demodulation of DCH in moving propagation conditions	Received E <sub>b</sub> /N <sub>0</sub> values	0.6 dB	Minimum requirement + TT
8.5 Demodulation of DCH in birth/death propagation conditions	Received E <sub>b</sub> /N <sub>0</sub> values	0.6 dB	Minimum requirement + TT
8.8.1 RACH preamble detection in static propagation conditions	Received E <sub>g</sub> /N <sub>0</sub> values	<u>0.4dB</u>	Minimum requirement + TT
8.8.2 RACH preamble detection in multipath fading case 3	Received E <sub>c</sub> /N <sub>0</sub> values	<u>0.6dB</u>	<u>Minimum requirement + TT</u>
8.8.3 Demodulation of RACH message in static propagation conditions	Received E <sub>b</sub> /N <sub>0</sub> values	<u>0.4dB</u>	Minimum requirement + TT
8.8.4 Demodulation of RACH message in multipath fading case 3	Received E <sub>b</sub> /N <sub>0</sub> values	<u>0.6dB</u>	Minimum requirement + TT

Table F.3: Derivation of Test Requirements (Performance tests)

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# 4.1.4 Measurement of performance requirement

#### Table 4.1B: Maximum Test System Uncertainty for Performance Requirements

Subclause	Maximum Test System Uncertainty <sup>1</sup>	Derivation of Test System Uncertainty
8.2, Demodulation in static	± 0.4dB	Wanted/AWGN: ± 0.4dB (relative uncertainty
propagation condition		for E <sub>b</sub> /N <sub>0</sub> )
-		(AWGN: ±1dB)
8.3, Demodulation of DCH	± 0.6dB	Fader: ± 0.5dB
in multipath fading		Wanted/AWGN: ± 0.4dB (relative)
conditions		Combined relative uncertainty for $E_b/N_0$ : ±
		0.6dB
8.4 Demodulation of DCH	± 0.6dB	Fader: ± 0.5dB
in moving propagation		Wanted/AWGN: ± 0.4dB (relative)
conditions		Combined relative uncertainty for E <sub>b</sub> /N <sub>0</sub> : ±
		0.6dB
8.5 Demodulation of DCH	± 0.6dB	Fader: ± 0.5dB
in birth/death propagation		Wanted/AWGN: ± 0.4dB (relative)
conditions		Combined relative uncertainty for E <sub>b</sub> /N <sub>0</sub> : ±
		0.6dB
8.8.1 RACH preamble	<u>± 0.4dB</u>	Wanted/AWGN: ± 0.4dB (relative uncertainty
detection in static		for E <sub>c</sub> /N <sub>0</sub> )
propagation conditions		(AWGN: ±1dB)
8.8.2 RACH preamble	<u>± 0.6dB</u>	Fader: ± 0.5dB
detection in multipath		Wanted/AWGN: ± 0.4dB (relative)
fading case 3		Combined relative uncertainty for E <sub>c</sub> /N <sub>0</sub> : ±
		<u>0.6dB</u>
8.8.3 Demodulation of	<u>± 0.4dB</u>	Wanted/AWGN: ± 0.4dB (relative uncertainty
RACH message in static		$\frac{\text{for } E_{b}/N_{0}}{1}$
propagation conditions		(AWGN: ±1dB)
8.8.4 Demodulation of	<u>± 0.6dB</u>	Fader: $\pm 0.5$ dB
RACH message in		Wanted/AWGN: ± 0.4dB (relative)
multipath fading case 3		Combined relative uncertainty for $E_b/N_0$ : ±
	<u> </u>	0.60B
Note 1: Only the overall s	timulus error is considered here. The effect	ct of errors in the BER/FER measurements
due to finite test d	luration is not considered.	

# 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

Subclause	Test Tolerance <sup>1</sup>	
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 <sup>3</sup>	
6.5.2.2 ACLR	0.8 dB	
6.5.3 Spurious emissions 0 dB		
6.6 Transmit intermodulation (interferer requirements) 0 dB <sup>2</sup>		
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 stimulu	s signal(s). See Annex F.	
Note 3: 0 dB test tolerance for the additional Band b requirements.		

Table 4.1C: Test Tolerances for transmitter tests.

# 4.2.2 Receiver

#### Table 4.1D: Test Tolerances for receiver tests.

Subclause	Test Tolerance <sup>1</sup>
7.2 Reference sensitivity level	0.7 dB
7.3 Dynamic range	1.2 dB
7.4 Adjacent channel selectivity	0 dB
7.5 Blocking characteristics	0 dB
7.6 Intermod Characteristics	0 dB
7.7 Spurious Emissions	0 dB <sup>2</sup>
Note 1: Unless otherwise stated, the Test Tolerances are applied to the stimulus signal(s). See Annex F.	
Note 2: The Test Tolerance is applied to the DUT Minimum Requirement. See Annex F.	

# 4.2.3 Performance requirement

#### Table 4.1E: Test Tolerances for Performance Requirements.

Subclause	Test Tolerance <sup>1</sup>	
8.2, Demodulation in static propagation condtion	0.4dB	
8.3, Demodulation of DCH in multiplath fading conditons	0.6dB	
8.4 Demodulation of DCH in moving propagation conditions	0.6dB	
8.5 Demodulation of DCH in birth/death propagation conditions	0.6dB	
8.8.1 RACH preamble detection in static propagation conditions	<u>0.4dB</u>	
8.8.2 RACH preamble detection in multipath fading case 3	<u>0.6dB</u>	
8.8.3 Demodulation of RACH message in static propagation	0.4dB	
conditions		
8.8.4 Demodulation of RACH message in multipath fading case 3	<u>0.6dB</u>	
Note 1: Unless otherwise stated, the Test Tolerances are applied to the stimulus signal(s). See		
Annex F.	-	

# 8.8 RACH performance

# 8.8.1 RACH preamble detection in static propagation conditions

### 8.8.1.1 Definition and applicability

The performance requirement of RACH for preamble detection in static propagation conditions is determined by the two parameters probability of false detection of the preamble (Pfa) and the probability of detection of preamble (Pd). The performance is measured by the required  $E_c/N_0$  at probability of detection, Pd of 0.99 and 0.999. Pfa is defined as a conditional probability of erroneous detection of the preamble when input is only noise (+interference). Pd is defined as conditional probability of detection of the preamble when the signal is present. Pfa shall be  $10^{-3}$  or less. Only one signature is used and it is known by the receiver.

The requirement in this subclause shall apply to base stations intended for general-purpose applications.

### 8.8.1.2 Conformance Minimum requirement

The  $P_d$  shall be above or equal to the limits for the  $E_c/N_0$  specified in table 8.16.

#### Table 8.16: Preamble detection requirements in AWGN channel

	E <sub>c</sub> /N <sub>0</sub> for required	E <sub>c</sub> /N <sub>0</sub> for required
	Pd ≥ 0.99	Pd ≥ 0.999
	<del>Pd = 0.99</del>	<del>Pd = 0.999</del>
Required E <sub>c</sub> /N <sub>0</sub>	-20.5 dB	-20.1 dB

The reference for this requirement is TS 25.104 subclause 8.7.1.

### 8.8.1.3 Test purpose

The test shall verify the receiver's ability to detect RACH preambles under static propagation conditions.

#### 8.8.1.4 Method of test

#### 8.8.1.4.1 Initial conditions

Test environment: normal; see subclause 4.4.1.

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

1) Connect the BS tester generating the wanted signal and AWGN generators to both BS antenna connectors for diversity reception via a combining network as shown in annex B.

#### 8.8.1.4.2 Procedure

- 1) Adjust the AWGN generator to -84 dBm/3.84 MHz at the BS input.
- 2) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A.
- 3) Adjust the equipment so that required E<sub>c</sub>/N<sub>0</sub> specified in table 8.178.16 is achieved. To achieve the specified E<sub>c</sub>/N<sub>0</sub>, the ratio of the wanted signal level (of the preamble part) relative to the AWGN signal at the BS input should be adjusted to: -84+E<sub>c</sub>/N<sub>0</sub> [dBm]. The wanted signal levels during transmission (of the preamble part) at the BS input for the specified E<sub>c</sub>/N<sub>0</sub> levels in table 8.16 is found in table 8.17.

#### Table 8.17: Wanted signal levels (of the preamble part) during transmission in AWGN channel

	<del>Pd = 0.99</del>	<del>Pd = 0.999</del>
Wanted signal level during transmission	<del>-104.5 dBm.</del>	<del>-104.1 dBm</del>

4) The test signal generator sends a preamble and the receiver tries to detect the preamble. This pattern is repeated. Preamble detection should be made only on those access slots a preamble has been sent in.

Preamble

Preamble

...

#### Figure 8.2: RACH test signal pattern

#### 8.8.1.5 Test requirements

The  $P_d$  shall be above or equal to the <u>Pd</u> limits for the  $E_c/N_0$  levels specified in table 8.178.16.

#### Table 8.17: Preamble detection test requirements in AWGN channel

<u>E<sub>c</sub>/N₀ for</u>	required	<u>E<sub>o</sub>/N₀ for</u>	required
<u>Pd ≥</u>	0.99	Pd ≥ 0	0.999
-20.1	dB	-19.7	7 dB

NOTE:If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance appliedfor this test is non-zero. The Test Tolerance for this test is defined in subclause 4.2 and the explanation of<br/>how the Minimum Requirement has been relaxed by the Test Tolerance is given in Annex F.

# 8.8.2 RACH preamble detection in multipath fading case 3

### 8.8.2.1 Definition and applicability

The performance requirement of RACH for preamble detection in in multipath fading case 3 is determined by the two parameters probability of false detection of the preamble (Pfa) and the probability of detection of preamble (Pd). The performance is measured by the required  $E_c/N_0$  at probability of detection, Pd of 0.99 and 0.999. Pfa is defined as a conditional probability of erroneous detection of the preamble when input is only noise (+interference). Pd is defined as conditional probability of detection of the preamble when the signal is present. Pfa shall be  $10^{-3}$  or less. Only one signature is used and it is known by the receiver.

The requirement in this subclause shall apply to base stations intended for general-purpose applications.

#### 8.8.2.2 Conformance minimum requirement

The  $P_d$  shall be above or equal to the limits for the  $E_c/N_0$  specified in table 8.18.

#### Table 8.18: Preamble detection requirements in fading case 3 channel

	E <sub>c</sub> /N <sub>0</sub> for required	E <sub>c</sub> /N₀ for required
	<b>Pd</b> ≥ 0.99	<b>Pd</b> ≥ 0.999
	<del>Pd = 0.99</del>	<del>Pd = 0.999</del>
Required E <sub>e</sub> /N <sub>0</sub>	-15.5 dB	-13.4 dB

The reference for this requirement is TS 25.104 subclause 8.7.1.

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#### 8.8.2.3 Test purpose

The test shall verify the receiver's ability to detect RACH preambles under multipath fading case 3 propagation conditions.

#### 8.8.2.4 Method of test

#### 8.8.2.4.1 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 the BS tester generating the wanted signal, multipath fading simulators and AWGN generators to both BS antenna connectors for diversity reception via a combining network as shown in annex B.

#### 8.8.2.4.2 Procedure

- 1) Adjust the AWGN generator to -84 dBm/3.84 MHz at the BS input.
- 2) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A.
- 3) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex D.
- 4) Adjust the equipment so that required  $E_c/N_0$  specified in table 8.198.18 is achieved. To achieve the specified  $E_c/N_0$ , the ratio of the wanted signal level (of the preamble part) relative to the AWGN signal at the BS input should be adjusted to: -84+ $E_c/N_0$  [dBm]. The wanted signal levels during transmission (of the preamble part) at the BS input for the specified  $E_c/N_0$  levels in table 8.18 is found in table 8.19.

#### Table 8.19: Wanted signal levels (of the preamble part) during transmission in fading case 3 channels

	<del>Pd = 0.99</del>	<del>Pd = 0.999</del>
Wanted signal level during transmission	<del>-99.5 dBm</del>	<del>-97,4 dBm</del>

5) The test signal generator sends a preamble and the receiver tries to detect the preamble. This pattern is repeated. Preamble detection should be made only on those access slots a preamble has been sent in.

Preamble

...

#### Figure 8.3: RACH test signal pattern

#### 8.8.2.5 Test requirements

The  $P_d$  shall be above or equal to the <u>Pd</u> limits for the  $E_c/N_0$  levels specified in table 8.198.18.

Table 8.19: Preamble detection test requirements in fading case 3 channel

$\frac{E_{c}/N_{0} \text{ for required}}{Pd \ge 0.99}$	<u>E<sub>c</sub>/N₀ for required</u> Pd ≥ 0.999	
<u>-14.9 dB</u>	-12.8 dB	

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.

# 8.8.3 Demodulation of RACH message in static propagation conditions

### 8.8.3.1 Definition and applicability

The performance requirement of RACH in static propagation conditions is determined by the maximum Block Error Ratio (BLER) allowed when the receiver input signal is at a specified  $E_b/N_0$  limit. The BLER is calculated for each of the measurement channels supported by the base station.

The power on the preamble is set to meet or exceed the requirements on Pfa and Pd in subclauses 8.8.1 and 8.8.2. Only one signature is used and it is known by the receiver.

The requirement in this subclause shall apply to base stations intended for general-purpose applications.

#### 8.8.3.2 Conformance Minimum requirement

The BLER shall not exceed the limit for the  $E_b/N_0$  specified in table 8.20.

#### Table 8.20: Performance requirements in AWGN channel

Transport Block size TB and TTI in frames	E <sub>b</sub> /N₀ for required BLER < 10 <sup>-1</sup>	E <sub>b</sub> /N₀ for required BLER < 10 <sup>-2</sup>
168 bits, TTI = 20 ms	4.1 dB	5.0 dB
360 bits, TTI = 20 ms	3.9 dB	4.8 dB

The reference for this requirement is TS 25.104 subclause 8.7.2.

#### 8.8.3.3 Test purpose

The test shall verify the receiver's ability to receive the test signal under static propagation conditions with a BLER not exceeding a specified limit.

#### 8.8.3.4 Method of test

8.8.3.4.1 Initial conditions

Test environment: normal; see subclause 4.4.1.

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

Preamble threshold factor: chosen to fulfil the requirements on Pfa and Pd in subclauses 8.8.1 and 8.8.2

1) Connect the BS tester generating the wanted signal and AWGN generators to both BS antenna connectors for diversity reception via a combining network as shown in annex B.

#### 8.8.3.4.2 Procedure

- 1) Adjust the AWGN generator to -84 dBm/3.84 MHz at the BS input.
- 2) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A.
- 3) Adjust the equipment so that required E<sub>b</sub>/N<sub>0</sub> specified in table <u>8.21</u>8.20 is achieved. To achieve the specified E<sub>b</sub>/N<sub>0</sub>, the ratio of the wanted signal level (of the message part) relative to the AWGN signal at the BS input should be adjusted to: -84+10\*Log10(TB/(TTI\*3.84\*10<sup>6</sup>))+E<sub>b</sub>/N<sub>0</sub> [dBm]. The wanted signal levels during transmission (of the message part) at the BS input for the specified E<sub>b</sub>/N<sub>0</sub> levels in table 8.20 is found in table 8.21.

#### Table 8.21: Wanted signal levels (of the message part) during transmission in AWGN channel

Transport Block size TB and TTI in frames	Wanted signal level during transmission for required BLER<10 <sup>-1</sup>	Wanted signal level during transmission for required BLER<10 <sup>-2</sup>
<del>168 bits, TTI = 20 ms</del>	<del>-106.5 dBm</del>	<del>-105.6 dBm</del>
<del>360 bits, TTI = 20 ms</del>	<del>-103.4 dBm</del>	<del>-102.5 dBm</del>

4) The test signal generator sends a preamble followed by the actual RACH message. This pattern is repeated (see figure 8.4). The receiver tries to detect the preamble and the message. The block error rate is calculated for the messages that have been decoded. Messages following undetected preambles shall not be taken into account in the BLER measurement.



Figure 8.4: RACH test signal pattern

#### 8.8.3.5 Test requirements

The BLER measured according the subclause 8.8.3.4.2 shall not exceed the <u>BLER</u> limits for the  $E_{b}/N_{0}$  levels specified in table 8.218.20.

#### Table 8.21: Test requirements in AWGN channel

Transport Block size TB and TTI in frames	<u>E<sub>b</sub>/N₀ for required</u> BLER < 10 <sup>-1</sup>	<u>E<sub>b</sub>/N₀ for required</u> BLER < 10 <sup>-2</sup>
<u>168 bits, TTI = 20 ms</u>	4.5 dB	<u>5.4 dB</u>
<u>360 bits, TTI = 20 ms</u>	<u>4.3 dB</u>	<u>5.2 dB</u>

<u>NOTE:</u> 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.

# 8.8.4 Demodulation of RACH message in multipath fading case 3

#### 8.8.4.1 Definition and applicability

The performance requirement of RACH in multipath fading case 3 is determined by the maximum Block Error Ratio (BLER) allowed when the receiver input signal is at a specified  $E_b/N_0$  limit. The BLER is calculated for each of the measurement channels supported by the base station.

The power on the preamble is set to meet or exceed the requirements on Pfa and Pd in subclauses 8.8.1 and 8.8.2. Only one signature is used and it is known by the receiver.

The requirement in this subclause shall apply to base stations intended for general-purpose applications.

### 8.8.4.2 Conformance Minimum requirement

The BLER shall not exceed the limit for the  $E_b/N_0$  specified in table 8.22.

#### Table 8.22: Performance requirements in fading case 3 channel

Transport Block size TB and TTI in frames	E <sub>b</sub> /N₀ for required BLER < 10 <sup>-1</sup>	E <sub>b</sub> /N₀ for required BLER < 10 <sup>-2</sup>
168 bits, TTI = 20 ms	7.4 dB	8.5 dB
360 bits, TTI = 20 ms	7.3 dB	8.3 dB

The reference for this requirement is TS 25.104 subclause 8.7.2.

#### 8.8.4.3 Test purpose

The test shall verify the receiver's ability to receive the test signal under multipath fading case 3 propagation conditions with a BLER not exceeding a specified limit.

#### 8.8.4.4 Method of test

8.8.4.4.1 Initial conditions

Test environment: normal; see subclause 4.4.1.

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

Preamble threshold factor: chosen to fulfil the requirements on Pfa and Pd in subclauses 8.8.1 and 8.8.2

1) Connect the BS tester generating the wanted signal, multipath fading simulators and AWGN generators to both BS antenna connectors for diversity reception via a combining network as shown in annex B.

#### 8.8.4.4.2 Procedure

- 1) Adjust the AWGN generator to -84 dBm/3.84 MHz at the BS input.
- 2) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A.
- 3) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex D.
- 4) Adjust the equipment so that required  $E_b/N_0$  specified in table 8.238.22 is achieved. To achieve the specified  $E_b/N_0$ , the ratio of the wanted signal level (of the message part) relative to the AWGN signal at the BS input should be adjusted to:

 $-84+10*Log10(TB/(TTI*3.84*10^6))+E_b/N_0$  [dBm]. The wanted signal levels during transmission (of the message part) at the BS input for the specified  $E_b/N_0$  levels in table 8.22 is found in table 8.23.

#### Table 8.23: Wanted signal levels (of the message part) during transmission in fading case 3 channel

Transport Block size TB and TTI in frames	Wanted signal level during transmission for required BLER<10 <sup>-1</sup>	Wanted signal level during transmission for required BLER<10 <sup>-2</sup>
<del>168 bits, TTI = 20 ms</del>	<del>-103.2 dBm</del>	<del>-102.1 dBm</del>
<del>360 bits, TTI = 20 ms</del>	<del>-100 dBm</del>	<del>-99 dBm</del>

5) The test signal generator sends a preamble followed by the actual RACH message. This pattern is repeated (see figure 8.5). The receiver tries to detect the preamble and the message. The block error rate is calculated for the messages that have been decoded. Messages following undetected preambles shall not be taken into account in the BLER measurement.

Preamble     Message     Preamble     Message	Preamble	Message	Preamble	Message	•••
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Figure 8.5: RACH test signal pattern

#### 8.8.4.5 Test requirements

The BLER measured according to subclause 8.8.4.4.2 shall not exceed the <u>BLER limits for the  $E_{b}/N_{0}$  levels specified in table 8.238.22.</u>

Transport Block size TB and TTI in frames	<u>E<sub>b</sub>/N₀ for required</u> BLER < 10 <sup>-1</sup>	<u>E<sub>b</sub>/N₀ for required</u> BLER < 10 <sup>-2</sup>
<u>168 bits, TTI = 20 ms</u>	<u>8.0 dB</u>	<u>9.1 dB</u>
<u>360 bits, TTI = 20 ms</u>	<u>7.9 dB</u>	<u>8.9 dB</u>

Table 8.23: Test requirements in fading case 3 channel

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  $\pm 2.5$  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.

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 requirement s)	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

Test	Minimum Requirement in TS 25.104	Test Tolerance (TT)	Test Requirement in TS 25.141
7.2 Reference sensitivity	Reference sensitivity level = - 121 dBm	0.7 dB	Formula: Reference sensitivity level + TT
	FER/BER limit = 0.001		Reference sensitivity level = -120.3 dBm
			FER/BER limit is not changed
7.3 Dynamic range	Wanted signal level = -91 dBm AWGN level = -73 dBm/3.84 MHz	1.2 dB	Formula: Wanted signal level + TT AWGN level unchanged
			Wanted signal level = -89.8 dBm
7.4 Adjacent channel selectivity	Wanted signal level = -115 dBm W-CDMA interferer level = -52 dBm	0 dB	Formula: Wanted signal level + TT W-CDMA interferer level unchanged
			Wanted signal level = -115 dBm
7.5 Blocking characteristics	Wanted signal level = -115 dBm Interferer level See table 7.4a / 7.4b	0 dB	Formula: Wanted signal level + TT Interferer level unchanged Wanted signal level = -115 dBm
7.6 Intermod Characteristics	Wanted signal level = -115 dBm Interferer1 level (10 MHz offset CW) = -48 dBm Interferer2 level (20 MHz offset	0 dB	Formula: Wanted signal level + TT Interferer1 level unchanged Interferer2 level unchanged
	W-CDMA Modulated) = -48 dBm		Wanted signal level = -115 dBm
7.7 Spurious Emissions	Maximum level defined in Table 7.7	0 dB	Formula: Maximum level + TT
			Add TT to Maximum level in table 7.7

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Test	Minimum Requirement in TS 25.104	Test Tolerance (TT)	Test Requirement in TS 25.141
8.2, Demodulation in static propagation condition	Received E <sub>b</sub> /N <sub>0</sub> values	0.4 dB	Minimum requirement + TT
8.3, Demodulation of DCH in multipath fading conditions	Received E <sub>b</sub> /N <sub>0</sub> values	0.6 dB	Minimum requirement + TT
8.4 Demodulation of DCH in moving propagation conditions	Received E <sub>b</sub> /N <sub>0</sub> values	0.6 dB	Minimum requirement + TT
8.5 Demodulation of DCH in birth/death propagation conditions	Received E <sub>b</sub> /N <sub>0</sub> values	0.6 dB	Minimum requirement + TT
8.8.1 RACH preamble detection in static propagation conditions	Received E <sub>g</sub> /N <sub>0</sub> values	<u>0.4dB</u>	Minimum requirement + TT
8.8.2 RACH preamble detection in multipath fading case 3	Received E <sub>c</sub> /N <sub>0</sub> values	<u>0.6dB</u>	<u>Minimum requirement + TT</u>
8.8.3 Demodulation of RACH message in static propagation conditions	Received E <sub>b</sub> /N <sub>0</sub> values	<u>0.4dB</u>	Minimum requirement + TT
8.8.4 Demodulation of RACH message in multipath fading case 3	Received E <sub>b</sub> /N <sub>0</sub> values	<u>0.6dB</u>	Minimum requirement + TT