TSG RAN Meeting #15 **RP-020029**

Cheju, Korea, 5 - 8 March 2002

Title: **CRs (Rel-4 and Rel-5 Category A) to TS 25.141**

Source: **TSG RAN WG4**

Agenda Item: **7.4.4**

RAN4 Tdoc	Spec	CR	Rev	Phase	Title	Cat	Curr Ver	New Ver
R4-020176	25.141	163		Rel-4	Fading generator for RACH preamble detection and RACH message demodulation	F	4.3.0	4.4.0
R4-020177	25.141	164		Rel-5	Fading generator for RACH preamble detection and RACH message demodulation	A	5.1.0	5.2.0

3GPP TSG RAN WG4 Meeting #21 **R4-020176**

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

CR-Form-v5

CHANGE REQUEST

⌘ **25.141** **CR** **163** ⌘ **rev** **-** ⌘ Current version: **4.3.0** ⌘

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

Title:	⌘	Fading generator for RACH preamble detection and RACH message demodulation
Source:	⌘	RAN WG4
Work item code:	⌘	TEI4
Date:	⌘	1/2/2002
Category:	⌘	**F**
Release:	⌘	Rel-4

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

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

Reason for change:	⌘	Multipath fading generators are not mentioned in the RACH preamble detection and RACH message demodulation test cases that of course are needed. It is also not mentioned how to configure the multipath fading emulators.
Summary of change:	⌘	Adding multipath fading simulators to the test environment description and describing how it shall be configured in the procedure description.
Consequences if not approved:	⌘	Information on test environment and configuration wrt multipath fading generators would be based on assumptions.

Clauses affected:	⌘	8.8.2.4.1, 8.8.2.4.2, 8.8.4.4.1, 8.8.4.4.2
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.

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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.

8.8.2 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 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

	Pd = 0.99	**Pd = 0.999**
Required E_c/N_0	-15.5 dB	-13.4 dB

The reference for this requirement is TS 25.104 subclause 8.7.1.

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)~~3)~~ Adjust the equipment so that required E_c/N_0 specified in table 8.18 is achieved. To achieve the specified E_c/N_O, the wanted signal level (of the preamble part) 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

	Pd = 0.99	**Pd = 0.999**
Wanted signal level during transmission	-99.5 dBm	-97,4 dBm

5)~~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.

Figure 8.3: RACH test signal pattern

8.8.2.5 Test requirements

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

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 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_b/N_0 for required BLER < 10^{-1}	E_b/N_0 for required BLER < 10^{-2}
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)~~3)~~ Adjust the equipment so that required E_b/N_0 specified in table 8.22 is achieved. To achieve the specified E_b/N_O, the wanted signal level (of the message part) at the BS input should be adjusted to: $-84+10*\text{Log10}(TB/(TTI*3.84*10^6))+E_b/N_0$ [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^{-1}	Wanted signal level during transmission for required BLER<10^{-2}
168 bits, TTI = 20 ms	-103.2 dBm	-102.1 dBm
360 bits, TTI = 20 ms	-100 dBm	-99 dBm

5)~~4)~~ 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.

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 limits specified in table 8.22.

3GPP TSG RAN WG4 Meeting #21 **R4-020177**

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

CR-Form-v5

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8.8.2.2 Conformance requirement

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Table 8.18: Preamble detection requirements in fading case 3 channel

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Required E_c/N_0	-15.5 dB	-13.4 dB

The reference for this requirement is TS 25.104 subclause 8.7.1.

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)~~3)~~ Adjust the equipment so that required E_c/N_0 specified in table 8.18 is achieved. To achieve the specified E_c/N_O, the wanted signal level (of the preamble part) 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.

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Figure 8.3: RACH test signal pattern

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8.8.4 Demodulation of RACH message in multipath fading case 3

8.8.4.1 Definition and applicability

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8.8.4.2 Conformance requirement

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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)~~3)~~ Adjust the equipment so that required E_b/N_0 specified in table 8.22 is achieved. To achieve the specified E_b/N_O, the wanted signal level (of the message part) at the BS input should be adjusted to: $-84+10*\text{Log10}(TB/(TTI*3.84*10^6))+E_b/N_0$ [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.

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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 limits specified in table 8.22.