3GPP TSG RAN Meeting #26 **RP-040410**
Vouliagmeni Athens, Greece, 8 - 10 December, 2004

Title **CRs (Rel-6) to TS25.104/TS25.141 on Power Control step test requirements for 1.5 dB and 2 dB**
Source **3GPP TSG RAN WG4 (Radio)**
Agenda Item **8.9**

WG Tdoc	Spec	CR	R	Cat	Rel	Curr Ver	Title	Work Item
R4-040604	25.104	230		F	Rel-6	6.7.0	Power Control step requirements for 1.5dB and 2.0dB	TEI6
R4-040605	25.141	356		F	Rel-6	6.7.0	Power Control step test requirements for 1.5dB and 2.0dB	TEI6

3GPP TSG RAN WG4 (Radio) Meeting #33 **R4-040604**

Yokohama, Japan 15 - 19 November 2004

CR-Form-v7.1

CHANGE REQUEST

⌘ **25.104** **CR** **230** ⌘**rev** ⌘ Current version: **6.7.0** ⌘

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Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☒ Core Network ☐

Title:	⌘	Power Control step requirements for 1.5dB and 2.0dB
Source:	⌘	3GPP TSG RAN WG4 (Radio)
Work item code:	⌘	TEI6
Date:	⌘	01/12/2004
Category:	⌘	**F**
Release:	⌘	Rel-6

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:
Ph2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*
Rel-7 *(Release 7)*

Reason for change:	⌘	TS 25.214 have a mandatory requirement to support 1 dB downlink power control step size, while 0.5, 1.5 and 2 dB step sizes is optional. The corresponding accuracy requirements for 1.5 and 2 dB are missing in TS 25.104.
Summary of change:	⌘	Adding two columns for 2 dB and 1.5 dB step size to the table for power control step tolerance and aggregated power control step range. The step tolerances is equal to (1± 0.5) times the step size. The aggregated step range is equal to (10± 2) times the step size.
Consequences if not approved:	⌘	There would not be any accuracy requirements for 1.5 and 2 dB downlink power control step size.

Clauses affected:	⌘	6.4.1.1.1				
Other specs affected:	⌘	**Y**	**N**		⌘	
			X	Other core specifications		
		X		Test specifications		25.141
			X	O&M Specifications		
Other comments:	⌘					

How to create CRs using this form:
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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.

6.4 Output power dynamics

Power control is used to limit the interference level. The transmitter uses a quality-based power control on both the uplink and downlink.

6.4.1 Inner loop power control in the downlink

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.

6.4.1.1 Power control steps

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

6.4.1.1.1 Minimum requirement

The BS transmitter shall have the capability of setting the inner loop code domain power with a step sizes of 1dB mandatory and 0.5, 1.5, 2.0 dB optional

a) The power control step due to inner loop power control shall be within the range shown in Table 6.1.

b) The aggregated output power change due to inner loop power control shall be within the range shown in Table 6.2.

Table 6.1: Transmitter power control step tolerance

Power control commands in the down link	Transmitter power control step tolerance							
	2 dB step size		**1.5 dB step size**		**1 dB step size**		**0.5 dB step size**	
	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Up (TPC command "1")	+1.0 dB	+3.0 dB	+0.75 dB	+2.25 dB	+0.5 dB	+1.5 dB	+0.25 dB	+0.75 dB
Down (TPC command "0")	-1.0 dB	-3.0 dB	-0.75 dB	-2.25 dB	-0.5 dB	-1.5 dB	-0.25 dB	-0.75 dB

Table 6.2: Transmitter aggregated power control step range

Power control commands in the down link	Transmitter aggregated power control step change after 10 consecutive equal commands (up or down)							
	2 dB step size		**1.5 dB step size**		**1 dB step size**		**0.5 dB step size**	
	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Up (TPC command "1")	+16 dB	+24 dB	+12 dB	+18 dB	+8 dB	+12 dB	+4 dB	+6 dB
Down (TPC command "0")	-16 dB	-24 dB	-12 dB	-18 dB	-8 dB	-12 dB	-4 dB	-6 dB

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CHANGE REQUEST

⌘ **25.141** **CR** **356** ⌘ **rev** ⌘ Current version: **6.7.0** ⌘

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Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☒ Core Network ☐

Title:	⌘	Power Control step test requirements for 1.5dB and 2.0dB
Source:	⌘	3GPP TSG RAN WG4 (Radio)
Work item code:	⌘	TEI6
Date:	⌘	01/12/2004
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Reason for change:	⌘	TS 25.214 have a mandatory requirement to support 1 dB downlink power control step size, while 0.5, 1.5 and 2 dB step sizes is optional. The corresponding accuracy test requirements for 1.5 and 2 dB are missing in TS 25.141.
Summary of change:	⌘	Adding two columns for 2 dB and 1.5 dB step size to the table for power control step tolerance and aggregated power control step range. The step tolerances is equal to (1± 0.5) times the step size. The aggregated step range is equal to (10± 2) times the step size.
Consequences if not approved:	⌘	There would not be any accuracy test requirements for 1.5 and 2 dB downlink power control step size.

Clauses affected:	⌘	4.1.2; 6.4.2.2; 6.4.2.5

		Y	N			
Other specs affected:	⌘	X		Other core specifications	⌘	25.104
			X	Test specifications		
			X	O&M Specifications		

Other comments:	⌘	

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4.1.2 Measurement of transmitter

Table 4.1: Maximum Test System Uncertainty for transmitter tests

Subclause	Maximum Test System Uncertainty	Derivation of Test System Uncertainty
6.2.1 Maximum Output Power	±0.7 dB	
6.2.2 CPICH Power accuracy	± 0.8 dB	
6.3 Frequency error	± 12 Hz	
6.4.2 Power control steps	± 0.1 dB for one 2 dB step ± 0.1 dB for one 1.5 dB step ± 0.1 dB for one 1 dB step ± 0.1 dB for one 0.5 dB step ± 0.1 dB for ten 2 dB steps ± 0.1 dB for ten 1.5 dB steps ± 0.1 dB for ten 1 dB step ± 0.1 dB for ten 0.5 dB steps	Result is difference between two absolute CDP measurements on the power controlled DPCH. Assume BTS output power on all other channels is constant. Assume Test equipment relative power accuracy over the range of the test conditions is perfect, or otherwise included in the system measurement error. For this test the absolute power change is < 3 dB.
6.4.3 Power control dynamic range	± 1.1 dB	
6.4.4 Total power dynamic range	± 0.3 dB	
6.4.5 IPDL Time mask	0.7 dB	
6.5.1 Occupied Bandwidth	±100 kHz	Accuracy = ±3*RBW. Assume 30 kHz bandwidth
6.5.2.1 Spectrum emission mask	±1.5 dB Due to carrier leakage, for measurements specified in a 1 MHz bandwidth close to the carrier (4 MHz to 8 MHz), integration of the measurement using several narrower measurements may be necessary in order to achieve the above accuracy.	
6.5.2.2 ACLR	5 MHz offset ± 0.8 dB 10 MHz offset ± 0.8 dB Note: Impact of measurement period (averaging) and intermod effects in the measurement receiver not yet fully studied. However, the above limits remain valid.	
6.5.3 Spurious emissions	± 2.0 dB for BS and coexistance bands for results > -60 dBm ± 3.0 dB for results < -60 dBm Outside above range: f≤2.2GHz : ± 1.5 dB 2.2 GHz < f ≤ 4 GHz : ± 2.0 dB f > 4 GHz : ±4.0 dB	
6.6 Transmit intermodulation (interferer requirements)	The value below applies only to the interference signal and is unrelated to the measurement uncertainty of the tests (6.5.2.1, 6.5.2.2 and 6.5.3) which have to be carried out in the presence of the interferer. . ± 1.0 dB	The uncertainty of interferer has double the effect on the result due to the frequency offset.
6.7.1 EVM	±2.5 % (for single code)	
6.7.2 Peak code Domain error	±1.0 dB	
6.7.3 Time alignment error in TX diversity	±0.1 T_c	
Annex H.3 Transmitted code power. Absolute	±0.9 dB	Absolute power accuracy = 0.7dB + relative power accuracy 0.2 dB.

Annex H.3 Transmitted code power. Relative	±0.2 dB	
Annex H.4 Transmitted carrier power	±0.3 dB	

6.4.2 Power control steps

The power control step is the required step change in the code domain 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, 1.5, 2.0 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.

Table 6.9: Transmitter power control step tolerance

Power control commands in the down link	Transmitter power control step tolerance							
	2 dB step size		1.5 dB step size		1 dB step size		0.5 dB step size	
	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Up (TPC command "1")	+1.0 dB	+3.0 dB	+0.75 dB	+2.25 dB	+0.5 dB	+1.5 dB	+0.25 dB	+0.75 dB
Down (TPC command "0")	-1.0 dB	-3.0 dB	-0.75 dB	-2.25 dB	-0.5 dB	-1.5 dB	-0.25 dB	-0.75 dB

Table 6.10: Transmitter aggregated power control step range

Power control commands in the down link	Transmitter aggregated power control step change after 10 consecutive equal commands (up or down)							
	2 dB step size		1.5 dB step size		1 dB step size		0.5 dB step size	
	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Up (TPC command "1")	+16 dB	+24 dB	+12 dB	+18 dB	+8 dB	+12 dB	+4 dB	+6 dB
Down (TPC command "0")	-16 dB	-24 dB	-12 dB	-18 dB	-8 dB	-12 dB	-4 dB	-6 dB

The normative reference for this requirement is TS 25.104 [1] subclause 6.4.1.1.1

6.4.2.3 Test purpose

To verify those requirements for the power control step size and response are met as specified in subclause 6.4.2.2.

6.4.2.4 Method of test

6.4.2.4.1 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 suitable measurement equipment to the BS antenna connector as shown in annex B.

2) Start BS transmission with channel configuration as specified in table 6.3 Test model 2. The DPCH intended for power control is on channel 120 starting at –3 dB.

3) Establish downlink power control with parameters as specified in table 6.11.

Table 6.11

Parameter	Level/status	Unit
UL signal mean power	Ref.sens + 10 dB	dBm
Data sequence	PN9	

6.4.2.4.2 Procedure

1) Set and send alternating TPC bits from the UE simulator or UL signal generator.

2) Measure mean power level of the code under the test each time TPC command is transmitted. All steps within power control dynamic range declared by manufacturer shall be measured. Use the code domain power measurement method defined in annex E.

3) Measure the 10 highest and the 10 lowest power step levels within the power control dynamic range declared by manufacturer by sending 10 consecutive equal commands as described table 6.10.

6.4.2.5 Test requirement

a) BS shall fulfil step size requirement shown in Table 6.12 for all power control steps declared by manufacture as specified in subclause 6.4.2.2.

b) For all measured Up/Down cycles, the difference of code domain power between before and after 10 equal commands (Up and Down), derived in step (3), shall not exceed the prescribed tolerance in table 6.13.

Table 6.12: Transmitter power control step tolerance

Power control commands in the down link	Transmitter power control step tolerance							
	2 dB step size		1.5 dB step size		1 dB step size		0.5 dB step size	
	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Up (TPC command "1")	+0.9 dB	+3.1 dB	+0.65 dB	+2.35 dB	+0.4 dB	+1.6 dB	+0.15 dB	+0.85 dB
Down (TPC command "0")	-0.9 dB	-3.1 dB	-0.65 dB	-2.35 dB	-0.4 dB	-1.6 dB	-0.15 dB	-0.85 dB

Table 6.13: Transmitter aggregated power control step range

Power control commands in the down link	Transmitter aggregated power control step change after 10 consecutive equal commands (up or down)							
	2 dB step size		1.5 dB step size		1 dB step size		0.5 dB step size	
	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Up (TPC command "1")	+15.9 dB	+24.1 dB	+11.9 dB	+18.1 dB	+7.9 dB	+12.1dB	+3.9 dB	+6.1 dB
Down (TPC command "0")	-15.9 dB	-24.1 dB	-11.9 dB	-18.1 dB	-7.9 dB	-12.1 dB	-3.9 dB	-6.1 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.