TSG RAN Meeting #15 **RP-020014**

Cheju, Korea, 5 - 8 March 2002

Title: **CRs (R'99 and Rel-4/Rel-5 Category A) to TS 25.101**

Source: **TSG RAN WG4**

Agenda Item: **7.4.3**

RAN4 Tdoc	Spec	CR	Rev	Phase	Title	Cat	Curr Ver	New Ver
R4-020385	25.101	154	1	R99	Power setting for uplink compressed mode	F	3.9.0	3.10.0
R4-020386	25.101	155	1	Rel-4	Power setting for uplink compressed mode	A	4.3.0	4.4.0
R4-020387	25.101	156	1	Rel-5	Power setting for uplink compressed mode	A	5.1.0	5.2.0
R4-020489	25.101	157	1	R99	Correction of power terms and definitions	F	3.9.0	3.10.0
R4-020285	25.101	159		Rel-4	Correction of power terms and definitions	A	4.3.0	4.4.0
R4-020286	25.101	160		Rel-5	Correction of power terms and definitions	A	5.1.0	5.2.0
R4-020492	25.101	158	1	R99	Correction of power spectral density	F	3.9.0	3.10.0
R4-020293	25.101	161		Rel-4	Correction of power spectral density	A	4.3.0	4.4.0
R4-020294	25.101	162		Rel-5	Correction of power spectral density	A	5.1.0	5.2.0

3GPP TSG RAN WG4 Meeting #21 R4-020385

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

CR-Form-v4

CHANGE REQUEST

⌘	25.101	CR	154	⌘	ev	1	⌘	Current version: 3.9.0	⌘

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

Title:	⌘	Power setting for uplink compressed mode
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: ⌘

25.214 Clause 5.1.2.3 defines method for calculating the adjustment to be applied to the transmission power after a transmission gap in compressed mode. The value of the parameter Δ_{RESUME} used in the determination of the adjustment can be calculated with two different ways depending on the used Initial Transmit Power (ITP) mode. In ITP mode 0 the value of Δ_{RESUME} is calculated based on the received downlink TPC command. Assuming that Δ_{PILOT} = 0, this results maximum change of ±2 dB in transmit power. In ITP mode 1 the value of Δ_{RESUME} depends on the TPC commands sent before the transmission gap. This may result large adjustments to transmit power. As an example transmit power is consequently lowered for 15 slots before transmission gap this results UE transmit power change of Δ_{DPCCH}= 19dB (Δ_{PILOT} = 0, Δ_{TPC}=2 dB, k_{sc}=1) after the transmission gap. The current power difference tolerance values (±3 dB) in Table 6.9 were defined based on the assumption that the transmit power level after and before the transmission gap are equal, following the ITP mode 0 behaviour. Also ITP mode 1 requirements needs to be clarified into this table, and they need to be in-line with TFC requirements.

Unnecessary measure unit markings removed from Table 6.7 and Table 6.8.

Summary of change: ⌘

Editorial corrections to Table 6.7 and Table 6.8.

Table 6.9 changed to specify the tolerances for transmitter power differences in compliance with RACH and TFC requirements.

Isolated Impact Analysis:

Aligning the requirements according to TS 25.214. This change would not change the equipments, since the ITP mode 0 requirement is the existing requirement with clarification of output power not changing after the gap less than 2 dB. If the change of output power due L1 algorithms is more than this the requirement from TFC power setting would apply. The impact to the implementations should be

		negligible.
Consequences if not approved:	⌘	The requirements between RACH, TFC change and compressed mode power settling are not consistent and unnecessary tight requirements are set for UE in compressed mode.

Clauses affected:	⌘	6.5.4			
Other specs affected:	⌘		Other core specifications	⌘	
		X	Test specifications		34.121
			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.

6.5.2 Transmit ON/OFF Time mask

The time mask for transmit ON/OFF defines the ramping time allowed for the UE between transmit OFF power and transmit ON power. Possible ON/OFF scenarios are RACH ,CPCH or UL compressed mode.

6.5.2.1 Minimum requirement

The transmit power levels versus time shall meet the mask specified in figure 6.2 for PRACH preambles and CPCH preambles, and the mask in figure 6.3 for all other cases. The signal is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off $\alpha = 0.22$ and a bandwidth equal to the chip rate.

On power is defined as either case as follows. The specification depends on each possible case.

- First preamble of RACH/CPCH: Open loop accuracy (Table 6.3).
- During preamble ramping of the RACH/CPCH, and between final RACH/CPCH preamble and RACH/CPCH message part: Accuracy depending on size of the required power difference.(Table 6.7). The step in total transmitted power between final RACH/CPCH preamble and RACH/CPCH message (control part + data part) shall be rounded to the closest integer dB value. A power step exactly half-way between two integer values shall be rounded to the closest integer of greater magnitude.
- After transmission gaps in compressed mode: Accuracy as in Table 6.9.
- Power step to Maximum Power: Maximum power accuracy (Table 6.1).

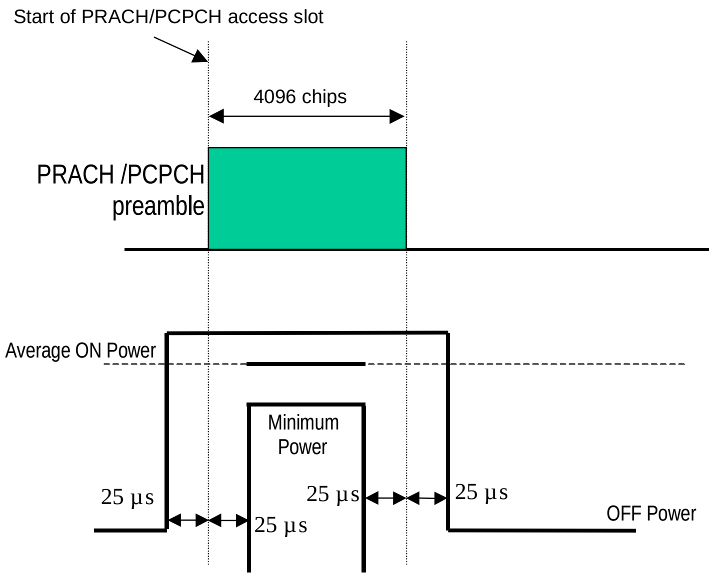

Figure 6.2: Transmit ON/OFF template for PRACH preambles and CPCH preambles

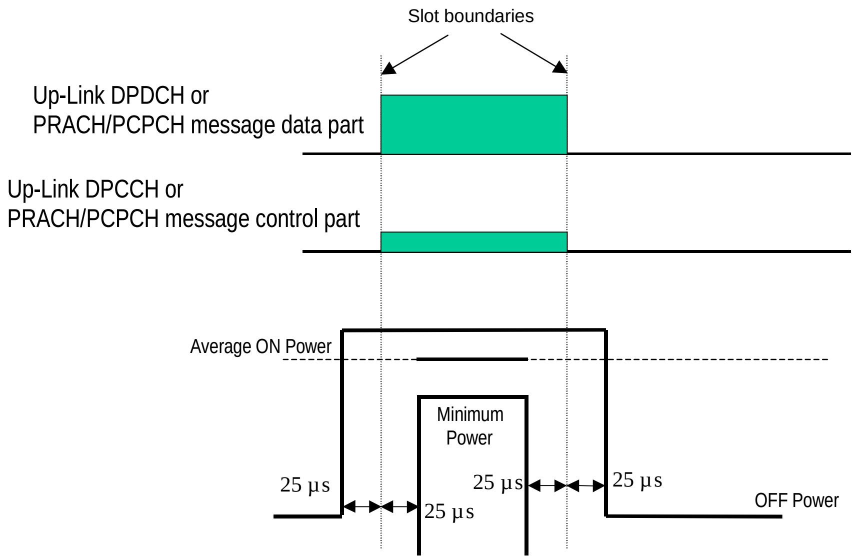

Figure 6.3: Transmit ON/OFF template for all other On/Off cases

Table 6.7: Transmitter power difference tolerance for RACH/CPCH preamble ramping, and between final RACH/CPCH preamble and RACH/CPCH message part

Power step size (Up or down)* ΔP [dB]	Transmitter power difference tolerance [dB]
0	+/- 1 ~~dB~~
1	+/- 1 ~~dB~~
2	+/- 1.5 ~~dB~~
3	+/- 2 ~~dB~~
$4 \le \Delta P \le 10$	+/- 2.5 ~~dB~~
$11 \le \Delta P \le 15$	+/- 3.5 ~~dB~~
$16 \le \Delta P \le 20$	+/- 4.5 ~~dB~~
$21 \le \Delta P$	+/- 6.5 ~~dB~~

NOTE: Power step size for RACH/CPCH preamble ramping is from 1 to 8 dB with 1 dB steps.

6.5.3 Change of TFC

A change of TFC (Transport Format Combination) in uplink means that the power in the uplink varies according to the change in data rate. DTX, where the DPCH is turned off, is a special case of variable data, which is used to minimise the interference between UE(s) by reducing the UE transmit power when voice, user or control information is not present.

6.5.3.1 Minimum requirement

A change of output power is required when the TFC, and thereby the data rate, is changed. The ratio of the amplitude between the DPDCH codes and the DPCCH code will vary. The power step due to a change in TFC shall be calculated in the UE so that the power transmitted on the DPCCH shall follow the inner loop power control. The step in total transmitted power (DPCCH + DPDCH) shall then be rounded to the closest integer dB value. A power step exactly half-way between two integer values shall be rounded to the closest integer of greater magnitude. The accuracy of the power step, given the step size, is specified in Table 6.8. The power change due to a change in TFC is defined as the relative power difference between the average power of the original (reference) timeslot and the average power of the target timeslot, not including the transient duration. The transient duration is from 25µs before the slot boundary to 25µs after the slot boundary. The power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off $\alpha = 0.22$ and a bandwidth equal to the chip rate.

Table 6.8: Transmitter power step tolerance

Power step size (Up or down) ΔP [dB]	Transmitter power step tolerance [dB]
0	+/- 0.5 ~~dB~~
1	+/- 0.5 ~~dB~~
2	+/- 1.0 ~~dB~~
3	+/- 1.5 ~~dB~~
$4 \le \Delta P \le 10$	+/- 2.0 ~~dB~~
$11 \le \Delta P \le 15$	+/- 3.0 ~~dB~~
$16 \le \Delta P \le 20$	+/- 4.0 ~~dB~~
$21 \le \Delta P$	+/- 6.0 ~~dB~~

The transmit power levels versus time shall meet the mask specified in Figure 6.4.

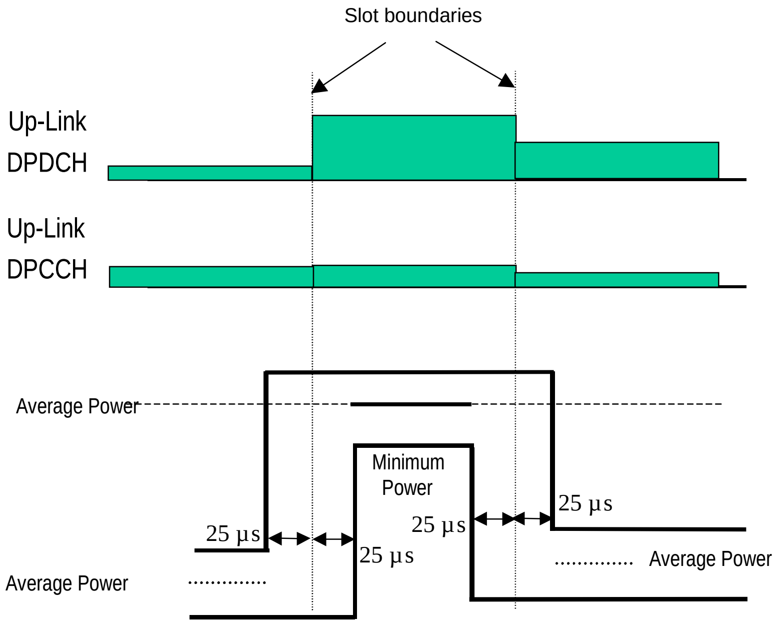

Figure 6.4: Transmit template during TFC change

6.5.4 Power setting in uplink compressed mode

Compressed mode in uplink means that the power in uplink is changed.

6.5.4.1 Minimum requirement

A change of output power is required during uplink compressed frames since the transmission of data is performed in a shorter interval. The ratio of the amplitude between the DPDCH codes and the DPCCH code will also vary. The power step due to compressed mode shall be calculated in the UE so that the energy transmitted on the pilot bits during each transmitted slot shall follow the inner loop power control.

Thereby, the power during compressed mode, and immediately afterwards, shall be such that the power on the DPCCH follows the steps due to inner loop power control combined with additional steps of $10\text{Log}_{10}(N_{pilot.prev} / N_{pilot.curr})$ dB where $N_{pilot.prev}$ is the number of pilot bits in the previously transmitted slot, and $N_{pilot.curr}$ is the current number of pilot bits per slot.

The resulting step in total transmitted power (DPCCH +DPDCH) shall then be rounded to the closest integer dB value. A power step exactly half-way between two integer values shall be rounded to the closest integer of greatest magnitude. The accuracy of the power step, given the step size, is specified in Table 6.8 in subclause 6.5.3.1. The power step is defined as the relative power difference between the average power of the original (reference) timeslot and the average power of the target timeslot, when neither the original timeslot nor the reference timeslot are in a transmission gap. The transient duration is not included, and is from 25µs before the slot boundary to 25µs after the slot boundary. The

relative power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off $\alpha = 0.22$ and a bandwidth equal to the chip rate.

In addition to any power change due to the ratio $N_{pilot.prev}$ / $N_{pilot.curr}$, the average power of the DPCCH in the first slot after a compressed mode transmission gap shall differ from the average power in the last slot before the transmission gap by an amount Δ_{RESUME}, where Δ_{RESUME} is calculated as described in clause 5.1.2.3 of TS 25.214.

The resulting difference in the total transmitted power (DPCCH + DPDCH) shall then be rounded to the closest integer dB value. A power difference exactly half-way between two integer values shall be rounded to the closest integer of greatest magnitude. The accuracy of the resulting difference in the total transmitted power (DPCCH + DPDCH) after a transmission gap of up to 14 slots shall be as specified in Table 6.9.

Table 6.9: Transmitter power difference tolerance after a transmission gap of up to 14 slots

~~Tolerance on required difference in total transmitter power after a transmission gap~~
~~+/- 3 dB~~

Power difference (Up or down) ΔP [dB]	Transmitter power step tolerance after a transmission gap [dB]
ΔP ≤ 2	+/- 3
3	+/- 3
4 ≤ ΔP ≤ 10	+/- 3.5
11 ≤ ΔP ≤ 15	+/- 4
16 ≤ ΔP ≤ 20	+/- 4.5
21 ≤ ΔP	+/- 6.5

The power difference is defined as the relative power difference between the average power of the original (reference) timeslot before the transmission gap and the average power of the target timeslot after the transmission gap, not including the transient durations. The transient durations at the start and end of the transmission gaps are each from 25μs before the slot boundary to 25μs after the slot boundary. The relative power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off $\alpha = 0.22$ and a bandwidth equal to the chip rate.

The transmit power levels versus time shall meet the mask specified in figure 6.5.

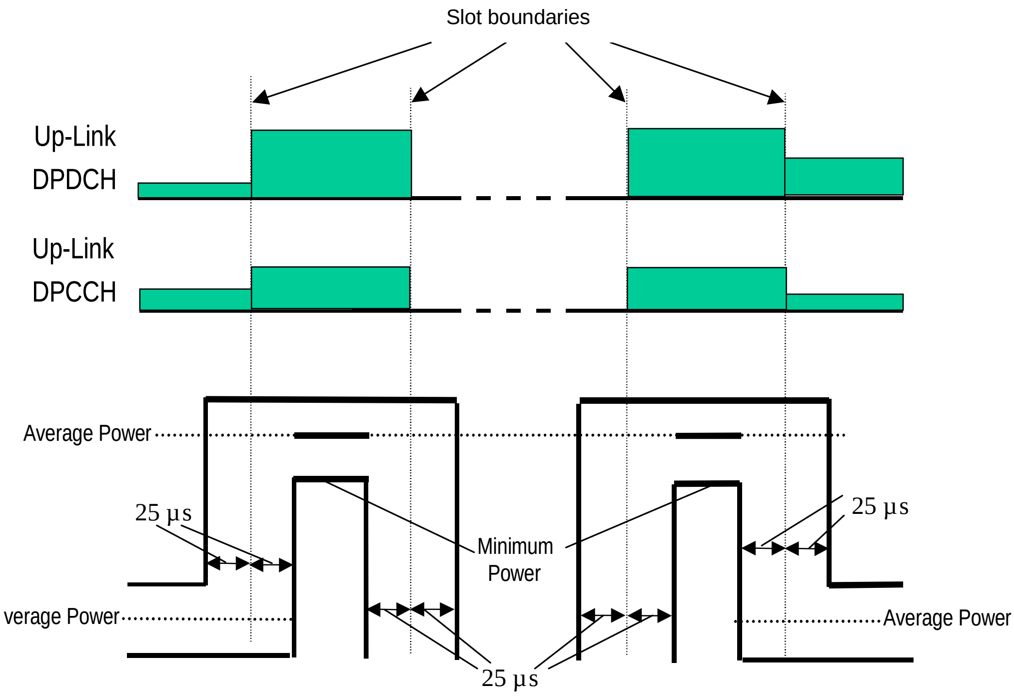

Figure 6.5: Transmit template during Compressed mode

3GPP TSG RAN WG4 Meeting #21 **R4-020294**

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

CR-Form-v4

CHANGE REQUEST

⌘ 25.101	CR 162	⌘ ev -	⌘ Current version: 5.1.0 ⌘

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

Title: ⌘	Correction of power spectral density		
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 existing requirements relating to power spectral density are incomplete. The bandwidth over which the power spectral density should be integrated is missing. The assumption that this should be 3.84 MHz is incorrect for signals containing information since the energy of the signal extends to (1+α) times the chip rate. For band limited white noise, it is correct to assume a (noise) bandwidth equal to the chip rate. Without these clarifications, it will not be possible to correctly generate or measure any of the quantities involved.
Summary of change: ⌘	3.2 Abbreviations: I_{oc}, I_{or} and $\hat{I}_{or}$ definitions clarified with note. 8 Performance required: The term "DPCH_Ec/Ior power" changed to "DPCH_Ec/Ior power ratio" Annex B: Table B.1: Change "Average Power" to "Relative Average Power". Annex C: Tables C.2; C.3; C.4 and C.5 Change "Power" to "Power ratio".
Consequences if not approved: ⌘	The incomplete requirements can be interpreted differently causing an incorrect understanding of UE performance. Isolated impact statement: Correction of requirements. Should not affect UE implementations or system performance but may impact conformance test implementation and conformance test results.

Clauses affected: ⌘	3, 8, Annex B, Annex C		
Other specs affected: ⌘	[ ] Other core specifications [ ] Test specifications [ ] O&M Specifications	⌘	34.121
Other comments: ⌘			

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3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following definitions apply:

Maximum Output Power: This s a measure of the maximum power the UE can transmit (i.e. the actual broadband power as would be measured assuming no measurement error).

Nominal Maximum Output Power: This is the nominal power defined by the UE power class.

Average power: The thermal power as measured through a root raised cosine filter with roll-off α = 0.22 and a bandwidth equal to the chip rate of the radio access mode. The period of measurement shall be one power control group (timeslot) unless otherwise stated.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ACLR	Adjacent Channel Leakage power Ratio
ACS	Adjacent Channel Selectivity
AICH	Acquisition Indication Channel
BER	Bit Error Ratio
BLER	Block Error Ratio
CW	Continuous Wave (un-modulated signal)
DCH	Dedicated Channel, which is mapped into Dedicated Physical Channel.
DL	Down Link (forward link)
DTX	Discontinuous Transmission
DPCCH	Dedicated Physical Control Channel
DPCH	Dedicated Physical Channel
$DPCH\_E_c$	Average energy per PN chip for DPCH.
$\frac{DPCH\_E_c}{I_{or}}$	The ratio of the transmit energy per PN chip of the DPCH to the total transmit power spectral density at the Node B antenna connector.
DPDCH	Dedicated Physical Data Channel
EIRP	Effective Isotropic Radiated Power
E_c	Average energy per PN chip.
$\frac{E_c}{I_{or}}$	The ratio of the average transmit energy per PN chip for different fields or physical channels to the total transmit power spectral density.
FACH	Forward Access Channel
FDD	Frequency Division Duplex
FDR	False transmit format Detection Ratio. A false Transport Format detection occurs when the receiver detects a different TF to that which was transmitted, and the decoded transport block(s) for this incorrect TF passes the CRC check(s).
F_{uw}	Frequency of unwanted signal. This is specified in bracket in terms of an absolute frequency(s) or a frequency offset from the assigned channel frequency.
Information Data Rate	Rate of the user information, which must be transmitted over the Air Interface. For example, output rate of the voice codec.
I_o	The total received power spectral density, including signal and interference, as measured at the UE antenna connector.
I_{oc}	The power spectral density (integrated in a noise bandwidth equal to the chip rate and normalized to the chip rate) of a band limited white noise source (simulating interference from cells, which are not defined in a test procedure) as measured at the UE antenna connector.

I_{or}	The total transmit power spectral density (integrated in a bandwidth of (1+α) times the chip rate and normalized to the chip rate) of the down link signal at the Node B antenna connector.
$\hat{I}_{or}$	The received power spectral density (integrated in a bandwidth of (1+α) times the chip rate and normalized to the chip rate) of the down link signal as measured at the UE antenna connector.
MER	Message Error Ratio
Node B	A logical node responsible for radio transmission / reception in one or more cells to/from the User Equipment. Terminates the Iub interface towards the RNC
OCNS	Orthogonal Channel Noise Simulator, a mechanism used to simulate the users or control signals on the other orthogonal channels of a downlink link.
$OCNS\_E_c$	Average energy per PN chip for the OCNS.
$\frac{OCNS\_E_c}{I_{or}}$	The ratio of the average transmit energy per PN chip for the OCNS to the total transmit power spectral density.
P-CCPCH	Primary Common Control Physical Channel
PCH	Paging Channel
$P-CCPCH\ \frac{E_c}{I_o}$	The ratio of the received P-CCPCH energy per chip to the total received power spectral density at the UE antenna connector.
$\frac{P-CCPCH\_E_c}{I_{or}}$	The ratio of the average transmit energy per PN chip for the P-CCPCH to the total transmit power spectral density.
P-CPICH	Primary Common Pilot Channel
PICH	Paging Indicator Channel
PPM	Parts Per Million
<REFSENS>	Reference sensitivity
<REF $\hat{I}_{or}$ >	Reference $\hat{I}_{or}$
RACH	Random Access Channel
SCH	Synchronization Channel consisting of Primary and Secondary synchronization channels
$S-CCPCH$	Secondary Common Control Physical Channel.
$S-CCPCH\_E_c$	Average energy per PN chip for S-CCPCH.
SIR	Signal to Interference ratio
SSDT	Site Selection Diversity Transmission
STTD	Space Time Transmit Diversity
TDD	Time Division Duplexing
TFC	Transport Format Combination
TFCI	Transport Format Combination Indicator
TPC	Transmit Power Control
TSTD	Time Switched Transmit Diversity
UE	User Equipment
UL	Up Link (reverse link)
UTRA	UMTS Terrestrial Radio Access

NOTE: The units of Power Spectral Density (PSD) are extensively used in this document. PSD is a function of power versus frequency and when integrated across a given bandwidth, the function represents the mean power in such a bandwidth. When the mean power is normalised to (divided by) the chip-rate it represents the mean energy per chip. Some signals are directly defined in terms of energy per chip, (DPCH_E_c, E_c, OCNS_E_c and S-CCPCH_E_c) and others defined in terms of PSD (I_o, I_{oc}, I_{or} and $\hat{I}_{or}$). There also exist quantities that are a ratio of energy per chip to PSD (DPCH_E_c/I_{or}, E_c/I_{or} etc.). This is the common practice of relating energy magnitudes in communication systems.

It can be seen that if both energy magnitudes in the ratio are divided by time, the ratio is converted from an energy ratio to a power ratio, which is more useful from a measurement point of view. It follows that an energy per chip of X dBm/3.84 MHz can be expressed as a mean power per chip of X dBm. Similarly, a signal PSD of Y dBm/3.84 MHz can be expressed as a signal power of Y dBm.

8 Performance requirement

8.1 General

The performance requirements for the UE in this subclause are specified for the measurement channels specified in Annex A, the propagation conditions specified in Annex B and the Down link Physical channels specified in Annex C. Unless stated DL power control is OFF.

8.2 Demodulation in static propagation conditions

8.2.1 (void)

Table 8.1:(void)

Table 8.2: (void)

8.2.2 Demodulation of Forward Access Channel (FACH)

Table 8.3: (void)

Table 8.4: (void)

8.2.3 Demodulation of Dedicated Channel (DCH)

The receive characteristic of the Dedicated Channel (DCH) in the static environment is determined by the Block Error Ratio (BLER). BLER is specified for each individual data rate of the DCH. DCH is mapped into the Dedicated Physical Channel (DPCH).

8.2.3.1 Minimum requirement

For the parameters specified in Table 8.5 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.6. These requirements are applicable for TFCS size 16.

Table 8.5: DCH parameters in static propagation conditions

Parameter	**Unit**	**Test 1**	**Test 2**	**Test 3**	**Test 4**
Phase reference		P-CPICH			
$\hat{I}_{or}/I_{oc}$	dB	-1			
I_{oc}	dBm/3.84 MHz	-60			
Information Data Rate	kbps	12.2	64	144	384

Table 8.6: DCH requirements in static propagation conditions

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-16.6 dB	10^{-2}
2	-13.1 dB	10^{-1}
	-12.8 dB	10^{-2}
3	-9.9 dB	10^{-1}
	-9.8 dB	10^{-2}
4	-5.6 dB	10^{-1}
	-5.5 dB	10^{-2}

8.3 Demodulation of DCH in multi-path fading propagation conditions

8.3.1 Single Link Performance

The receive characteristics of the Dedicated Channel (DCH) in different multi-path fading environments are determined by the Block Error Ratio (BLER) values. BLER is measured for the each of the individual data rate specified for the DPCH. DCH is mapped into in Dedicated Physical Channel (DPCH).

8.3.1.1 Minimum requirement

For the parameters specified in Table 8.7, 8.9 , 8.11, 8.13 and 8.14A the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.8, 8.10, 8.12, 8.14 and 8.14B. For the parameters specified in Table 8.14C the downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio measured values, which are averaged over one slot, shall be below the specified value in Table 8.14D more than 90% of the time. These requirements are applicable for TFCS size 16.

Table 8.7: Test Parameters for DCH in multi-path fading propagation conditions (Case 1)

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
Phase reference		P-CPICH			
$\hat{I}_{or}/I_{oc}$	dB	9			
I_{oc}	dBm/3.84 MHz	-60			
Information Data Rate	kbps	12.2	64	144	384

Table 8.8: Test requirements for DCH in multi-path fading propagation conditions (Case 1)

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-15.0 dB	10^{-2}
2	-13.9 dB	10^{-1}
	-10.0 dB	10^{-2}
3	-10.6 dB	10^{-1}
	-6.8 dB	10^{-2}
4	-6.3 dB	10^{-1}
	-2.2 dB	10^{-2}

Table 8.9: DCH parameters in multi-path fading propagation conditions (Case 2)

Parameter	Unit	Test 5	Test 6	Test 7	Test 8
Phase reference		P-CPICH			
$\hat{I}_{or}/I_{oc}$	dB	-3	-3	3	6
I_{oc}	dBm/3.84 MHz	-60			
Information Data Rate	kbps	12.2	64	144	384

Table 8.10: DCH requirements in multi-path fading propagation (Case 2)

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
5	-7.7 dB	10^{-2}
6	-6.4 dB	10^{-1}
	-2.7 dB	10^{-2}
7	-8.1 dB	10^{-1}
	-5.1 dB	10^{-2}
8	-5.5 dB	10^{-1}
	-3.2 dB	10^{-2}

Table 8.11: DCH parameters in multi-path fading propagation conditions (Case 3)

Parameter	Unit	Test 9	Test 10	Test 11	Test 12
Phase reference		P-CPICH			
$\hat{I}_{or}/I_{oc}$	dB	-3	-3	3	6
I_{oc}	dBm/3.84 MHz	-60			
Information Data Rate	kbps	12.2	64	144	384

Table 8.12: DCH requirements in multi-path fading propagation conditions (Case 3)

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
9	-11.8 dB	10^{-2}
10	-8.1 dB	10^{-1}
	-7.4 dB	10^{-2}
	-6.8 dB	10^{-3}
11	-9.0 dB	10^{-1}
	-8.5 dB	10^{-2}
	-8.0 dB	10^{-3}
12	-5.9 dB	10^{-1}
	-5.1 dB	10^{-2}
	-4.4 dB	10^{-3}

Table 8.13: DCH parameters in multi-path fading propagation conditions (Case 1) with S-CPICH

Parameter	Unit	Test 13	Test 14	Test 15	Test 16
Phase reference		S-CPICH			
$\hat{I}_{or}/I_{oc}$	dB	9			
I_{oc}	dBm/3.84 MHz	-60			
Information Data Rate	kbps	12.2	64	144	384

Table 8.14: DCH requirements in multi-path fading propagation conditions (Case 1) with S-CPICH

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
13	-15.0 dB	10^{-2}
14	-13.9 dB	10^{-1}
	-10.0 dB	10^{-2}
15	-10.6 dB	10^{-1}
	-6.8 dB	10^{-2}
16	-6.3 dB	10^{-1}
	-2.2 dB	10^{-2}

Table 8.14A: DCH parameters in multi-path fading propagation conditions (Case 6)

Parameter	Unit	Test 17	Test 18	Test 19	Test 20
Phase reference		P-CPICH			
$\hat{I}_{or}/I_{oc}$	dB	-3	-3	3	6
I_{oc}	dBm/3.84 MHz	-60			
Information Data Rate	kbps	12.2	64	144	384

Table 8.14B: DCH requirements in multi-path fading propagation conditions (Case 6)

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
17	-8.8 dB	10^{-2}
18	-5.1 dB	10^{-1}
	-4.4 dB	10^{-2}
	-3.8 dB	10^{-3}
19	-6.0 dB	10^{-1}
	-5.5 dB	10^{-2}
	-5.0 dB	10^{-3}
20	-2.9 dB	10^{-1}
	-2.1 dB	10^{-2}
	-1.4 dB	10^{-3}

Table 8.14C: DCH parameters in multi-path fading propagation conditions (Case 7)

Parameter	Unit	Test 21	Test 22	Test 23	Test 24
Phase reference		DPCCH			
$\hat{I}_{or}/I_{oc}$	dB	0	0	6	12
I_{oc}	dBm/3.84 MHz	-60			
Information Data Rate	kbps	12.2	64	144	384
Target quality value on DTCH	BLER	0.01	0.01	0.01	0.1
Maximum_DL_Power	dB	7			
Minimum_DL_Power	dB	-18			
DL Power Control step size, Δ_{TPC}	dB	1			
Limited Power Increase	-	"Not used"			

Table 8.14D: DCH requirements in multi-path fading propagation conditions (Case 7)

Test Number	$\frac{DPCH\_E_c}{I_{or}}$
21	-14.0 dB
22	-9.1 dB
23	-9.4 dB
24	-7.4 dB

8.4 Demodulation of DCH in moving propagation conditions

8.4.1 Single link performance

The receive single link performance of the Dedicated Channel (DCH) in dynamic moving propagation conditions are determined by the Block Error Ratio (BLER) values. BLER is measured for the each of the individual data rate specified for the DPCH. DCH is mapped into Dedicated Physical Channel (DPCH).

8.4.1.1 Minimum requirement

For the parameters specified in Table 8.15 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.16.

Table 8.15: DCH parameters in moving propagation conditions

Parameter	Unit	Test 1	Test 2
Phase reference		P-CPICH	
$\hat{I}_{or}/I_{oc}$	dB	-1	
I_{oc}	dBm/3.84 MHz	-60	
Information Data Rate	kbps	12.2	64

Table 8.16: DCH requirements in moving propagation conditions

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-14.5 dB	10^{-2}
2	-10.9 dB	10^{-2}

8.5 Demodulation of DCH in birth-death propagation conditions

8.5.1 Single link performance

The receive single link performance of the Dedicated Channel (DCH) in dynamic birth-death propagation conditions are determined by the Block Error Ratio (BLER) values. BER is measured for the each of the individual data rate specified for the DPCH. DCH is mapped into Dedicated Physical Channel (DPCH).

8.5.1.1 Minimum requirement

For the parameters specified in Table 8.17 the average downlink $DPCH\_E_c$ power ratio shall be below the specified value for the BLER shown in Table 8.18.

Table 8.17: DCH parameters in birth-death propagation conditions

Parameter	Unit	Test 1	Test 2
Phase reference		P-CPICH	
$\hat{I}_{or}/I_{oc}$	dB	-1	
I_{oc}	dBm/3.84 MHz	-60	
Information Data Rate	kbps	12.2	64

Table 8.18: DCH requirements in birth-death propagation conditions

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-12.6 dB	10^{-2}
2	-8.7 dB	10^{-2}

8.6 Demodulation of DCH in downlink Transmit diversity modes

8.6.1 Demodulation of DCH in open-loop transmit diversity mode

The receive characteristic of the Dedicated Channel (DCH) in open loop transmit diversity mode is determined by the Block Error Ratio (BLER). DCH is mapped into in Dedicated Physical Channel (DPCH).

8.6.1.1 Minimum requirement

For the parameters specified in Table 8.19 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.20.

Table 8.19: Test parameters for DCH reception in an open loop transmit diversity scheme. (Propagation condition: Case 1)

Parameter	Unit	Test 1
Phase reference		P-CPICH
$\hat{I}_{or}/I_{oc}$	dB	9
I_{oc}	dBm/3.84 MHz	-60
Information data rate	kbps	12.2

Table 8.20: Test requirements for DCH reception in open loop transmit diversity scheme

Test Number	$\frac{DPCH\_E_c}{I_{or}}$ (antenna 1/2)	BLER
1	-16.8 dB	10^{-2}

8.6.2 Demodulation of DCH in closed loop transmit diversity mode

The receive characteristic of the dedicated channel (DCH) in closed loop transmit diversity mode is determined by the Block Error Ratio (BLER). DCH is mapped into in Dedicated Physical Channel (DPCH).

8.6.2.1 Minimum requirement

For the parameters specified in Table 8.21 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.22.

Table 8.21: Test Parameters for DCH Reception in closed loop transmit diversity mode (Propagation condition: Case 1)

Parameter	Unit	Test 1 (Mode 1)	Test 2 (Mode 2)
$\hat{I}_{or}/I_{oc}$	dB	9	9
I_{oc}	dBm/3.84 MHz	-60	-60
Information data rate	kbps	12.2	12.2
Feedback error rate	%	4	4

Table 8.22: Test requirements for DCH reception in closed loop transmit diversity mode

Test Number	$\frac{DPCH\_E_c}{I_{or}}$ (see note)	BLER
1	-18.0 dB	10^{-2}
2	-18.3 dB	10^{-2}
NOTE: This is the total power from both antennas. Power sharing between antennas are feedback mode dependent as specified in TS25.214.		

8.6.3 Demodulation of DCH in Site Selection Diversity Transmission Power Control mode

The bit error characteristics of UE receiver is determined in Site Selection Diversity Transmission power control (SSDT) mode. Two Node B emulators are required for this performance test. The delay profiles of signals received from different Node Bs are assumed to be the same but time shifted by 10 chip periods (2604 ns).

8.6.3.1 Minimum requirements

The downlink physical channels and their relative power to Ior are the same as those specified in clause C.3.2 irrespective of Node Bs and the test cases. DPCH_Ec/Ior value applies whenever DPDCH in the cell is transmitted. In Test 1 and Test 3, the received powers at UE from two Node Bs are the same, while 3dB offset is given to one that comes from one of Node Bs for Test 2 and Test 4 as specified in Table 8.23.

For the parameters specified in Table 8.23 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.24.

Table 8.23: DCH parameters in multi-path propagation conditions during SSDT mode (Propagation condition: Case 1)

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
Phase reference		P-CPICH			
$\hat{I}_{or1}/I_{oc}$	dB	0	-3	0	0
$\hat{I}_{or2}/I_{oc}$	dB	0	0	0	-3
I_{oc}	dBm/3.84 MHz	-60			
Information Data Rate	kbps	12.2	12.2	12.2	12.2
Cell ID code word error ratio in uplink	%	1	1	1	1
Number of FBI bits assigned to "S" Field		1	1	2	2
Code word Set		Long	Long	Short	Short
UL DPCCH slot Format		#2		#5	

NOTE: The code word errors are introduced independently in both uplink channels.

Table 8.24: DCH requirements in multi-path propagation conditions during SSDT Mode

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-7.5 dB	10^{-2}
2	-6.5 dB	10^{-2}
3	-10.5 dB	10^{-2}
4	-9.2 dB	10^{-2}

8.7 Demodulation in Handover conditions

8.7.1 Demodulation of DCH in Inter-Cell Soft Handover

The bit error rate characteristics of UE is determined during an inter-cell soft handover. During the soft handover a UE receives signals from different cells. A UE has to be able to demodulate two PCCPCH channels and to combine the energy of DCH channels. Delay profiles of signals received from different cells are assumed to be the same but time shifted by 10 chips.

The receive characteristics of the different channels during inter-cell handover are determined by the average Block Error Ratio (BLER) values.

8.7.1.1 Minimum requirement

For the parameters specified in Table 8.25 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.26.

Table 8.25: DCH parameters in multi-path propagation conditions during Soft Handoff (Case 3)

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
Phase reference		P-CPICH			
$\hat{I}_{or1}/I_{oc}$ and $\hat{I}_{or2}/I_{oc}$	dB	0	0	3	6
I_{oc}	dBm/3.84 MHz	-60			
Information data Rate	kbps	12.2	64	144	384

Table 8.26: DCH requirements in multi-path propagation conditions during Soft Handoff (Case 3)

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-15.2 dB	10^{-2}
2	-11.8 dB	10^{-1}
	-11.3 dB	10^{-2}
3	-9.6 dB	10^{-1}
	-9.2 dB	10^{-2}
4	-6.0 dB	10^{-1}
	-5.5 dB	10^{-2}

8.7.2 Combining of TPC commands from radio links of different radio link sets

8.7.2.1 Minimum requirement

Test parameters are specified in Table 8.27. The delay profiles of the signals received from the different cells are the same but time-shifted by 10 chips.

For Test 1, the uplink power changes between adjacent slots shall be as shown in Table 8.28 over the 4 consecutive slots. Note that this case is without an additional noise source I_{oc}.

For Test 2, the Cell1 and Cell2 TPC patterns are repeated a number of times. If the transmitted power of a given slot is increased compared to the previous slot, then a variable "Transmitted power UP" is increased by one, otherwise a variable "Transmitted power DOWN" is increased by one. The requirements for "Transmitted power UP" and "Transmitted power DOWN" are shown in Table 8.28A.

Table 8.27: Parameters for TPC command combining

Parameter	Unit	Test 1	Test 2
Phase reference	-	P-CPICH	
DPCH_Ec/Ior	dB	-12	
$\hat{I}_{or1}$ and $\hat{I}_{or2}$	dBm/3.84 MHz	-60	
I_{oc}	dBm/3.84 MHz	-	-60
Power-Control-Algorithm	-	Algorithm 1	
Cell 1 TPC commands over 4 slots	-	{0,0,1,1}	
Cell 2 TPC commands over 4 slots	-	{0,1,0,1}	
Information data Rate	kbps	12.2	
Propagation condition	-	Static without AWGN source I_{oc}	Multi-path fading case 3

Table 8.28: Test requirements for Test 1

Test Number	Required power changes over the 4 consecutive slots
1	Down, Down, Down, Up

Table 8.28A: Requirements for Test 2

Test Number	Ratio (Transmitted power UP) / (Total number of slots)	Ratio (Transmitted power DOWN) / (Total number of slots)
2	≥0.25	≥0.5

8.8 Power control in downlink

Power control in the downlink is the ability of the UE receiver to converge to required link quality set by the network while using as low power as possible in downlink . If a BLER target has been assigned to a DCCH (See Annex A.3), then it has to be such that outer loop is based on DTCH and not on DCCH.

8.8.1 Power control in the downlink, constant BLER target

8.8.1.1 Minimum requirements

For the parameters specified in Table 8.29 the downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio measured values, which are averaged over one slot, shall be below the specified value in Table 8.30 more than 90% of the time. BLER shall be as shown in Table 8.30. Power control in downlink is ON during the test.

Table 8.29: Test parameter for downlink power control

Parameter	Unit	Test 1	Test 2
$\hat{I}_{or}/I_{oc}$	dB	9	-1
I_{oc}	dBm/3.84 MHz	-60	
Information Data Rate	kbps	12.2	
Target quality value on DTCH	BLER	0.01	
Propagation condition		Case 4	
Maximum_DL_Power *	dB	7	
Minimum_DL_Power *	dB	-18	
DL Power Control step size, Δ_{TPC}	dB	1	
Limited Power Increase	-	"Not used"	

NOTE: Power is compared to P-CPICH as specified in [4].

Table 8.30: Requirements in downlink power control

Parameter	Unit	Test 1	Test 2
$\frac{DPCH\_E_c}{I_{or}}$	dB	-16.0	-9.0
Measured quality on DTCH	BLER	0.01±30%	0.01±30%

8.8.2 Power control in the downlink, initial convergence

This requirement verifies that DL power control works properly during the first seconds after DPCH connection is established

8.8.2.1 Minimum requirements

For the parameters specified in Table 8.31 the downlink DPCH_Ec/Ior power ratio measured values, which are averaged over 50 ms, shall be within the range specified in Table 8.32 more than 90% of the time. T1 equals to 500 ms and it starts 10 ms after the DPDCH connection is initiated. T2 equals to 500 ms and it starts when T1 has expired. Power control is ON during the test.

The first 10 ms shall not be used for averaging, ie the first sample to be input to the averaging filter is at the beginning of T1. The averaging shall be performed with a sliding rectangular window averaging filter. The window size of the averaging filter is linearly increased from 0 up to 50 ms during the first 50 ms of T1, and then kept equal to 50ms.

Table 8.31: Test parameters for downlink power control

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
Target quality value on DTCH	BLER	0.01	0.01	0.1	0.1
Initial DPCH_Ec/Ior	dB	-5.9	-25.9	-3	-22.1
Information Data Rate	kbps	12.2	12.2	64	64
$\hat{I}_{or}/I_{oc}$	dB	-1			
I_{oc}	dBm/3.84 MHz	-60			
Propagation condition		Static			
Maximum_DL_Power	dB	7			
Minimum_DL_Power	dB	-18			
DL Power Control step size, Δ_{TPC}	dB	1			
Limited Power Increase	-	"Not used"			

Table 8.32: Requirements in downlink power control

Parameter	Unit	Test 1 and Test 2	Test 3 and Test 4
$\frac{DPCH\_E_c}{I_{or}}$ during T1	dB	-18.9 ≤ DPCH_Ec/Ior ≤ -11.9	-15.1 ≤ DPCH_Ec/Ior ≤ -8.1
$\frac{DPCH\_E_c}{I_{or}}$ during T2	dB	-18.9 ≤ DPCH_Ec/Ior ≤ -14.9	-15.1 ≤ DPCH_Ec/Ior ≤ -11.1

8.8.3 Power control in downlink, wind up effects

8.8.3.1 Minimum requirements

This test is run in three stages where stage 1 is for convergence of the power control loop, in stage two the maximum downlink power for the dedicated channel is limited not to be higher than the parameter specified in Table 8.33. All parameters used in the three stages are specified in Table 8.33. The downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio measured values, which are averaged over one slot, during stage 3 shall be lower than the value specified in Table 8.34 more than 90% of the time.

Power control of the UE is ON during the test.

Table 8.33: Test parameter for downlink power control, wind-up effects

Parameter	Unit	Test 1		
		Stage 1	Stage 2	Stage 3
Time in each stage	s	>15	5	0.5
$\hat{I}_{or}/I_{oc}$	dB	5		
I_{oc}	dBm/3.84 MHz	-60		
Information Data Rate	kbps	12.2		
Quality target on DTCH	BLER	0.01		
Propagation condition		Case 4		
Maximum_DL_Power	dB	7	-6.2	7
Minimum_DL_Power	dB	-18		
DL Power Control step size, Δ_{TPC}	dB	1		
Limited Power Increase	-	“Not used”		

Table 8.34: Requirements in downlink power control, wind-up effects

Parameter	Unit	Test 1, stage 3
$\frac{DPCH\_E_c}{I_{or}}$	dB	-13.3

8.9 Downlink compressed mode

Downlink compressed mode is used to create gaps in the downlink transmission, to allow the UE to make measurements on other frequencies.

8.9.1 Single link performance

The receiver single link performance of the Dedicated Traffic Channel (DCH) in compressed mode is determined by the Block Error Ratio (BLER) and transmitted DPCH_Ec/Ior power ratio in the downlink.

The compressed mode parameters are given in clause A.5. Tests 1 and 2 are using Set 1 compressed mode pattern parameters from Table A.21 in clause A.5 while tests 3 and 4 are using Set 2 compressed mode patterns from the same table.

8.9.1.1 Minimum requirements

For the parameters specified in Table 8.35 the downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio measured values, which are averaged over one slot, shall be below the specified value in Table 8.36 more than 90% of the time. The measured quality on DTCH shall be as required in Table 8.36.

Downlink power control is ON during the test. Uplink TPC commands shall be error free. System simulator shall increase the transmitted power during compressed frames by the same amount that UE is expected to increase its SIR target during those frames.

Table 8.35: Test parameter for downlink compressed mode

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
Delta SIR1	dB	0	3	0	3
Delta SIR after1	dB	0	3	0	3
Delta SIR2	dB	0	0	0	0
Delta SIR after2	dB	0	0	0	0
$\hat{I}_{or}/I_{oc}$	dB	9			
I_{oc}	dBm/3.84 MHz	-60			
Information Data Rate	kbps	12.2			
Propagation condition		Case 2			
Target quality value on DTCH	BLER	0.01			
Maximum_DL_Power	dB	7			
Minimum_DL_Power	dB	-18			
DL Power Control step size, Δ_{TPC}	dB	1			
Limited Power Increase	-	"Not used"			

Table 8.36: Requirements in downlink compressed mode

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
$\frac{DPCH\_E_c}{I_{or}}$	dB	-15.4	No requirements	-15.4	No requirements
Measured quality of compressed and recovery frames	BLER	No requirements	<0.001	No requirements	<0.001
Measured quality on DTCH	BLER	0.01 ± 30 %			

8.10 Blind transport format detection

Performance of Blind transport format detection is determined by the Block Error Ratio (BLER) values and by the measured average transmitted DPCH_Ec/Ior value.

8.10.1 Minimum requirement

For the parameters specified in Table 8.37 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.38.

Table 8.37: Test parameters for Blind transport format detection

Parameter	Unit	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
$\hat{I}_{or}/I_{oc}$	dB	-1			-3		
I_{oc}	dBm/3.84 MHz	-60					
Information Data Rate	kbps	12.2 (rate 1)	7.95 (rate 2)	1.95 (rate 3)	12.2 (rate 1)	7.95 (rate 2)	1.95 (rate 3)
propagation condition	-	static			multi-path fading case 3		
TFCI	-	off					

B.2.2 Multi-path fading propagation conditions

Table B1 shows propagation conditions that are used for the performance measurements in multi-path fading environment. All taps have classical Doppler spectrum.

Table B.1: Propagation Conditions for Multi path Fading Environments

Case 1, speed 3km/h		**Case 2, speed 3 km/h**		**Case 3, speed 120 km/h**		**Case 4, speed 3 km/h**		*** Case 5, speed 50 km/h**		**Case 6, speed 250 km/h**	
Relative Delay [ns]	Relative mean ~~Average~~ Power [dB]	Relative Delay [ns]	Relative mean ~~Average~~ Power [dB]	Relative Delay [ns]	Relative mean ~~Average~~ Power [dB]	Relative Delay [ns]	Relative mean ~~Average~~ Power [dB]	Relative Delay [ns]	Relative mean ~~Average~~ Power [dB]	Relative Delay [ns]	Relative mean ~~Average~~ Power [dB]
0	0	0	0	0	0	0	0	0	0	0	0
976	-10	976	0	260	-3	976	0	976	-10	260	-3
		20000	0	521	-6					521	-6
				781	-9					781	-9

NOTE: Case 5 is only used in TS25.133.

C.3 During connection

The following clauses, describes the downlink Physical Channels that are transmitted during a connection i.e., when measurements are done. For these measurements the offset between DPCH and SCH shall be zero chips at Node B meaning that SCH is overlapping with the first symbols in DPCH in the beginning of DPCH slot structure.

C.3.1 Measurement of Rx Characteristics

Table C.2 is applicable for measurements on the Receiver Characteristics (clause 7) with the exception of subclause 7.4 (Maximum input level).

Table C.2: Downlink Physical Channels transmitted during a connection

Physical Channel	Power ratio
P-CPICH	P-CPICH_Ec / DPCH_Ec = 7 dB
P-CCPCH	P-CCPCH_Ec / DPCH_Ec = 5 dB
SCH	SCH_Ec / DPCH_Ec = 5 dB
PICH	PICH_Ec / DPCH_Ec = 2 dB
DPCH	Test dependent power

C.3.2 Measurement of Performance requirements

Table C.3 is applicable for measurements on the Performance requirements (clause 8), including subclause 7.4 (Maximum input level) and subclause 6.4.4 (Out-of-synchronization handling of output power).

Table C.3: Downlink Physical Channels transmitted during a connection[1]

Physical Channel	Power ratio	NOTE
P-CPICH	P-CPICH_Ec/Ior = -10 dB	Use of P-CPICH or S-CPICH as phase reference is specified for each requirement and is also set by higher layer signalling.
S-CPICH	S-CPICH_Ec/Ior = -10 dB	When S-CPICH is the phase reference in a test condition, the phase of S-CPICH shall be 180 degrees offset from the phase of P-CPICH. When S-CPICH is not the phase reference, it is not transmitted.
P-CCPCH	P-CCPCH_Ec/Ior = -12 dB	
SCH	SCH_Ec/Ior = -12 dB	This power shall be divided equally between Primary and Secondary Synchronous channels
PICH	PICH_Ec/Ior = -15 dB	
DPCH	Test dependent power	When S-CPICH is the phase reference in a test condition, the phase of DPCH shall be 180 degrees offset from the phase of P-CPICH.
OCNS	Necessary power so that total transmit power spectral density of Node B (Ior) adds to one[1]	OCNS interference consists of 16 dedicated data channels as specified in table C.6.

NOTE 1 For dynamic power correction required to compensate for the presence of transient channels, e.g. control channels, a subset of the DPCH channels may be used.

C.3.3 Connection with open-loop transmit diversity mode

Table C.4 is applicable for measurements for subclause 8.6.1 (Demodulation of DCH in open loop transmit diversity mode).

Table C.4: Downlink Physical Channels transmitted during a connection[1]

Physical Channel	Power ratio	NOTE
P-CPICH (antenna 1)	P-CPICH_Ec1/Ior = -13 dB	1. Total P-CPICH_Ec/Ior = -10 dB
P-CPICH (antenna 2)	P-CPICH_Ec2/Ior = -13 dB	
P-CCPCH (antenna 1)	P-CCPCH_Ec1/Ior = -15 dB	1. STTD applied 2. Total P-CCPCH_Ec/Ior = -12 dB
P-CCPCH (antenna 2)	P-CCPCH_Ec2/Ior = -15 dB	
SCH (antenna 1 / 2)	SCH_Ec/Ior = -12 dB	1. TSTD applied. 2. This power shall be divided equally between Primary and Secondary Synchronous channels
PICH (antenna 1)	PICH_Ec1/Ior = -18 dB	1. STTD applied 2. Total PICH_Ec/Ior = -15 dB
PICH (antenna 2)	PICH_Ec2/Ior = -18 dB	
DPCH	Test dependent power	1. STTD applied 2. Total power from both antennas
OCNS	Necessary power so that total transmit power spectral density of Node B (Ior) adds to one[1]	1.This power shall be divided equally between antennas 2.OCNS interference consists of 16 dedicated data channels as specified in Table C.6.

NOTE 1 For dynamic power correction required to compensate for the presence of transient channels, e.g. control channels, a subset of the DPCH channels may be used.

C.3.4 Connection with closed loop transmit diversity mode

Table C.5 is applicable for measurements for subclause 8.6.2 (Demodulation of DCH in closed loop transmit diversity mode).

Table C.5: Downlink Physical Channels transmitted during a connection[1]

Physical Channel	Power ratio	NOTE
P-CPICH (antenna 1)	P-CPICH_Ec1/Ior = -13 dB	1. Total P-CPICH_Ec/Ior = -10 dB
P-CPICH (antenna 2)	P-CPICH_Ec2/Ior = -13 dB	
P-CCPCH (antenna 1)	P-CCPCH_Ec1/Ior = -15 dB	1. STTD applied
P-CCPCH (antenna 2)	P-CCPCH_Ec2/Ior = -15 dB	1. STTD applied, 2. total P-CCPCH_Ec/Ior = -12 dB
SCH (antenna 1 / 2)	SCH_Ec/Ior = -12 dB	1. TSTD applied
PICH (antenna 1)	PICH_Ec1/Ior = -18 dB	1. STTD applied 2. STTD applied, total PICH_Ec/Ior = -15 dB
PICH (antenna 2)	PICH_Ec2/Ior = -18 dB	
DPCH	Test dependent power	1. Total power from both antennas
OCNS	Necessary power so that total transmit power spectral density of Node B (Ior) adds to one[1]	1.This power shall be divided equally between antennas 2. OCNS interference consists of 16 dedicated data channels. as specified in Table C.6.

NOTE 1 For dynamic power correction required to compensate for the presence of transient channels, e.g. control channels, a subset of the DPCH channels may be used.

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CHANGE REQUEST

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

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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 existing requirements relating to power spectral density are incomplete. The bandwidth over which the power spectral density should be integrated is missing. The assumption that this should be 3.84 MHz is incorrect for signals containing information since the energy of the signal extends to (1+α) times the chip rate. For band limited white noise, it is correct to assume a (noise) bandwidth equal to the chip rate. Without these clarifications, it will not be possible to correctly generate or measure any of the quantities involved.
Summary of change: ⌘	3.2 Abbreviations: I_{oc}, I_{or} and $\hat{I}_{or}$ definitions clarified with note. 8 Performance required: The term "DPCH_Ec/Ior power" changed to "DPCH_Ec/Ior power ratio" Annex B: Table B.1: Change "Average Power" to "Relative Average Power". Annex C: Tables C.2; C.3; C.4 and C.5 Change "Power" to "Power ratio".
Consequences if not approved: ⌘	The incomplete requirements can be interpreted differently causing an incorrect understanding of UE performance. Isolated impact statement: Correction of requirements. Should not affect UE implementations or system performance but may impact conformance test implementation and conformance test results.

Clauses affected: ⌘	3, 8, Annex B, Annex C	
Other specs affected: ⌘	[ ] Other core specifications [ ] Test specifications [ ] O&M Specifications	⌘ 34.121
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.

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following definitions apply:

Maximum Output Power: This s a measure of the maximum power the UE can transmit (i.e. the actual broadband power as would be measured assuming no measurement error).

Nominal Maximum Output Power: This is the nominal power defined by the UE power class.

Average power: The thermal power as measured through a root raised cosine filter with roll-off $\alpha = 0.22$ and a bandwidth equal to the chip rate of the radio access mode. The period of measurement shall be one power control group (timeslot) unless otherwise stated.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ACLR	Adjacent Channel Leakage power Ratio
ACS	Adjacent Channel Selectivity
AICH	Acquisition Indication Channel
BER	Bit Error Ratio
BLER	Block Error Ratio
CW	Continuous Wave (un-modulated signal)
DCH	Dedicated Channel, which is mapped into Dedicated Physical Channel.
DL	Down Link (forward link)
DTX	Discontinuous Transmission
DPCCH	Dedicated Physical Control Channel
DPCH	Dedicated Physical Channel
$DPCH\_E_c$	Average energy per PN chip for DPCH.
$\frac{DPCH\_E_c}{I_{or}}$	The ratio of the transmit energy per PN chip of the DPCH to the total transmit power spectral density at the Node B antenna connector.
DPDCH	Dedicated Physical Data Channel
EIRP	Effective Isotropic Radiated Power
E_c	Average energy per PN chip.
$\frac{E_c}{I_{or}}$	The ratio of the average transmit energy per PN chip for different fields or physical channels to the total transmit power spectral density.
FACH	Forward Access Channel
FDD	Frequency Division Duplex
FDR	False transmit format Detection Ratio. A false Transport Format detection occurs when the receiver detects a different TF to that which was transmitted, and the decoded transport block(s) for this incorrect TF passes the CRC check(s).
F_{uw}	Frequency of unwanted signal. This is specified in bracket in terms of an absolute frequency(s) or a frequency offset from the assigned channel frequency.
Information Data Rate	Rate of the user information, which must be transmitted over the Air Interface. For example, output rate of the voice codec.
I_o	The total received power spectral density, including signal and interference, as measured at the UE antenna connector.
I_{oc}	The power spectral density (integrated in a noise bandwidth equal to the chip rate and normalized to the chip rate) of a band limited white noise source (simulating interference from cells, which are not defined in a test procedure) as measured at the UE antenna connector.

I_{or}	The total transmit power spectral density (integrated in a bandwidth of (1+α) times the chip rate and normalized to the chip rate) of the down link signal at the Node B antenna connector.
$\hat{I}_{or}$	The received power spectral density (integrated in a bandwidth of (1+α) times the chip rate and normalized to the chip rate) of the down link signal as measured at the UE antenna connector.
MER	Message Error Ratio
Node B	A logical node responsible for radio transmission / reception in one or more cells to/from the User Equipment. Terminates the Iub interface towards the RNC
OCNS	Orthogonal Channel Noise Simulator, a mechanism used to simulate the users or control signals on the other orthogonal channels of a downlink link.
$OCNS\_E_c$	Average energy per PN chip for the OCNS.
$\frac{OCNS\_E_c}{I_{or}}$	The ratio of the average transmit energy per PN chip for the OCNS to the total transmit power spectral density.
P-CCPCH	Primary Common Control Physical Channel
PCH	Paging Channel
$P-CCPCH\ \frac{E_c}{I_o}$	The ratio of the received P-CCPCH energy per chip to the total received power spectral density at the UE antenna connector.
$\frac{P-CCPCH\_E_c}{I_{or}}$	The ratio of the average transmit energy per PN chip for the P-CCPCH to the total transmit power spectral density.
P-CPICH	Primary Common Pilot Channel
PICH	Paging Indicator Channel
PPM	Parts Per Million
RACH	Random Access Channel
SCH	Synchronization Channel consisting of Primary and Secondary synchronization channels
$S-CCPCH$	Secondary Common Control Physical Channel.
$S-CCPCH\_E_c$	Average energy per PN chip for S-CCPCH.
SIR	Signal to Interference ratio
SSDT	Site Selection Diversity Transmission
STTD	Space Time Transmit Diversity
TDD	Time Division Duplexing
TFC	Transport Format Combination
TFCI	Transport Format Combination Indicator
TPC	Transmit Power Control
TSTD	Time Switched Transmit Diversity
UE	User Equipment
UL	Up Link (reverse link)
UTRA	UMTS Terrestrial Radio Access

NOTE: The units of Power Spectral Density (PSD) are extensively used in this document. PSD is a function of power versus frequency and when integrated across a given bandwidth, the function represents the mean power in such a bandwidth. When the mean power is normalised to (divided by) the chip-rate it represents the mean energy per chip. Some signals are directly defined in terms of energy per chip, ($DPCH\_E_c$, E_c, $OCNS\_E_c$ and $S-CCPCH\_E_c$) and others defined in terms of PSD (I_o, I_{oc}, I_{or} and $\hat{I}_{or}$). There also exist quantities that are a ratio of energy per chip to PSD ($DPCH\_E_c/I_{or}$, E_c/I_{or} etc.). This is the common practice of relating energy magnitudes in communication systems.

It can be seen that if both energy magnitudes in the ratio are divided by time, the ratio is converted from an energy ratio to a power ratio, which is more useful from a measurement point of view. It follows that an energy per chip of X dBm/3.84 MHz can be expressed as a mean power per chip of X dBm. Similarly, a signal PSD of Y dBm/3.84 MHz can be expressed as a signal power of Y dBm.

8 Performance requirement

8.1 General

The performance requirements for the UE in this subclause are specified for the measurement channels specified in Annex A, the propagation conditions specified in Annex B and the Down link Physical channels specified in Annex C. Unless stated DL power control is OFF.

8.2 Demodulation in static propagation conditions

8.2.1 (void)

Table 8.1:(void)

Table 8.2: (void)

8.2.2 Demodulation of Forward Access Channel (FACH)

Table 8.3: (void)

Table 8.4: (void)

8.2.3 Demodulation of Dedicated Channel (DCH)

The receive characteristic of the Dedicated Channel (DCH) in the static environment is determined by the Block Error Ratio (BLER). BLER is specified for each individual data rate of the DCH. DCH is mapped into the Dedicated Physical Channel (DPCH).

8.2.3.1 Minimum requirement

For the parameters specified in Table 8.5 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.6. These requirements are applicable for TFCS size 16.

Table 8.5: DCH parameters in static propagation conditions

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
Phase reference		P-CPICH			
$\hat{I}_{or}/I_{oc}$	dB	-1			
I_{oc}	dBm/3.84 MHz	-60			
Information Data Rate	kbps	12.2	64	144	384

Table 8.6: DCH requirements in static propagation conditions

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-16.6 dB	10^{-2}
2	-13.1 dB	10^{-1}
	-12.8 dB	10^{-2}
3	-9.9 dB	10^{-1}
	-9.8 dB	10^{-2}
4	-5.6 dB	10^{-1}
	-5.5 dB	10^{-2}

8.3 Demodulation of DCH in multi-path fading propagation conditions

8.3.1 Single Link Performance

The receive characteristics of the Dedicated Channel (DCH) in different multi-path fading environments are determined by the Block Error Ratio (BLER) values. BLER is measured for the each of the individual data rate specified for the DPCH. DCH is mapped into in Dedicated Physical Channel (DPCH).

8.3.1.1 Minimum requirement

For the parameters specified in Table 8.7, 8.9 , 8.11, 8.13 and 8.14A the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.8, 8.10, 8.12, 8.14 and 8.14B. These requirements are applicable for TFCS size 16.

Table 8.7: Test Parameters for DCH in multi-path fading propagation conditions (Case 1)

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
Phase reference		P-CPICH			
$\hat{I}_{or}/I_{oc}$	dB	9			
I_{oc}	dBm/3.84 MHz	-60			
Information Data Rate	kbps	12.2	64	144	384

Table 8.8: Test requirements for DCH in multi-path fading propagation conditions (Case 1)

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-15.0 dB	10^{-2}
2	-13.9 dB	10^{-1}
	-10.0 dB	10^{-2}
3	-10.6 dB	10^{-1}
	-6.8 dB	10^{-2}
4	-6.3 dB	10^{-1}
	-2.2 dB	10^{-2}

Table 8.9: DCH parameters in multi-path fading propagation conditions (Case 2)

Parameter	Unit	Test 5	Test 6	Test 7	Test 8
Phase reference		P-CPICH			
$\hat{I}_{or}/I_{oc}$	dB	-3	-3	3	6
I_{oc}	dBm/3.84 MHz	-60			
Information Data Rate	kbps	12.2	64	144	384

Table 8.10: DCH requirements in multi-path fading propagation (Case 2)

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
5	-7.7 dB	10^{-2}
6	-6.4 dB	10^{-1}
	-2.7 dB	10^{-2}
7	-8.1 dB	10^{-1}
	-5.1 dB	10^{-2}
8	-5.5 dB	10^{-1}
	-3.2 dB	10^{-2}

Table 8.11: DCH parameters in multi-path fading propagation conditions (Case 3)

Parameter	Unit	Test 9	Test 10	Test 11	Test 12
Phase reference		P-CPICH			
$\hat{I}_{or}/I_{oc}$	dB	-3	-3	3	6
I_{oc}	dBm/3.84 MHz	-60			
Information Data Rate	kbps	12.2	64	144	384

Table 8.12: DCH requirements in multi-path fading propagation conditions (Case 3)

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
9	-11.8 dB	10^{-2}
10	-8.1 dB	10^{-1}
	-7.4 dB	10^{-2}
	-6.8 dB	10^{-3}
11	-9.0 dB	10^{-1}
	-8.5 dB	10^{-2}
	-8.0 dB	10^{-3}
12	-5.9 dB	10^{-1}
	-5.1 dB	10^{-2}
	-4.4 dB	10^{-3}

Table 8.13: DCH parameters in multi-path fading propagation conditions (Case 1) with S-CPICH

Parameter	Unit	Test 13	Test 14	Test 15	Test 16
Phase reference		S-CPICH			
$\hat{I}_{or}/I_{oc}$	dB	9			
I_{oc}	dBm/3.84 MHz	-60			
Information Data Rate	kbps	12.2	64	144	384

Table 8.14: DCH requirements in multi-path fading propagation conditions (Case 1) with S-CPICH

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
13	-15.0 dB	10^{-2}
14	-13.9 dB	10^{-1}
	-10.0 dB	10^{-2}
15	-10.6 dB	10^{-1}
	-6.8 dB	10^{-2}
16	-6.3 dB	10^{-1}
	-2.2 dB	10^{-2}

Table 8.14A: DCH parameters in multi-path fading propagation conditions (Case 6)

Parameter	Unit	Test 17	Test 18	Test 19	Test 20
Phase reference		P-CPICH			
$\hat{I}_{or}/I_{oc}$	dB	-3	-3	3	6
I_{oc}	dBm/3.84 MHz	-60			
Information Data Rate	kbps	12.2	64	144	384

Table 8.14B: DCH requirements in multi-path fading propagation conditions (Case 6)

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
17	-8.8 dB	10^{-2}
18	-5.1 dB	10^{-1}
	-4.4 dB	10^{-2}
	-3.8 dB	10^{-3}
19	-6.0 dB	10^{-1}
	-5.5 dB	10^{-2}
	-5.0 dB	10^{-3}
20	-2.9 dB	10^{-1}
	-2.1 dB	10^{-2}
	-1.4 dB	10^{-3}

8.4 Demodulation of DCH in moving propagation conditions

8.4.1 Single link performance

The receive single link performance of the Dedicated Channel (DCH) in dynamic moving propagation conditions are determined by the Block Error Ratio (BLER) values. BLER is measured for the each of the individual data rate specified for the DPCH. DCH is mapped into Dedicated Physical Channel (DPCH).

8.4.1.1 Minimum requirement

For the parameters specified in Table 8.15 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.16.

Table 8.15: DCH parameters in moving propagation conditions

Parameter	Unit	Test 1	Test 2
Phase reference		P-CPICH	
$\hat{I}_{or}/I_{oc}$	dB	-1	
I_{oc}	dBm/3.84 MHz	-60	
Information Data Rate	kbps	12.2	64

Table 8.16: DCH requirements in moving propagation conditions

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-14.5 dB	10^{-2}
2	-10.9 dB	10^{-2}

8.5 Demodulation of DCH in birth-death propagation conditions

8.5.1 Single link performance

The receive single link performance of the Dedicated Channel (DCH) in dynamic birth-death propagation conditions are determined by the Block Error Ratio (BLER) values. BER is measured for the each of the individual data rate specified for the DPCH. DCH is mapped into Dedicated Physical Channel (DPCH).

8.5.1.1 Minimum requirement

For the parameters specified in Table 8.17 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.18.

Table 8.17: DCH parameters in birth-death propagation conditions

Parameter	Unit	Test 1	Test 2
Phase reference		P-CPICH	
$\hat{I}_{or}/I_{oc}$	dB	-1	
I_{oc}	dBm/3.84 MHz	-60	
Information Data Rate	kbps	12.2	64

Table 8.18: DCH requirements in birth-death propagation conditions

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-12.6 dB	10^{-2}
2	-8.7 dB	10^{-2}

8.6 Demodulation of DCH in downlink Transmit diversity modes

8.6.1 Demodulation of DCH in open-loop transmit diversity mode

The receive characteristic of the Dedicated Channel (DCH) in open loop transmit diversity mode is determined by the Block Error Ratio (BLER). DCH is mapped into in Dedicated Physical Channel (DPCH).

8.6.1.1 Minimum requirement

For the parameters specified in Table 8.19 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.20.

Table 8.19: Test parameters for DCH reception in an open loop transmit diversity scheme (Propagation condition: Case 1)

Parameter	Unit	Test 1
Phase reference		P-CPICH
$\hat{I}_{or}/I_{oc}$	dB	9
I_{oc}	dBm/3.84 MHz	-60
Information data rate	kbps	12.2

Table 8.20: Test requirements for DCH reception in open loop transmit diversity scheme

Test Number	$\frac{DPCH\_E_c}{I_{or}}$ (antenna 1/2)	BLER
1	-16.8 dB	10^{-2}

8.6.2 Demodulation of DCH in closed loop transmit diversity mode

The receive characteristic of the dedicated channel (DCH) in closed loop transmit diversity mode is determined by the Block Error Ratio (BLER). DCH is mapped into in Dedicated Physical Channel (DPCH).

8.6.2.1 Minimum requirement

For the parameters specified in Table 8.21 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.22.

Table 8.21: Test Parameters for DCH Reception in closed loop transmit diversity mode (Propagation condition: Case 1)

Parameter	Unit	Test 1 (Mode 1)	Test 2 (Mode 2)
$\hat{I}_{or}/I_{oc}$	dB	9	9
I_{oc}	dBm/3.84 MHz	-60	-60
Information data rate	kbps	12.2	12.2
Feedback error rate	%	4	4

Table 8.22: Test requirements for DCH reception in closed loop transmit diversity mode

Test Number	$\frac{DPCH\_E_c}{I_{or}}$ (see note)	BLER
1	-18.0 dB	10^{-2}
2	-18.3 dB	10^{-2}
NOTE: This is the total power from both antennas. Power sharing between antennas are feedback mode dependent as specified in TS25.214.		

8.6.3 Demodulation of DCH in Site Selection Diversity Transmission Power Control mode

The bit error characteristics of UE receiver is determined in Site Selection Diversity Transmission power control (SSDT) mode. Two Node B emulators are required for this performance test. The delay profiles of signals received from different Node Bs are assumed to be the same but time shifted by 10 chip periods (2604 ns).

8.6.3.1 Minimum requirements

The downlink physical channels and their relative power to Ior are the same as those specified in clause C.3.2 irrespective of Node Bs and the test cases. DPCH_Ec/Ior value applies whenever DPDCH in the cell is transmitted. In Test 1 and Test 3, the received powers at UE from two Node Bs are the same, while 3dB offset is given to one that comes from one of Node Bs for Test 2 and Test 4 as specified in Table 8.23.

For the parameters specified in Table 8.23 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.24.

Table 8.23: DCH parameters in multi-path propagation conditions during SSDT mode (Propagation condition: Case 1)

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
Phase reference		P-CPICH			
$\hat{I}_{or1}/I_{oc}$	dB	0	-3	0	0
$\hat{I}_{or2}/I_{oc}$	dB	0	0	0	-3
I_{oc}	dBm/3.84 MHz	-60			
Information Data Rate	kbps	12.2	12.2	12.2	12.2
Cell ID code word error ratio in uplink	%	1	1	1	1
Number of FBI bits assigned to "S" Field		1	1	2	2
Code word Set		Long	Long	Short	Short
UL DPCCH slot Format		#2		#5	

NOTE: The code word errors are introduced independently in both uplink channels.

Table 8.24: DCH requirements in multi-path propagation conditions during SSDT Mode

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-7.5 dB	10^{-2}
2	-6.5 dB	10^{-2}
3	-10.5 dB	10^{-2}
4	-9.2 dB	10^{-2}

8.7 Demodulation in Handover conditions

8.7.1 Demodulation of DCH in Inter-Cell Soft Handover

The bit error rate characteristics of UE is determined during an inter-cell soft handover. During the soft handover a UE receives signals from different cells. A UE has to be able to demodulate two PCCPCH channels and to combine the energy of DCH channels. Delay profiles of signals received from different cells are assumed to be the same but time shifted by 10 chips.

The receive characteristics of the different channels during inter-cell handover are determined by the average Block Error Ratio (BLER) values.

8.7.1.1 Minimum requirement

For the parameters specified in Table 8.25 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.26.

Table 8.25: DCH parameters in multi-path propagation conditions during Soft Handoff (Case 3)

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
Phase reference		P-CPICH			
$\hat{I}_{or1}/I_{oc}$ and $\hat{I}_{or2}/I_{oc}$	dB	0	0	3	6
I_{oc}	dBm/3.84 MHz	-60			
Information data Rate	kbps	12.2	64	144	384

Table 8.26: DCH requirements in multi-path propagation conditions during Soft Handoff (Case 3)

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-15.2 dB	10^{-2}
2	-11.8 dB	10^{-1}
	-11.3 dB	10^{-2}
3	-9.6 dB	10^{-1}
	-9.2 dB	10^{-2}
4	-6.0 dB	10^{-1}
	-5.5 dB	10^{-2}

8.7.2 Combining of TPC commands from radio links of different radio link sets

8.7.2.1 Minimum requirement

Test parameters are specified in Table 8.27. The delay profiles of the signals received from the different cells are the same but time-shifted by 10 chips.

For Test 1, the uplink power changes between adjacent slots shall be as shown in Table 8.28 over the 4 consecutive slots. Note that this case is without an additional noise source I_{oc}.

For Test 2, the Cell1 and Cell2 TPC patterns are repeated a number of times. If the transmitted power of a given slot is increased compared to the previous slot, then a variable "Transmitted power UP" is increased by one, otherwise a variable "Transmitted power DOWN" is increased by one. The requirements for "Transmitted power UP" and "Transmitted power DOWN" are shown in Table 8.28A.

Table 8.27: Parameters for TPC command combining

Parameter	Unit	Test 1	Test 2
Phase reference	-	P-CPICH	
DPCH_Ec/Ior	dB	-12	
$\hat{I}_{or1}$ and $\hat{I}_{or2}$	dBm/3.84 MHz	-60	
I_{oc}	dBm/3.84 MHz	-	-60
Power-Control-Algorithm	-	Algorithm 1	
Cell 1 TPC commands over 4 slots	-	{0,0,1,1}	
Cell 2 TPC commands over 4 slots	-	{0,1,0,1}	
Information data Rate	kbps	12.2	
Propagation condition	-	Static without AWGN source I_{oc}	Multi-path fading case 3

Table 8.28: Test requirements for Test 1

Test Number	Required power changes over the 4 consecutive slots
1	Down, Down, Down, Up

Table 8.28A: Requirements for Test 2

Test Number	Ratio (Transmitted power UP) / (Total number of slots)	Ratio (Transmitted power DOWN) / (Total number of slots)
2	≥0.25	≥0.5

8.8 Power control in downlink

Power control in the downlink is the ability of the UE receiver to converge to required link quality set by the network while using as low power as possible in downlink . If a BLER target has been assigned to a DCCH (See Annex A.3), then it has to be such that outer loop is based on DTCH and not on DCCH.

8.8.1 Power control in the downlink, constant BLER target

8.8.1.1 Minimum requirements

For the parameters specified in Table 8.29 the downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio measured values, which are averaged over one slot, shall be below the specified value in Table 8.30 more than 90% of the time. BLER shall be as shown in Table 8.30. Power control in downlink is ON during the test.

Table 8.29: Test parameter for downlink power control

Parameter	Unit	Test 1	Test 2
$\hat{I}_{or}/I_{oc}$	dB	9	-1
I_{oc}	dBm/3.84 MHz	-60	
Information Data Rate	kbps	12.2	
Target quality value on DTCH	BLER	0.01	
Propagation condition		Case 4	
Maximum_DL_Power *	dB	7	
Minimum_DL_Power *	dB	-18	
DL Power Control step size, Δ_{TPC}	dB	1	
Limited Power Increase	-	"Not used"	

NOTE: Power is compared to P-CPICH as specified in [4].

Table 8.30: Requirements in downlink power control

Parameter	Unit	Test 1	Test 2
$\frac{DPCH\_E_c}{I_{or}}$	dB	-16.0	-9.0
Measured quality on DTCH	BLER	0.01±30%	0.01±30%

8.8.2 Power control in the downlink, initial convergence

This requirement verifies that DL power control works properly during the first seconds after DPCH connection is established.

8.8.2.1 Minimum requirements

For the parameters specified in Table 8.31 the downlink DPCH_Ec/Ior power ratio measured values, which are averaged over 50 ms, shall be within the range specified in Table 8.32 more than 90% of the time. T1 equals to 500 ms and it starts 10 ms after the DPDCH connection is initiated. T2 equals to 500 ms and it starts when T1 has expired. Power control is ON during the test.

The first 10 ms shall not be used for averaging, ie the first sample to be input to the averaging filter is at the beginning of T1. The averaging shall be performed with a sliding rectangular window averaging filter. The window size of the averaging filter is linearly increased from 0 up to 50 ms during the first 50 ms of T1, and then kept equal to 50ms.

Table 8.31: Test parameters for downlink power control

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
Target quality value on DTCH	BLER	0.01	0.01	0.1	0.1
Initial DPCH_Ec/Ior	dB	-5.9	-25.9	-3	-22.1
Information Data Rate	kbps	12.2	12.2	64	64
$\hat{I}_{or}/I_{oc}$	dB	-1			
I_{oc}	dBm/3.84 MHz	-60			
Propagation condition		Static			
Maximum_DL_Power	dB	7			
Minimum_DL_Power	dB	-18			
DL Power Control step size, Δ_{TPC}	dB	1			
Limited Power Increase	-	"Not used"			

Table 8.32: Requirements in downlink power control

Parameter	Unit	Test 1 and Test 2	Test 3 and Test 4
$\frac{DPCH\_E_c}{I_{or}}$ during T1	dB	-18.9 ≤ DPCH_Ec/Ior ≤ -11.9	-15.1 ≤ DPCH_Ec/Ior ≤ -8.1
$\frac{DPCH\_E_c}{I_{or}}$ during T2	dB	-18.9 ≤ DPCH_Ec/Ior ≤ -14.9	-15.1 ≤ DPCH_Ec/Ior ≤ -11.1

8.8.3 Power control in downlink, wind up effects

8.8.3.1 Minimum requirements

This test is run in three stages where stage 1 is for convergence of the power control loop, in stage two the maximum downlink power for the dedicated channel is limited not to be higher than the parameter specified in Table 8.33. All parameters used in the three stages are specified in Table 8.33. The downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio measured values, which are averaged over one slot, during stage 3 shall be lower than the value specified in Table 8.34 more than 90% of the time.

Power control of the UE is ON during the test.

Table 8.33: Test parameter for downlink power control, wind-up effects

Parameter	Unit	Test 1		
		Stage 1	Stage 2	Stage 3
Time in each stage	s	>15	5	0.5
$\hat{I}_{or}/I_{oc}$	dB	5		
I_{oc}	dBm/3.84 MHz	-60		
Information Data Rate	kbps	12.2		
Quality target on DTCH	BLER	0.01		
Propagation condition		Case 4		
Maximum_DL_Power	dB	7	-6.2	7
Minimum_DL_Power	dB	-18		
DL Power Control step size, Δ_{TPC}	dB	1		
Limited Power Increase	-	"Not used"		

Table 8.34: Requirements in downlink power control, wind-up effects

Parameter	Unit	Test 1, stage 3
$\frac{DPCH\_E_c}{I_{or}}$	dB	-13.3

8.9 Downlink compressed mode

Downlink compressed mode is used to create gaps in the downlink transmission, to allow the UE to make measurements on other frequencies.

8.9.1 Single link performance

The receiver single link performance of the Dedicated Traffic Channel (DCH) in compressed mode is determined by the Block Error Ratio (BLER) and transmitted DPCH_Ec/Ior power ratio in the downlink.

The compressed mode parameters are given in clause A.5. Tests 1 and 2 are using Set 1 compressed mode pattern parameters from Table A.21 in clause A.5 while tests 3 and 4 are using Set 2 compressed mode patterns from the same table.

8.9.1.1 Minimum requirements

For the parameters specified in Table 8.35 the downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio measured values, which are averaged over one slot, shall be below the specified value in Table 8.36 more than 90% of the time. The measured quality on DTCH shall be as required in Table 8.36.

Downlink power control is ON during the test. Uplink TPC commands shall be error free. System simulator shall increase the transmitted power during compressed frames by the same amount that UE is expected to increase its SIR target during those frames.

Table 8.35: Test parameter for downlink compressed mode

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
Delta SIR1	dB	0	3	0	3
Delta SIR after1	dB	0	3	0	3
Delta SIR2	dB	0	0	0	0
Delta SIR after2	dB	0	0	0	0
$\hat{I}_{or}/I_{oc}$	dB	9			
I_{oc}	dBm/3.84 MHz	-60			
Information Data Rate	kbps	12.2			
Propagation condition		Case 2			
Target quality value on DTCH	BLER	0.01			
Maximum_DL_Power	dB	7			
Minimum_DL_Power	dB	-18			
DL Power Control step size, Δ_{TPC}	dB	1			
Limited Power Increase	-	"Not used"			

Table 8.36: Requirements in downlink compressed mode

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
$\frac{DPCH\_E_c}{I_{or}}$	dB	-15.4	No requirements	-15.4	No requirements
Measured quality of compressed and recovery frames	BLER	No requirements	<0.001	No requirements	<0.001
Measured quality on DTCH	BLER	0.01 ± 30 %			

8.10 Blind transport format detection

Performance of Blind transport format detection is determined by the Block Error Ratio (BLER) values and by the measured average transmitted DPCH_Ec/Ior value.

8.10.1 Minimum requirement

For the parameters specified in Table 8.37 the average downlink $DPCH\_E_c$ power ratio shall be below the specified value for the BLER shown in Table 8.38.

Table 8.37: Test parameters for Blind transport format detection

Parameter	Unit	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
$\hat{I}_{or}/I_{oc}$	dB	-1			-3		
I_{oc}	dBm/3.84 MHz	-60					
Information Data Rate	kbps	12.2 (rate 1)	7.95 (rate 2)	1.95 (rate 3)	12.2 (rate 1)	7.95 (rate 2)	1.95 (rate 3)
propagation condition	-	static			multi-path fading case 3		
TFCI	-	off					

B.2 Propagation Conditions

B.2.1 Static propagation condition

The propagation for the static performance measurement is an Additive White Gaussian Noise (AWGN) environment. No fading and multi-paths exist for this propagation model.

B.2.2 Multi-path fading propagation conditions

Table B1 shows propagation conditions that are used for the performance measurements in multi-path fading environment. All taps have classical Doppler spectrum.

Table B.1: Propagation Conditions for Multi path Fading Environments

Case 1, speed 3km/h		Case 2, speed 3 km/h		Case 3, speed 120 km/h		Case 4, speed 3 km/h		* Case 5, speed 50 km/h		Case 6, speed 250 km/h	
Relative Delay [ns]	Relative mean ~~Average~~ Power [dB]	Relative Delay [ns]	Relative mean ~~Average~~ Power [dB]	Relative Delay [ns]	Relative mean ~~Average~~ Power [dB]	Relative Delay [ns]	Relative mean ~~Average~~ Power [dB]	Relative Delay [ns]	Relative mean ~~Average~~ Power [dB]	Relative Delay [ns]	Relative mean ~~Average~~ Power [dB]
0	0	0	0	0	0	0	0	0	0	0	0
976	-10	976	0	260	-3	976	0	976	-10	260	-3
		20000	0	521	-6					521	-6
				781	-9					781	-9

NOTE: Case 5 is only used in TS25.133.

C.3 During connection

The following clauses, describes the downlink Physical Channels that are transmitted during a connection i.e., when measurements are done. For these measurements the offset between DPCH and SCH shall be zero chips at Node B meaning that SCH is overlapping with the first symbols in DPCH in the beginning of DPCH slot structure.

C.3.1 Measurement of Rx Characteristics

Table C.2 is applicable for measurements on the Receiver Characteristics (clause 7) with the exception of subclause 7.4 (Maximum input level).

Table C.2: Downlink Physical Channels transmitted during a connection

Physical Channel	Power ratio
P-CPICH	P-CPICH_Ec / DPCH_Ec = 7 dB
P-CCPCH	P-CCPCH_Ec / DPCH_Ec = 5 dB
SCH	SCH_Ec / DPCH_Ec = 5 dB
PICH	PICH_Ec / DPCH_Ec = 2 dB
DPCH	Test dependent power

C.3.2 Measurement of Performance requirements

Table C.3 is applicable for measurements on the Performance requirements (clause 8), including subclause 7.4 (Maximum input level) and subclause 6.4.4 (Out-of-synchronization handling of output power).

Table C.3: Downlink Physical Channels transmitted during a connection[1]

Physical Channel	Power ratio	NOTE
P-CPICH	P-CPICH_Ec/Ior = -10 dB	Use of P-CPICH or S-CPICH as phase reference is specified for each requirement and is also set by higher layer signalling.
S-CPICH	S-CPICH_Ec/Ior = -10 dB	When S-CPICH is the phase reference in a test condition, the phase of S-CPICH shall be 180 degrees offset from the phase of P-CPICH. When S-CPICH is not the phase reference, it is not transmitted.
P-CCPCH	P-CCPCH_Ec/Ior = -12 dB	
SCH	SCH_Ec/Ior = -12 dB	This power shall be divided equally between Primary and Secondary Synchronous channels
PICH	PICH_Ec/Ior = -15 dB	
DPCH	Test dependent power	When S-CPICH is the phase reference in a test condition, the phase of DPCH shall be 180 degrees offset from the phase of P-CPICH.
OCNS	Necessary power so that total transmit power spectral density of Node B (Ior) adds to one[1]	OCNS interference consists of 16 dedicated data channels as specified in table C.6.

NOTE 1 For dynamic power correction required to compensate for the presence of transient channels, e.g. control channels, a subset of the DPCH channels may be used.

C.3.3 Connection with open-loop transmit diversity mode

Table C.4 is applicable for measurements for subclause 8.6.1 (Demodulation of DCH in open loop transmit diversity mode).

Table C.4: Downlink Physical Channels transmitted during a connection[1]

Physical Channel	Power ratio	NOTE
P-CPICH (antenna 1)	P-CPICH_Ec1/Ior = -13 dB	1. Total P-CPICH_Ec/Ior = -10 dB
P-CPICH (antenna 2)	P-CPICH_Ec2/Ior = -13 dB	
P-CCPCH (antenna 1)	P-CCPCH_Ec1/Ior = -15 dB	1. STTD applied 2. Total P-CCPCH_Ec/Ior = -12 dB
P-CCPCH (antenna 2)	P-CCPCH_Ec2/Ior = -15 dB	
SCH (antenna 1 / 2)	SCH_Ec/Ior = -12 dB	1. TSTD applied. 2. This power shall be divided equally between Primary and Secondary Synchronous channels
PICH (antenna 1)	PICH_Ec1/Ior = -18 dB	1. STTD applied 2. Total PICH_Ec/Ior = -15 dB
PICH (antenna 2)	PICH_Ec2/Ior = -18 dB	
DPCH	Test dependent power	1. STTD applied 2. Total power from both antennas
OCNS	Necessary power so that total transmit power spectral density of Node B (Ior) adds to one[1]	1.This power shall be divided equally between antennas 2.OCNS interference consists of 16 dedicated data channels as specified in Table C.6.

NOTE 1 For dynamic power correction required to compensate for the presence of transient channels, e.g. control channels, a subset of the DPCH channels may be used.

C.3.4 Connection with closed loop transmit diversity mode

Table C.5 is applicable for measurements for subclause 8.6.2 (Demodulation of DCH in closed loop transmit diversity mode).

Table C.5: Downlink Physical Channels transmitted during a connection[1]

Physical Channel	Power ratio	NOTE
P-CPICH (antenna 1)	P-CPICH_Ec1/Ior = -13 dB	1. Total P-CPICH_Ec/Ior = -10 dB
P-CPICH (antenna 2)	P-CPICH_Ec2/Ior = -13 dB	
P-CCPCH (antenna 1)	P-CCPCH_Ec1/Ior = -15 dB	1. STTD applied
P-CCPCH (antenna 2)	P-CCPCH_Ec2/Ior = -15 dB	1. STTD applied, 2. total P-CCPCH_Ec/Ior = -12 dB
SCH (antenna 1 / 2)	SCH_Ec/Ior = -12 dB	1. TSTD applied
PICH (antenna 1)	PICH_Ec1/Ior = -18 dB	1. STTD applied 2. STTD applied, total PICH_Ec/Ior = -15 dB
PICH (antenna 2)	PICH_Ec2/Ior = -18 dB	
DPCH	Test dependent power	1. Total power from both antennas
OCNS	Necessary power so that total transmit power spectral density of Node B (Ior) adds to one[1]	1.This power shall be divided equally between antennas 2. OCNS interference consists of 16 dedicated data channels. as specified in Table C.6.

NOTE 1 For dynamic power correction required to compensate for the presence of transient channels, e.g. control channels, a subset of the DPCH channels may be used.

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

CR-Form-v4

CHANGE REQUEST

⌘	**25.101**	**CR**	**160**	⌘	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 [X]	Radio Access Network [ ]	Core Network [ ]

Title:	⌘	Correction of power terms and definitions
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 existing requirements relating to power are incomplete, inconsistent and ambiguous. The proposed changes remove the possibility of misinterpreting the specification.

Summary of change: ⌘ 3.1 For maximum output power, replaced the term “broadband” by defining the bandwidth as being at least (1+ α) times the chip rate over a period of at least one timeslot. This definition allows the use of a broadband (thermal) power meter.

3.1 Added definition of mean power (consistent with ITU radio regulation S1.156) which includes a minimum bandwidth requirement of (1+ α) times the chip rate. This ensures all the signal power is captured and does not unnecessarily restrict the choice of measurement method.

3.1 Average power definition becomes the RRC filtered mean power definition.

6.2.1 Replacement of “broadband” by “at least (1+ α) times the chip rate”. Added measurement period of “at least one slot”. This definition is consistent with thermal power measurements as the bandwidth and measurement period are not restricted.

6.4.1 Open loop power control defined as mean power.

6.4.2 Inner loop power control defined as mean power. Table 6.5 title “average” – changed to “aggregate”.

6.4.3 Minimum output power defined as mean power.

6.5.1 Transmit off power defined as RRC filtered mean power.

6.5.2 Transmit on power defined as mean power, off power defined as RRC filtered mean power.

		6.5.3 Change of TFC defined as mean power. 6.5.4 Power setting in uplink compressed mode defined as mean power. 6.6.2.1 Spectrum emission mask reference power defined as RRC filtered mean power. Added clarification about noise bandwidth of the integrated method. 6.6.2.2 ACLR defined as RRC filtered mean power. 6.7.1 Transmit intermodulation defined RRC filtered mean power. 6.8.3 Peak code domain error – removed reference to power control group 7.3 Receiver sensitivity level – defined as mean power. 7.4 Maximum input level – defined as mean power. Tables 7.3, 7.5, 7.6, 7.7, 7.8, 7.9 & 7.9A "Average transmit output power" is changed to "UE transmitted mean power". Table 7.5 I_{oac} defined as mean power in dBm not power spectral density in dBm/3.84 MHz. Table 7.6 format changed to match the other 5 tables. Table 7.6 and 7.9 $I_{blocking}$ defined as mean power in dBm not power spectral density in dBm/3.84 MHz.
Consequences if not approved:	⌘	Existing power specifications are incomplete, inconsistent and ambiguous which will lead to different interpretation of power quantities (e.g. maximum power, SEM, Interferer levels etc.). This will lead to inconsistent performance measurement results. Isolated impact statement: Correction of requirements. Correct interpretation of the existing spec will not affect UE implementations or system performance. However, incorrect interpretation may impact conformance test implementation and conformance test results.

Clauses affected:	⌘	3, 6, 7		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	34.121
Other comments:	⌘			

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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.

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following definitions apply:

Maximum Output Power: This is a measure of the maximum power the UE can transmit (i.e. the actual broadband power as would be measured assuming no measurement error) in a bandwidth of at least (1+ α) times the chip rate of the radio access mode. The period of measurement shall be at least one timeslot.

Nominal Maximum Output Power: This is the nominal power defined by the UE power class.

Mean power: When applied to a W-CDMA modulated signal this is the power (transmitted or received) in a bandwidth of at least (1+ α) times the chip rate of the radio access mode. The period of measurement shall be at least one timeslot unless otherwise stated.

RRC filtered mean Average power: The thermal mean power as measured through a root raised cosine filter with roll-off factor α = 0.22 and a bandwidth equal to the chip rate of the radio access mode. The period of measurement shall be one power control group (timeslot) unless otherwise stated.

NOTE 1: The RRC filtered mean power of a perfectly modulated W-CDMA signal is 0.246 dB lower than the mean power of the same signal.

6 Transmitter characteristics

6.1 General

Unless detailed the transmitter characteristic are specified at the antenna connector of the UE. For UE with integral antenna only, a reference antenna with a gain of 0 dBi is assumed. Transmitter characteristics for UE(s) with multiple antennas/antenna connectors are FFS.

The UE antenna performance has a significant impact on system performance, and minimum requirements on the antenna efficiency are therefore intended to be included in future versions of the present document. It is recognised that different requirements and test methods are likely to be required for the different types of UE.

All the parameters in clause 6 are defined using the UL reference measurement channel (12.2 kbps) specified in subclause A.2.1 and unless stated with the UL power control ON

6.2 Transmit power

6.2.1 UE maximum output power

The following Power Classes define the nominal maximum output power. The nominal power defined is the ~~broadband~~ transmit power of the UE, i.e. the power in a bandwidth of at least (1+α) times the chip rate of the radio access mode. The period of measurement shall be at least one timeslot.

Table 6.1: UE Power Classes

Operating Band	Power Class 1		Power Class 2		Power Class 3		Power Class 4	
	Power (dBm)	Tol (dB)	Power (dBm)	Tol (dB)	Power (dBm)	Tol (dB)	Power (dBm)	Tol (dB)
Band I	+33	+1/-3	+27	+1/-3	+24	+1/-3	+21	+2/-2
Band II	-	-	-	-	+24	+1/-3	+21	+2/-2
Band III	-	-	-	-	+24	+1/-3	+21	+2/-2

NOTE: The tolerance allowed for the nominal maximum output power applies even for the multi-code transmission mode.

6.3 Frequency Error

The UE modulated carrier frequency shall be accurate to within ±0.1 PPM observed over a period of one timeslot compared to the carrier frequency received from the Node B. These signals will have an apparent error due to Node B frequency error and Doppler shift. In the later case, signals from the Node B must be averaged over sufficient time that errors due to noise or interference are allowed for within the above ±0.1PPM figure. The UE shall use the same frequency source for both RF frequency generation and the chip clock.

Table 6.2: Frequency Error

AFC	Frequency stability
ON	within ± 0.1 PPM

6.4 Output power dynamics

Power control is used to limit the interference level.

6.4.1 Open loop power control

Open loop power control is the ability of the UE transmitter to sets its output power to a specific value. The open loop power control tolerance is given in Table 6.3

6.4.1.1 Minimum requirement

The UE open loop power is defined as the ~~average~~ mean power in a timeslot or ON power duration, whichever is available~~, and they are measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off α = 0.22 and a bandwidth equal to the chip rate~~.

Table 6.3: Open loop power control tolerance

Normal conditions	± 9 dB
Extreme conditions	± 12 dB

6.4.2 Inner loop power control in the uplink

Inner loop power control in the Uplink is the ability of the UE transmitter to adjust its output power in accordance with one or more TPC commands received in the downlink.

6.4.2.1 Power control steps

The power control step is the change in the UE transmitter output power in response to a single TPC command, TPC_cmd, derived at the UE.

6.4.2.1.1 Minimum requirement

The UE transmitter shall have the capability of changing the output power with a step size of 1, 2 and 3 dB according to the value of Δ_{TPC} or Δ_{RP-TPC}, in the slot immediately after the TPC_cmd can be derived

(a) The transmitter output power step due to inner loop power control shall be within the range shown in Table 6.4.

(b) The transmitter average output power step due to inner loop power control shall be within the range shown in Table 6.5. Here a TPC_cmd group is a set of TPC_cmd values derived from a corresponding sequence of TPC commands of the same duration.

The inner loop power step is defined as the relative power difference between the ~~average~~ mean power of the original (reference) timeslot and the ~~average~~ mean power of the target timeslot, not including the transient duration. The transient duration is from 25µs before the slot boundary to 25µs after the slot boundary.~~The power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off α = 0.22 and a bandwidth equal to the chip rate.~~

Table 6.4: Transmitter power control range

TPC_ cmd	Transmitter power control range					
	1 dB step size		2 dB step size		3 dB step size	
	Lower	Upper	Lower	Upper	Lower	Upper
+ 1	+0.5 dB	+1.5 dB	+1 dB	+3 dB	+1.5 dB	+4.5 dB
0	-0.5 dB	+0.5 dB	-0.5 dB	+0.5 dB	-0.5 dB	+0.5 dB
-1	-0.5 dB	-1.5 dB	-1 dB	-3 dB	-1.5 dB	-4.5 dB

Table 6.5: Transmitter ~~average~~ aggregate power control range

TPC_ cmd group	Transmitter power control range after 10 equal TPC_ cmd groups				Transmitter power control range after 7 equal TPC_ cmd groups	
	1 dB step size		2 dB step size		3 dB step size	
	Lower	Upper	Lower	Upper	Lower	Upper
+1	+8 dB	+12 dB	+16 dB	+24 dB	+16 dB	+26 dB
0	-1 dB	+1 dB	-1 dB	+1 dB	-1 dB	+1 dB
-1	-8 dB	-12 dB	-16 dB	-24 dB	-16 dB	-26 dB
0,0,0,0,+1	+6 dB	+14 dB	N/A	N/A	N/A	N/A
0,0,0,0,-1	-6 dB	-14 dB	N/A	N/A	N/A	N/A

The UE shall meet the above requirements for inner loop power control over the power range bounded by the Minimum output power as defined in subclause 6.4.3, and the Maximum output power supported by the UE (i.e. the actual power as would be measured assuming no measurement error). This power shall be in the range specified for the power class of the UE in subclause 6.2.1.

6.4.3 Minimum output power

The minimum controlled output power of the UE is when the power is set to a minimum value.

6.4.3.1 Minimum requirement

The minimum output power is defined ~~as an averaged~~the mean power in ~~a~~one time slot ~~measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off α = 0.22 and a bandwidth equal to the chip rate~~. The minimum output power shall be less than –50 dBm.

6.4.4 Out-of-synchronization handling of output power

The UE shall monitor the DPCCH quality in order to detect a loss of the signal on Layer 1, as specified in TS 25.214. The thresholds Q_{out} and Q_{in} specify at what DPCCH quality levels the UE shall shut its power off and when it shall turn its power on respectively. The thresholds are not defined explicitly, but are defined by the conditions under which the UE shall shut its transmitter off and turn it on, as stated in this subclause.

The DPCCH quality shall be monitored in the UE and compared to the thresholds Q_{out} and Q_{in} for the purpose of monitoring synchronization. The threshold Q_{out} should correspond to a level of DPCCH quality where no reliable detection of the TPC commands transmitted on the downlink DPCCH can be made. This can be at a TPC command error ratio level of e.g. 30%. The threshold Q_{in} should correspond to a level of DPCCH quality where detection of the TPC commands transmitted on the downlink DPCCH is significantly more reliable than at Q_{out}. This can be at a TPC command error ratio level of e.g. 20%.

6.4.4.1 Minimum requirement

When the UE estimates the DPCCH quality over the last 160 ms period to be worse than a threshold Q_{out}, the UE shall shut its transmitter off within 40 ms. The UE shall not turn its transmitter on again until the DPCCH quality exceeds an acceptable level Q_{in}. When the UE estimates the DPCCH quality over the last 160 ms period to be better than a threshold Q_{in}, the UE shall again turn its transmitter on within 40 ms.

The UE transmitter shall be considered "off" if the transmitted power is below the level defined in subclause 6.5.1 (Transmit off power). Otherwise the transmitter shall be considered as "on".

6.4.4.2 Test case

This subclause specifies a test case, which provides additional information for how the minimum requirement should be interpreted for the purpose of conformance testing.

The quality levels at the thresholds Q_{out} and Q_{in} correspond to different signal levels depending on the downlink conditions DCH parameters. For the conditions in Table 6.6, a signal with the quality at the level Q_{out} can be generated by a DPCCH_Ec/Ior ratio of –25 dB, and a signal with Q_{in} by a DPCCH_Ec/Ior ratio of –21 dB. The DL reference

measurement channel (12.2) kbps specified in subclause A.3.1 and with static propagation conditions. The downlink physical channels, other than those specified in Table 6.6, are as specified in Table C.3 of Annex C.

Figure 6.1 shows an example scenario where the DPCCH_Ec/Ior ratio varies from a level where the DPCH is demodulated under normal conditions, down to a level below Q_{out} where the UE shall shut its power off and then back up to a level above Q_{in} where the UE shall turn the power back on.

Table 6.6: DCH parameters for the Out-of-synch handling test case

Parameter	Unit	Value
$\hat{I}_{or}/I_{oc}$	dB	-1
I_{oc}	dBm/3.84 MHz	-60
$\frac{DPDCH\_E_c}{I_{or}}$	dB	See figure 6.1: Before point A -16.6 After point A Not defined
$\frac{DPCCH\_E_c}{I_{or}}$	dB	See figure 6.1
Information Data Rate	kbps	12.2

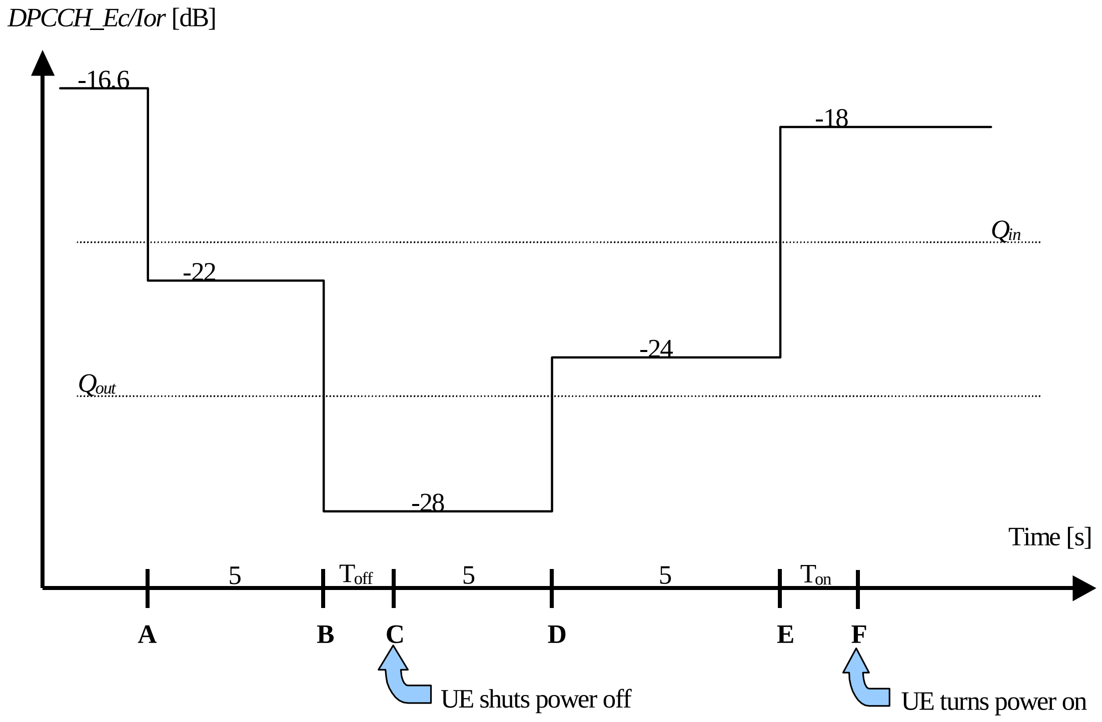

Figure 6.1: Test case for out-of-synch handling in the UE

In this test case, the requirements for the UE are that:

1. The UE shall not shut its transmitter off before point B.
2. The UE shall shut its transmitter off before point C, which is T_{off} = 200 ms after point B.
3. The UE shall not turn its transmitter on between points C and E.
4. The UE shall turn its transmitter on before point F, which is T_{on} = 200 ms after point E.

6.5 Transmit ON/OFF power

6.5.1 Transmit OFF power

Transmit OFF power is defined as the RRC filtered meanaverage power when the transmitter is off. The transmit OFF power state is when the UE does not transmit except during UL compressed mode.

6.5.1.1 Minimum requirement

The transmit OFF power is defined as the RRC filtered meanaverage power in a duration of at least one timeslot excluding any transient periods, measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off $\alpha = 0.22$ and a bandwidth equal to the chip rate. The requirement for the transmit OFF power shall be less than –56 dBm.

6.5.2 Transmit ON/OFF Time mask

The time mask for transmit ON/OFF defines the ramping time allowed for the UE between transmit OFF power and transmit ON power. Possible ON/OFF scenarios are RACH ,CPCH or UL compressed mode.

6.5.2.1 Minimum requirement

The transmit power levels versus time shall meet the mask specified in figure 6.2 for PRACH preambles and CPCH preambles, and the mask in figure 6.3 for all other cases. The off signal is measured defined as the RRC filtered mean powerwith a filter that has a Root-Raised Cosine (RRC) filter response with a roll off $\alpha = 0.22$ and a bandwidth equal to the chip rate.

The Oon signal is defined as the mean power is defined as either case as follows.

The specification depends on each possible case.

- First preamble of RACH/CPCH: Open loop accuracy (Table 6.3).

- During preamble ramping of the RACH/CPCH, and between final RACH/CPCH preamble and RACH/CPCH message part: Accuracy depending on size of the required power difference.(Table 6.7). The step in total transmitted power between final RACH/CPCH preamble and RACH/CPCH message (control part + data part) shall be rounded to the closest integer dB value. A power step exactly half-way between two integer values shall be rounded to the closest integer of greater magnitude.

- After transmission gaps in compressed mode: Accuracy as in Table 6.9.

- Power step to Maximum Power: Maximum power accuracy (Table 6.1).

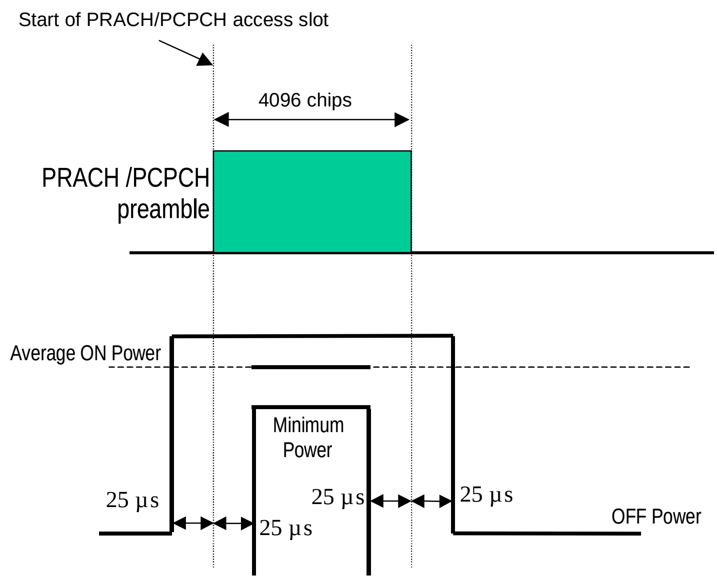

Figure 6.2: Transmit ON/OFF template for PRACH preambles and CPCH preambles

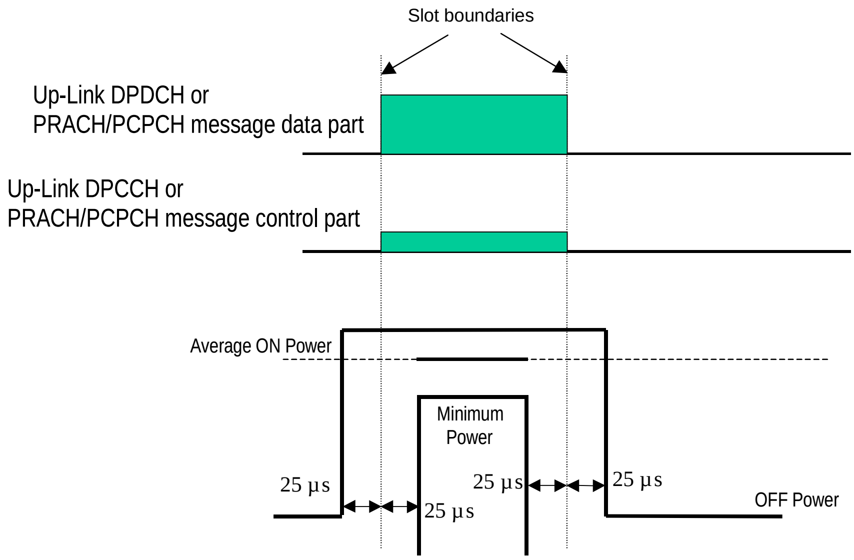

Figure 6.3: Transmit ON/OFF template for all other On/Off cases

Table 6.7: Transmitter power difference tolerance for RACH/CPCH preamble ramping, and between final RACH/CPCH preamble and RACH/CPCH message part

Power step size (Up or down)* ΔP [dB]	Transmitter power difference tolerance [dB]
0	+/- 1 dB
1	+/- 1 dB
2	+/- 1.5 dB
3	+/- 2 dB
$4 \leq \Delta P \leq 10$	+/- 2.5 dB
$11 \leq \Delta P \leq 15$	+/- 3.5 dB
$16 \leq \Delta P \leq 20$	+/- 4.5 dB
$21 \leq \Delta P$	+/- 6.5 dB

NOTE: Power step size for RACH/CPCH preamble ramping is from 1 to 8 dB with 1 dB steps.

6.5.3 Change of TFC

A change of TFC (Transport Format Combination) in uplink means that the power in the uplink varies according to the change in data rate. DTX, where the DPCH is turned off, is a special case of variable data, which is used to minimise the interference between UE(s) by reducing the UE transmit power when voice, user or control information is not present.

6.5.3.1 Minimum requirement

A change of output power is required when the TFC, and thereby the data rate, is changed. The ratio of the amplitude between the DPDCH codes and the DPCCH code will vary. The power step due to a change in TFC shall be calculated in the UE so that the power transmitted on the DPCCH shall follow the inner loop power control. The step in total transmitted power (DPCCH + DPDCH) shall then be rounded to the closest integer dB value. A power step exactly half-way between two integer values shall be rounded to the closest integer of greater magnitude. The accuracy of the power step, given the step size, is specified in Table 6.8. The power change due to a change in TFC is defined as the relative power difference between the ~~average~~ mean power of the original (reference) timeslot and the ~~average~~ mean power of the target timeslot, not including the transient duration. The transient duration is from 25µs before the slot boundary to 25µs after the slot boundary. ~~The power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off α = 0.22 and a bandwidth equal to the chip rate.~~

Table 6.8: Transmitter power step tolerance

Power step size (Up or down) ΔP [dB]	Transmitter power step tolerance [dB]
0	+/- 0.5 dB
1	+/- 0.5 dB
2	+/- 1.0 dB
3	+/- 1.5 dB
$4 \le \Delta P \le 10$	+/- 2.0 dB
$11 \le \Delta P \le 15$	+/- 3.0 dB
$16 \le \Delta P \le 20$	+/- 4.0 dB
$21 \le \Delta P$	+/- 6.0 dB

The transmit power levels versus time shall meet the mask specified in Figure 6.4.

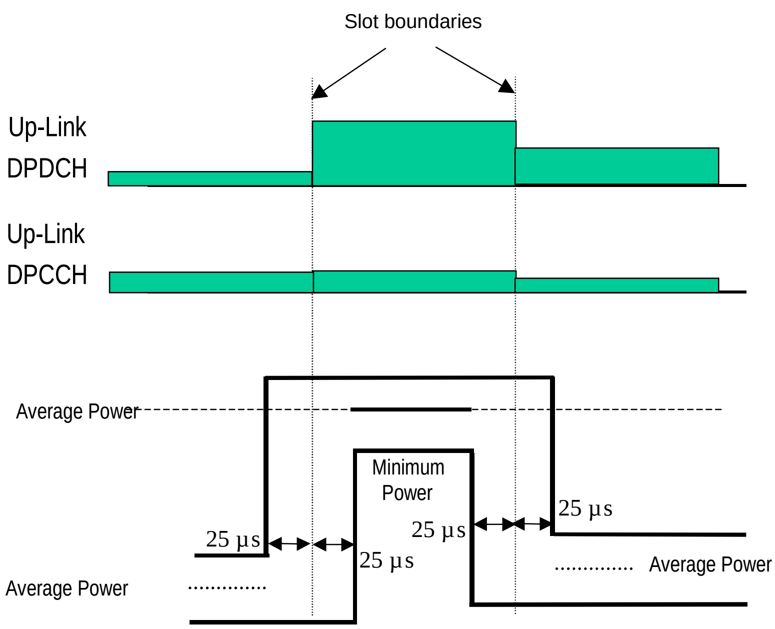

Figure 6.4: Transmit template during TFC change

6.5.4 Power setting in uplink compressed mode

Compressed mode in uplink means that the power in uplink is changed.

6.5.4.1 Minimum requirement

A change of output power is required during uplink compressed frames since the transmission of data is performed in a shorter interval. The ratio of the amplitude between the DPDCH codes and the DPCCH code will also vary. The power step due to compressed mode shall be calculated in the UE so that the energy transmitted on the pilot bits during each transmitted slot shall follow the inner loop power control.

Thereby, the power during compressed mode, and immediately afterwards, shall be such that the mean power of~~n~~ the DPCCH follows the steps due to inner loop power control combined with additional steps of $10\text{Log}_{10}(N_{pilot.prev} / N_{pilot.curr})$ dB where $N_{pilot.prev}$ is the number of pilot bits in the previously transmitted slot, and $N_{pilot.curr}$ is the current number of pilot bits per slot.

The resulting step in total transmitted power (DPCCH +DPDCH) shall then be rounded to the closest integer dB value. A power step exactly half-way between two integer values shall be rounded to the closest integer of greatest magnitude. The accuracy of the power step, given the step size, is specified in Table 6.8 in subclause 6.5.3.1. The power step is defined as the relative power difference between the ~~average~~ mean power of the original (reference) timeslot and the ~~average~~ mean power of the target timeslot, when neither the original timeslot nor the reference timeslot are in a transmission gap. The transient duration is not included, and is from 25µs before the slot boundary to 25µs after the slot boundary. ~~The relative power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off α = 0.22 and a bandwidth equal to the chip rate.~~

In addition to any power change due to the ratio $N_{pilot.prev} / N_{pilot.curr}$, the ~~average~~ mean power of the DPCCH in the first slot after a compressed mode transmission gap shall differ from the ~~average~~ mean power of the DPCCH in the last slot before the transmission gap by an amount Δ_{RESUME}, where Δ_{RESUME} is calculated as described in clause 5.1.2.3 of TS 25.214.

The resulting difference in the total transmitted power (DPCCH + DPDCH) shall then be rounded to the closest integer dB value. A power difference exactly half-way between two integer values shall be rounded to the closest integer of greatest magnitude. The accuracy of the resulting difference in the total transmitted power (DPCCH + DPDCH) after a transmission gap of up to 14 slots shall be as specified in Table 6.9.

Table 6.9: Transmitter power difference tolerance after a transmission gap of up to 14 slots

Tolerance on required difference in total transmitter power after a transmission gap
+/- 3 dB

The power difference is defined as the ~~relative power~~ difference between the ~~average~~ mean power of the original (reference) timeslot before the transmission gap and the ~~average~~ mean power of the target timeslot after the transmission gap, not including the transient durations. The transient durations at the start and end of the transmission gaps are each from 25µs before the slot boundary to 25µs after the slot boundary. ~~The relative power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off α = 0.22 and a bandwidth equal to the chip rate.~~

The transmit power levels versus time shall meet the mask specified in figure 6.5.

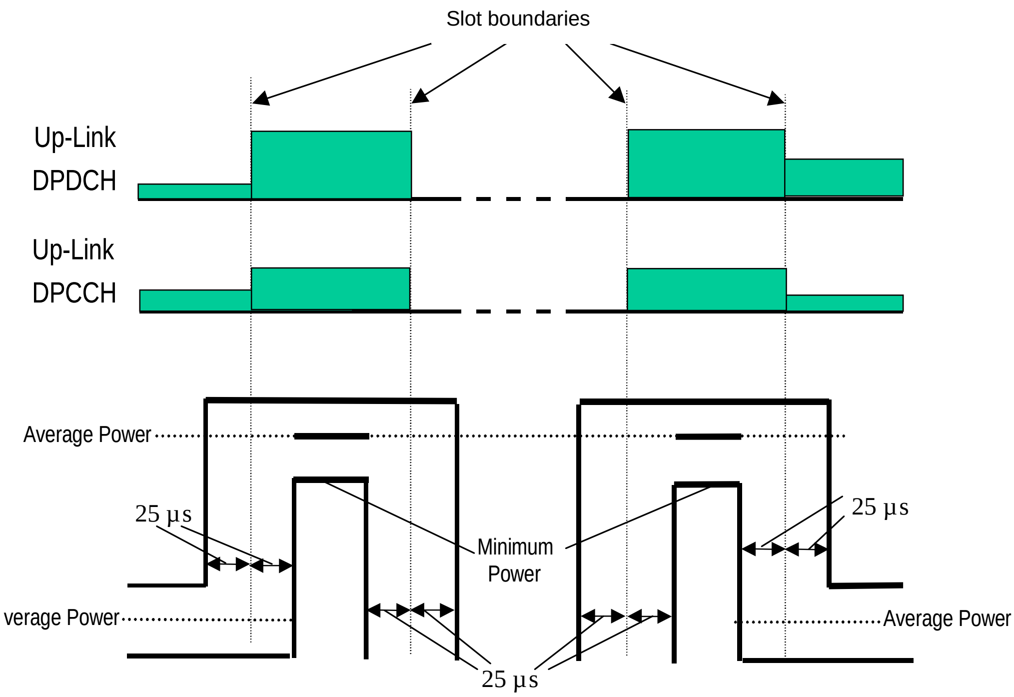

Figure 6.5: Transmit template during Compressed mode

6.6 Output RF spectrum emissions

6.6.1 Occupied bandwidth

Occupied bandwidth is a measure of the bandwidth containing 99 % of the total integrated power of the transmitted spectrum, centered on the assigned channel frequency. The occupied channel bandwidth shall be less than 5 MHz based on a chip rate of 3.84 Mcps.

6.6.2 Out of band emission

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

6.6.2.1 Spectrum emission mask

The spectrum emission mask of the UE applies to frequencies, which are between 2.5 MHz and 12.5 MHz away from the UE centre carrier frequency. The out of channel emission is specified relative to the RRC filtered mean power of the UE carrier ~~output power measured in a 3.84 MHz bandwidth~~.

6.6.2.1.1 Minimum requirement

The power of any UE emission shall not exceed the levels specified in Table 6.10

Table 6.10: Spectrum Emission Mask Requirement

Δf* in MHz	Minimum requirement Band I, II, III	Additional requirements Band II	Measurement bandwidth
2.5 - 3.5	$\left\{-35-15\cdot\left(\frac{\Delta f}{MHz}-2.5\right)\right\}dBc$	-15 dBm	30 kHz **
3.5 - 7.5	$\left\{-35-1\cdot\left(\frac{\Delta f}{MHz}-3.5\right)\right\}dBc$	-13 dBm	1 MHz ***
7.5 - 8.5	$\left\{-39-10\cdot\left(\frac{\Delta f}{MHz}-7.5\right)\right\}dBc$	-13 dBm	1 MHz ***
8.5 - 12.5 MHz	-49 dBc	-13 dBm	1 MHz ***

* Δf is the separation between the carrier frequency and the centre of the measuring filter.

** The first and last measurement position with a 30 kHz filter is at Δf equals to 2.515 MHz and 3.485 MHz.

*** The first and last measurement position with a 1 MHz filter is at Δf equals to 4 MHz and 12 MHz. As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be different from the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

The lower limit shall be –50 dBm/3.84 MHz or which ever is higher.

6.6.2.2 Adjacent Channel Leakage power Ratio (ACLR)

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the RRC filtered mean ~~average~~ power centered on the assigned channel frequency to the RRC filtered mean ~~average~~ power centered on an adjacent channel frequency. ~~In both cases the average power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with roll-off α =0.22 and a bandwidth equal to the chip rate.~~

6.6.2.2.1 Minimum requirement

If the adjacent channel power is greater than –50dBm then the ACLR shall be higher than the value specified in Table 6.11.

Table 6.11: UE ACLR

Power Class	Adjacent channel frequency relative to assigned channel frequency	ACLR limit
3	+ 5 MHz or – 5 MHz	33 dB
3	+ 10 MHz or – 10 MHz	43 dB
4	+ 5 MHz or – 5 MHz	33 dB
4	+ 10 MHz or –10 MHz	43 dB

NOTE 1: The requirement shall still be met in the presence of switching transients.
NOTE 2: The ACLR requirements reflect what can be achieved with present state of the art technology.
NOTE 3: Requirement on the UE shall be reconsidered when the state of the art technology progresses.

6.6.3 Spurious emissions

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.

The frequency boundary and the detailed transitions of the limits between the requirement for out band emissions and spectrum emissions are based on ITU-R Recommendations SM.329-8[2].

6.6.3.1 Minimum requirement

These requirements are only applicable for frequencies, which are greater than 12.5 MHz away from the UE centre carrier frequency.

Table 6.12: General spurious emissions requirements

Frequency Bandwidth	Measurement Bandwidth	Minimum requirement
9 kHz ≤ f < 150 kHz	1 kHz	-36 dBm
150 kHz ≤ f < 30 MHz	10 kHz	-36 dBm
30 MHz ≤ f < 1000 MHz	100 kHz	-36 dBm
1 GHz ≤ f < 12.75 GHz	1 MHz	-30 dBm

Table 6.13: Additional spurious emissions requirements

Operating Band	Frequency Bandwidth	Measurement Bandwidth	Minimum requirement
I	925 MHz ≤ f ≤ 935 MHz	100 kHz	-67 dBm *
	935 MHz < f ≤ 960 MHz	100 kHz	-79 dBm *
	1805 MHz ≤ f ≤ 1880 MHz	100 kHz	-71 dBm *
	1893.5 MHz <f<1919.6 MHz	300 kHz	-41 dBm
II	-	-	-
III	925 MHz ≤ f ≤ 935 MHz	100 kHz	-67 dBm *
	935 MHz < f ≤ 960 MHz	100 kHz	-79 dBm *
	2110 MHz ≤ f ≤ 2170 MHz		
*	The measurements are made on frequencies which are integer multiples of 200 kHz. As exceptions, up to five measurements with a level up to the applicable requirements defined in Table 6.12 are permitted for each UARFCN used in the measurement		

6.7 Transmit intermodulation

The transmit intermodulation performance is a measure of the capability of the transmitter to inhibit the generation of signals in its non linear elements caused by presence of the wanted signal and an interfering signal reaching the transmitter via the antenna.

6.7.1 Minimum requirement

User Equipment(s) transmitting in close vicinity of each other can produce intermodulation products, which can fall into the UE, or Node B receive band as an unwanted interfering signal. The UE intermodulation attenuation is defined by the ratio of the ~~output~~ RRC filtered mean power of the wanted signal to the ~~output~~ RRC filtered mean power of the intermodulation product when an interfering CW signal is added at a level below the wanted signal. ~~Both the wanted signal power and the IM product power are measured with a filter that has a Root-Raised Cosine (RRC) filter response with roll-off α =0.22 and a bandwidth equal to the chip rate.~~

The requirement of transmitting intermodulation for a carrier spacing of 5 MHz is prescribed in Table 6.14.

Table 6.14: Transmit Intermodulation

Interference Signal Frequency Offset	5MHz	10MHz
Interference CW Signal Level	-40dBc	
Intermodulation Product	-31dBc	-41dBc

6.8 Transmit modulation

6.8.1 Transmit pulse shape filter

The transmit pulse shaping filter is a root-raised cosine (RRC) with roll-off α =0.22 in the frequency domain. The impulse response of the chip impulse filter $RC_0(t)$ is:

$$RC_0(t) = \frac{\sin\left(\pi \frac{t}{T_C}(1-\alpha)\right) + 4\alpha \frac{t}{T_C}\cos\left(\pi \frac{t}{T_C}(1+\alpha)\right)}{\pi \frac{t}{T_C}\left(1-\left(4\alpha \frac{t}{T_C}\right)^2\right)}$$

Where the roll-off factor α =0.22 and the chip duration is

$$T = \frac{1}{chiprate} \approx 0.26042 \quad \mu s$$

6.8.2 Error Vector Magnitude

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.

6.8.2.1 Minimum requirement

The Error Vector Magnitude shall not exceed 17.5 % for the parameters specified in Table 6.15.

Table 6.15: Parameters for Error Vector Magnitude/Peak Code Domain Error

Parameter	Unit	Level
UE Output Power	dBm	≥ –20
Operating conditions		Normal conditions
Power control step size	dB	1

6.8.3 Peak code domain error

The Peak Code Domain Error is computed by projecting power of the error vector (as defined in 6.8.2) onto the code domain at a specific spreading factor. The Code Domain Error for every code in the domain is defined as the ratio of the mean power of the projection onto that code, to the mean power of the composite reference waveform. This ratio is expressed in dB. The Peak Code Domain Error is defined as the maximum value for the Code Domain Error for all codes. The measurement interval is one ~~power control group (~~timeslot~~)~~.

The requirement for peak code domain error is only applicable for multi-code transmission.

6.8.3.1 Minimum requirement

The peak code domain error shall not exceed -15 dB at spreading factor 4 for the parameters specified in Table 6.15 . The requirements are defined using the UL reference measurement channel specified in subclause A.2.5.

7 Receiver characteristics

7.1 General

Unless otherwise stated the receiver characteristics are specified at the antenna connector of the UE. For UE(s) with an integral antenna only, a reference antenna with a gain of 0 dBi is assumed. UE with an integral antenna may be taken into account by converting these power levels into field strength requirements, assuming a 0 dBi gain antenna. Receiver characteristics for UE(s) with multiple antennas/antenna connectors are FFS.

The UE antenna performance has a significant impact on system performance, and minimum requirements on the antenna efficiency are therefore intended to be included in future versions of the present document. It is recognised that different requirements and test methods are likely to be required for the different types of UE.

All the parameters in clause 7 are defined using the DL reference measurement channel (12.2 kbps) specified in subclause A.3.1 and unless stated are with DL power control OFF.

7.2 Diversity characteristics

A suitable receiver structure using coherent reception in both channel impulse response estimation and code tracking procedures is assumed. Three forms of diversity are considered to be available in UTRA/FDD.

Table 7.1: Diversity characteristics for UTRA/FDD

Time diversity	Channel coding and interleaving in both up link and down link
Multi-path diversity	Rake receiver or other suitable receiver structure with maximum combining. Additional processing elements can increase the delay-spread performance due to increased capture of signal energy.
Antenna diversity	Antenna diversity with maximum ratio combing in the Node B and optionally in the UE. Possibility for downlink transmit diversity in the Node B.

7.3 Reference sensitivity level

The reference sensitivity level <REFSENS> is the minimum ~~receiver input~~mean power ~~measured~~ received at the UE antenna port at which the Bit Error Ratio (BER) ~~does~~ shall not exceed a specific value.

7.3.1 Minimum requirement

The BER shall not exceed 0.001 for the parameters specified in Table 7.2.

Table 7.2: Test parameters for reference sensitivity

Operating Band	Unit	DPCH_Ec <REFSENS>	<REF$\hat{I}_{or}$>
I	dBm/3.84 MHz	-117	-106.7
II	dBm/3.84 MHz	-115	-104.7
III	dBm/3.84 MHz	-114	-103.7
1. For Power class 3 this shall be at the maximum output power 2. For Power class 4 this shall be at the maximum output power			

7.4 Maximum input level

This is defined as the maximum ~~receiver input~~mean power received at the UE antenna port, which does not degrade the specified BER performance.

7.4.1 Minimum requirement

The BER shall not exceed 0.001 for the parameters specified in Table 7.3.

Table 7.3: Maximum input level

Parameter	Unit	Level
$\frac{DPCH\_Ec}{I_{or}}$	dB	-19
$\hat{I}_{or}$	dBm/3.84 MHz	-25
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)
~~1. For Power class 3 the average transmit output power shall be +20 dBm~~ ~~2. For Power class 4 the average transmit output power shall be +18 dBm~~		

NOTE: Since the spreading factor is large (10log(SF)=21dB), the majority of the total input signal consists of the OCNS interference. The structure of OCNS signal is defined in Annex C.3.2.

7.5 Adjacent Channel Selectivity (ACS)

Adjacent Channel Selectivity (ACS) is a measure of a receiver's ability to receive a W-CDMA signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

7.5.1 Minimum requirement

The ACS shall be better than the value indicated in Table 7.4 for the test parameters specified in Table 7.5 where the BER shall not exceed 0.001.

Table 7.4: Adjacent Channel Selectivity

Power Class	Unit	ACS
3	dB	33
4	dB	33

Table 7.5: Test parameters for Adjacent Channel Selectivity

Parameter	Unit	Level
DPCH_Ec	dBm/3.84 MHz	-103
$\hat{I}_{or}$	dBm/3.84 MHz	-92.7
I_{oac} mean power (modulated)	dBm~~/3.84 MHz~~	-52
F_{uw} (offset)	MHz	+5 or -5
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)
~~1. For Power class 3 the average transmit output power shall be +20 dBm~~ ~~2. For Power class 4 the average transmit output power shall be +18 dBm~~		

NOTE: The I_{oac} (modulated) signal consists of the common channels needed for tests as specified in Table C.7 and 16 dedicated data channels as specified in Table C.6.

7.6 Blocking characteristics

The blocking characteristic is a measure of the receiver's ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels, without this unwanted input signal causing a degradation of the performance of the receiver beyond a specified limit. The blocking performance shall apply at all frequencies except those at which a spurious response occur.

7.6.1 Minimum requirement (In-band blocking)

The BER shall not exceed 0.001 for the parameters specified in Table 7.6.

Table 7.6: In-band blocking

~~Parameter~~	~~Unit~~	~~Offset~~	~~Offset~~
~~DPCH_Ec~~	~~dBm/3.84 MHz~~	~~<REFSENS>+3 dB~~	~~<REFSENS>+3 dB~~
~~$\hat{I}_{or}$~~	~~dBm/3.84 MHz~~	~~<REF$\hat{I}_{or}$> + 3 dB~~	~~<REF$\hat{I}_{or}$> + 3 dB~~
~~$I_{blocking}$ (modulated)~~	~~dBm/3.84 MHz~~	~~-56~~	~~-44~~
~~F_{uw} (offset)~~	~~MHz~~	~~+10 or -10~~	~~+15 or -15~~
~~1. For Power class 3 the average transmit output power shall be +20 dBm~~ ~~2. For Power class 4 the average transmit output power shall be +18 dBm~~			

Parameter	Unit	Level	
DPCH_Ec	dBm/3.84 MHz	<REFSENS>+3 dB	
$\hat{I}_{or}$	dBm/3.84 MHz	<REF$\hat{I}_{or}$> + 3 dB	
$I_{blocking}$ mean power (modulated)	dBm	-56 (for F_{uw} offset ±10 MHz)	-44 (for F_{uw} offset ±15 MHz)
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)	

Note: $I_{blocking}$ (modulated) consists of the common channels needed for tests as specified in Table C.7 and 16 dedicated data channels as specified in Table C.6.

7.6.2 Minimum requirement (Out of-band blocking)

The BER shall not exceed 0.001 for the parameters specified in Table 7.7. For Table 7.7 up to 24 exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1 MHz step size. For these exceptions the requirements of clause 7.7 Spurious response are applicable.

Table 7.7: Out of band blocking

Parameter	Unit	Frequency range 1	Frequency range 2	Frequency range 3
DPCH_Ec	dBm/3.84 MHz	<REFSENS>+3 dB	<REFSENS>+3 dB	<REFSENS>+3 dB
$\hat{I}_{or}$	dBm/3.84 MHz	<REF$\hat{I}_{or}$> + 3 dB	<REF$\hat{I}_{or}$> + 3 dB	<REF$\hat{I}_{or}$> + 3 dB
$I_{blocking}$ (CW)	dBm	-44	-30	-15
F_{uw} (Band I operation)	MHz	2050<f <2095 2185<f <2230	2025 <f <2050 2230 <f <2255	1< f <2025 2255<f<12750
F_{uw} (Band II operation)	MHz	1870<f <1915 2005<f <2050	1845 <f <1870 2050 <f <2075	1< f <1845 2075<f<12750
III (Band III operation)	MHz	1745 <f <1790 1895<f <1940	1720 <f < 1745 1940<f < 1965	1< f <1720 1965<f<12750
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)		
Band I operation	For 2095<f<2110 MHz and 2170<f<2185 MHz, the appropriate in-band blocking or adjacent channel selectivity in subclause 7.5.1 and subclause 7.6.1 shall be applied.			
Band II operation	For 1915<f<1930 MHz and 1990<f<2005 MHz, the appropriate in-band blocking or adjacent channel selectivity in subclause 7.5.1 and subclause 7.6.2 shall be applied			
Band III operation	For 1790<f<1805 MHz and 1880<f<1895 MHz, the appropriate in-band blocking or adjacent channel selectivity in subclause 7.5.1 and subclause 7.6.2 shall be applied.			
~~1. For Power class 3 the average transmit output power shall be +20 dBm~~ ~~2. For Power class 4 the average transmit output power shall be +18 dBm~~				

7.6.3 Minimum requirement (Narrow band blocking)

The BER shall not exceed 0.001 for the parameters specified in Table 7.7A. This requirement is measure of a receiver's ability to receive a W-CDMA signal at its assigned channel frequency in the presence of an unwanted narrow band interferer at a frequency, which is less than the nominal channel spacing

Table 7.7A: Narrow band blocking characteristics

Parameter	Unit	Band II	Band III
DPCH_Ec	dBm/3.84 MHz	<REFSENS> + 10 dB	<REFSENS> + 10 dB
$\hat{I}_{or}$	dBm/3.84 MHz	<REF$\hat{I}_{or}$> + 10 dB	<REF$\hat{I}_{or}$> + 10 dB
$I_{blocking}$ (GMSK)	dBm	-57	-56
F_{uw} (offset)	MHz	2.7	2.8
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)	
~~1. For Power class 3 the average transmit output power shall be +20 dBm~~ ~~2. For Power class 4 the average transmit output power shall be +18 dBm~~			

NOTE: $I_{blocking}$ (GMSK) is an interfering signal as defined in TS45.004

7.7 Spurious response

Spurious response is a measure of the receiver's ability to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out of band blocking limit as specified in subclause 7.6.2 is not met.

7.7.1 Minimum requirement

The BER shall not exceed 0.001 for the parameters specified in Table 7.8.

Table 7.8: Spurious Response

Parameter	Unit	Level
DPCH_Ec	dBm/3.84 MHz	<REFSENS> +3 dB
$\hat{I}_{or}$	dBm/3.84 MHz	<REF$\hat{I}_{or}$> +3 dB
$I_{blocking}$ (CW)	dBm	-44
F_{uw}	MHz	Spurious response frequencies
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)
~~1. For Power class 3 the average transmit output power shall be +20 dBm~~ ~~2. For Power class 4 the average transmit output power shall be +18 dBm~~		

7.8 Intermodulation characteristics

Third and higher order mixing of the two interfering RF signals can produce an interfering signal in the band of the desired channel. Intermodulation response rejection is a measure of the capability of the receiver to receiver a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.

7.8.1 Minimum requirement

The BER shall not exceed 0.001 for the parameters specified in Table 7.9.

Table 7.9: Receive intermodulation characteristics

Parameter	Unit	Level	
DPCH_Ec	dBm/3.84 MHz	<REFSENS> +3 dB	
$\hat{I}_{or}$	dBm/3.84 MHz	<REF$\hat{I}_{or}$> +3 dB	
I_{ouw1} (CW)	dBm	-46	
I_{ouw2} mean power (modulated)	dBm~~/3.84 MHz~~	-46	
F_{uw1} (offset)	MHz	10	-10
F_{uw2} (offset)	MHz	20	-20
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)	
~~1. For Power class 3 the average transmit output power shall be +20 dBm~~ ~~2. For Power class 4 the average transmit output power shall be +18 dBm~~			

NOTE: I_{ouw2} (modulated) consists of the common channels needed for tests as specified in Table C.7 and 16 dedicated data channels as specified in Table C.6.

7.8.2 Minimum requirement (Narrow band)

The BER shall not exceed 0.001 for the parameters specified in Table 7.9A.

Table 7.9A: Receive intermodulation characteristics

Parameter	Unit	Band II		Band III	
DPCH_Ec	~~D~~dBm/3.84 MHz	<REFSENS>+ 10 dB		<REFSENS>+ 10 dB	
$\hat{I}_{or}$	~~D~~dBm/3.84 MHz	<REF$\hat{I}_{or}$> + 10 dB		[<REF$\hat{I}_{or}$> +10 dB	
I_{ouw1} (CW)	dBm	-44		-43	
I_{ouw2} (GMSK)	dBm	-44		-43	
F_{uw1} (offset)	MHz	3.5	-3.5	3.6	-3.6
F_{uw2} (offset)	MHz	5.9	-5.9	6.0	-6.0
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)			
~~1. For Power class 3 the UE shall transmit continuously at an average power of +20 dBm~~ ~~2. For Power class 4 the UE shall transmit continuously at an average power of +18 dBm~~					

NOTE: I_{ouw2} (GMSK) is an interfering signal as defined in TS45.004.

7.9 Spurious emissions

The spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the UE antenna connector.

7.9.1 Minimum requirement

The power of any narrow band CW spurious emission shall not exceed the maximum level specified in Table 7.10 and Table 7.11

Table 7.10: General receiver spurious emission requirements

Frequency Band	Measurement Bandwidth	Maximum level	Note
30MHz ≤ f < 1GHz	100 kHz	-57 dBm	
1GHz ≤ f ≤ 12.75 GHz	1 MHz	-47 dBm	

Table 7.11: Additional receiver spurious emission requirements

Band	Frequency Band	Measurement Bandwidth	Maximum level	Note
I	1920 MHz ≤ f ≤ 1980 MHz	3.84 MHz	-60 dBm	Mobile transmit band in URA_PCH, Cell_PCH and idle state
	2110 MHz ≤ f ≤ 2170 MHz	3.84 MHz	-60 dBm	Mobile receive band
II	1850 MHz ≤ f ≤ 1910 MHz	3.84 MHz	-60 dBm	UE transmit band in URA_PCH, Cell_PCH and idle state
	1930 MHz ≤ f ≤ 1990 MHz	3.84 MHz	-60 dBm	UE receive band
III	1710 MHz ≤ f ≤ 1785 MHz	3.84 MHz	-60 dBm	UE transmit band in URA_PCH, Cell_PCH and idle state
	1805 MHz ≤ f ≤ 1880 MHz	3.84 MHz	-60 dBm	UE receive band

3GPP TSG RAN WG4 Meeting #21 R4-020285

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

CR-Form-v4

CHANGE REQUEST

⌘	25.101	CR	159	⌘	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 [X] Radio Access Network [ ] Core Network [ ]

Title: ⌘	Correction of power terms and definitions		
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 existing requirements relating to power are incomplete, inconsistent and ambiguous. The proposed changes remove the possibility of misinterpreting the specification.
Summary of change: ⌘	3.1 For maximum output power, replaced the term “broadband” by defining the bandwidth as being at least (1+ α) times the chip rate over a period of at least one timeslot. This definition allows the use of a broadband (thermal) power meter. 3.1 Added definition of mean power (consistent with ITU radio regulation S1.156) which includes a minimum bandwidth requirement of (1+ α) times the chip rate. This ensures all the signal power is captured and does not unnecessarily restrict the choice of measurement method. 3.1 Average power definition becomes the RRC filtered mean power definition. 6.2.1 Replacement of “broadband” by “at least (1+ α) times the chip rate”. Added measurement period of “at least one slot”. This definition is consistent with thermal power measurements as the bandwidth and measurement period are not restricted. 6.4.1 Open loop power control defined as mean power. 6.4.2 Inner loop power control defined as mean power. Table 6.5 title “average” – changed to “aggregate”. 6.4.3 Minimum output power defined as mean power. 6.5.1 Transmit off power defined as RRC filtered mean power. 6.5.2 Transmit on power defined as mean power, off power defined as RRC filtered mean power.

		6.5.3 Change of TFC defined as mean power. 6.5.4 Power setting in uplink compressed mode defined as mean power. 6.6.2.1 Spectrum emission mask reference power defined as RRC filtered mean power. Added clarification about noise bandwidth of the integrated method. 6.6.2.2 ACLR defined as RRC filtered mean power. 6.7.1 Transmit intermodulation defined RRC filtered mean power. 6.8.3 Peak code domain error – removed reference to power control group 7.3 Receiver sensitivity level – defined as mean power. 7.4 Maximum input level – defined as mean power. Tables 7.3, 7.5, 7.6, 7.7, 7.8, & 7.9 “Average transmit output power” is changed to “UE transmitted mean power”. Table 7.5 I_{oac} defined as mean power in dBm not power spectral density in dBm/3.84 MHz. Table 7.6 format changed to match the other 5 tables. Table 7.6 and 7.9 $I_{blocking}$ defined as mean power in dBm not power spectral density in dBm/3.84 MHz.
Consequences if not approved:	⌘	Existing power specifications are incomplete, inconsistent and ambiguous which will lead to different interpretation of power quantities (e.g. maximum power, SEM, Interferer levels etc.). This will lead to inconsistent performance measurement results. Isolated impact statement: Correction of requirements. Correct interpretation of the existing spec will not affect UE implementations or system performance. However, incorrect interpretation may impact conformance test implementation and conformance test results.

Clauses affected:	⌘	3, 6, 7			
Other specs affected:	⌘	☐	Other core specifications Test specifications O&M Specifications	⌘	34.121
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.

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following definitions apply:

Maximum Output Power: This is a measure of the maximum power the UE can transmit (i.e. the actual broadband power as would be measured assuming no measurement error) in a bandwidth of at least (1+ α) times the chip rate of the radio access mode. The period of measurement shall be at least one timeslot.

Nominal Maximum Output Power: This is the nominal power defined by the UE power class.

Mean power: When applied to a W-CDMA modulated signal this is the power (transmitted or received) in a bandwidth of at least (1+ α) times the chip rate of the radio access mode. The period of measurement shall be at least one timeslot unless otherwise stated.

RRC filtered mean Average power: The thermal mean power as measured through a root raised cosine filter with roll-off factor α = 0.22 and a bandwidth equal to the chip rate of the radio access mode. The period of measurement shall be one power control group (timeslot) unless otherwise stated.

NOTE 1: The RRC filtered mean power of a perfectly modulated W-CDMA signal is 0.246 dB lower than the mean power of the same signal.

NOTE 2: The roll-off factor α is defined in section 6.8.1.

6.1 General

Unless detailed the transmitter characteristic are specified at the antenna connector of the UE. For UE with integral antenna only, a reference antenna with a gain of 0 dBi is assumed. Transmitter characteristics for UE(s) with multiple antennas/antenna connectors are FFS.

The UE antenna performance has a significant impact on system performance, and minimum requirements on the antenna efficiency are therefore intended to be included in future versions of the present document. It is recognised that different requirements and test methods are likely to be required for the different types of UE.

All the parameters in clause 6 are defined using the UL reference measurement channel (12.2 kbps) specified in subclause A.2.1 and unless stated with the UL power control ON

6.2 Transmit power

6.2.1 UE maximum output power

The following Power Classes define the nominal maximum output power. The nominal power defined is the broadband transmit power of the UE, i.e. the power in a bandwidth of at least (1+α) times the chip rate of the radio access mode. The period of measurement shall be at least one timeslot.

Table 6.1: UE Power Classes

Power Class	Nominal maximum output power	Tolerance
1	+33 dBm	+1/-3 dB
2	+27 dBm	+1/-3 dB
3	+24 dBm	+1/-3 dB
4	+21 dBm	± 2 dB

NOTE: The tolerance allowed for the nominal maximum output power applies even for the multi-code transmission mode.

6.3 Frequency Error

The UE modulated carrier frequency shall be accurate to within ±0.1 PPM observed over a period of one timeslot compared to the carrier frequency received from the Node B. These signals will have an apparent error due to Node B frequency error and Doppler shift. In the later case, signals from the Node B must be averaged over sufficient time that errors due to noise or interference are allowed for within the above ±0.1PPM figure. The UE shall use the same frequency source for both RF frequency generation and the chip clock.

Table 6.2: Frequency Error

AFC	Frequency stability
ON	within ± 0.1 PPM

6.4 Output power dynamics

Power control is used to limit the interference level.

6.4.1 Open loop power control

Open loop power control is the ability of the UE transmitter to sets its output power to a specific value. The open loop power control tolerance is given in Table 6.3

6.4.1.1 Minimum requirement

The UE open loop power is defined as the ~~average~~ mean power in a timeslot or ON power duration, whichever is available~~, and they are measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off α = 0.22 and a bandwidth equal to the chip rate~~.

Table 6.3: Open loop power control tolerance

Normal conditions	± 9 dB
Extreme conditions	± 12 dB

6.4.2 Inner loop power control in the uplink

Inner loop power control in the Uplink is the ability of the UE transmitter to adjust its output power in accordance with one or more TPC commands received in the downlink.

6.4.2.1 Power control steps

The power control step is the change in the UE transmitter output power in response to a single TPC command, TPC_cmd, derived at the UE.

6.4.2.1.1 Minimum requirement

The UE transmitter shall have the capability of changing the output power with a step size of 1, 2 and 3 dB according to the value of Δ_{TPC} or $\Delta_{RP\text{-}TPC}$, in the slot immediately after the TPC_cmd can be derived

(a) The transmitter output power step due to inner loop power control shall be within the range shown in Table 6.4.

(b) The transmitter average output power step due to inner loop power control shall be within the range shown in Table 6.5. Here a TPC_cmd group is a set of TPC_cmd values derived from a corresponding sequence of TPC commands of the same duration.

The inner loop power step is defined as the relative power difference between the ~~average~~ mean power of the original (reference) timeslot and the ~~average~~ mean power of the target timeslot, not including the transient duration. The transient duration is from 25µs before the slot boundary to 25µs after the slot boundary.~~The power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off α = 0.22 and a bandwidth equal to the chip rate~~

Table 6.4: Transmitter power control range

TPC_ cmd	Transmitter power control range					
	1 dB step size		2 dB step size		3 dB step size	
	Lower	Upper	Lower	Upper	Lower	Upper
+ 1	+0.5 dB	+1.5 dB	+1 dB	+3 dB	+1.5 dB	+4.5 dB
0	-0.5 dB	+0.5 dB	-0.5 dB	+0.5 dB	-0.5 dB	+0.5 dB
-1	-0.5 dB	-1.5 dB	-1 dB	-3 dB	-1.5 dB	-4.5 dB

Table 6.5: Transmitter ~~average~~ aggregate power control range

TPC_ cmd group	Transmitter power control range after 10 equal TPC_ cmd groups				Transmitter power control range after 7 equal TPC_ cmd groups	
	1 dB step size		2 dB step size		3 dB step size	
	Lower	Upper	Lower	Upper	Lower	Upper
+1	+8 dB	+12 dB	+16 dB	+24 dB	+16 dB	+26 dB
0	-1 dB	+1 dB	-1 dB	+1 dB	-1 dB	+1 dB
-1	-8 dB	-12 dB	-16 dB	-24 dB	-16 dB	-26 dB
0,0,0,0,+1	+6 dB	+14 dB	N/A	N/A	N/A	N/A
0,0,0,0,-1	-6 dB	-14 dB	N/A	N/A	N/A	N/A

The UE shall meet the above requirements for inner loop power control over the power range bounded by the Minimum output power as defined in subclause 6.4.3, and the Maximum output power supported by the UE (i.e. the actual power as would be measured assuming no measurement error). This power shall be in the range specified for the power class of the UE in subclause 6.2.1.

6.4.3 Minimum output power

The minimum controlled output power of the UE is when the power is set to a minimum value.

6.4.3.1 Minimum requirement

The minimum output power is defined as ~~an averaged~~the mean power in ~~a~~one time slot ~~measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off α = 0.22 and a bandwidth equal to the chip rate~~. The minimum output power shall be less than –50 dBm.

6.4.4 Out-of-synchronization handling of output power

The UE shall monitor the DPCCH quality in order to detect a loss of the signal on Layer 1, as specified in TS 25.214. The thresholds Q_{out} and Q_{in} specify at what DPCCH quality levels the UE shall shut its power off and when it shall turn its power on respectively. The thresholds are not defined explicitly, but are defined by the conditions under which the UE shall shut its transmitter off and turn it on, as stated in this subclause.

The DPCCH quality shall be monitored in the UE and compared to the thresholds Q_{out} and Q_{in} for the purpose of monitoring synchronization. The threshold Q_{out} should correspond to a level of DPCCH quality where no reliable detection of the TPC commands transmitted on the downlink DPCCH can be made. This can be at a TPC command error ratio level of e.g. 30%. The threshold Q_{in} should correspond to a level of DPCCH quality where detection of the TPC commands transmitted on the downlink DPCCH is significantly more reliable than at Q_{out}. This can be at a TPC command error ratio level of e.g. 20%.

6.4.4.1 Minimum requirement

When the UE estimates the DPCCH quality over the last 160 ms period to be worse than a threshold Q_{out}, the UE shall shut its transmitter off within 40 ms. The UE shall not turn its transmitter on again until the DPCCH quality exceeds an acceptable level Q_{in}. When the UE estimates the DPCCH quality over the last 160 ms period to be better than a threshold Q_{in}, the UE shall again turn its transmitter on within 40 ms.

The UE transmitter shall be considered “off” if the transmitted power is below the level defined in subclause 6.5.1 (Transmit off power). Otherwise the transmitter shall be considered as “on”.

6.4.4.2 Test case

This subclause specifies a test case, which provides additional information for how the minimum requirement should be interpreted for the purpose of conformance testing.

The quality levels at the thresholds Q_{out} and Q_{in} correspond to different signal levels depending on the downlink conditions DCH parameters. For the conditions in Table 6.6, a signal with the quality at the level Q_{out} can be generated by a DPCCH_Ec/Ior ratio of –25 dB, and a signal with Q_{in} by a DPCCH_Ec/Ior ratio of –21 dB. The DL reference

measurement channel (12.2) kbps specified in subclause A.3.1 and with static propagation conditions. The downlink physical channels, other than those specified in Table 6.6, are as specified in Table C.3 of Annex C.

Figure 6.1 shows an example scenario where the DPCCH_Ec/Ior ratio varies from a level where the DPCH is demodulated under normal conditions, down to a level below Q_{out} where the UE shall shut its power off and then back up to a level above Q_{in} where the UE shall turn the power back on.

Table 6.6: DCH parameters for the Out-of-synch handling test case

Parameter	Unit	Value
$\hat{I}_{or}/I_{oc}$	dB	-1
I_{oc}	dBm/3.84 MHz	-60
$\frac{DPDCH\_E_c}{I_{or}}$	dB	See figure 6.1: Before point A -16.6 After point A Not defined
$\frac{DPCCH\_E_c}{I_{or}}$	dB	See figure 6.1
Information Data Rate	kbps	12.2

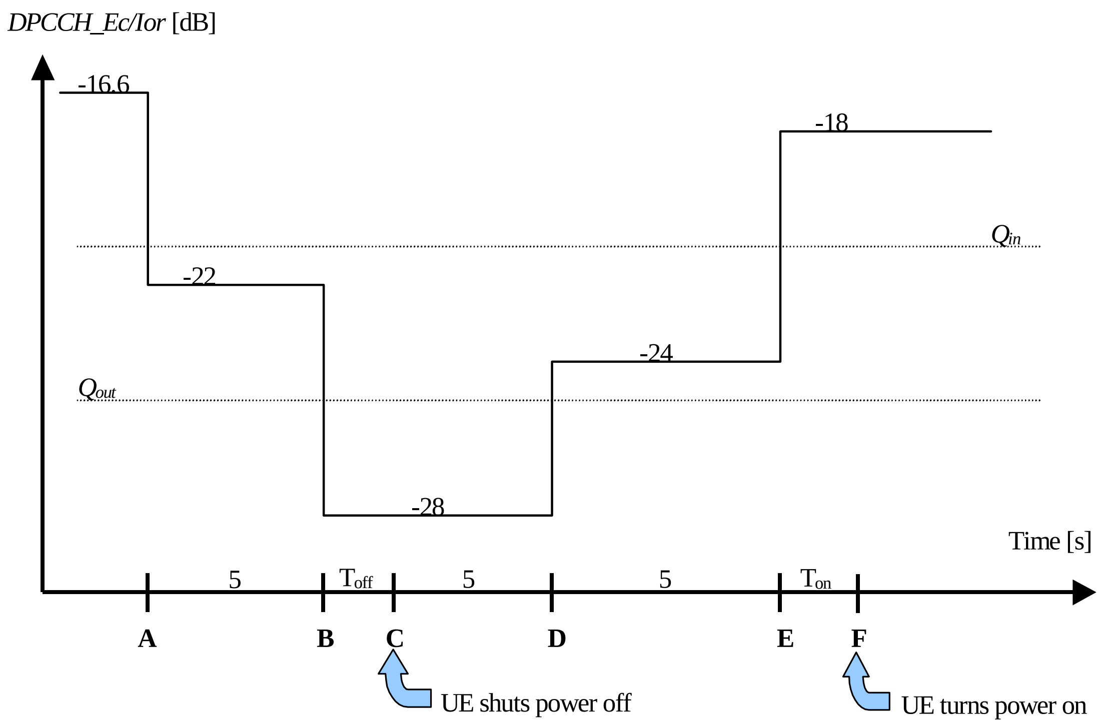

Figure 6.1: Test case for out-of-synch handling in the UE

In this test case, the requirements for the UE are that:

1. The UE shall not shut its transmitter off before point B.
2. The UE shall shut its transmitter off before point C, which is T_{off} = 200 ms after point B.
3. The UE shall not turn its transmitter on between points C and E.
4. The UE shall turn its transmitter on before point F, which is T_{on} = 200 ms after point E.

6.5 Transmit ON/OFF power

6.5.1 Transmit OFF power

Transmit OFF power is defined as the RRC filtered mean~~average~~ power when the transmitter is off. The transmit OFF power state is when the UE does not transmit except during UL compressed mode.

6.5.1.1 Minimum requirement

The transmit OFF power is defined as the RRC filtered mean~~average~~ power in a duration of at least one timeslot excluding any transient periods~~, measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off α = 0.22 and a bandwidth equal to the chip rate~~. The requirement for the transmit OFF power shall be less than –56 dBm.

6.5.2 Transmit ON/OFF Time mask

The time mask for transmit ON/OFF defines the ramping time allowed for the UE between transmit OFF power and transmit ON power. Possible ON/OFF scenarios are RACH ,CPCH or UL compressed mode.

6.5.2.1 Minimum requirement

The transmit power levels versus time shall meet the mask specified in figure 6.2 for PRACH preambles and CPCH preambles, and the mask in figure 6.3 for all other cases. The off signal is ~~measured~~ defined as the RRC filtered mean power~~with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off α = 0.22 and a bandwidth equal to the chip rate~~.

The ~~O~~on signal is defined as the mean power~~ is defined as either case as follows~~.

The specification depends on each possible case.

- First preamble of RACH/CPCH: Open loop accuracy (Table 6.3).

- During preamble ramping of the RACH/CPCH, and between final RACH/CPCH preamble and RACH/CPCH message part: Accuracy depending on size of the required power difference.(Table 6.7). The step in total transmitted power between final RACH/CPCH preamble and RACH/CPCH message (control part + data part) shall be rounded to the closest integer dB value. A power step exactly half-way between two integer values shall be rounded to the closest integer of greater magnitude.

- After transmission gaps in compressed mode: Accuracy as in Table 6.9.

- Power step to Maximum Power: Maximum power accuracy (Table 6.1).

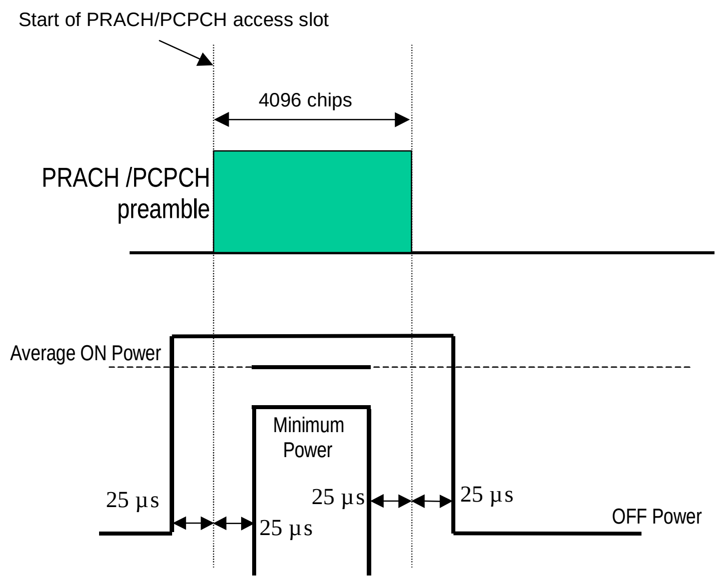

Figure 6.2: Transmit ON/OFF template for PRACH preambles and CPCH preambles

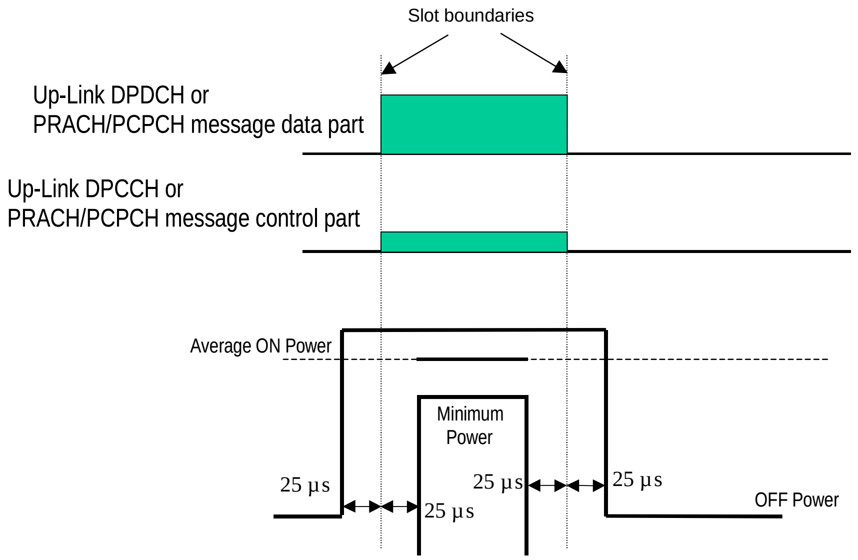

Figure 6.3: Transmit ON/OFF template for all other On/Off cases

Table 6.7: Transmitter power difference tolerance for RACH/CPCH preamble ramping, and between final RACH/CPCH preamble and RACH/CPCH message part

Power step size (Up or down)* ΔP [dB]	Transmitter power difference tolerance [dB]
0	+/- 1 dB
1	+/- 1 dB
2	+/- 1.5 dB
3	+/- 2 dB
4 ≤ ΔP ≤ 10	+/- 2.5 dB
11 ≤ ΔP ≤ 15	+/- 3.5 dB
16 ≤ ΔP ≤ 20	+/- 4.5 dB
21 ≤ ΔP	+/- 6.5 dB

NOTE: Power step size for RACH/CPCH preamble ramping is from 1 to 8 dB with 1 dB steps.

6.5.3 Change of TFC

A change of TFC (Transport Format Combination) in uplink means that the power in the uplink varies according to the change in data rate. DTX, where the DPCH is turned off, is a special case of variable data, which is used to minimise the interference between UE(s) by reducing the UE transmit power when voice, user or control information is not present.

6.5.3.1 Minimum requirement

A change of output power is required when the TFC, and thereby the data rate, is changed. The ratio of the amplitude between the DPDCH codes and the DPCCH code will vary. The power step due to a change in TFC shall be calculated in the UE so that the power transmitted on the DPCCH shall follow the inner loop power control. The step in total transmitted power (DPCCH + DPDCH) shall then be rounded to the closest integer dB value. A power step exactly half-way between two integer values shall be rounded to the closest integer of greater magnitude. The accuracy of the power step, given the step size, is specified in Table 6.8. The power change due to a change in TFC is defined as the relative power difference between the ~~average~~ mean power of the original (reference) timeslot and the ~~average~~ mean power of the target timeslot, not including the transient duration. The transient duration is from 25µs before the slot boundary to 25µs after the slot boundary. ~~The power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off α = 0.22 and a bandwidth equal to the chip rate.~~

Table 6.8: Transmitter power step tolerance

Power step size (Up or down) ΔP [dB]	Transmitter power step tolerance [dB]
0	+/- 0.5 dB
1	+/- 0.5 dB
2	+/- 1.0 dB
3	+/- 1.5 dB
$4 \leq \Delta P \leq 10$	+/- 2.0 dB
$11 \leq \Delta P \leq 15$	+/- 3.0 dB
$16 \leq \Delta P \leq 20$	+/- 4.0 dB
$21 \leq \Delta P$	+/- 6.0 dB

The transmit power levels versus time shall meet the mask specified in Figure 6.4.

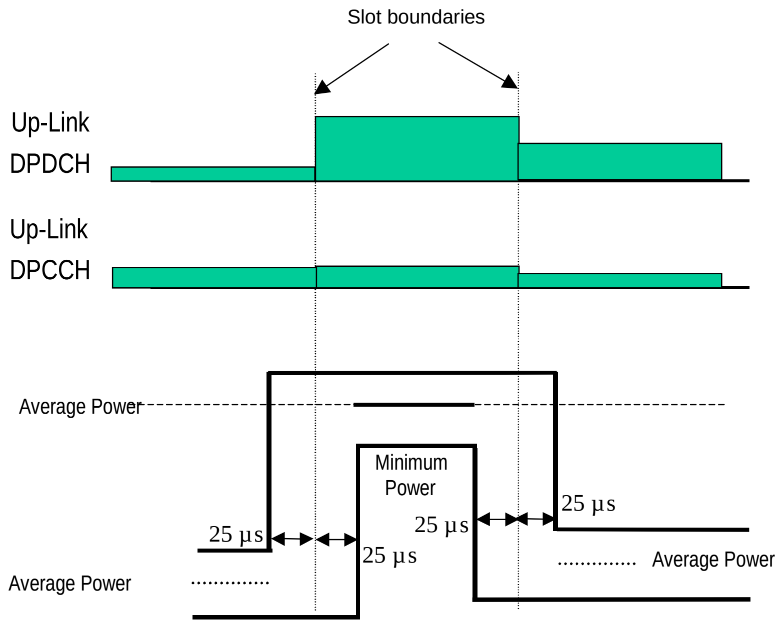

Figure 6.4: Transmit template during TFC change

6.5.4 Power setting in uplink compressed mode

Compressed mode in uplink means that the power in uplink is changed.

6.5.4.1 Minimum requirement

A change of output power is required during uplink compressed frames since the transmission of data is performed in a shorter interval. The ratio of the amplitude between the DPDCH codes and the DPCCH code will also vary. The power step due to compressed mode shall be calculated in the UE so that the energy transmitted on the pilot bits during each transmitted slot shall follow the inner loop power control.

Thereby, the power during compressed mode, and immediately afterwards, shall be such that the mean power ofn the DPCCH follows the steps due to inner loop power control combined with additional steps of $10Log_{10}(N_{pilot.prev} / N_{pilot.curr})$ dB where $N_{pilot.prev}$ is the number of pilot bits in the previously transmitted slot, and $N_{pilot.curr}$ is the current number of pilot bits per slot.

The resulting step in total transmitted power (DPCCH +DPDCH) shall then be rounded to the closest integer dB value. A power step exactly half-way between two integer values shall be rounded to the closest integer of greatest magnitude. The accuracy of the power step, given the step size, is specified in Table 6.8 in subclause 6.5.3.1. The power step is defined as the relative power difference between the average mean power of the original (reference) timeslot and the average mean power of the target timeslot, when neither the original timeslot nor the reference timeslot are in a transmission gap. The transient duration is not included, and is from 25µs before the slot boundary to 25µs after the slot boundary. The relative power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off α = 0.22 and a bandwidth equal to the chip rate.

In addition to any power change due to the ratio $N_{pilot.prev} / N_{pilot.curr}$, the average mean power of the DPCCH in the first slot after a compressed mode transmission gap shall differ from the average mean power of the DPCCH in the last slot before the transmission gap by an amount Δ_{RESUME}, where Δ_{RESUME} is calculated as described in clause 5.1.2.3 of TS 25.214.

The resulting difference in the total transmitted power (DPCCH + DPDCH) shall then be rounded to the closest integer dB value. A power difference exactly half-way between two integer values shall be rounded to the closest integer of greatest magnitude. The accuracy of the resulting difference in the total transmitted power (DPCCH + DPDCH) after a transmission gap of up to 14 slots shall be as specified in Table 6.9.

Table 6.9: Transmitter power difference tolerance after a transmission gap of up to 14 slots

Tolerance on required difference in total transmitter power after a transmission gap
+/- 3 dB

The power difference is defined as the relative power difference between the average mean power of the original (reference) timeslot before the transmission gap and the average mean power of the target timeslot after the transmission gap, not including the transient durations. The transient durations at the start and end of the transmission gaps are each from 25µs before the slot boundary to 25µs after the slot boundary. The relative power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off α = 0.22 and a bandwidth equal to the chip rate.

The transmit power levels versus time shall meet the mask specified in figure 6.5.

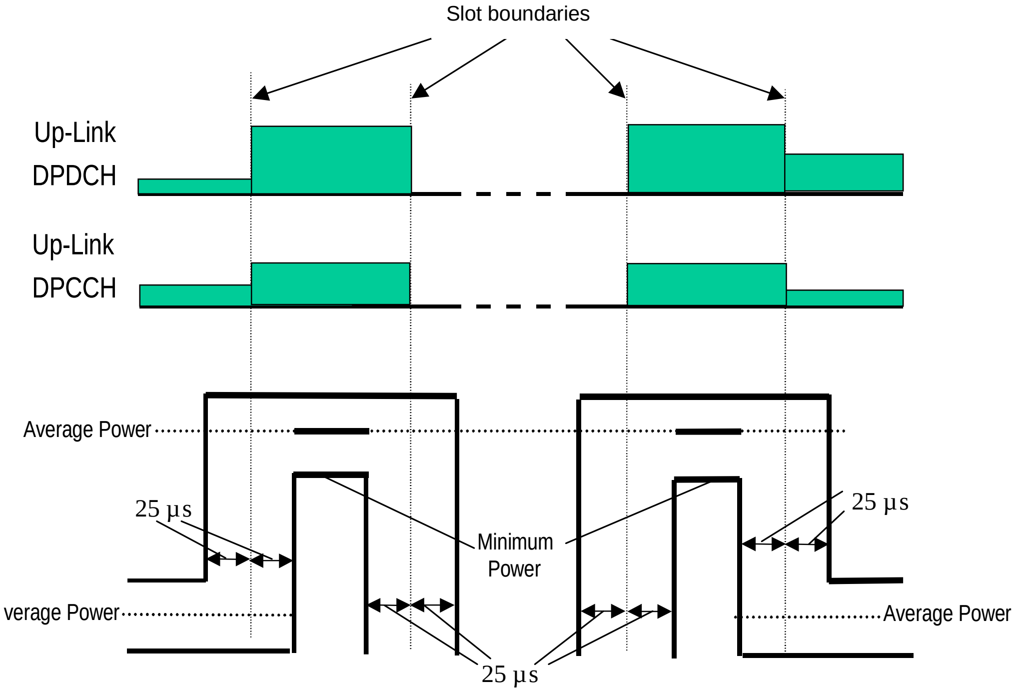

Figure 6.5: Transmit template during Compressed mode

6.6 Output RF spectrum emissions

6.6.1 Occupied bandwidth

Occupied bandwidth is a measure of the bandwidth containing 99 % of the total integrated power of the transmitted spectrum, centered on the assigned channel frequency. The occupied channel bandwidth shall be less than 5 MHz based on a chip rate of 3.84 Mcps.

6.6.2 Out of band emission

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

6.6.2.1 Spectrum emission mask

The spectrum emission mask of the UE applies to frequencies, which are between 2.5 MHz and 12.5 MHz away from the UE centre carrier frequency. The out of channel emission is specified relative to the RRC filtered mean power of the UE carrier ~~output power measured in a 3.84 MHz bandwidth~~.

6.6.2.1.1 Minimum requirement

The power of any UE emission shall not exceed the levels specified in Table 6.10

Table 6.10: Spectrum Emission Mask Requirement

Δf* in MHz	Minimum requirement	Additional Minimum requirement for operation in Band b	Measurement bandwidth
2.5 - 3.5	$\left\{-35-15\cdot\left(\frac{\Delta f}{MHz}-2.5\right)\right\}dBc$	-15 dBm	30 kHz **
3.5 - 7.5	$\left\{-35-1\cdot\left(\frac{\Delta f}{MHz}-3.5\right)\right\}dBc$	-13 dBm	1 MHz ***
7.5 - 8.5	$\left\{-39-10\cdot\left(\frac{\Delta f}{MHz}-7.5\right)\right\}dBc$	-13 dBm	1 MHz ***
8.5 - 12.5 MHz	-49 dBc	-13 dBm	1 MHz ***
* Δf is the separation between the carrier frequency and the centre of the measuring filter.			
** The first and last measurement position with a 30 kHz filter is at Δf equals to 2.515 MHz and 3.485 MHz.			
*** The first and last measurement position with a 1 MHz filter is at Δf equals to 4 MHz and 12 MHz. As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be different from the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.			
The lower limit shall be –50 dBm/3.84 MHz or which ever is higher.			

6.6.2.2 Adjacent Channel Leakage power Ratio (ACLR)

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the RRC filtered mean ~~average~~ power centered on the assigned channel frequency to the RRC filtered mean ~~average~~ power centered on an adjacent channel frequency. ~~In both cases the average power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with roll-off α =0.22 and a bandwidth equal to the chip rate.~~

6.6.2.2.1 Minimum requirement

If the adjacent channel power is greater than –50dBm then the ACLR shall be higher than the value specified in Table 6.11.

Table 6.11: UE ACLR

Power Class	Adjacent channel frequency relative to assigned channel frequency	ACLR limit
3	+ 5 MHz or – 5 MHz	33 dB
3	+ 10 MHz or – 10 MHz	43 dB
4	+ 5 MHz or – 5 MHz	33 dB
4	+ 10 MHz or –10 MHz	43 dB

NOTE 1: The requirement shall still be met in the presence of switching transients.
NOTE 2: The ACLR requirements reflect what can be achieved with present state of the art technology.
NOTE 3: Requirement on the UE shall be reconsidered when the state of the art technology progresses.

6.6.3 Spurious emissions

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.

The frequency boundary and the detailed transitions of the limits between the requirement for out band emissions and spectrum emissions are based on ITU-R Recommendations SM.329-8[2].

6.6.3.1 Minimum requirement

These requirements are only applicable for frequencies, which are greater than 12.5 MHz away from the UE centre carrier frequency.

Table 6.12: General spurious emissions requirements

Frequency Bandwidth	Measurement Bandwidth	Minimum requirement
9 kHz ≤ f < 150 kHz	1 kHz	-36 dBm
150 kHz ≤ f < 30 MHz	10 kHz	-36 dBm
30 MHz ≤ f < 1000 MHz	100 kHz	-36 dBm
1 GHz ≤ f < 12.75 GHz	1 MHz	-30 dBm

Table 6.13: Additional spurious emissions requirements

Paired band	Frequency Bandwidth	Measurement Bandwidth	Minimum requirement
For operation in frequency bands as defined in subclause 5.2(a)	1893.5 MHz <f<1919.6 MHz	300 kHz	-41 dBm
	925 MHz ≤ f ≤ 935 MHz	100 kHz	-67 dBm *
	935 MHz < f ≤ 960 MHz	100 kHz	-79 dBm *
	1805 MHz ≤ f ≤ 1880 MHz	100 kHz	-71 dBm *
*: The measurements are made on frequencies which are integer multiples of 200 kHz. As exceptions, up to five measurements with a level up to the applicable requirements defined in Table 6.12 are permitted for each UARFCN used in the measurement			

6.7 Transmit intermodulation

The transmit intermodulation performance is a measure of the capability of the transmitter to inhibit the generation of signals in its non linear elements caused by presence of the wanted signal and an interfering signal reaching the transmitter via the antenna.

6.7.1 Minimum requirement

User Equipment(s) transmitting in close vicinity of each other can produce intermodulation products, which can fall into the UE, or Node B receive band as an unwanted interfering signal. The UE intermodulation attenuation is defined by the ratio of the ~~output~~ RRC filtered mean power of the wanted signal to the ~~output~~ RRC filtered mean power of the intermodulation product when an interfering CW signal is added at a level below the wanted signal. ~~Both the wanted signal power and the IM product power are measured with a filter that has a Root-Raised Cosine (RRC) filter response with roll-off α =0.22 and a bandwidth equal to the chip rate.~~

The requirement of transmitting intermodulation for a carrier spacing of 5 MHz is prescribed in Table 6.14.

Table 6.14: Transmit Intermodulation

Interference Signal Frequency Offset	5MHz	10MHz
Interference CW Signal Level	-40dBc	
Intermodulation Product	-31dBc	-41dBc

6.8 Transmit modulation

6.8.1 Transmit pulse shape filter

The transmit pulse shaping filter is a root-raised cosine (RRC) with roll-off α =0.22 in the frequency domain. The impulse response of the chip impulse filter $RC_0(t)$ is:

$$RC_0(t) = \frac{\sin\left(\pi \frac{t}{T_C}(1-\alpha)\right) + 4\alpha \frac{t}{T_C} \cos\left(\pi \frac{t}{T_C}(1+\alpha)\right)}{\pi \frac{t}{T_C}\left(1-\left(4\alpha \frac{t}{T_C}\right)^2\right)}$$

Where the roll-off factor α =0.22 and the chip duration is

$$T = \frac{1}{chiprate} \approx 0.26042 \ \mu s$$

6.8.2 Error Vector Magnitude

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.

6.8.2.1 Minimum requirement

The Error Vector Magnitude shall not exceed 17.5 % for the parameters specified in Table 6.15.

Table 6.15: Parameters for Error Vector Magnitude/Peak Code Domain Error

Parameter	Unit	Level
UE Output Power	dBm	≥ –20
Operating conditions		Normal conditions
Power control step size	dB	1

6.8.3 Peak code domain error

The Peak Code Domain Error is computed by projecting power of the error vector (as defined in 6.8.2) onto the code domain at a specific spreading factor. The Code Domain Error for every code in the domain is defined as the ratio of the mean power of the projection onto that code, to the mean power of the composite reference waveform. This ratio is expressed in dB. The Peak Code Domain Error is defined as the maximum value for the Code Domain Error for all codes. The measurement interval is one ~~power control group (~~timeslot~~)~~.

The requirement for peak code domain error is only applicable for multi-code transmission.

6.8.3.1 Minimum requirement

The peak code domain error shall not exceed -15 dB at spreading factor 4 for the parameters specified in Table 6.15 . The requirements are defined using the UL reference measurement channel specified in subclause A.2.5.

7 Receiver characteristics

7.1 General

Unless otherwise stated the receiver characteristics are specified at the antenna connector of the UE. For UE(s) with an integral antenna only, a reference antenna with a gain of 0 dBi is assumed. UE with an integral antenna may be taken into account by converting these power levels into field strength requirements, assuming a 0 dBi gain antenna. Receiver characteristics for UE(s) with multiple antennas/antenna connectors are FFS.

The UE antenna performance has a significant impact on system performance, and minimum requirements on the antenna efficiency are therefore intended to be included in future versions of the present document. It is recognised that different requirements and test methods are likely to be required for the different types of UE.

All the parameters in clause 7 are defined using the DL reference measurement channel (12.2 kbps) specified in subclause A.3.1 and unless stated are with DL power control OFF.

7.2 Diversity characteristics

A suitable receiver structure using coherent reception in both channel impulse response estimation and code tracking procedures is assumed. Three forms of diversity are considered to be available in UTRA/FDD.

Table 7.1: Diversity characteristics for UTRA/FDD

Time diversity	Channel coding and interleaving in both up link and down link
Multi-path diversity	Rake receiver or other suitable receiver structure with maximum combining. Additional processing elements can increase the delay-spread performance due to increased capture of signal energy.
Antenna diversity	Antenna diversity with maximum ratio combing in the Node B and optionally in the UE. Possibility for downlink transmit diversity in the Node B.

7.3 Reference sensitivity level

The reference sensitivity level is the minimum ~~receiver input~~mean power ~~measured~~ received at the UE antenna port at which the Bit Error Ratio (BER) ~~does~~ shall not exceed a specific value.

7.3.1 Minimum requirement

The BER shall not exceed 0.001 for the parameters specified in Table 7.2.

Table 7.2: Test parameters for reference sensitivity

Parameter	Unit	Level
DPCH_Ec	dBm/3.84 MHz	-117
$\hat{I}_{or}$	dBm/3.84 MHz	-106.7
1. For Power class 3 this shall be at the maximum output power		
2. For Power class 4 this shall be at the maximum output power		

7.4 Maximum input level

This is defined as the maximum ~~receiver input~~mean power received at the UE antenna port, which does not degrade the specified BER performance.

7.4.1 Minimum requirement

The BER shall not exceed 0.001 for the parameters specified in Table 7.3.

Table 7.3: Maximum input level

Parameter	Unit	Level
$\frac{DPCH\_Ec}{I_{or}}$	dB	-19
$\hat{I}_{or}$	dBm/3.84 MHz	-25
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)
~~1. For Power class 3 the average transmit output power shall be +20 dBm~~ ~~2. For Power class 4 the average transmit output power shall be +18 dBm~~		

NOTE: Since the spreading factor is large (10log(SF)=21dB), the majority of the total input signal consists of the OCNS interference. The structure of OCNS signal is defined in Annex C.3.2.

7.5 Adjacent Channel Selectivity (ACS)

Adjacent Channel Selectivity (ACS) is a measure of a receiver's ability to receive a W-CDMA signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

7.5.1 Minimum requirement

The ACS shall be better than the value indicated in Table 7.4 for the test parameters specified in Table 7.5 where the BER shall not exceed 0.001.

Table 7.4: Adjacent Channel Selectivity

Power Class	Unit	ACS
3	dB	33
4	dB	33

Table 7.5: Test parameters for Adjacent Channel Selectivity

Parameter	Unit	Level
DPCH_Ec	dBm/3.84 MHz	-103
$\hat{I}_{or}$	dBm/3.84 MHz	-92.7
I_{oac} mean power (modulated)	dBm~~/3.84 MHz~~	-52
F_{uw} (offset)	MHz	+5 or -5
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)
~~1. For Power class 3 the average transmit output power shall be +20 dBm~~ ~~2. For Power class 4 the average transmit output power shall be +18 dBm~~		

NOTE: The I_{oac} (modulated) signal consists of the common channels needed for tests as specified in Table C.7 and 16 dedicated data channels as specified in Table C.6.

7.6 Blocking characteristics

The blocking characteristic is a measure of the receiver's ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels, without this unwanted input signal causing a degradation of the performance of the receiver beyond a specified limit. The blocking performance shall apply at all frequencies except those at which a spurious response occur.

7.6.1 Minimum requirement

The BER shall not exceed 0.001 for the parameters specified in Table 7.6 and Table 7.7. For Table 7.7 up to 24 exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1 MHz step size.

Table 7.6: In-band blocking

~~Parameter~~	~~Unit~~	~~Offset~~	~~Offset~~
~~DPCH_Ec~~	~~dBm/3.84 MHz~~	~~-114~~	~~-114~~
~~$\hat{I}_{or}$~~	~~dBm/3.84 MHz~~	~~-103.7~~	~~-103.7~~
~~$I_{blocking}$ (modulated)~~	~~dBm/3.84 MHz~~	~~-56~~	~~-44~~
~~F_{uw} (offset)~~	~~MHz~~	~~+10 or -10~~	~~+15 or -15~~
~~1. For Power class 3 the average transmit output power shall be +20 dBm~~ ~~2. For Power class 4 the average transmit output power shall be +18 dBm~~			

Parameter	Unit	Level	
DPCH_Ec	dBm/3.84 MHz	-114	
$\hat{I}_{or}$	dBm/3.84 MHz	-103.7	
$I_{blocking}$ mean power (modulated)	dBm	-56 (for F_{uw} offset ±10 MHz)	-44 (for F_{uw} offset ±15 MHz)
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)	

Note: $I_{blocking}$ (modulated) consists of the common channels needed for tests as specified in Table C.7 and 16 dedicated data channels as specified in Table C.6.

Table 7.7: Out of band blocking

Parameter	Unit	Band 1	Band 2	Band 3
DPCH_Ec	dBm/3.84 MHz	-114	-114	-114
$\hat{I}_{or}$	dBm/3.84 MHz	-103.7	-103.7	-103.7
$I_{blocking}$ (CW)	dBm	-44	-30	-15
F_{uw} For operation in frequency bands as defined in subclause 5.2(a)	MHz	2050<f <2095 2185<f <2230	2025 <f <2050 2230 <f <2255	1< f <2025 2255<f<12750
F_{uw} For operation in frequency bands as defined in subclause 5.2(b)	MHz	1870<f <1915 2005<f <2050	1845 <f <1870 2050 <f <2075	1< f <1845 2075<f<12750
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)		
~~1. For Power class 3 the average transmit output power shall be +20 dBm~~ ~~2. For Power class 4 the average transmit output power shall be +18 dBm~~				
For operation in bands referenced in 5.2(a), from 2095<f<2110 MHz and 2170<f<2185 MHz, the appropriate in-band blocking or adjacent channel selectivity in subclause 7.5.1 and table 7.6 shall be applied.				
For operation in bands referenced in 5.2(b), 1915<f<1930 MHz and 1990<f<2005 MHz, the appropriate in-band blocking or adjacent channel selectivity in subclause 7.5.1 and table 7.6 shall be applied				

7.7 Spurious response

Spurious response is a measure of the receiver's ability to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the blocking limit is not met.

7.7.1 Minimum requirement

The BER shall not exceed 0.001 for the parameters specified in Table 7.8.

Table 7.8: Spurious Response

Parameter	Unit	Level
DPCH_Ec	dBm/3.84 MHz	-114
$\hat{I}_{or}$	dBm/3.84 MHz	-103.7
$I_{blocking}$ (CW)	dBm	-44
F_{uw}	MHz	Spurious response frequencies
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)
1. For Power class 3 the average transmit output power shall be +20 dBm 2. For Power class 4 the average transmit output power shall be +18 dBm		

7.8 Intermodulation characteristics

Third and higher order mixing of the two interfering RF signals can produce an interfering signal in the band of the desired channel. Intermodulation response rejection is a measure of the capability of the receiver to receiver a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.

7.8.1 Minimum requirement

The BER shall not exceed 0.001 for the parameters specified in Table 7.9.

Table 7.9: Receive intermodulation characteristics

Parameter	Unit	Level	
DPCH_Ec	dBm/3.84 MHz	-114	
$\hat{I}_{or}$	dBm/3.84 MHz	-103.7	
I_{ouw1} (CW)	dBm	-46	
I_{ouw2} mean power (modulated)	dBm/3.84 MHz	-46	
F_{uw1} (offset)	MHz	10	-10
F_{uw2} (offset)	MHz	20	-20
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)	
1. For Power class 3 the average transmit output power shall be +20 dBm 2. For Power class 4 the average transmit output power shall be +18 dBm			

NOTE: I_{ouw2} (modulated) consists of the common channels needed for tests as specified in Table C.7 and 16 dedicated data channels as specified in Table C.6.

7.9 Spurious emissions

The spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the UE antenna connector.

7.9.1 Minimum requirement

The power of any narrow band CW spurious emission shall not exceed the maximum level specified in Table 7.10 and Table 7.11

Table 7.10: General receiver spurious emission requirements

Frequency Band	Measurement Bandwidth	Maximum level	Note
30MHz ≤ f < 1GHz	100 kHz	-57 dBm	
1GHz ≤ f ≤ 12.75 GHz	1 MHz	-47 dBm	

Table 7.11: Additional receiver spurious emission requirements

	Frequency Band	Measurement Bandwidth	Maximum level	Note
For operation in frequency bands as defined in subclause 5.2(a)	1920 MHz ≤ f ≤ 1980 MHz	3.84 MHz	-60 dBm	Mobile transmit band in URA_PCH, Cell_PCH and idle state
	2110 MHz ≤ f ≤ 2170 MHz	3.84 MHz	-60 dBm	Mobile receive band

3GPP TSG RAN WG4 Meeting #21 R4-020492

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CR-Form-v4

CHANGE REQUEST

⌘	**25.101**	**CR**	**158**	⌘	ev	**1**	⌘	Current version:	**3.9.0**	⌘

*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 [X] Radio Access Network [ ] Core Network [ ]

Title:	⌘	Correction of power spectral density
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 existing requirements relating to power spectral density are incomplete. The bandwidth over which the power spectral density should be integrated is missing. The assumption that this should be 3.84 MHz is incorrect for signals containing information since the energy of the signal extends to (1+α) times the chip rate. For band limited white noise, it is correct to assume a (noise) bandwidth equal to the chip rate. Without these clarifications, it will not be possible to correctly generate or measure any of the quantities involved.
Summary of change:	⌘	3.2 Abbreviations: I_{oc}, I_{or} and $\hat{I}_{or}$ definitions clarified with note. 8 Performance required: The term "DPCH_Ec/Ior power" changed to "DPCH_Ec/Ior power ratio" Annex B: Table B.1: Change "Average Power" to "Relative Average Power". Annex C: Tables C.2; C.3; C.4 and C.5 Change "Power" to "Power ratio".
Consequences if not approved:	⌘	The incomplete requirements can be interpreted differently causing an incorrect understanding of UE performance. Isolated impact statement: Correction of requirements. Should not affect UE implementations or system performance but may impact conformance test implementation and conformance test results.

Clauses affected:	⌘	3, 8, Annex B, Annex C
Other specs affected:	⌘	[ ] Other core specifications ⌘ 34.121 [ ] Test specifications [ ] O&M Specifications
Other comments:	⌘	

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3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following definitions apply:

Maximum Output Power: This s a measure of the maximum power the UE can transmit (i.e. the actual broadband power as would be measured assuming no measurement error).

Nominal Maximum Output Power: This is the nominal power defined by the UE power class.

Average power: The thermal power as measured through a root raised cosine filter with roll-off $\alpha = 0.22$ and a bandwidth equal to the chip rate of the radio access mode. The period of measurement shall be one power control group (timeslot) unless otherwise stated.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ACLR	Adjacent Channel Leakage power Ratio
ACS	Adjacent Channel Selectivity
AICH	Acquisition Indication Channel
BER	Bit Error Ratio
BLER	Block Error Ratio
CW	Continuous Wave (un-modulated signal)
DCH	Dedicated Channel, which is mapped into Dedicated Physical Channel.
DL	Down Link (forward link)
DTX	Discontinuous Transmission
DPCCH	Dedicated Physical Control Channel
DPCH	Dedicated Physical Channel
$DPCH\_E_c$	Average energy per PN chip for DPCH.
$\frac{DPCH\_E_c}{I_{or}}$	The ratio of the transmit energy per PN chip of the DPCH to the total transmit power spectral density at the Node B antenna connector.
DPDCH	Dedicated Physical Data Channel
EIRP	Effective Isotropic Radiated Power
E_c	Average energy per PN chip.
$\frac{E_c}{I_{or}}$	The ratio of the average transmit energy per PN chip for different fields or physical channels to the total transmit power spectral density.
FACH	Forward Access Channel
FDD	Frequency Division Duplex
FDR	False transmit format Detection Ratio. A false Transport Format detection occurs when the receiver detects a different TF to that which was transmitted, and the decoded transport block(s) for this incorrect TF passes the CRC check(s).
F_{uw}	Frequency of unwanted signal. This is specified in bracket in terms of an absolute frequency(s) or a frequency offset from the assigned channel frequency.
Information Data Rate	Rate of the user information, which must be transmitted over the Air Interface. For example, output rate of the voice codec.
I_o	The total received power spectral density , including signal and interference, as measured at the UE antenna connector.
I_{oc}	The power spectral density (integrated in a noise bandwidth equal to the chip rate and normalized to the chip rate) of a band limited white noise source (simulating interference from cells, which are not defined in a test procedure) as measured at the UE antenna connector.

I_{or}	The total transmit power spectral density (integrated in a bandwidth of (1+α) times the chip rate and normalized to the chip rate) of the down-link signal at the Node B antenna connector.
$\hat{I}_{or}$	The received power spectral density (integrated in a bandwidth of (1+α) times the chip rate and normalized to the chip rate) of the down-link signal as measured at the UE antenna connector.
MER	Message Error Ratio
Node B	A logical node responsible for radio transmission / reception in one or more cells to/from the User Equipment. Terminates the Iub interface towards the RNC
OCNS	Orthogonal Channel Noise Simulator, a mechanism used to simulate the users or control signals on the other orthogonal channels of a downlink link.
$OCNS\_E_c$	Average energy per PN chip for the OCNS.
$\frac{OCNS\_E_c}{I_{or}}$	The ratio of the average transmit energy per PN chip for the OCNS to the total transmit power spectral density.
P-CCPCH	Primary Common Control Physical Channel
PCH	Paging Channel
$P-CCPCH\ \frac{E_c}{I_o}$	The ratio of the received P-CCPCH energy per chip to the total received power spectral density at the UE antenna connector.
$\frac{P-CCPCH\_E_c}{I_{or}}$	The ratio of the average transmit energy per PN chip for the P-CCPCH to the total transmit power spectral density.
P-CPICH	Primary Common Pilot Channel
PICH	Paging Indicator Channel
PPM	Parts Per Million
RACH	Random Access Channel
SCH	Synchronization Channel consisting of Primary and Secondary synchronization channels
$S-CCPCH$	Secondary Common Control Physical Channel.
$S-CCPCH\_E_c$	Average energy per PN chip for S-CCPCH.
SIR	Signal to Interference ratio
SSDT	Site Selection Diversity Transmission
STTD	Space Time Transmit Diversity
TDD	Time Division Duplexing
TFC	Transport Format Combination
TFCI	Transport Format Combination Indicator
TPC	Transmit Power Control
TSTD	Time Switched Transmit Diversity
UE	User Equipment
UL	Up Link (reverse link)
UTRA	UMTS Terrestrial Radio Access

NOTE: The units of Power Spectral Density (PSD) are extensively used in this document. PSD is a function of power versus frequency and when integrated across a given bandwidth, the function represents the mean power in such a bandwidth. When the mean power is normalised to (divided by) the chip-rate it represents the mean energy per chip. Some signals are directly defined in terms of energy per chip, ($DPCH\_E_c$, E_c, $OCNS\_E_c$ and $S-CCPCH\_E_c$) and others defined in terms of PSD (I_o, I_{oc}, I_{or} and $\hat{I}_{or}$). There also exist quantities that are a ratio of energy per chip to PSD ($DPCH\_E_c/I_{or}$, E_c/I_{or} etc.). This is the common practice of relating energy magnitudes in communication systems.

It can be seen that if both energy magnitudes in the ratio are divided by time, the ratio is converted from an energy ratio to a power ratio, which is more useful from a measurement point of view. It follows that an energy per chip of X dBm/3.84 MHz can be expressed as a mean power per chip of X dBm. Similarly, a signal PSD of Y dBm/3.84 MHz can be expressed as a signal power of Y dBm.

8.2.3 Demodulation of Dedicated Channel (DCH)

The receive characteristic of the Dedicated Channel (DCH) in the static environment is determined by the Block Error Ratio (BLER). BLER is specified for each individual data rate of the DCH. DCH is mapped into the Dedicated Physical Channel (DPCH).

8.2.3.1 Minimum requirement

For the parameters specified in Table 8.5 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.6. These requirements are applicable for TFCS size 16.

Table 8.5: DCH parameters in static propagation conditions

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
Phase reference		P-CPICH			
$\hat{I}_{or}/I_{oc}$	dB	-1			
I_{oc}	dBm/3.84 MHz	-60			
Information Data Rate	kbps	12.2	64	144	384

Table 8.6: DCH requirements in static propagation conditions

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-16.6 dB	10^{-2}
2	-13.1 dB	10^{-1}
	-12.8 dB	10^{-2}
3	-9.9 dB	10^{-1}
	-9.8 dB	10^{-2}
4	-5.6 dB	10^{-1}
	-5.5 dB	10^{-2}

8.3 Demodulation of DCH in multi-path fading propagation conditions

8.3.1 Single Link Performance

The receive characteristics of the Dedicated Channel (DCH) in different multi-path fading environments are determined by the Block Error Ratio (BLER) values. BLER is measured for the each of the individual data rate specified for the DPCH. DCH is mapped into in Dedicated Physical Channel (DPCH).

8.3.1.1 Minimum requirement

For the parameters specified in Table 8.7, 8.9 , 8.11, 8.13 and 8.14A the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.8, 8.10, 8.12, 8.14 and 8.14B. These requirements are applicable for TFCS size 16.

8.4 Demodulation of DCH in moving propagation conditions

8.4.1 Single link performance

The receive single link performance of the Dedicated Channel (DCH) in dynamic moving propagation conditions are determined by the Block Error Ratio (BLER) values. BLER is measured for the each of the individual data rate specified for the DPCH. DCH is mapped into Dedicated Physical Channel (DPCH).

8.4.1.1 Minimum requirement

For the parameters specified in Table 8.15 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.16.

Table 8.15: DCH parameters in moving propagation conditions

Parameter	Unit	Test 1	Test 2
Phase reference		P-CPICH	
$\hat{I}_{or}/I_{oc}$	dB	-1	
I_{oc}	dBm/3.84 MHz	-60	
Information Data Rate	kbps	12.2	64

Table 8.16: DCH requirements in moving propagation conditions

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-14.5 dB	10^{-2}
2	-10.9 dB	10^{-2}

8.5 Demodulation of DCH in birth-death propagation conditions

8.5.1 Single link performance

The receive single link performance of the Dedicated Channel (DCH) in dynamic birth-death propagation conditions are determined by the Block Error Ratio (BLER) values. BER is measured for the each of the individual data rate specified for the DPCH. DCH is mapped into Dedicated Physical Channel (DPCH).

8.5.1.1 Minimum requirement

For the parameters specified in Table 8.17 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.18.

Table 8.17: DCH parameters in birth-death propagation conditions

Parameter	Unit	Test 1	Test 2
Phase reference		P-CPICH	
$\hat{I}_{or}/I_{oc}$	dB	-1	
I_{oc}	dBm/3.84 MHz	-60	
Information Data Rate	kbps	12.2	64

Table 8.18: DCH requirements in birth-death propagation conditions

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-12.6 dB	10^{-2}
2	-8.7 dB	10^{-2}

8.6 Demodulation of DCH in downlink Transmit diversity modes

8.6.1 Demodulation of DCH in open-loop transmit diversity mode

The receive characteristic of the Dedicated Channel (DCH) in open loop transmit diversity mode is determined by the Block Error Ratio (BLER). DCH is mapped into in Dedicated Physical Channel (DPCH).

8.6.1.1 Minimum requirement

For the parameters specified in Table 8.19 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.20.

Table 8.19: Test parameters for DCH reception in an open loop transmit diversity scheme (Propagation condition: Case 1)

Parameter	Unit	Test 1
Phase reference		P-CPICH
$\hat{I}_{or}/I_{oc}$	dB	9
I_{oc}	dBm/3.84 MHz	-60
Information data rate	kbps	12.2

Table 8.20: Test requirements for DCH reception in open loop transmit diversity scheme

Test Number	$\frac{DPCH\_E_c}{I_{or}}$ (antenna 1/2)	BLER
1	-16.8 dB	10^{-2}

8.6.2 Demodulation of DCH in closed loop transmit diversity mode

The receive characteristic of the dedicated channel (DCH) in closed loop transmit diversity mode is determined by the Block Error Ratio (BLER). DCH is mapped into in Dedicated Physical Channel (DPCH).

8.6.2.1 Minimum requirement

For the parameters specified in Table 8.21 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.22.

Table 8.21: Test Parameters for DCH Reception in closed loop transmit diversity mode (Propagation condition: Case 1)

Parameter	Unit	Test 1 (Mode 1)	Test 2 (Mode 2)
$\hat{I}_{or}/I_{oc}$	dB	9	9
I_{oc}	dBm/3.84 MHz	-60	-60
Information data rate	kbps	12.2	12.2
Feedback error rate	%	4	4

Table 8.22: Test requirements for DCH reception in closed loop transmit diversity mode

Test Number	$\frac{DPCH\_E_c}{I_{or}}$ (see note)	BLER
1	-18.0 dB	10^{-2}
2	-18.3 dB	10^{-2}
NOTE: This is the total power from both antennas. Power sharing between antennas are feedback mode dependent as specified in TS25.214.		

8.6.3 Demodulation of DCH in Site Selection Diversity Transmission Power Control mode

The bit error characteristics of UE receiver is determined in Site Selection Diversity Transmission power control (SSDT) mode. Two Node B emulators are required for this performance test. The delay profiles of signals received from different Node Bs are assumed to be the same but time shifted by 10 chip periods (2604 ns).

8.6.3.1 Minimum requirements

The downlink physical channels and their relative power to Ior are the same as those specified in clause C.3.2 irrespective of Node Bs and the test cases. DPCH_Ec/Ior value applies whenever DPDCH in the cell is transmitted. In Test 1 and Test 3, the received powers at UE from two Node Bs are the same, while 3dB offset is given to one that comes from one of Node Bs for Test 2 and Test 4 as specified in Table 8.23.

For the parameters specified in Table 8.23 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.24.

Table 8.23: DCH parameters in multi-path propagation conditions during SSDT mode (Propagation condition: Case 1)

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
Phase reference		P-CPICH			
$\hat{I}_{or1}/I_{oc}$	dB	0	-3	0	0
$\hat{I}_{or2}/I_{oc}$	dB	0	0	0	-3
I_{oc}	dBm/3.84 MHz	-60			
Information Data Rate	kbps	12.2	12.2	12.2	12.2
Cell ID code word error ratio in uplink	%	1	1	1	1
Number of FBI bits assigned to "S" Field		1	1	2	2
Code word Set		Long	Long	Short	Short
UL DPCCH slot Format		#2		#5	

NOTE: The code word errors are introduced independently in both uplink channels.

Table 8.24: DCH requirements in multi-path propagation conditions during SSDT Mode

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-7.5 dB	10^{-2}
2	-6.5 dB	10^{-2}
3	-10.5 dB	10^{-2}
4	-9.2 dB	10^{-2}

8.7 Demodulation in Handover conditions

8.7.1 Demodulation of DCH in Inter-Cell Soft Handover

The bit error rate characteristics of UE is determined during an inter-cell soft handover. During the soft handover a UE receives signals from different cells. A UE has to be able to demodulate two PCCPCH channels and to combine the energy of DCH channels. Delay profiles of signals received from different cells are assumed to be the same but time shifted by 10 chips.

The receive characteristics of the different channels during inter-cell handover are determined by the average Block Error Ratio (BLER) values.

8.7.1.1 Minimum requirement

For the parameters specified in Table 8.25 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.26.

Table 8.25: DCH parameters in multi-path propagation conditions during Soft Handoff (Case 3)

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
Phase reference		P-CPICH			
$\hat{I}_{or1}/I_{oc}$ and $\hat{I}_{or2}/I_{oc}$	dB	0	0	3	6
I_{oc}	dBm/3.84 MHz	-60			
Information data Rate	kbps	12.2	64	144	384

Table 8.26: DCH requirements in multi-path propagation conditions during Soft Handoff (Case 3)

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-15.2 dB	10^{-2}
2	-11.8 dB	10^{-1}
	-11.3 dB	10^{-2}
3	-9.6 dB	10^{-1}
	-9.2 dB	10^{-2}
4	-6.0 dB	10^{-1}
	-5.5 dB	10^{-2}

8.7.2 Combining of TPC commands from radio links of different radio link sets

8.7.2.1 Minimum requirement

Test parameters are specified in Table 8.27. The delay profiles of the signals received from the different cells are the same but time-shifted by 10 chips.

For Test 1, the uplink power changes between adjacent slots shall be as shown in Table 8.28 over the 4 consecutive slots. Note that this case is without an additional noise source I_{oc}.

For Test 2, the Cell1 and Cell2 TPC patterns are repeated a number of times. If the transmitted power of a given slot is increased compared to the previous slot, then a variable "Transmitted power UP" is increased by one, otherwise a variable "Transmitted power DOWN" is increased by one. The requirements for "Transmitted power UP" and "Transmitted power DOWN" are shown in Table 8.28A.

Table 8.27: Parameters for TPC command combining

Parameter	Unit	Test 1	Test 2
Phase reference	-	P-CPICH	
DPCH_Ec/Ior	dB	-12	
$\hat{I}_{or1}$ and $\hat{I}_{or2}$	dBm/3.84 MHz	-60	
I_{oc}	dBm/3.84 MHz	-	-60
Power-Control-Algorithm	-	Algorithm 1	
Cell 1 TPC commands over 4 slots	-	{0,0,1,1}	
Cell 2 TPC commands over 4 slots	-	{0,1,0,1}	
Information data Rate	kbps	12.2	
Propagation condition	-	Static without AWGN source I_{oc}	Multi-path fading case 3

Table 8.28: Test requirements for Test 1

Test Number	Required power changes over the 4 consecutive slots
1	Down, Down, Down, Up

Table 8.28A: Requirements for Test 2

Test Number	Ratio (Transmitted power UP) / (Total number of slots)	Ratio (Transmitted power DOWN) / (Total number of slots)
2	≥0.25	≥0.5

8.8 Power control in downlink

Power control in the downlink is the ability of the UE receiver to converge to required link quality set by the network while using as low power as possible in downlink . If a BLER target has been assigned to a DCCH (See Annex A.3), then it has to be such that outer loop is based on DTCH and not on DCCH.

8.8.1 Power control in the downlink, constant BLER target

8.8.1.1 Minimum requirements

For the parameters specified in Table 8.29 the downlink $\frac{DPCH\_E_c}{I}$ power ratio measured values, which are averaged over one slot, shall be below the specified value in Table 8.30 more than 90% of the time. BLER shall be as shown in Table 8.30. Power control in downlink is ON during the test.

Table 8.29: Test parameter for downlink power control

Parameter	Unit	Test 1	Test 2
$\hat{I}_{or}/I_{oc}$	dB	9	-1
I_{oc}	dBm/3.84 MHz	-60	
Information Data Rate	kbps	12.2	
Target quality value on DTCH	BLER	0.01	
Propagation condition		Case 4	
Maximum_DL_Power *	dB	7	
Minimum_DL_Power *	dB	-18	
DL Power Control step size, Δ_{TPC}	dB	1	
Limited Power Increase	-	"Not used"	

NOTE: Power is compared to P-CPICH as specified in [4].

Table 8.30: Requirements in downlink power control

Parameter	Unit	Test 1	Test 2
$\frac{DPCH\_E_c}{I_{or}}$	dB	-16.0	-9.0
Measured quality on DTCH	BLER	0.01±30%	0.01±30%

8.8.2 Power control in the downlink, initial convergence

This requirement verifies that DL power control works properly during the first seconds after DPCH connection is established

8.8.2.1 Minimum requirements

For the parameters specified in Table 8.31 the downlink DPCH_Ec/Ior power ratio measured values, which are averaged over 50 ms, shall be within the range specified in Table 8.32 more than 90% of the time. T1 equals to 500 ms and it starts 10 ms after the DPDCH connection is initiated. T2 equals to 500 ms and it starts when T1 has expired. Power control is ON during the test.

The first 10 ms shall not be used for averaging, ie the first sample to be input to the averaging filter is at the beginning of T1. The averaging shall be performed with a sliding rectangular window averaging filter. The window size of the averaging filter is linearly increased from 0 up to 50 ms during the first 50 ms of T1, and then kept equal to 50ms.

Table 8.31: Test parameters for downlink power control

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
Target quality value on DTCH	BLER	0.01	0.01	0.1	0.1
Initial DPCH_Ec/Ior	dB	-5.9	-25.9	-3	-22.1
Information Data Rate	kbps	12.2	12.2	64	64
$\hat{I}_{or}/I_{oc}$	dB	-1			
I_{oc}	dBm/3.84 MHz	-60			
Propagation condition		Static			
Maximum_DL_Power	dB	7			
Minimum_DL_Power	dB	-18			
DL Power Control step size, Δ_{TPC}	dB	1			
Limited Power Increase	-	"Not used"			

Table 8.32: Requirements in downlink power control

Parameter	Unit	Test 1 and Test 2	Test 3 and Test 4
$\frac{DPCH\_E_c}{I_{or}}$ during T1	dB	-18.9 ≤ DPCH_Ec/Ior ≤ -11.9	-15.1 ≤ DPCH_Ec/Ior ≤ -8.1
$\frac{DPCH\_E_c}{I_{or}}$ during T2	dB	-18.9 ≤ DPCH_Ec/Ior ≤ -14.9	-15.1 ≤ DPCH_Ec/Ior ≤ -11.1

8.8.3 Power control in downlink, wind up effects

8.8.3.1 Minimum requirements

This test is run in three stages where stage 1 is for convergence of the power control loop, in stage two the maximum downlink power for the dedicated channel is limited not to be higher than the parameter specified in Table 8.33. All parameters used in the three stages are specified in Table 8.33. The downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio measured values, which are averaged over one slot, during stage 3 shall be lower than the value specified in Table 8.34 more than 90% of the time.

Power control of the UE is ON during the test.

Table 8.33: Test parameter for downlink power control, wind-up effects

Parameter	Unit	Test 1		
		Stage 1	Stage 2	Stage 3
Time in each stage	s	>15	5	0.5
$\hat{I}_{or}/I_{oc}$	dB	5		
I_{oc}	dBm/3.84 MHz	-60		
Information Data Rate	kbps	12.2		
Quality target on DTCH	BLER	0.01		
Propagation condition		Case 4		
Maximum_DL_Power	dB	7	-6.2	7
Minimum_DL_Power	dB	-18		
DL Power Control step size, Δ_{TPC}	dB	1		
Limited Power Increase	-	"Not used"		

Table 8.34: Requirements in downlink power control, wind-up effects

Parameter	Unit	Test 1, stage 3
$\frac{DPCH\_E_c}{I_{or}}$	dB	-13.3

8.9 Downlink compressed mode

Downlink compressed mode is used to create gaps in the downlink transmission, to allow the UE to make measurements on other frequencies.

8.9.1 Single link performance

The receiver single link performance of the Dedicated Traffic Channel (DCH) in compressed mode is determined by the Block Error Ratio (BLER) and transmitted DPCH_Ec/Ior power in the downlink.

The compressed mode parameters are given in clause A.5. Tests 1 and 2 are using Set 1 compressed mode pattern parameters from Table A.21 in clause A.5 while tests 3 and 4 are using Set 2 compressed mode patterns from the same table.

8.9.1.1 Minimum requirements

For the parameters specified in Table 8.35 the downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio measured values, which are averaged over one slot, shall be below the specified value in Table 8.36 more than 90% of the time. The measured quality on DTCH shall be as required in Table 8.36.

Downlink power control is ON during the test. Uplink TPC commands shall be error free. System simulator shall increase the transmitted power during compressed frames by the same amount that UE is expected to increase its SIR target during those frames.

Table 8.35: Test parameter for downlink compressed mode

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
Delta SIR1	dB	0	3	0	3
Delta SIR after1	dB	0	3	0	3
Delta SIR2	dB	0	0	0	0
Delta SIR after2	dB	0	0	0	0
$\hat{I}_{or}/I_{oc}$	dB	9			
I_{oc}	dBm/3.84 MHz	-60			
Information Data Rate	kbps	12.2			
Propagation condition		Case 2			
Target quality value on DTCH	BLER	0.01			
Maximum_DL_Power	dB	7			
Minimum_DL_Power	dB	-18			
DL Power Control step size, Δ_{TPC}	dB	1			
Limited Power Increase	-	"Not used"			

Table 8.36: Requirements in downlink compressed mode

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
$\frac{DPCH\_E_c}{I_{or}}$	dB	-15.4	No requirements	-15.4	No requirements
Measured quality of compressed and recovery frames	BLER	No requirements	<0.001	No requirements	<0.001
Measured quality on DTCH	BLER	0.01 ± 30 %			

8.10 Blind transport format detection

Performance of Blind transport format detection is determined by the Block Error Ratio (BLER) values and by the measured average transmitted DPCH_Ec/Ior value.

8.10.1 Minimum requirement

For the parameters specified in Table 8.37 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in Table 8.38.

Table 8.37: Test parameters for Blind transport format detection

Parameter	Unit	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
$\hat{I}_{or}/I_{oc}$	dB	-1			-3		
I_{oc}	dBm/3.84 MHz	-60					
Information Data Rate	kbps	12.2 (rate 1)	7.95 (rate 2)	1.95 (rate 3)	12.2 (rate 1)	7.95 (rate 2)	1.95 (rate 3)
propagation condition	-	static			multi-path fading case 3		
TFCI	-	off					

B.2 Propagation Conditions

B.2.1 Static propagation condition

The propagation for the static performance measurement is an Additive White Gaussian Noise (AWGN) environment. No fading and multi-paths exist for this propagation model.

B.2.2 Multi-path fading propagation conditions

Table B1 shows propagation conditions that are used for the performance measurements in multi-path fading environment. All taps have classical Doppler spectrum.

Table B.1: Propagation Conditions for Multi path Fading Environments

Case 1, speed 3km/h		**Case 2, speed 3 km/h**		**Case 3, speed 120 km/h**		**Case 4, speed 3 km/h**		*** Case 5, speed 50 km/h**		**Case 6, speed 250 km/h**	
Relative Delay [ns]	Relative mean ~~Average~~ Power [dB]	Relative Delay [ns]	Relative mean ~~Average~~ Power [dB]	Relative Delay [ns]	Relative mean ~~Average~~ Power [dB]	Relative Delay [ns]	Relative mean ~~Average~~ Power [dB]	Relative Delay [ns]	Relative mean ~~Average~~ Power [dB]	Relative Delay [ns]	Relative mean ~~Average~~ Power [dB]
0	0	0	0	0	0	0	0	0	0	0	0
976	-10	976	0	260	-3	976	0	976	-10	260	-3
		20000	0	521	-6					521	-6
				781	-9					781	-9

NOTE: Case 5 is only used in TS25.133.

C.3 During connection

The following clauses, describes the downlink Physical Channels that are transmitted during a connection i.e., when measurements are done. For these measurements the offset between DPCH and SCH shall be zero chips at Node B meaning that SCH is overlapping with the first symbols in DPCH in the beginning of DPCH slot structure.

C.3.1 Measurement of Rx Characteristics

Table C.2 is applicable for measurements on the Receiver Characteristics (clause 7) with the exception of subclause 7.4 (Maximum input level).

Table C.2: Downlink Physical Channels transmitted during a connection

Physical Channel	Power ratio
P-CPICH	P-CPICH_Ec / DPCH_Ec = 7 dB
P-CCPCH	P-CCPCH_Ec / DPCH_Ec = 5 dB
SCH	SCH_Ec / DPCH_Ec = 5 dB
PICH	PICH_Ec / DPCH_Ec = 2 dB
DPCH	Test dependent power

C.3.2 Measurement of Performance requirements

Table C.3 is applicable for measurements on the Performance requirements (clause 8), including subclause 7.4 (Maximum input level) and subclause 6.4.4 (Out-of-synchronization handling of output power).

Table C.3: Downlink Physical Channels transmitted during a connection[1]

Physical Channel	Power ratio	NOTE
P-CPICH	P-CPICH_Ec/Ior = -10 dB	Use of P-CPICH or S-CPICH as phase reference is specified for each requirement and is also set by higher layer signalling.
S-CPICH	S-CPICH_Ec/Ior = -10 dB	When S-CPICH is the phase reference in a test condition, the phase of S-CPICH shall be 180 degrees offset from the phase of P-CPICH. When S-CPICH is not the phase reference, it is not transmitted.
P-CCPCH	P-CCPCH_Ec/Ior = -12 dB	
SCH	SCH_Ec/Ior = -12 dB	This power shall be divided equally between Primary and Secondary Synchronous channels
PICH	PICH_Ec/Ior = -15 dB	
DPCH	Test dependent power	When S-CPICH is the phase reference in a test condition, the phase of DPCH shall be 180 degrees offset from the phase of P-CPICH.
OCNS	Necessary power so that total transmit power spectral density of Node B (Ior) adds to one[1]	OCNS interference consists of 16 dedicated data channels as specified in table C.6.

NOTE 1 For dynamic power correction required to compensate for the presence of transient channels, e.g. control channels, a subset of the DPCH channels may be used.

C.3.3 Connection with open-loop transmit diversity mode

Table C.4 is applicable for measurements for subclause 8.6.1 (Demodulation of DCH in open loop transmit diversity mode).

Table C.4: Downlink Physical Channels transmitted during a connection[1]

Physical Channel	Power ratio	NOTE
P-CPICH (antenna 1)	P-CPICH_Ec1/Ior = -13 dB	1. Total P-CPICH_Ec/Ior = -10 dB
P-CPICH (antenna 2)	P-CPICH_Ec2/Ior = -13 dB	
P-CCPCH (antenna 1)	P-CCPCH_Ec1/Ior = -15 dB	1. STTD applied 2. Total P-CCPCH_Ec/Ior = -12 dB
P-CCPCH (antenna 2)	P-CCPCH_Ec2/Ior = -15 dB	
SCH (antenna 1 / 2)	SCH_Ec/Ior = -12 dB	1. TSTD applied. 2. This power shall be divided equally between Primary and Secondary Synchronous channels
PICH (antenna 1)	PICH_Ec1/Ior = -18 dB	1. STTD applied 2. Total PICH_Ec/Ior = -15 dB
PICH (antenna 2)	PICH_Ec2/Ior = -18 dB	
DPCH	Test dependent power	1. STTD applied 2. Total power from both antennas
OCNS	Necessary power so that total transmit power spectral density of Node B (Ior) adds to one[1]	1.This power shall be divided equally between antennas 2.OCNS interference consists of 16 dedicated data channels as specified in Table C.6.

NOTE 1 For dynamic power correction required to compensate for the presence of transient channels, e.g. control channels, a subset of the DPCH channels may be used.

C.3.4 Connection with closed loop transmit diversity mode

Table C.5 is applicable for measurements for subclause 8.6.2 (Demodulation of DCH in closed loop transmit diversity mode).

Table C.5: Downlink Physical Channels transmitted during a connection[1]

Physical Channel	Power ratio	NOTE
P-CPICH (antenna 1)	P-CPICH_Ec1/Ior = -13 dB	1. Total P-CPICH_Ec/Ior = -10 dB
P-CPICH (antenna 2)	P-CPICH_Ec2/Ior = -13 dB	
P-CCPCH (antenna 1)	P-CCPCH_Ec1/Ior = -15 dB	1. STTD applied
P-CCPCH (antenna 2)	P-CCPCH_Ec2/Ior = -15 dB	1. STTD applied, 2. total P-CCPCH_Ec/Ior = -12 dB
SCH (antenna 1 / 2)	SCH_Ec/Ior = -12 dB	1. TSTD applied
PICH (antenna 1)	PICH_Ec1/Ior = -18 dB	1. STTD applied 2. STTD applied, total PICH_Ec/Ior = -15 dB
PICH (antenna 2)	PICH_Ec2/Ior = -18 dB	
DPCH	Test dependent power	1. Total power from both antennas
OCNS	Necessary power so that total transmit power spectral density of Node B (Ior) adds to one[1]	1.This power shall be divided equally between antennas 2.OCNS interference consists of 16 dedicated data channels. as specified in Table C.6.

NOTE 1 For dynamic power correction required to compensate for the presence of transient channels, e.g. control channels, a subset of the DPCH channels may be used.

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CR-Form-v4

CHANGE REQUEST

⌘	25.101	CR	157	⌘	ev	1	⌘	Current version:	3.9.0	⌘

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

Title: ⌘	Correction of power terms and definitions		
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 existing requirements relating to power are incomplete, inconsistent and ambiguous. The proposed changes remove the possibility of misinterpreting the specification.
Summary of change: ⌘	3.1 For maximum output power, replaced the term "broadband" by defining the bandwidth as being at least (1+ α) times the chip rate over a period of at least one timeslot. This definition allows the use of a broadband (thermal) power meter. 3.1 Added definition of mean power (consistent with ITU radio regulation S1.156) which includes a minimum bandwidth requirement of (1+ α) times the chip rate. This ensures all the signal power is captured and does not unnecessarily restrict the choice of measurement method. 3.1 Average power definition becomes the RRC filtered mean power definition. 6.2.1 Replacement of "broadband" by "at least (1+ α) times the chip rate". Added measurement period of "at least one slot". This definition is consistent with thermal power measurements as the bandwidth and measurement period are not restricted. 6.4.1 Open loop power control defined as mean power. 6.4.2 Inner loop power control defined as mean power. Table 6.5 title "average" – changed to "aggregate". 6.4.3 Minimum output power defined as mean power. 6.5.1 Transmit off power defined as RRC filtered mean power. 6.5.2 Transmit on power defined as mean power, off power defined as RRC filtered mean power.

		6.5.3 Change of TFC defined as mean power. 6.5.4 Power setting in uplink compressed mode defined as mean power. 6.6.2.1 Spectrum emission mask reference power defined as RRC filtered mean power. Added clarification about noise bandwidth of the integrated method. 6.6.2.2 ACLR defined as RRC filtered mean power. 6.7.1 Transmit intermodulation defined RRC filtered mean power. 6.8.3 Peak code domain error – removed reference to power control group 7.3 Receiver sensitivity level – defined as mean power. 7.4 Maximum input level – defined as mean power. Tables 7.3, 7.5, 7.6, 7.7, 7.8, & 7.9 “Average transmit output power” is changed to “UE transmitted mean power”. Table 7.5 I_{oac} defined as mean power in dBm not power spectral density in dBm/3.84 MHz. Table 7.6 format changed to match the other 5 tables. Table 7.6 and 7.9 $I_{blocking}$ defined as mean power in dBm not power spectral density in dBm/3.84 MHz.
Consequences if not approved:	⌘	Existing power specifications are incomplete, inconsistent and ambiguous which will lead to different interpretation of power quantities (e.g. maximum power, SEM, Interferer levels etc.). This will lead to inconsistent performance measurement results. Isolated impact statement: Correction of requirements. Correct interpretation of the existing spec will not affect UE implementations or system performance. However, incorrect interpretation may impact conformance test implementation and conformance test results.

Clauses affected:	⌘	3, 6, 7		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	34.121
Other comments:	⌘			

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3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following definitions apply:

Maximum Output Power: This is a measure of the maximum power the UE can transmit (i.e. the actual broadband power as would be measured assuming no measurement error) in a bandwidth of at least (1+ α) times the chip rate of the radio access mode. The period of measurement shall be at least one timeslot.

Nominal Maximum Output Power: This is the nominal power defined by the UE power class.

Mean power: When applied to a W-CDMA modulated signal this is the power (transmitted or received) in a bandwidth of at least (1+ α) times the chip rate of the radio access mode. The period of measurement shall be at least one timeslot unless otherwise stated.

RRC filtered mean Average power: The thermal mean power as measured through a root raised cosine filter with roll-off factor α = 0.22 and a bandwidth equal to the chip rate of the radio access mode. The period of measurement shall be one power control group (timeslot) unless otherwise stated.

NOTE 1: The RRC filtered mean power of a perfectly modulated W-CDMA signal is 0.246 dB lower than the mean power of the same signal.

NOTE 2: The roll-off factor α is defined in section 6.8.1.

6 Transmitter characteristics

6.1 General

Unless detailed the transmitter characteristic are specified at the antenna connector of the UE. For UE with integral antenna only, a reference antenna with a gain of 0 dBi is assumed. Transmitter characteristics for UE(s) with multiple antennas/antenna connectors are FFS.

The UE antenna performance has a significant impact on system performance, and minimum requirements on the antenna efficiency are therefore intended to be included in future versions of the present document. It is recognised that different requirements and test methods are likely to be required for the different types of UE.

All the parameters in clause 6 are defined using the UL reference measurement channel (12.2 kbps) specified in subclause A.2.1 and unless stated with the UL power control ON

6.2 Transmit power

6.2.1 UE maximum output power

The following Power Classes define the nominal maximum output power. The nominal power defined is the ~~broadband~~ transmit power of the UE, i.e. the power in a bandwidth of at least (1+α) times the chip rate of the radio access mode. The period of measurement shall be at least one timeslot.

Table 6.1: UE Power Classes

Power Class	Nominal maximum output power	Tolerance
1	+33 dBm	+1/-3 dB
2	+27 dBm	+1/-3 dB
3	+24 dBm	+1/-3 dB
4	+21 dBm	± 2 dB

NOTE: The tolerance allowed for the nominal maximum output power applies even for the multi-code transmission mode.

6.3 Frequency Error

The UE modulated carrier frequency shall be accurate to within ±0.1 PPM observed over a period of one timeslot compared to the carrier frequency received from the Node B. These signals will have an apparent error due to Node B frequency error and Doppler shift. In the later case, signals from the Node B must be averaged over sufficient time that errors due to noise or interference are allowed for within the above ±0.1PPM figure. The UE shall use the same frequency source for both RF frequency generation and the chip clock.

Table 6.2: Frequency Error

AFC	Frequency stability
ON	within ± 0.1 PPM

6.4 Output power dynamics

Power control is used to limit the interference level.

6.4.1 Open loop power control

Open loop power control is the ability of the UE transmitter to sets its output power to a specific value. The open loop power control tolerance is given in Table 6.3

6.4.1.1 Minimum requirement

The UE open loop power is defined as the ~~average~~ mean power in a timeslot or ON power duration, whichever is available~~, and they are measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off α = 0.22 and a bandwidth equal to the chip rate~~.

Table 6.3: Open loop power control tolerance

Conditions	Tolerance
Normal conditions	± 9 dB
Extreme conditions	± 12 dB

6.4.2 Inner loop power control in the uplink

Inner loop power control in the Uplink is the ability of the UE transmitter to adjust its output power in accordance with one or more TPC commands received in the downlink.

6.4.2.1 Power control steps

The power control step is the change in the UE transmitter output power in response to a single TPC command, TPC_cmd, derived at the UE.

6.4.2.1.1 Minimum requirement

The UE transmitter shall have the capability of changing the output power with a step size of 1, 2 and 3 dB according to the value of Δ_{TPC} or $\Delta_{RP\text{-}TPC}$, in the slot immediately after the TPC_cmd can be derived

(a) The transmitter output power step due to inner loop power control shall be within the range shown in Table 6.4.

(b) The transmitter average output power step due to inner loop power control shall be within the range shown in Table 6.5. Here a TPC_cmd group is a set of TPC_cmd values derived from a corresponding sequence of TPC commands of the same duration.

The inner loop power step is defined as the relative power difference between the ~~average~~ mean power of the original (reference) timeslot and the ~~average~~ mean power of the target timeslot, not including the transient duration. The transient duration is from 25µs before the slot boundary to 25µs after the slot boundary. ~~The power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off α = 0.22 and a bandwidth equal to the chip rate~~

Table 6.4: Transmitter power control range

TPC_cmd	Transmitter power control range					
	1 dB step size		2 dB step size		3 dB step size	
	Lower	Upper	Lower	Upper	Lower	Upper
+ 1	+0.5 dB	+1.5 dB	+1 dB	+3 dB	+1.5 dB	+4.5 dB
0	-0.5 dB	+0.5 dB	-0.5 dB	+0.5 dB	-0.5 dB	+0.5 dB
-1	-0.5 dB	-1.5 dB	-1 dB	-3 dB	-1.5 dB	-4.5 dB

Table 6.5: Transmitter ~~average~~ aggregate power control range

TPC_ cmd group	Transmitter power control range after 10 equal TPC_ cmd groups				Transmitter power control range after 7 equal TPC_ cmd groups	
	1 dB step size		2 dB step size		3 dB step size	
	Lower	Upper	Lower	Upper	Lower	Upper
+1	+8 dB	+12 dB	+16 dB	+24 dB	+16 dB	+26 dB
0	-1 dB	+1 dB	-1 dB	+1 dB	-1 dB	+1 dB
-1	-8 dB	-12 dB	-16 dB	-24 dB	-16 dB	-26 dB
0,0,0,0,+1	+6 dB	+14 dB	N/A	N/A	N/A	N/A
0,0,0,0,-1	-6 dB	-14 dB	N/A	N/A	N/A	N/A

The UE shall meet the above requirements for inner loop power control over the power range bounded by the Minimum output power as defined in subclause 6.4.3, and the Maximum output power supported by the UE (i.e. the actual power as would be measured assuming no measurement error). This power shall be in the range specified for the power class of the UE in subclause 6.2.1.

6.4.3 Minimum output power

The minimum controlled output power of the UE is when the power is set to a minimum value.

6.4.3.1 Minimum requirement

The minimum output power is defined as ~~an averaged~~the mean power in ~~a~~one time slot ~~measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off α = 0.22 and a bandwidth equal to the chip rate~~. The minimum output power shall be less than –50 dBm.

6.4.4 Out-of-synchronization handling of output power

The UE shall monitor the DPCCH quality in order to detect a loss of the signal on Layer 1, as specified in TS 25.214. The thresholds Q_{out} and Q_{in} specify at what DPCCH quality levels the UE shall shut its power off and when it shall turn its power on respectively. The thresholds are not defined explicitly, but are defined by the conditions under which the UE shall shut its transmitter off and turn it on, as stated in this subclause.

The DPCCH quality shall be monitored in the UE and compared to the thresholds Q_{out} and Q_{in} for the purpose of monitoring synchronization. The threshold Q_{out} should correspond to a level of DPCCH quality where no reliable detection of the TPC commands transmitted on the downlink DPCCH can be made. This can be at a TPC command error ratio level of e.g. 30%. The threshold Q_{in} should correspond to a level of DPCCH quality where detection of the TPC commands transmitted on the downlink DPCCH is significantly more reliable than at Q_{out}. This can be at a TPC command error ratio level of e.g. 20%.

6.4.4.1 Minimum requirement

When the UE estimates the DPCCH quality over the last 160 ms period to be worse than a threshold Q_{out}, the UE shall shut its transmitter off within 40 ms. The UE shall not turn its transmitter on again until the DPCCH quality exceeds an acceptable level Q_{in}. When the UE estimates the DPCCH quality over the last 160 ms period to be better than a threshold Q_{in}, the UE shall again turn its transmitter on within 40 ms.

The UE transmitter shall be considered “off” if the transmitted power is below the level defined in subclause 6.5.1 (Transmit off power). Otherwise the transmitter shall be considered as “on”.

6.4.4.2 Test case

This subclause specifies a test case, which provides additional information for how the minimum requirement should be interpreted for the purpose of conformance testing.

The quality levels at the thresholds Q_{out} and Q_{in} correspond to different signal levels depending on the downlink conditions DCH parameters. For the conditions in Table 6.6, a signal with the quality at the level Q_{out} can be generated by a DPCCH_Ec/Ior ratio of –25 dB, and a signal with Q_{in} by a DPCCH_Ec/Ior ratio of –21 dB. The DL reference

measurement channel (12.2) kbps specified in subclause A.3.1 and with static propagation conditions. The downlink physical channels, other than those specified in Table 6.6, are as specified in Table C.3 of Annex C.

Figure 6.1 shows an example scenario where the DPCCH_Ec/Ior ratio varies from a level where the DPCH is demodulated under normal conditions, down to a level below Q_{out} where the UE shall shut its power off and then back up to a level above Q_{in} where the UE shall turn the power back on.

Table 6.6: DCH parameters for the Out-of-synch handling test case

Parameter	Unit	Value
$\hat{I}_{or}/I_{oc}$	dB	-1
I_{oc}	dBm/3.84 MHz	-60
$\frac{DPDCH\_E_c}{I_{or}}$	dB	See figure 6.1: Before point A -16.6 After point A Not defined
$\frac{DPCCH\_E_c}{I_{or}}$	dB	See figure 6.1
Information Data Rate	kbps	12.2

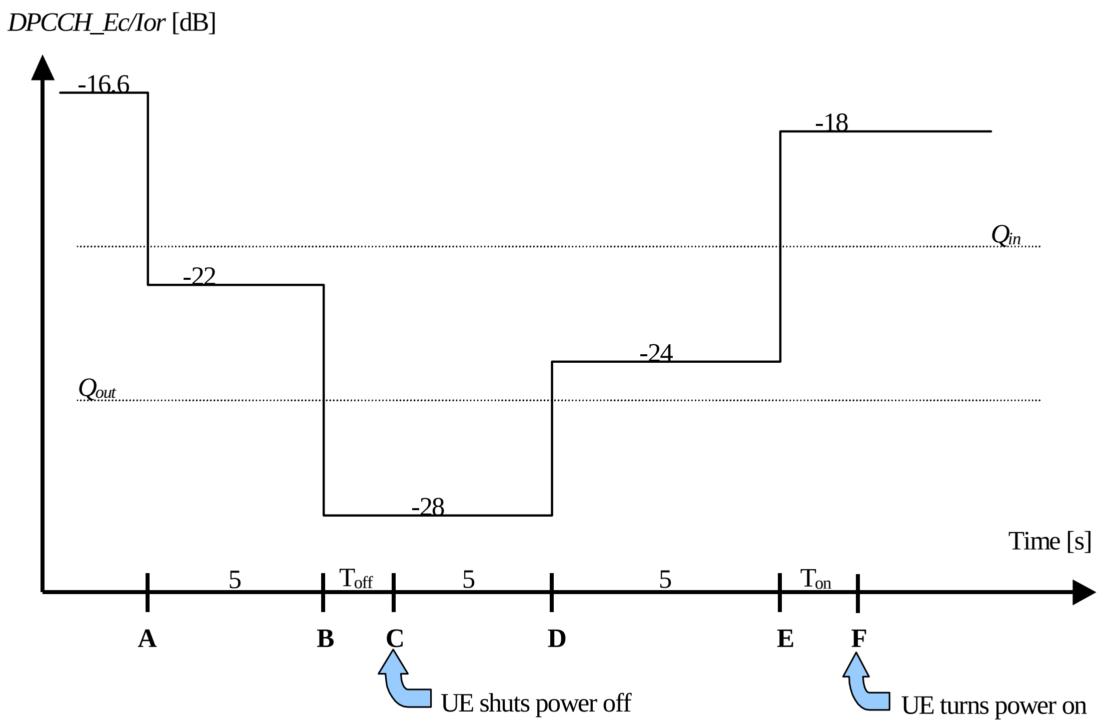

Figure 6.1: Test case for out-of-synch handling in the UE.

In this test case, the requirements for the UE are that:

1. The UE shall not shut its transmitter off before point B.
2. The UE shall shut its transmitter off before point C, which is T_{off} = 200 ms after point B.
3. The UE shall not turn its transmitter on between points C and E.
4. The UE shall turn its transmitter on before point F, which is T_{on} = 200 ms after point E.

6.5 Transmit ON/OFF power

6.5.1 Transmit OFF power

Transmit OFF power is defined as the RRC filtered mean~~average~~ power when the transmitter is off. The transmit OFF power state is when the UE does not transmit except during UL compressed mode.

6.5.1.1 Minimum requirement

The transmit OFF power is defined as the RRC filtered mean~~average~~ power in a duration of at least one timeslot excluding any transient periods~~, measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off α = 0.22 and a bandwidth equal to the chip rate~~. The requirement for the transmit OFF power shall be less than –56 dBm.

6.5.2 Transmit ON/OFF Time mask

The time mask for transmit ON/OFF defines the ramping time allowed for the UE between transmit OFF power and transmit ON power. Possible ON/OFF scenarios are RACH ,CPCH or UL compressed mode.

6.5.2.1 Minimum requirement

The transmit power levels versus time shall meet the mask specified in figure 6.2 for PRACH preambles and CPCH preambles, and the mask in figure 6.3 for all other cases. The off signal is ~~measured~~ defined as the RRC filtered mean power~~with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off α = 0.22 and a bandwidth equal to the chip rate~~.

The ~~O~~on signal is defined as the mean power~~ is defined as either case as follows~~.

The specification depends on each possible case.

- First preamble of RACH/CPCH: Open loop accuracy (Table 6.3).
- During preamble ramping of the RACH/CPCH, and between final RACH/CPCH preamble and RACH/CPCH message part: Accuracy depending on size of the required power difference.(Table 6.7). The step in total transmitted power between final RACH/CPCH preamble and RACH/CPCH message (control part + data part) shall be rounded to the closest integer dB value. A power step exactly half-way between two integer values shall be rounded to the closest integer of greater magnitude.
- After transmission gaps in compressed mode: Accuracy as in Table 6.9.
- Power step to Maximum Power: Maximum power accuracy (Table 6.1).

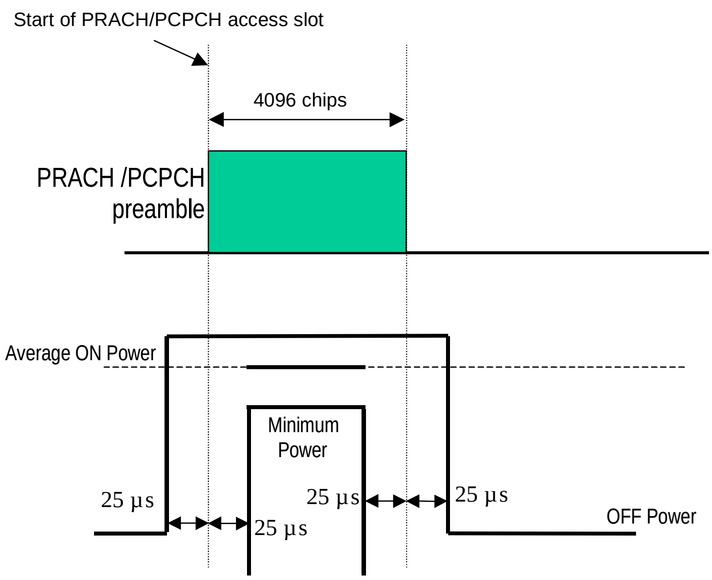

Figure 6.2: Transmit ON/OFF template for PRACH preambles and CPCH preambles

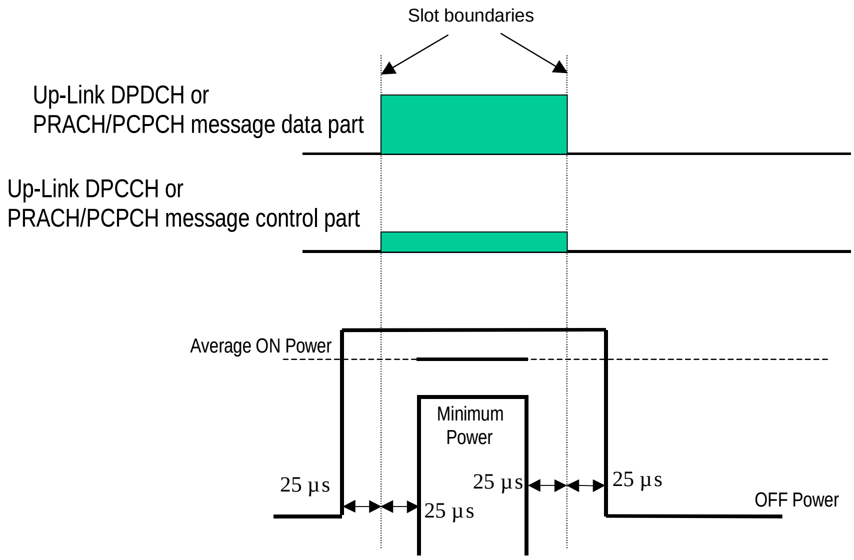

Figure 6.3: Transmit ON/OFF template for all other On/Off cases

Table 6.7: Transmitter power difference tolerance for RACH/CPCH preamble ramping, and between final RACH/CPCH preamble and RACH/CPCH message part

Power step size (Up or down)* ΔP [dB]	Transmitter power difference tolerance [dB]
0	+/- 1 dB
1	+/- 1 dB
2	+/- 1.5 dB
3	+/- 2 dB
$4 \leq \Delta P \leq 10$	+/- 2.5 dB
$11 \leq \Delta P \leq 15$	+/- 3.5 dB
$16 \leq \Delta P \leq 20$	+/- 4.5 dB
$21 \leq \Delta P$	+/- 6.5 dB

NOTE: Power step size for RACH/CPCH preamble ramping is from 1 to 8 dB with 1 dB steps.

6.5.3 Change of TFC

A change of TFC (Transport Format Combination) in uplink means that the power in the uplink varies according to the change in data rate. DTX, where the DPCH is turned off, is a special case of variable data, which is used to minimise the interference between UE(s) by reducing the UE transmit power when voice, user or control information is not present.

6.5.3.1 Minimum requirement

A change of output power is required when the TFC, and thereby the data rate, is changed. The ratio of the amplitude between the DPDCH codes and the DPCCH code will vary. The power step due to a change in TFC shall be calculated in the UE so that the power transmitted on the DPCCH shall follow the inner loop power control. The step in total transmitted power (DPCCH + DPDCH) shall then be rounded to the closest integer dB value. A power step exactly half-way between two integer values shall be rounded to the closest integer of greater magnitude. The accuracy of the power step, given the step size, is specified in Table 6.8. The power change due to a change in TFC is defined as the relative power difference between the ~~average~~ mean power of the original (reference) timeslot and the ~~average~~ mean power of the target timeslot, not including the transient duration. The transient duration is from 25µs before the slot boundary to 25µs after the slot boundary. ~~The power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off $\alpha = 0.22$ and a bandwidth equal to the chip rate.~~

Table 6.8: Transmitter power step tolerance

Power step size (Up or down) ΔP [dB]	Transmitter power step tolerance [dB]
0	+/- 0.5 dB
1	+/- 0.5 dB
2	+/- 1.0 dB
3	+/- 1.5 dB
$4 \leq \Delta P \leq 10$	+/- 2.0 dB
$11 \leq \Delta P \leq 15$	+/- 3.0 dB
$16 \leq \Delta P \leq 20$	+/- 4.0 dB
$21 \leq \Delta P$	+/- 6.0 dB

The transmit power levels versus time shall meet the mask specified in Figure 6.4.

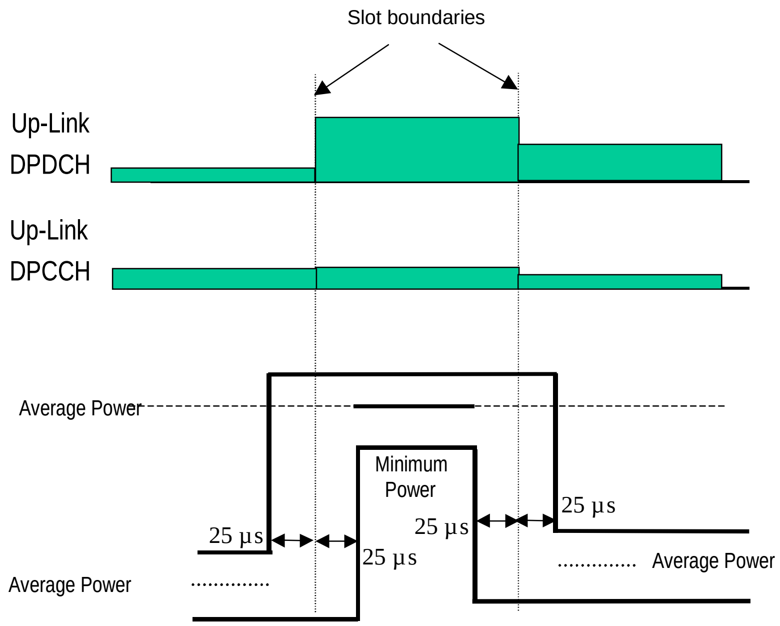

Figure 6.4: Transmit template during TFC change

6.5.4 Power setting in uplink compressed mode

Compressed mode in uplink means that the power in uplink is changed.

6.5.4.1 Minimum requirement

A change of output power is required during uplink compressed frames since the transmission of data is performed in a shorter interval. The ratio of the amplitude between the DPDCH codes and the DPCCH code will also vary. The power step due to compressed mode shall be calculated in the UE so that the energy transmitted on the pilot bits during each transmitted slot shall follow the inner loop power control.

Thereby, the power during compressed mode, and immediately afterwards, shall be such that the mean power of~~n~~ the DPCCH follows the steps due to inner loop power control combined with additional steps of $10Log_{10}(N_{pilot.prev} / N_{pilot.curr})$ dB where $N_{pilot.prev}$ is the number of pilot bits in the previously transmitted slot, and $N_{pilot.curr}$ is the current number of pilot bits per slot.

The resulting step in total transmitted power (DPCCH +DPDCH) shall then be rounded to the closest integer dB value. A power step exactly half-way between two integer values shall be rounded to the closest integer of greatest magnitude. The accuracy of the power step, given the step size, is specified in Table 6.8 in subclause 6.5.3.1. The power step is defined as the relative power difference between the ~~average~~ mean power of the original (reference) timeslot and the ~~average~~ mean power of the target timeslot, when neither the original timeslot nor the reference timeslot are in a transmission gap. The transient duration is not included, and is from 25µs before the slot boundary to 25µs after the slot boundary. ~~The relative power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off $\alpha = 0.22$ and a bandwidth equal to the chip rate.~~

In addition to any power change due to the ratio $N_{pilot.prev} / N_{pilot.curr}$, the ~~average~~ mean power of the DPCCH in the first slot after a compressed mode transmission gap shall differ from the ~~average~~ mean power of the DPCCH in the last slot before the transmission gap by an amount Δ_{RESUME}, where Δ_{RESUME} is calculated as described in clause 5.1.2.3 of TS 25.214.

The resulting difference in the total transmitted power (DPCCH + DPDCH) shall then be rounded to the closest integer dB value. A power difference exactly half-way between two integer values shall be rounded to the closest integer of greatest magnitude. The accuracy of the resulting difference in the total transmitted power (DPCCH + DPDCH) after a transmission gap of up to 14 slots shall be as specified in Table 6.9.

Table 6.9: Transmitter power difference tolerance after a transmission gap of up to 14 slots

Tolerance on required difference in total transmitter power after a transmission gap
+/- 3 dB

The power difference is defined as the ~~relative power~~ difference between the ~~average~~ mean power of the original (reference) timeslot before the transmission gap and the ~~average~~ mean power of the target timeslot after the transmission gap, not including the transient durations. The transient durations at the start and end of the transmission gaps are each from 25µs before the slot boundary to 25µs after the slot boundary. ~~The relative power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off $\alpha = 0.22$ and a bandwidth equal to the chip rate.~~

The transmit power levels versus time shall meet the mask specified in figure 6.5.

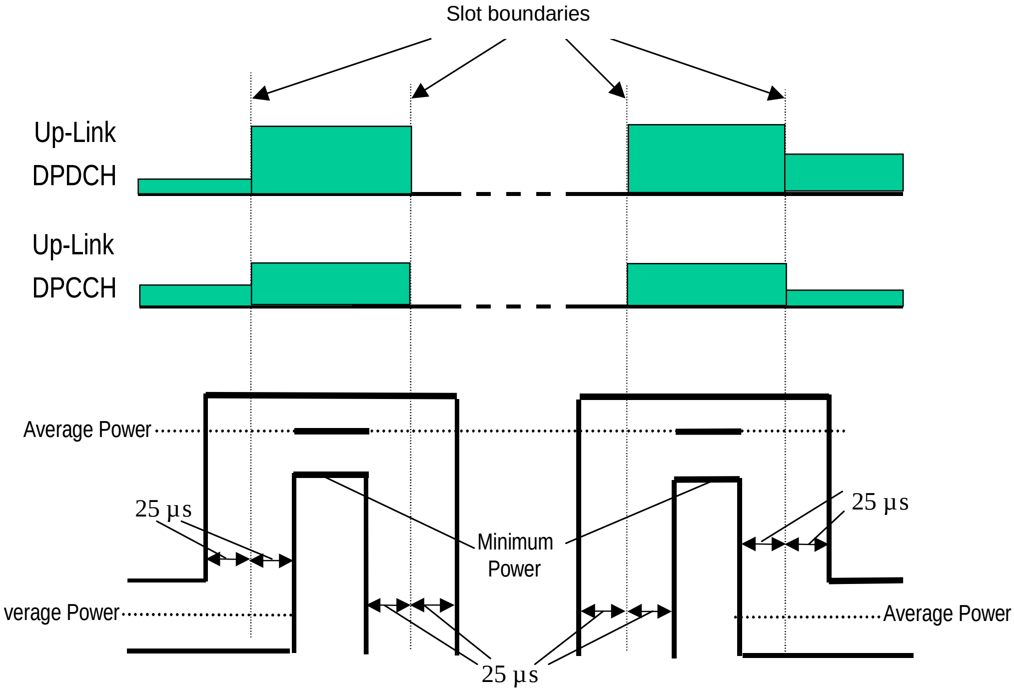

Figure 6.5: Transmit template during Compressed mode

6.6 Output RF spectrum emissions

6.6.1 Occupied bandwidth

Occupied bandwidth is a measure of the bandwidth containing 99 % of the total integrated power of the transmitted spectrum, centered on the assigned channel frequency. The occupied channel bandwidth shall be less than 5 MHz based on a chip rate of 3.84 Mcps.

6.6.2 Out of band emission

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

6.6.2.1 Spectrum emission mask

The spectrum emission mask of the UE applies to frequencies, which are between 2.5 MHz and 12.5 MHz away from the UE centre carrier frequency. The out of channel emission is specified relative to the RRC filtered mean power of the UE carrier ~~output power measured in a 3.84 MHz bandwidth~~.

6.6.2.1.1 Minimum requirement

The power of any UE emission shall not exceed the levels specified in Table 6.10

Table 6.10: Spectrum Emission Mask Requirement

Δf* in MHz	Minimum requirement	Measurement bandwidth
2.5 - 3.5	$\left\{-35-15\cdot\left(\frac{\Delta f}{MHz}-2.5\right)\right\}dBc$	30 kHz **
3.5 - 7.5	$\left\{-35-1\cdot\left(\frac{\Delta f}{MHz}-3.5\right)\right\}dBc$	1 MHz ***
7.5 - 8.5	$\left\{-39-10\cdot\left(\frac{\Delta f}{MHz}-7.5\right)\right\}dBc$	1 MHz ***
8.5 - 12.5 MHz	-49 dBc	1 MHz ***
* Δf is the separation between the carrier frequency and the centre of the measuring filter.		
** The first and last measurement position with a 30 kHz filter is at Δf equals to 2.515 MHz and 3.485 MHz.		
*** The first and last measurement position with a 1 MHz filter is at Δf equals to 4 MHz and 12 MHz. As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be different from the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.		
The lower limit shall be –50 dBm/3.84 MHz or which ever is higher.		

6.6.2.2 Adjacent Channel Leakage power Ratio (ACLR)

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the RRC filtered mean ~~average~~ power centered on the assigned channel frequency to the RRC filtered mean ~~average~~ power centered on an adjacent channel frequency. ~~In both cases the average power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with roll-off α =0.22 and a bandwidth equal to the chip rate.~~

6.6.2.2.1 Minimum requirement

If the adjacent channel power is greater than –50dBm then the ACLR shall be higher than the value specified in Table 6.11.

Table 6.11: UE ACLR

Power Class	Adjacent channel frequency relative to assigned channel frequency	ACLR limit
3	+ 5 MHz or – 5 MHz	33 dB
3	+ 10 MHz or – 10 MHz	43 dB
4	+ 5 MHz or – 5 MHz	33 dB
4	+ 10 MHz or –10 MHz	43 dB

NOTE 1: The requirement shall still be met in the presence of switching transients.

NOTE 2: The ACLR requirements reflect what can be achieved with present state of the art technology.

NOTE 3: Requirement on the UE shall be reconsidered when the state of the art technology progresses.

6.6.3 Spurious emissions

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.

The frequency boundary and the detailed transitions of the limits between the requirement for out band emissions and spectrum emissions are based on ITU-R Recommendations SM.329-8[2].

6.6.3.1 Minimum requirement

These requirements are only applicable for frequencies, which are greater than 12.5 MHz away from the UE centre carrier frequency.

Table 6.12: General spurious emissions requirements

Frequency Bandwidth	Measurement Bandwidth	Minimum requirement
9 kHz ≤ f < 150 kHz	1 kHz	-36 dBm
150 kHz ≤ f < 30 MHz	10 kHz	-36 dBm
30 MHz ≤ f < 1000 MHz	100 kHz	-36 dBm
1 GHz ≤ f < 12.75 GHz	1 MHz	-30 dBm

Table 6.13: Additional spurious emissions requirements

Paired band	Frequency Bandwidth	Measurement Bandwidth	Minimum requirement
For operation in frequency bands as defined in subclause 5.2(a)	1893.5 MHz <f<1919.6 MHz	300 kHz	-41 dBm
	925 MHz ≤ f ≤ 935 MHz	100 kHz	-67 dBm *
	935 MHz < f ≤ 960 MHz	100 kHz	-79 dBm *
	1805 MHz ≤ f ≤ 1880 MHz	100 kHz	-71 dBm *
*: The measurements are made on frequencies which are integer multiples of 200 kHz. As exceptions, up to five measurements with a level up to the applicable requirements defined in Table 6.12 are permitted for each UARFCN used in the measurement			

6.7 Transmit intermodulation

The transmit intermodulation performance is a measure of the capability of the transmitter to inhibit the generation of signals in its non linear elements caused by presence of the wanted signal and an interfering signal reaching the transmitter via the antenna.

6.7.1 Minimum requirement

User Equipment(s) transmitting in close vicinity of each other can produce intermodulation products, which can fall into the UE, or Node B receive band as an unwanted interfering signal. The UE intermodulation attenuation is defined by the ratio of the ~~output~~ RRC filtered mean power of the wanted signal to the ~~output~~ RRC filtered mean power of the intermodulation product when an interfering CW signal is added at a level below the wanted signal. ~~Both the wanted signal power and the IM product power are measured with a filter that has a Root-Raised Cosine (RRC) filter response with roll-off α =0.22 and a bandwidth equal to the chip rate.~~

The requirement of transmitting intermodulation for a carrier spacing of 5 MHz is prescribed in Table 6.14.

Table 6.14: Transmit Intermodulation

Interference Signal Frequency Offset	5MHz	10MHz
Interference CW Signal Level	-40dBc	
Intermodulation Product	-31dBc	-41dBc

6.8 Transmit modulation

6.8.1 Transmit pulse shape filter

The transmit pulse shaping filter is a root-raised cosine (RRC) with roll-off α =0.22 in the frequency domain. The impulse response of the chip impulse filter $RC_0(t)$ is:

$$RC_0(t) = \frac{\sin\left(\pi \frac{t}{T_C}(1-\alpha)\right) + 4\alpha \frac{t}{T_C}\cos\left(\pi \frac{t}{T_C}(1+\alpha)\right)}{\pi \frac{t}{T_C}\left(1-\left(4\alpha \frac{t}{T_C}\right)^2\right)}$$

Where the roll-off factor α =0.22 and the chip duration is

$$T = \frac{1}{chiprate} \approx 0.26042 \ \ \mu s$$

6.8.2 Error Vector Magnitude

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.

6.8.2.1 Minimum requirement

The Error Vector Magnitude shall not exceed 17.5 % for the parameters specified in Table 6.15.

Table 6.15: Parameters for Error Vector Magnitude/Peak Code Domain Error

Parameter	Unit	Level
UE Output Power	dBm	≥ –20
Operating conditions		Normal conditions
Power control step size	dB	1

6.8.3 Peak code domain error

The Peak Code Domain Error is computed by projecting power of the error vector (as defined in 6.8.2) onto the code domain at a specific spreading factor. The Code Domain Error for every code in the domain is defined as the ratio of the mean power of the projection onto that code, to the mean power of the composite reference waveform. This ratio is expressed in dB. The Peak Code Domain Error is defined as the maximum value for the Code Domain Error for all codes. The measurement interval is one ~~power control group (~~timeslot~~)~~.

The requirement for peak code domain error is only applicable for multi-code transmission.

6.8.3.1 Minimum requirement

The peak code domain error shall not exceed -15 dB at spreading factor 4 for the parameters specified in Table 6.15 . The requirements are defined using the UL reference measurement channel specified in subclause A.2.5.

7 Receiver characteristics

7.1 General

Unless otherwise stated the receiver characteristics are specified at the antenna connector of the UE. For UE(s) with an integral antenna only, a reference antenna with a gain of 0 dBi is assumed. UE with an integral antenna may be taken into account by converting these power levels into field strength requirements, assuming a 0 dBi gain antenna. Receiver characteristics for UE(s) with multiple antennas/antenna connectors are FFS.

The UE antenna performance has a significant impact on system performance, and minimum requirements on the antenna efficiency are therefore intended to be included in future versions of the present document. It is recognised that different requirements and test methods are likely to be required for the different types of UE.

All the parameters in clause 7 are defined using the DL reference measurement channel (12.2 kbps) specified in subclause A.3.1 and unless stated are with DL power control OFF.

7.2 Diversity characteristics

A suitable receiver structure using coherent reception in both channel impulse response estimation and code tracking procedures is assumed. Three forms of diversity are considered to be available in UTRA/FDD.

Table 7.1: Diversity characteristics for UTRA/FDD

Time diversity	Channel coding and interleaving in both up link and down link
Multi-path diversity	Rake receiver or other suitable receiver structure with maximum combining. Additional processing elements can increase the delay-spread performance due to increased capture of signal energy.
Antenna diversity	Antenna diversity with maximum ratio combing in the Node B and optionally in the UE. Possibility for downlink transmit diversity in the Node B.

7.3 Reference sensitivity level

The reference sensitivity level is the minimum ~~receiver input~~mean power ~~measured~~ received at the UE antenna port at which the Bit Error Ratio (BER) ~~does~~ shall not exceed a specific value.

7.3.1 Minimum requirement

The BER shall not exceed 0.001 for the parameters specified in Table 7.2.

Table 7.2: Test parameters for reference sensitivity

Parameter	Unit	Level
DPCH_Ec	dBm/3.84 MHz	-117
$\hat{I}_{or}$	dBm/3.84 MHz	-106.7
1. For Power class 3 this shall be at the maximum output power 2. For Power class 4 this shall be at the maximum output power		

7.4 Maximum input level

This is defined as the maximum ~~receiver input~~mean power received at the UE antenna port, which does not degrade the specified BER performance.

7.4.1 Minimum requirement

The BER shall not exceed 0.001 for the parameters specified in Table 7.3.

Table 7.3: Maximum input level

Parameter	Unit	Level
$\frac{DPCH\_Ec}{I_{or}}$	dB	-19
$\hat{I}_{or}$	dBm/3.84 MHz	-25
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)
~~1. For Power class 3 the average transmit output power shall be +20 dBm~~ ~~2. For Power class 4 the average transmit output power shall be +18 dBm~~		

NOTE: Since the spreading factor is large (10log(SF)=21dB), the majority of the total input signal consists of the OCNS interference. The structure of OCNS signal is defined in Annex C.3.2.

7.5 Adjacent Channel Selectivity (ACS)

Adjacent Channel Selectivity (ACS) is a measure of a receiver's ability to receive a W-CDMA signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

7.5.1 Minimum requirement

The ACS shall be better than the value indicated in Table 7.4 for the test parameters specified in Table 7.5 where the BER shall not exceed 0.001.

Table 7.4: Adjacent Channel Selectivity

Power Class	Unit	ACS
3	dB	33
4	dB	33

Table 7.5: Test parameters for Adjacent Channel Selectivity

Parameter	Unit	Level
DPCH_Ec	dBm/3.84 MHz	-103
$\hat{I}_{or}$	dBm/3.84 MHz	-92.7
I_{oac} mean power (modulated)	dBm~~/3.84 MHz~~	-52
F_{uw} (offset)	MHz	+5 or -5
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)
~~1. For Power class 3 the average transmit output power shall be +20 dBm~~ ~~2. For Power class 4 the average transmit output power shall be +18 dBm~~		

NOTE: The I_{oac} (modulated) signal consists of the common channels needed for tests as specified in Table C.7 and 16 dedicated data channels as specified in Table C.6.

7.6 Blocking characteristics

The blocking characteristic is a measure of the receiver's ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels, without this unwanted input signal causing a degradation of the performance of the receiver beyond a specified limit. The blocking performance shall apply at all frequencies except those at which a spurious response occur.

7.6.1 Minimum requirement

The BER shall not exceed 0.001 for the parameters specified in Table 7.6 and Table 7.7. For Table 7.7 up to 24 exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1 MHz step size.

Table 7.6: In-band blocking

~~Parameter~~	~~Unit~~	~~Offset~~	~~Offset~~
~~DPCH_Ec~~	~~dBm/3.84 MHz~~	~~-114~~	~~-114~~
~~$\hat{I}_{or}$~~	~~dBm/3.84 MHz~~	~~-103.7~~	~~-103.7~~
~~$I_{blocking}$ (modulated)~~	~~dBm/3.84 MHz~~	~~-56~~	~~-44~~
~~F_{uw} (offset)~~	~~MHz~~	~~+10 or -10~~	~~+15 or -15~~
~~1. For Power class 3 the average transmit output power shall be +20 dBm~~ ~~2. For Power class 4 the average transmit output power shall be +18 dBm~~			

Parameter	Unit	Level	
DPCH_Ec	dBm/3.84 MHz	-114	
$\hat{I}_{or}$	dBm/3.84 MHz	-103.7	
$I_{blocking}$ mean power (modulated)	dBm	-56 (for F_{uw} offset ±10 MHz)	-44 (for F_{uw} offset ±15 MHz)
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)	

Note: $I_{blocking}$ (modulated) consists of the common channels needed for tests as specified in Table C.7 and 16 dedicated data channels as specified in Table C.6.

Table 7.7: Out of band blocking

Parameter	Unit	Band 1	Band 2	Band 3
DPCH_Ec	dBm/3.84 MHz	-114	-114	-114
$\hat{I}_{or}$	dBm/3.84 MHz	-103.7	-103.7	-103.7
$I_{blocking}$ (CW)	dBm	-44	-30	-15
F_{uw} For operation in frequency bands as defined in subclause 5.2(a)	MHz	2050<f <2095 2185<f <2230	2025 <f <2050 2230 <f <2255	1< f <2025 2255<f<12750
F_{uw} For operation in frequency bands as defined in subclause 5.2(b)	MHz	1870<f <1915 2005<f <2050	1845 <f <1870 2050 <f <2075	1< f <1845 2075<f<12750
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)		
~~1. For Power class 3 the average transmit output power shall be +20 dBm~~ ~~2. For Power class 4 the average transmit output power shall be +18 dBm~~				
For operation in bands referenced in 5.2(a), from 2095<f<2110 MHz and 2170<f<2185 MHz, the appropriate in-band blocking or adjacent channel selectivity in subclause 7.5.1 and table 7.6 shall be applied.				
For operation in bands referenced in 5.2(b), 1915<f<1930 MHz and 1990<f<2005 MHz, the appropriate in-band blocking or adjacent channel selectivity in subclause 7.5.1 and table 7.6 shall be applied				

7.7 Spurious response

Spurious response is a measure of the receiver's ability to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the blocking limit is not met.

7.7.1 Minimum requirement

The BER shall not exceed 0.001 for the parameters specified in Table 7.8.

Table 7.8: Spurious Response

Parameter	Unit	Level
DPCH_Ec	dBm/3.84 MHz	-114
$\hat{I}_{or}$	dBm/3.84 MHz	-103.7
$I_{blocking}$ (CW)	dBm	-44
F_{uw}	MHz	Spurious response frequencies
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)
~~1. For Power class 3 the average transmit output power shall be +20 dBm~~ ~~2. For Power class 4 the average transmit output power shall be +18 dBm~~		

7.8 Intermodulation characteristics

Third and higher order mixing of the two interfering RF signals can produce an interfering signal in the band of the desired channel. Intermodulation response rejection is a measure of the capability of the receiver to receiver a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.

7.8.1 Minimum requirement

The BER shall not exceed 0.001 for the parameters specified in Table 7.9.

Table 7.9: Receive intermodulation characteristics

Parameter	Unit	Level	
DPCH_Ec	dBm/3.84 MHz	-114	
$\hat{I}_{or}$	dBm/3.84 MHz	-103.7	
I_{ouw1} (CW)	dBm	-46	
I_{ouw2} mean power (modulated)	dBm~~/3.84 MHz~~	-46	
F_{uw1} (offset)	MHz	10	-10
F_{uw2} (offset)	MHz	20	-20
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)	
~~1. For Power class 3 the average transmit output power shall be +20 dBm~~ ~~2. For Power class 4 the average transmit output power shall be +18 dBm~~			

NOTE: I_{ouw2} (modulated) consists of the common channels needed for tests as specified in Table C.7 and 16 dedicated data channels as specified in Table C.6.

7.9 Spurious emissions

The spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the UE antenna connector.

7.9.1 Minimum requirement

The power of any narrow band CW spurious emission shall not exceed the maximum level specified in Table 7.10 and Table 7.11

Table 7.10: General receiver spurious emission requirements

Frequency Band	Measurement Bandwidth	Maximum level	Note
30MHz ≤ f < 1GHz	100 kHz	-57 dBm	
1GHz ≤ f ≤ 12.75 GHz	1 MHz	-47 dBm	

Table 7.11: Additional receiver spurious emission requirements

	Frequency Band	Measurement Bandwidth	Maximum level	Note
For operation in frequency bands as defined in subclause 5.2(a)	1920 MHz ≤ f ≤ 1980 MHz	3.84 MHz	-60 dBm	Mobile transmit band in URA_PCH, Cell_PCH and idle state
	2110 MHz ≤ f ≤ 2170 MHz	3.84 MHz	-60 dBm	Mobile receive band

3GPP TSG RAN WG4 Meeting #21 **R4-020387**
Sophia Antipolis, France 28th January - 1st February 2002

CR-Form-v4

CHANGE REQUEST

⌘	25.101	CR	156	⌘	ev	1	⌘	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 [X] Radio Access Network [ ] Core Network [ ]

Title:	⌘	Power setting for uplink compressed mode		
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: ⌘ 25.214 Clause 5.1.2.3 defines method for calculating the adjustment to be applied to the transmission power after a transmission gap in compressed mode. The value of the parameter Δ_{RESUME} used in the determination of the adjustment can be calculated with two different ways depending on the used Initial Transmit Power (ITP) mode. In ITP mode 0 the value of Δ_{RESUME} is calculated based on the received downlink TPC command. Assuming that Δ_{PILOT} = 0, this results maximum change of ±2 dB in transmit power. In ITP mode 1 the value of Δ_{RESUME} depends on the TPC commands sent before the transmission gap. This may result large adjustments to transmit power. As an example transmit power is consequently lowered for 15 slots before transmission gap this results UE transmit power change of Δ_{DPCCH}= 19dB (Δ_{PILOT} = 0, Δ_{TPC}=2 dB, k_{sc}=1) after the transmission gap. The current power difference tolerance values (±3 dB) in Table 6.9 were defined based on the assumption that the transmit power level after and before the transmission gap are equal, following the ITP mode 0 behaviour. Also ITP mode 1 requirements needs to be clarified into this table, and they need to be in-line with TFC requirements.

Unnecessary measure unit markings removed from Table 6.7 and Table 6.8.

Summary of change: ⌘ Editorial corrections to Table 6.7 and Table 6.8.

Table 6.9 changed to specify the tolerances for transmitter power differences in compliance with RACH and TFC requirements.

Isolated Impact Analysis:

Aligning the requirements according to TS 25.214. This change would not change the equipments, since the ITP mode 0 requirement is the existing requirement with clarification of output power not changing after the gap less than 2 dB. If the change of output power due L1 algorithms is more than this the requirement from TFC power setting would apply. The impact to the implementations should be

		negligible.	
Consequences if not approved:	⌘	The requirements between RACH, TFC change and compressed mode power settling are not consistent and unnecessary tight requirements are set for UE in compressed mode.	

Clauses affected:	⌘	6.5.4		
Other specs affected:	⌘	[ ] Other core specifications [X] Test specifications [ ] O&M Specifications	⌘	34.121
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

6.5.2 Transmit ON/OFF Time mask

The time mask for transmit ON/OFF defines the ramping time allowed for the UE between transmit OFF power and transmit ON power. Possible ON/OFF scenarios are RACH ,CPCH or UL compressed mode.

6.5.2.1 Minimum requirement

The transmit power levels versus time shall meet the mask specified in figure 6.2 for PRACH preambles and CPCH preambles, and the mask in figure 6.3 for all other cases. The signal is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off $\alpha = 0.22$ and a bandwidth equal to the chip rate.

On power is defined as either case as follows. The specification depends on each possible case.

- First preamble of RACH/CPCH: Open loop accuracy (Table 6.3).
- During preamble ramping of the RACH/CPCH, and between final RACH/CPCH preamble and RACH/CPCH message part: Accuracy depending on size of the required power difference.(Table 6.7). The step in total transmitted power between final RACH/CPCH preamble and RACH/CPCH message (control part + data part) shall be rounded to the closest integer dB value. A power step exactly half-way between two integer values shall be rounded to the closest integer of greater magnitude.
- After transmission gaps in compressed mode: Accuracy as in Table 6.9.
- Power step to Maximum Power: Maximum power accuracy (Table 6.1).

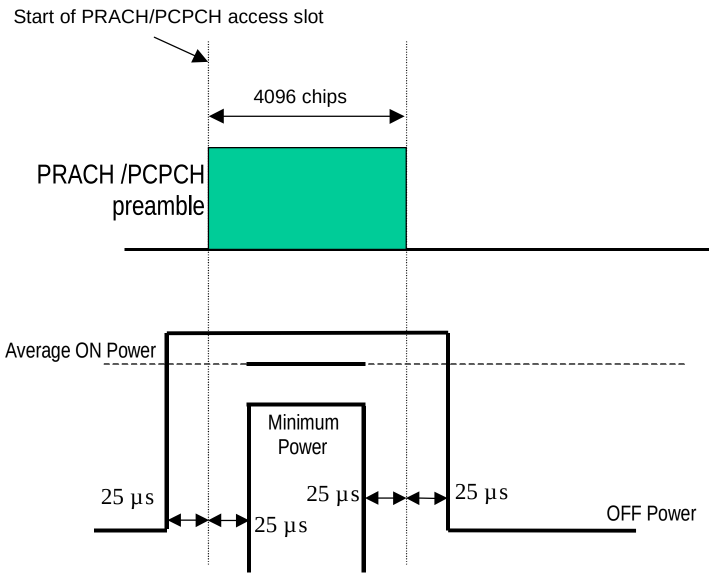

Figure 6.2: Transmit ON/OFF template for PRACH preambles and CPCH preambles

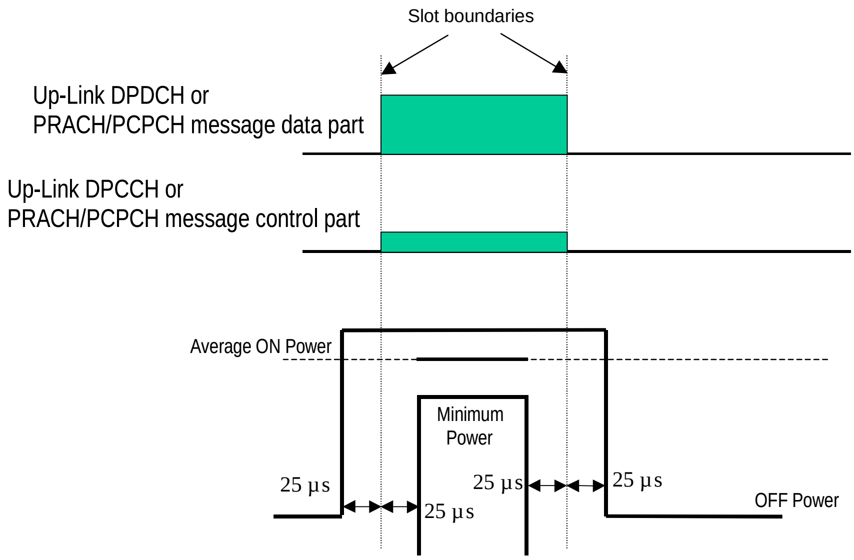

Figure 6.3: Transmit ON/OFF template for all other On/Off cases

Table 6.7: Transmitter power difference tolerance for RACH/CPCH preamble ramping, and between final RACH/CPCH preamble and RACH/CPCH message part

Power step size (Up or down)* ΔP [dB]	Transmitter power difference tolerance [dB]
0	+/- 1 ~~dB~~
1	+/- 1 ~~dB~~
2	+/- 1.5 ~~dB~~
3	+/- 2 ~~dB~~
$4 \leq \Delta P \leq 10$	+/- 2.5 ~~dB~~
$11 \leq \Delta P \leq 15$	+/- 3.5 ~~dB~~
$16 \leq \Delta P \leq 20$	+/- 4.5 ~~dB~~
$21 \leq \Delta P$	+/- 6.5 ~~dB~~

NOTE: Power step size for RACH/CPCH preamble ramping is from 1 to 8 dB with 1 dB steps.

6.5.3 Change of TFC

A change of TFC (Transport Format Combination) in uplink means that the power in the uplink varies according to the change in data rate. DTX, where the DPCH is turned off, is a special case of variable data, which is used to minimise the interference between UE(s) by reducing the UE transmit power when voice, user or control information is not present.

6.5.3.1 Minimum requirement

A change of output power is required when the TFC, and thereby the data rate, is changed. The ratio of the amplitude between the DPDCH codes and the DPCCH code will vary. The power step due to a change in TFC shall be calculated in the UE so that the power transmitted on the DPCCH shall follow the inner loop power control. The step in total transmitted power (DPCCH + DPDCH) shall then be rounded to the closest integer dB value. A power step exactly half-way between two integer values shall be rounded to the closest integer of greater magnitude. The accuracy of the power step, given the step size, is specified in Table 6.8. The power change due to a change in TFC is defined as the relative power difference between the average power of the original (reference) timeslot and the average power of the target timeslot, not including the transient duration. The transient duration is from 25µs before the slot boundary to 25µs after the slot boundary. The power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off $\alpha = 0.22$ and a bandwidth equal to the chip rate.

Table 6.8: Transmitter power step tolerance

Power step size (Up or down) ΔP [dB]	Transmitter power step tolerance [dB]
0	+/- 0.5 ~~dB~~
1	+/- 0.5 ~~dB~~
2	+/- 1.0 ~~dB~~
3	+/- 1.5 ~~dB~~
$4 \leq \Delta P \leq 10$	+/- 2.0 ~~dB~~
$11 \leq \Delta P \leq 15$	+/- 3.0 ~~dB~~
$16 \leq \Delta P \leq 20$	+/- 4.0 ~~dB~~
$21 \leq \Delta P$	+/- 6.0 ~~dB~~

The transmit power levels versus time shall meet the mask specified in Figure 6.4.

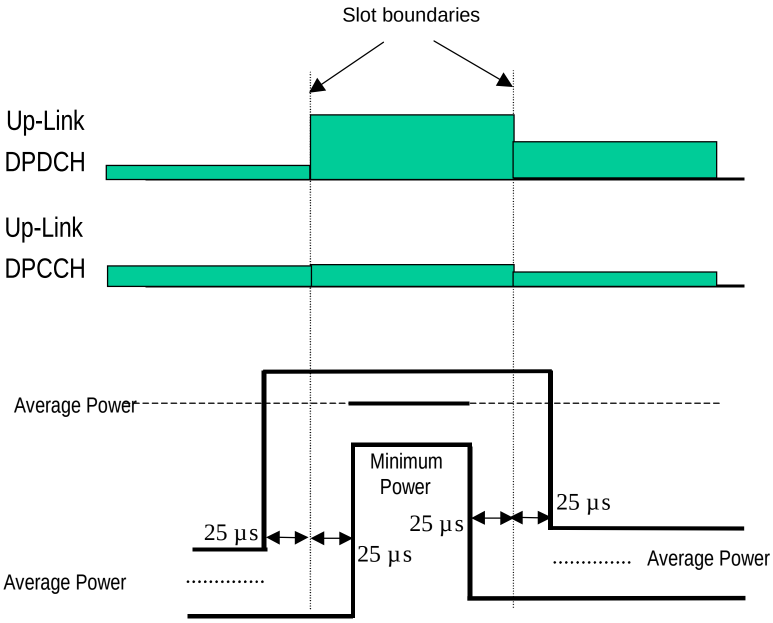

Figure 6.4: Transmit template during TFC change

6.5.4 Power setting in uplink compressed mode

Compressed mode in uplink means that the power in uplink is changed.

6.5.4.1 Minimum requirement

A change of output power is required during uplink compressed frames since the transmission of data is performed in a shorter interval. The ratio of the amplitude between the DPDCH codes and the DPCCH code will also vary. The power step due to compressed mode shall be calculated in the UE so that the energy transmitted on the pilot bits during each transmitted slot shall follow the inner loop power control.

Thereby, the power during compressed mode, and immediately afterwards, shall be such that the power on the DPCCH follows the steps due to inner loop power control combined with additional steps of $10\text{Log}_{10}(N_{pilot.prev} / N_{pilot.curr})$ dB where $N_{pilot.prev}$ is the number of pilot bits in the previously transmitted slot, and $N_{pilot.curr}$ is the current number of pilot bits per slot.

The resulting step in total transmitted power (DPCCH +DPDCH) shall then be rounded to the closest integer dB value. A power step exactly half-way between two integer values shall be rounded to the closest integer of greatest magnitude. The accuracy of the power step, given the step size, is specified in Table 6.8 in subclause 6.5.3.1. The power step is defined as the relative power difference between the average power of the original (reference) timeslot and the average power of the target timeslot, when neither the original timeslot nor the reference timeslot are in a transmission gap. The transient duration is not included, and is from 25µs before the slot boundary to 25µs after the slot boundary. The

relative power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off $\alpha = 0.22$ and a bandwidth equal to the chip rate.

In addition to any power change due to the ratio $N_{pilot.prev}$ / $N_{pilot.curr}$, the average power of the DPCCH in the first slot after a compressed mode transmission gap shall differ from the average power in the last slot before the transmission gap by an amount Δ_{RESUME}, where Δ_{RESUME} is calculated as described in clause 5.1.2.3 of TS 25.214.

The resulting difference in the total transmitted power (DPCCH + DPDCH) shall then be rounded to the closest integer dB value. A power difference exactly half-way between two integer values shall be rounded to the closest integer of greatest magnitude. The accuracy of the resulting difference in the total transmitted power (DPCCH + DPDCH) after a transmission gap of up to 14 slots shall be as specified in Table 6.9.

Table 6.9: Transmitter power difference tolerance after a transmission gap of up to 14 slots

~~Tolerance on required difference in total transmitter power after a transmission gap~~
~~+/- 3 dB~~

Power difference (Up or down) ΔP [dB]	Transmitter power step tolerance after a transmission gap [dB]
ΔP ≤ 2	+/- 3
3	+/- 3
4 ≤ ΔP ≤ 10	+/- 3.5
11 ≤ ΔP ≤ 15	+/- 4
16 ≤ ΔP ≤ 20	+/- 4.5
21 ≤ ΔP	+/- 6.5

The power difference is defined as the relative power difference between the average power of the original (reference) timeslot before the transmission gap and the average power of the target timeslot after the transmission gap, not including the transient durations. The transient durations at the start and end of the transmission gaps are each from 25µs before the slot boundary to 25µs after the slot boundary. The relative power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off $\alpha = 0.22$ and a bandwidth equal to the chip rate.

The transmit power levels versus time shall meet the mask specified in figure 6.5.

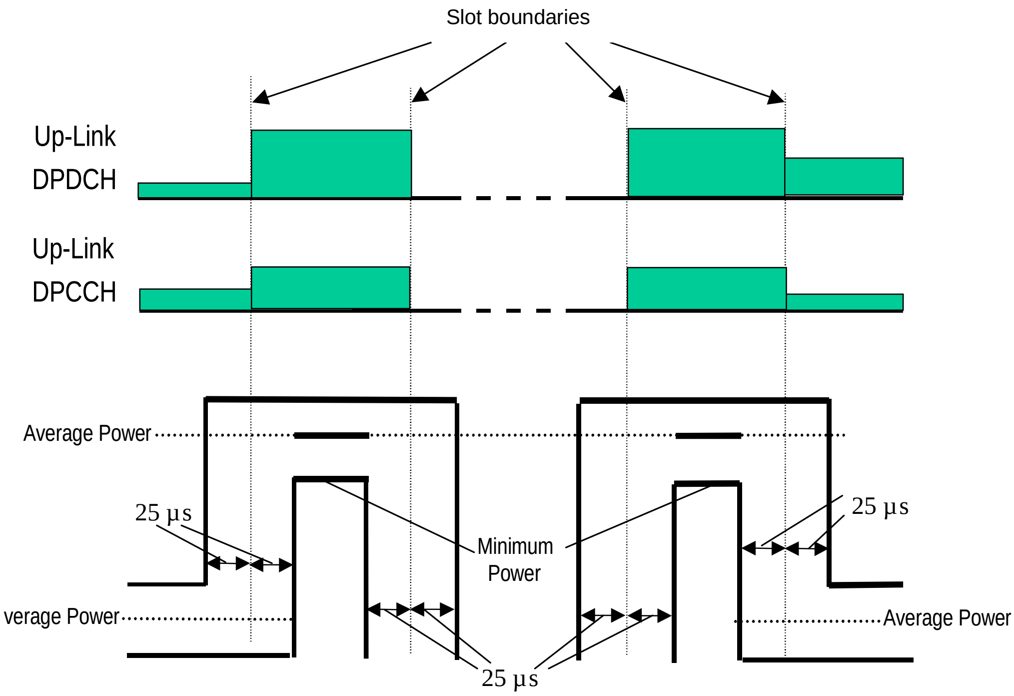

Figure 6.5: Transmit template during Compressed mode

CR-Form-v4

CHANGE REQUEST

⌘ **25.101 CR 155** ⌘ ev **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 [X] Radio Access Network [ ] Core Network [ ]

Title: ⌘	Power setting for uplink compressed mode
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: ⌘ 25.214 Clause 5.1.2.3 defines method for calculating the adjustment to be applied to the transmission power after a transmission gap in compressed mode. The value of the parameter Δ_{RESUME} used in the determination of the adjustment can be calculated with two different ways depending on the used Initial Transmit Power (ITP) mode. In ITP mode 0 the value of Δ_{RESUME} is calculated based on the received downlink TPC command. Assuming that Δ_{PILOT} = 0, this results maximum change of ±2 dB in transmit power. In ITP mode 1 the value of Δ_{RESUME} depends on the TPC commands sent before the transmission gap. This may result large adjustments to transmit power. As an example transmit power is consequently lowered for 15 slots before transmission gap this results UE transmit power change of Δ_{DPCCH}= 19dB (Δ_{PILOT} = 0, Δ_{TPC}=2 dB, k_{sc}=1) after the transmission gap. The current power difference tolerance values (±3 dB) in Table 6.9 were defined based on the assumption that the transmit power level after and before the transmission gap are equal, following the ITP mode 0 behaviour. Also ITP mode 1 requirements needs to be clarified into this table, and they need to be in-line with TFC requirements.

Unnecessary measure unit markings removed from Table 6.7 and Table 6.8.

Summary of change: ⌘ Editorial corrections to Table 6.7 and Table 6.8.

Table 6.9 changed to specify the tolerances for transmitter power differences in compliance with RACH and TFC requirements.

Isolated Impact Analysis:

Aligning the requirements according to TS 25.214. This change would not change the equipments, since the ITP mode 0 requirement is the existing requirement with clarification of output power not changing after the gap less than 2 dB. If the change of output power due L1 algorithms is more than this the requirement from TFC power setting would apply. The impact to the implementations should be

		negligible.
Consequences if not approved:	⌘	The requirements between RACH, TFC change and compressed mode power settling are not consistent and unnecessary tight requirements are set for UE in compressed mode.

Clauses affected:	⌘	6.5.4			
Other specs affected:	⌘		Other core specifications	⌘	
		X	Test specifications		34.121
			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

6.5.2 Transmit ON/OFF Time mask

The time mask for transmit ON/OFF defines the ramping time allowed for the UE between transmit OFF power and transmit ON power. Possible ON/OFF scenarios are RACH ,CPCH or UL compressed mode.

6.5.2.1 Minimum requirement

The transmit power levels versus time shall meet the mask specified in figure 6.2 for PRACH preambles and CPCH preambles, and the mask in figure 6.3 for all other cases. The signal is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off $\alpha = 0.22$ and a bandwidth equal to the chip rate.

On power is defined as either case as follows. The specification depends on each possible case.

- First preamble of RACH/CPCH: Open loop accuracy (Table 6.3).
- During preamble ramping of the RACH/CPCH, and between final RACH/CPCH preamble and RACH/CPCH message part: Accuracy depending on size of the required power difference.(Table 6.7). The step in total transmitted power between final RACH/CPCH preamble and RACH/CPCH message (control part + data part) shall be rounded to the closest integer dB value. A power step exactly half-way between two integer values shall be rounded to the closest integer of greater magnitude.
- After transmission gaps in compressed mode: Accuracy as in Table 6.9.
- Power step to Maximum Power: Maximum power accuracy (Table 6.1).

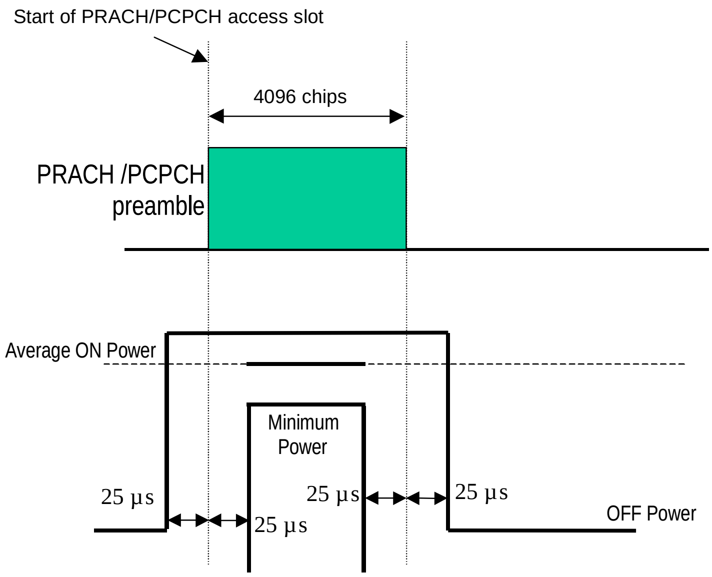

Figure 6.2: Transmit ON/OFF template for PRACH preambles and CPCH preambles

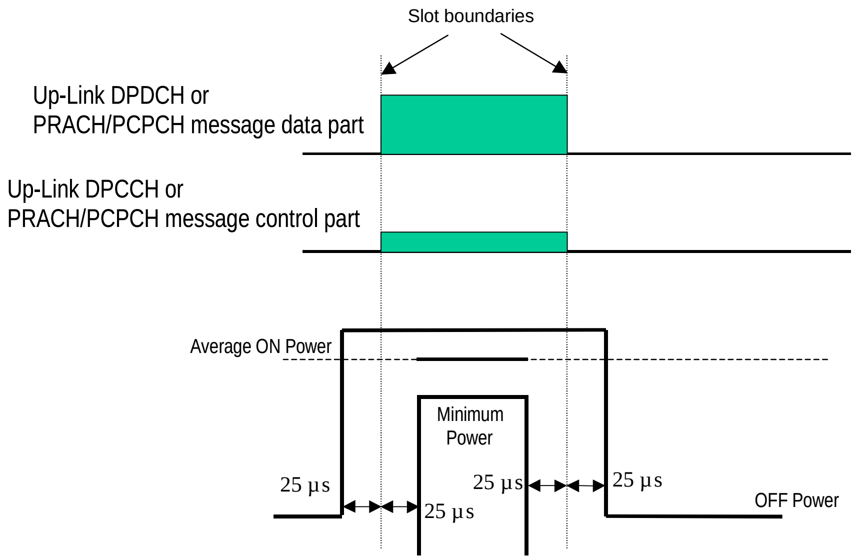

Figure 6.3: Transmit ON/OFF template for all other On/Off cases

Table 6.7: Transmitter power difference tolerance for RACH/CPCH preamble ramping, and between final RACH/CPCH preamble and RACH/CPCH message part

Power step size (Up or down)* ΔP [dB]	Transmitter power difference tolerance [dB]
0	+/- 1 ~~dB~~
1	+/- 1 ~~dB~~
2	+/- 1.5 ~~dB~~
3	+/- 2 ~~dB~~
$4 \le \Delta P \le 10$	+/- 2.5 ~~dB~~
$11 \le \Delta P \le 15$	+/- 3.5 ~~dB~~
$16 \le \Delta P \le 20$	+/- 4.5 ~~dB~~
$21 \le \Delta P$	+/- 6.5 ~~dB~~

NOTE: Power step size for RACH/CPCH preamble ramping is from 1 to 8 dB with 1 dB steps.

6.5.3 Change of TFC

A change of TFC (Transport Format Combination) in uplink means that the power in the uplink varies according to the change in data rate. DTX, where the DPCH is turned off, is a special case of variable data, which is used to minimise the interference between UE(s) by reducing the UE transmit power when voice, user or control information is not present.

6.5.3.1 Minimum requirement

A change of output power is required when the TFC, and thereby the data rate, is changed. The ratio of the amplitude between the DPDCH codes and the DPCCH code will vary. The power step due to a change in TFC shall be calculated in the UE so that the power transmitted on the DPCCH shall follow the inner loop power control. The step in total transmitted power (DPCCH + DPDCH) shall then be rounded to the closest integer dB value. A power step exactly half-way between two integer values shall be rounded to the closest integer of greater magnitude. The accuracy of the power step, given the step size, is specified in Table 6.8. The power change due to a change in TFC is defined as the relative power difference between the average power of the original (reference) timeslot and the average power of the target timeslot, not including the transient duration. The transient duration is from 25µs before the slot boundary to 25µs after the slot boundary. The power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off $\alpha = 0.22$ and a bandwidth equal to the chip rate.

Table 6.8: Transmitter power step tolerance

Power step size (Up or down) ΔP [dB]	Transmitter power step tolerance [dB]
0	+/- 0.5 ~~dB~~
1	+/- 0.5 ~~dB~~
2	+/- 1.0 ~~dB~~
3	+/- 1.5 ~~dB~~
$4 \leq \Delta P \leq 10$	+/- 2.0 ~~dB~~
$11 \leq \Delta P \leq 15$	+/- 3.0 ~~dB~~
$16 \leq \Delta P \leq 20$	+/- 4.0 ~~dB~~
$21 \leq \Delta P$	+/- 6.0 ~~dB~~

The transmit power levels versus time shall meet the mask specified in Figure 6.4.

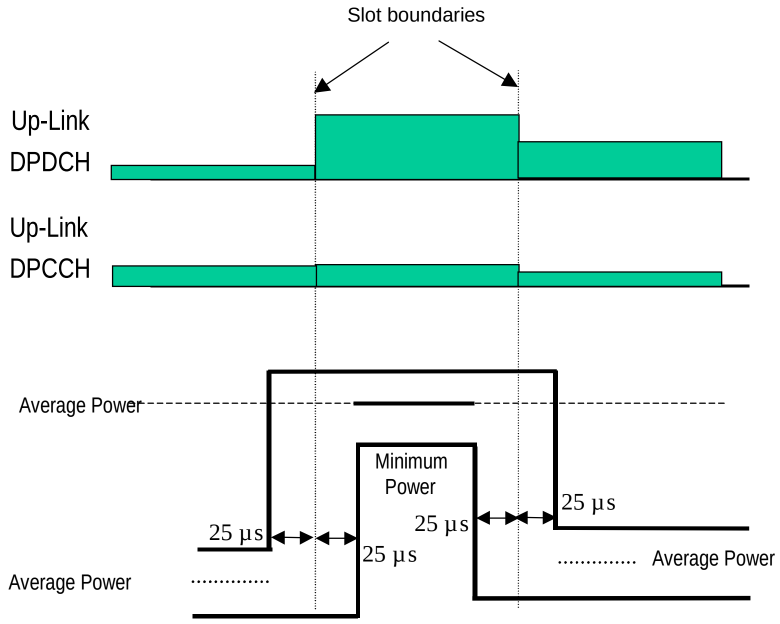

Figure 6.4: Transmit template during TFC change

6.5.4 Power setting in uplink compressed mode

Compressed mode in uplink means that the power in uplink is changed.

6.5.4.1 Minimum requirement

A change of output power is required during uplink compressed frames since the transmission of data is performed in a shorter interval. The ratio of the amplitude between the DPDCH codes and the DPCCH code will also vary. The power step due to compressed mode shall be calculated in the UE so that the energy transmitted on the pilot bits during each transmitted slot shall follow the inner loop power control.

Thereby, the power during compressed mode, and immediately afterwards, shall be such that the power on the DPCCH follows the steps due to inner loop power control combined with additional steps of $10\text{Log}_{10}(N_{pilot.prev} / N_{pilot.curr})$ dB where $N_{pilot.prev}$ is the number of pilot bits in the previously transmitted slot, and $N_{pilot.curr}$ is the current number of pilot bits per slot.

The resulting step in total transmitted power (DPCCH +DPDCH) shall then be rounded to the closest integer dB value. A power step exactly half-way between two integer values shall be rounded to the closest integer of greatest magnitude. The accuracy of the power step, given the step size, is specified in Table 6.8 in subclause 6.5.3.1. The power step is defined as the relative power difference between the average power of the original (reference) timeslot and the average power of the target timeslot, when neither the original timeslot nor the reference timeslot are in a transmission gap. The transient duration is not included, and is from 25µs before the slot boundary to 25µs after the slot boundary. The

relative power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off $\alpha = 0.22$ and a bandwidth equal to the chip rate.

In addition to any power change due to the ratio $N_{pilot.prev}$ / $N_{pilot.curr}$, the average power of the DPCCH in the first slot after a compressed mode transmission gap shall differ from the average power in the last slot before the transmission gap by an amount Δ_{RESUME}, where Δ_{RESUME} is calculated as described in clause 5.1.2.3 of TS 25.214.

The resulting difference in the total transmitted power (DPCCH + DPDCH) shall then be rounded to the closest integer dB value. A power difference exactly half-way between two integer values shall be rounded to the closest integer of greatest magnitude. The accuracy of the resulting difference in the total transmitted power (DPCCH + DPDCH) after a transmission gap of up to 14 slots shall be as specified in Table 6.9.

Table 6.9: Transmitter power difference tolerance after a transmission gap of up to 14 slots

~~Tolerance on required difference in total transmitter power after a transmission gap~~
~~+/- 3 dB~~

Power difference (Up or down) ΔP [dB]	Transmitter power step tolerance after a transmission gap [dB]
ΔP ≤ 2	+/- 3
3	+/- 3
4 ≤ ΔP ≤ 10	+/- 3.5
11 ≤ ΔP ≤ 15	+/- 4
16 ≤ ΔP ≤ 20	+/- 4.5
21 ≤ ΔP	+/- 6.5

The power difference is defined as the relative power difference between the average power of the original (reference) timeslot before the transmission gap and the average power of the target timeslot after the transmission gap, not including the transient durations. The transient durations at the start and end of the transmission gaps are each from 25μs before the slot boundary to 25μs after the slot boundary. The relative power is measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off $\alpha = 0.22$ and a bandwidth equal to the chip rate.

The transmit power levels versus time shall meet the mask specified in figure 6.5.

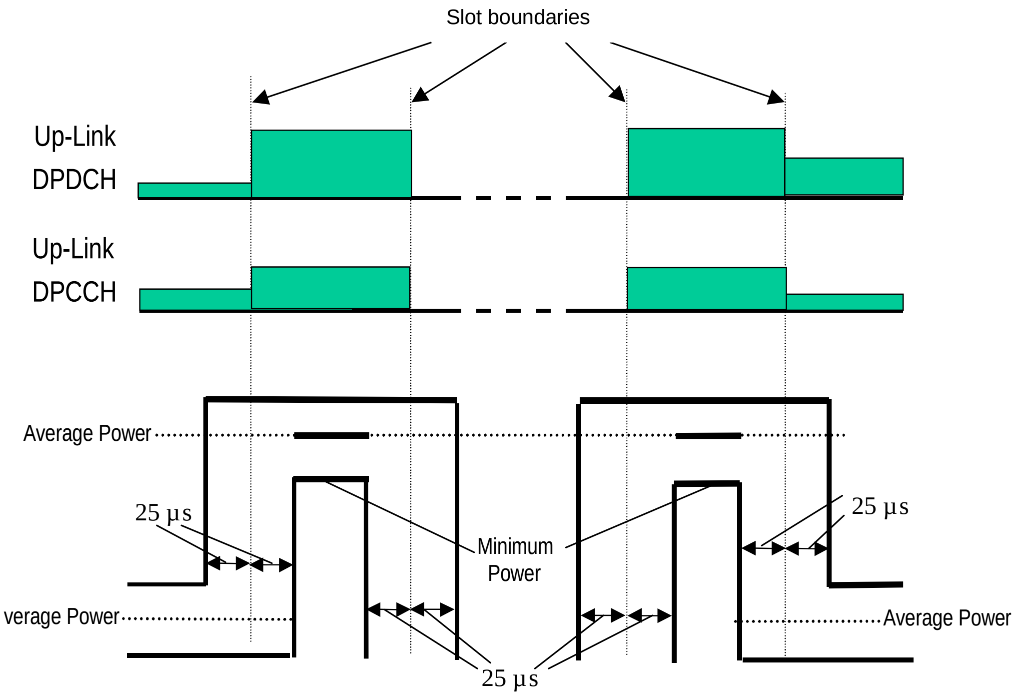

Figure 6.5: Transmit template during Compressed mode