ETSI TS 101 851-5-1 V2.1.1 (2008-01)

Technical Specification

**Satellite Earth Stations and Systems (SES);
Satellite Component of UMTS/IMT-2000;
Part 5: UE Radio Transmission and Reception;
Sub-part 1: G-family (S-UMTS-G 25.101)**

Reference
DTS/SES-00256-5

Keywords
FDD, IMT-2000, radio, satellite, transmission, UMTS, WCDMA

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Satellite Earth Stations and Systems (SES).

The present document is specifying the Satellite Radio Interface referenced as SRI Family G at ITU-R, in the frame of the modification of ITU-R Recommendation M.1457-5 [10]. This modification has been approved at ITU-R SG8 meeting in November 2005.

The present document is part 5, sub-part 1 of a multi-part deliverable covering Satellite Earth Stations and Systems (SES); Satellite Component of UMTS/IMT-2000; G-family, as identified below:

Part 1: "Physical channels and mapping of transport channels into physical channels";

Part 2: "Multiplexing and channel coding";

Part 3: "Spreading and modulation";

Part 4: "Physical layer procedures";

Part 5: "UE Radio Transmission and Reception";

Sub-part 1: "G-family (S-UMTS-G 25.101)";

Part 6: "Ground stations and space segment radio transmission and reception".

Introduction

S-UMTS stands for the Satellite component of the Universal Mobile Telecommunication System. S-UMTS systems will complement the terrestrial UMTS (T-UMTS) and inter-work with other IMT-2000 family members through the UMTS core network. S-UMTS will be used to deliver 3rd generation mobile satellite services (MSS) utilizing either low (LEO) or medium (MEO) earth orbiting, or geostationary (GEO) satellite(s). S-UMTS systems are based on terrestrial 3GPP specifications and will support access to GSM/UMTS core networks.

NOTE 1: The term T-UMTS will be used in the present document to further differentiate the Terrestrial UMTS component.

Due to the differences between terrestrial and satellite channel characteristics, some modifications to the terrestrial UMTS (T-UMTS) standards are necessary. Some specifications are directly applicable, whereas others are applicable with modifications. Similarly, some T-UMTS specifications do not apply, whilst some S-UMTS specifications have no corresponding T-UMTS specification.

Since S-UMTS is derived from T-UMTS, the organization of the S-UMTS specifications closely follows the original 3rd Generation Partnership Project (3GPP) structure. The S-UMTS numbers have been designed to correspond to the 3GPP terrestrial UMTS numbering system. All S-UMTS specifications are allocated a unique S-UMTS number as follows:

S-UMTS-n xx.yyy

Where:

- The numbers xx and yyy correspond to the 3GPP-numbering scheme.
- n (n=A, B, C, …) denotes the family of S-UMTS specifications.

An S-UMTS system is defined by the combination of a family of S-UMTS specifications and 3GPP specifications, as follows:

- If an S-UMTS specification exists it takes precedence over the corresponding 3GPP specification (if any). This precedence rule applies to any references in the corresponding 3GPP specifications.

NOTE 2: Any references to 3GPP specifications within the S-UMTS specifications are not subject to this precedence rule. For example, an S-UMTS specification may contain specific references to the corresponding 3GPP specification.

- If an S-UMTS specification does not exist, the corresponding 3GPP specification may or may not apply. The exact applicability of the complete list of 3GPP specifications shall be defined at a later stage.

1 Scope

The present document is to establish the minimum RF characteristics for the User Equipment (UE).

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.
- Non-specific reference may be made only to a complete document or a part thereof and only in the following cases:
  - if it is accepted that it will be possible to use all future changes of the referenced document for the purposes of the referring document;
  - for informative references.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

For online referenced documents, information sufficient to identify and locate the source shall be provided. Preferably, the primary source of the referenced document should be cited, in order to ensure traceability. Furthermore, the reference should, as far as possible, remain valid for the expected life of the document. The reference shall include the method of access to the referenced document and the full network address, with the same punctuation and use of upper case and lower case letters.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

[1] ETSI TS 101 851-1-1: "Satellite Earth Stations and Systems (SES); Satellite Component of UMTS/IMT-2000; Part 1: Physical channels and mapping of transport channels into physical channels; Sub-part 1: G-family (S-UMTS-G 25.211)".

[2] ETSI TS 101 851-2-1: "Satellite Earth Stations and Systems (SES); Satellite Component of UMTS/IMT-2000; Part 2: Multiplexing and channel coding; Sub-part 1: G-family (S-UMTS-G 25.212)".

[3] ETSI TS 101 851-3-1: "Satellite Earth Stations and Systems (SES); Satellite Component of UMTS/IMT-2000; Part 3: Spreading and modulation; Sub-part 1: G-family (S-UMTS-G 25.213)".

[4] ETSI TS 101 851-4-1: "Satellite Earth Stations and Systems (SES); Satellite Component of UMTS/IMT-2000; Part 4: Physical layer procedures; Sub-part 1: G-family (S-UMTS-G 25.214)".

[5] ETSI TR 121 905: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Vocabulary for 3GPP Specifications (3GPP TR 21.905)".

[6] ETSI TS 125 101: "Universal Mobile Telecommunications System (UMTS); User Equipment (UE) radio transmission and reception (FDD) (3GPP TS 25.101)".

[7] ETSI TS 125 306: "Universal Mobile Telecommunications System (UMTS); UE Radio Access capabilities (3GPP TS 25.306)".

[8] ETSI TBR 042: "Satellite Personal Communications Networks (S-PCN); Mobile Earth Stations (MES), including handheld earth stations, for S-PCN in the 2,0 GHz bands under the Mobile Satellite Service (MSS); Terminal essential requirements".

[9] ETSI TS 145 004: "Digital cellular telecommunications system (Phase 2+); Modulation (3GPP TS 45.004)".

2.2 Informative references

[10] ITU-R Recommendation M.1457-5: "Detailed specifications of the radio interfaces of International Mobile Telecommunications-2000 (IMT-2000)".

[11] ETSI TR 102 058: "Satellite Earth Stations and Systems (SES); Satellite Component of UMTS/IMT-2000; Evaluation of the W-CDMA UTRA FDD as a Satellite Radio Interface".

[12] ETSI TR 102 277: "Satellite Earth Stations and Systems (SES);Satellite Component of UMTS/IMT-2000;W-CDMA Radio Interface for Multimedia Broadcast/Multicast Service (MBMS)".

[13] ITU-R Recommendation SM.329: "Unwanted emissions in the spurious domain".

[14] IEC publications 68-2-1: "Environmental testing - Part 2-1: Tests - Test A: Cold".

[15] IEC publications 68-2-2: "Environmental testing - Part 2-2: Tests - Test B: Dry heat".

3 Definitions symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TS 101 851-2-1 [2] and the following apply:

Adjacent Channel Leakage power Ratio (ACLR): ratio of the RRC filtered mean power centred on the assigned channel frequency to the RRC filtered mean power centred on an adjacent channel frequency

Adjacent Channel Selectivity (ACS): 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)

Block Error Rate (BLER): error rate of the transport (data) blocks passed by the physical layer to MAC layer for a given transport channel (i.e. physical layer error rate)

Complementary Ground Component (CGC): ground-based infrastructure at fixed locations used to enhance satellite coverage in zones where communications with one or several space stations cannot be ensured with the required quality

Enhanced performance requirements type 1: performance requirements which are optional for the UE. The requirements are based on UEs which utilize receiver diversity

Transmission Time Interval: interval of time over which a transport block is transmitted; multiple transport blocks may be transmitted in a transmission time interval per transport channel

3.2 Symbols

For the purposes of the present document the following symbols apply:

α	Roll-off factor
β	Beta factor
$DPCH\_E_c$	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
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
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
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 downlink 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 downlink signal as measured at the UE antenna connector
$P-CCPCH\ \frac{E_c}{I_o}$	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
<REFSENS>	Reference sensitivity
$<REF\ \hat{I}_{or}>$	Reference $\hat{I}_{or}$
$S-CCPCH\_E_c$	Average energy per PN chip for S-CCPCH

3.3 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
AWGN	Additive White Gaussian Noise
BCH	Broadcast CHannel
BER	Bit Error Ratio
BLER	BLock Error Ratio
CDP	Code Domain Power
CGC	Complementary Ground Component
CW	Continuous Wave (un-modulated signal)
DCCH	Dedicated Control CHannel
DCH	Dedicated Channel
DL	Down Link (forward link)
DPCCH	Dedicated Physical Control CHannel
DPCH	Dedicated Physical CHannel
DPDCH	Dedicated Physical Data CHannel

DTCH	Dedicated Traffic CHannel
DTX	Discontinuous Transmission
ECDP	Effective Code Domain Power
EVM	Error Vector Magnitude
LEO	Low Earth Orbit
LOS	Line Of Sight
MBMS	Multimedia Broadcast Multicast Service
NLOS	No Line Of Sight
OCNS	Orthogonal Channel Noise Simulator

NOTE: A mechanism used to simulate the users or control signals on the other orthogonal channels of a downlink link.

P-CCPCH	Primary Common Control Physical CHannel
PCH	Paging Channel
P-CPICH	Primary Common PIlot CHannel
PICH	Paging Indicator CHannel
PPM	Parts Per Million
PRACH	Physical Random Access CHannel
RACH	Random Access CHannel
RF	Radio Frequency
RRC	Root-Raised Cosine
S-CCPCH	Secondary Common Control Physical CHannel
SCH	Synchronization CHannel

NOTE: Consisting of Primary and Secondary synchronization channels.

TFC	Transport Format Combination
TFCI	Transport Format Combination Indicator
Tol	Tolerance
TPC	Transmit Power Control
UARFCN	USRA Absolute Radio Frequency Channel Number
UE	User Equipment
UL	Up Link (reverse link)
USRA	UMTS Satellite Radio Access
TFCS	Transport Format Combination Set

4 General

4.1 Introduction

In the event of conflict between the present specification and any applicable ETSI harmonized standard for UE operating in the 2 170 MHz to 2 200 MHz (space-to-earth) and 1 980 MHz to 2 010 MHz (earth-to-space) frequency bands, the Harmonized Standard takes precedence.

4.2 Relationship between Minimum Requirements and Test Requirements

Void.

4.3 Control and monitoring functions

This requirement verifies that the control and monitoring functions of the UE prevent it from transmitting if no acceptable spot/CGC cell can be found by the UE.

4.3.1 Minimum requirement

The power of the UE, as measured with a thermal detector, shall not exceed -30 dBm if no acceptable spot/CGC cell can be found by the UE.

5 Frequency bands and channel arrangement

5.1 General

The information presented in this clause is based on a chip rate of 3,84 Mcps.

5.2 Frequency bands

S-UMTS is designed to operate in either of the following paired bands:

Table 5.1: Frequency bands

Operating Band	UL Frequencies UE transmit, satellite receive	DL frequencies UE receive, satellite transmit
I	1 980 MHz to 2 010 MHz	2 170 -2 200 MHz

5.3 TX-RX frequency separation

S-UMTS is designed to operate with the following TX-RX frequency separation:

Table 5.2: Tx-Rx frequency separation

Operating Band	TX-RX frequency separation
I	190 MHz To be checked if we could reduce to 160 MHz

S-UMTS can support both fixed and variable transmit to receive frequency separation.

5.4 Channel arrangement

5.4.1 Channel spacing

The nominal channel spacing is 5 MHz, but this can be adjusted to optimize performance in a particular deployment scenario.

5.4.2 Channel raster

The channel raster is 200 kHz, which means that the centre frequency must be an integer multiple of 200 kHz.

5.4.3 Channel number

The carrier frequency is designated by the USRA Absolute Radio Frequency Channel Number (UARFCN).

The UARFCN values are defined as follows:

Table 5.3: UARFCN definition

	UARFCN	Carrier frequency [MHz]
Uplink	$N_u = 5 * F_{uplink}$	1 982,5 MHz $\leq F_{uplink} \leq$ 2 007,5 MHz where F_{uplink} is the uplink frequency in MHz
Downlink	$N_d = 5 * F_{downlink}$	2 172,5 MHz $\leq F_{downlink} \leq$ 2 197,5 MHz where $F_{downlink}$ is the downlink frequency in MHz

5.4.4 UARFCN

The following UARFCN range shall be supported for each paired band.

Table 5.4: UTRA Absolute Radio Frequency Channel Number

Operating Band	Uplink UE transmit, satellite receive	Downlink UE receive, satellite transmit
I	9 912 to 10 038	10 862 to 10 988

6 Transmitter Characteristics

6.1 General

Unless otherwise stated 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.

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 recognized 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 (4,75 kbit/s) specified in clause A.2.1 and unless stated with the UL power control ON.

6.2 Transmission 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 $(1 + \alpha)$ times the chip rate of the radio access mode (α : roll off factor). 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	+39	+1/-3

6.2.2 UE Relative code domain power accuracy

The UE Relative code domain power accuracy is a measure of the ability of the UE to correctly set the level of individual code powers relative to the total power of all active codes. The measure of accuracy is the difference between two dB ratios:

UE Relative CDP accuracy = (Measured CDP ratio) - (Nominal CDP ratio)

Where:

Measured CDP ratio = 10*log((Measured code power) / (Measured total power of all active codes))

Nominal CDP ratio = 10*log((Nominal CDP) / (Sum of all nominal CDPs))

The nominal CDP of a code is relative to the total of all codes and is derived from β factors. The sum of all nominal CDPs will equal 1 by definition.

NOTE: The above definition of UE relative CDP accuracy is independent of variations in the actual total power of the signal and of noise in the signal that falls on inactive codes.

The required accuracy of the UE relative CDP is given in table 6.2. The UE relative CDP accuracy shall be maintained over the period during which the total of all active code powers remains unchanged or one timeslot, whichever is the longer.

Table 6.2: UE Relative CDP accuracy

Nominal CDP ratio	Accuracy (dB)
≥ -10 dB	±1,5
-10 dB to ≥ -15 dB	±2,0
-15 dB to ≥ -20 dB	±2,5

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 satellite or CGC. For the PRACH preambles the measurement interval is lengthened to 3 904 chips (4 096 chip nominal preamble period less a 25 μs transient period allowance at each end of the burst). These signals will have an apparent error due to Space Segment and CGC frequency error and Doppler shift. In the later case, signals from the Space Segment/CGC must be averaged over sufficient time that errors due to noise or interference are allowed for within the above ±0,1 PPM figure. The UE shall use the same frequency source for both RF frequency generation and the chip clock.

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 mean power in a timeslot or ON power duration, whichever is available.

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 0,5 dB, 1 dB, 2 dB and 3 dB according to the value of Δ_{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 mean power of the original (reference) timeslot and the mean power of the target timeslot, not including the transient duration. The transient duration is from 25 μs before the slot boundary to 25 μs after the slot boundary.

Table 6.4: Transmitter power control range

TPC_ cmd	Transmitter power control range							
	0,5 dB step size		1 dB step size		2 dB step size		3 dB step size	
	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
+1	+0,5 dB	+0,75 dB	+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	-0,5 dB	+0,5 dB
-1	-0,5 dB	-0,75 dB	-0,5 dB	-1,5 dB	-1 dB	-3 dB	-1,5 dB	-4,5 dB

Table 6.5: Transmitter 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	
	0.5 dB step size		1 dB step size		2 dB step size		3 dB step size	
	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
+1	+4 dB	+6 dB	+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 dB	+1 dB
-1	-4 dB	-6 dB	-8 dB	-12 dB	-16 dB	-24 dB	-16 dB	-26 dB
0,0,0,0,+1	+3 dB	+7 dB	+6 dB	+14 dB	N/A	N/A	N/A	N/A
0,0,0,0,-1	-3 dB	-7 dB	-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 clause 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 clause 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 the mean power in one time slot. 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 [4]. 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 clause.

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 clause 6.5.1 (Transmit off power). Otherwise the transmitter shall be considered as "on".

6.4.4.2 Test case

This clause 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 -28 dB, and a signal with Q_{in} by a DPCCH_Ec/Ior ratio of -24 dB. The DL reference measurement channel (4,75) kbit/s specified in clause A.3.2 and with static propagation conditions. The downlink physical channels, other than those specified in table 6.6, are as specified in table C.3.

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

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 -19,1 After point A Not defined
$\frac{DPCCH\_E_c}{I_{or}}$	dB	See figure 6.1
Information Data Rate	kbit/s	4,75

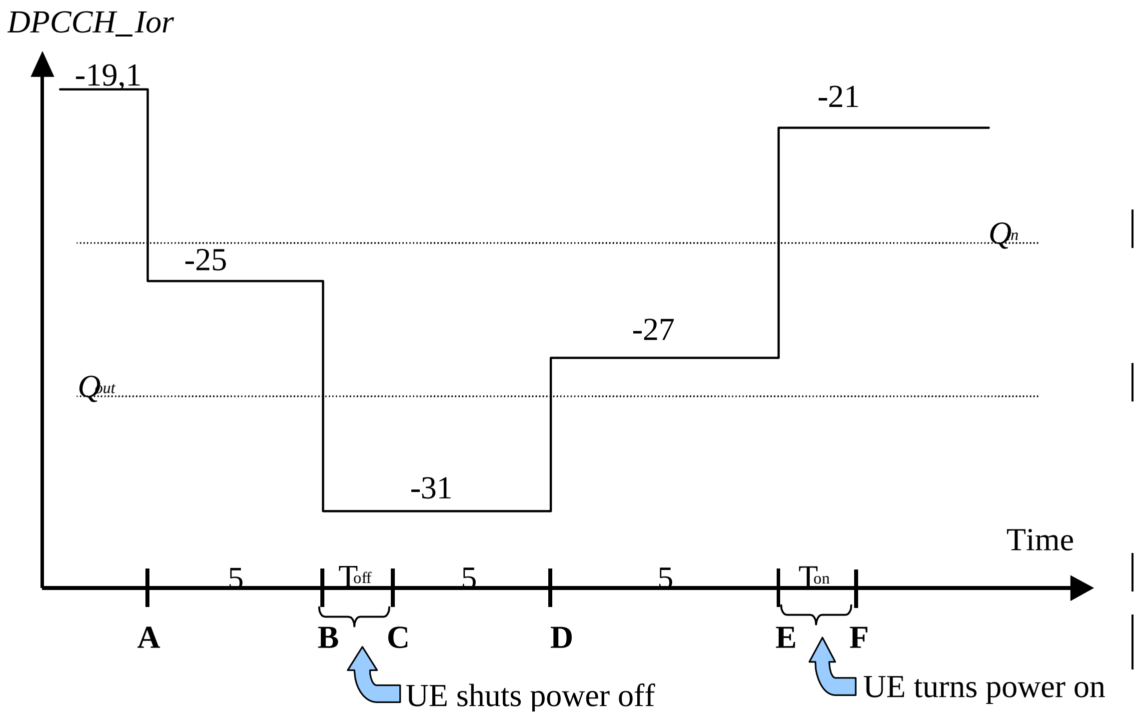

Figure 6.1: Test case for out-of-synch handling in the UE

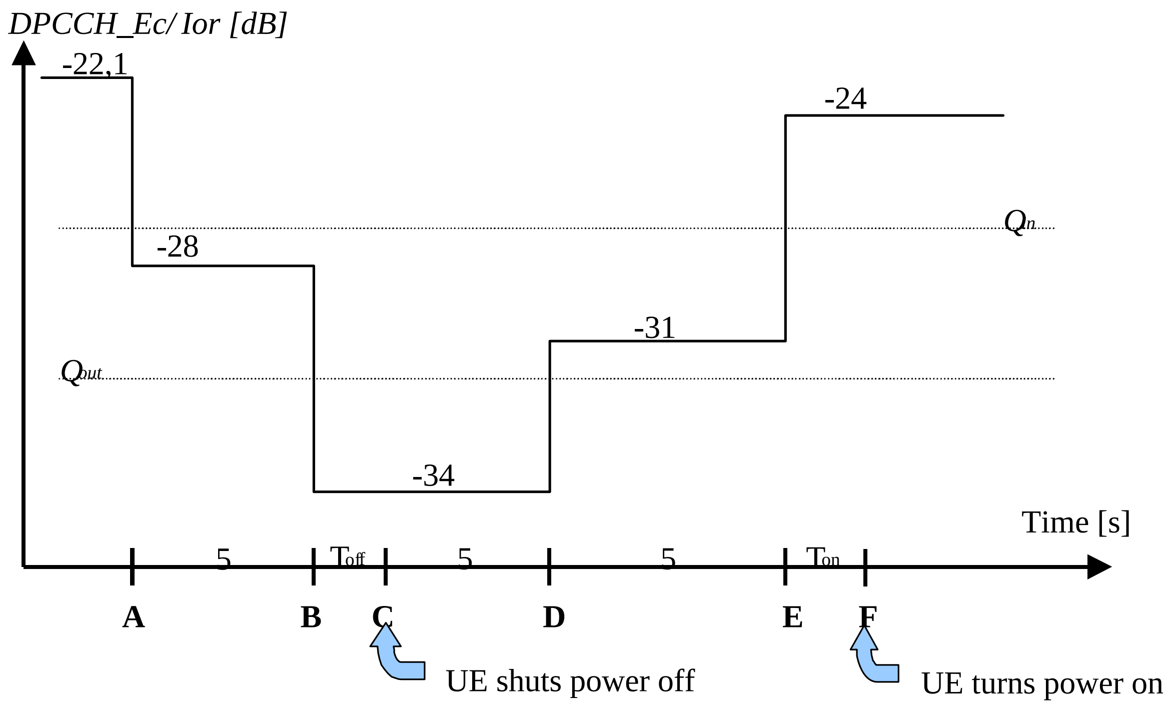

Figure 6.2: Test case for out-of-synch handling in the UE supporting the enhanced performance requirements type1 (receiver diversity)

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 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 power in a duration of at least one timeslot excluding any transient periods. 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. During the transient period there are no additional requirements on UE transmit power beyond what is required in clause 6.2 (maximum power observed over a period of at least one timeslot). ON/OFF scenarios include PRACH preamble bursts, the beginning or end of PRACH message parts and the beginning or end of UL DPCH transmissions.

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 the mask in figure 6.3 for all other cases. The off period observation period is defined as the RRC filtered mean power in a duration of at least one timeslot excluding any transient periods. For PRACH preambles, the on power observation period is 3 904 chips (4 096 chips less the transient periods).

The specification depends on each possible case:

- First preamble of RACH: Open loop accuracy (table 6.3).
- During preamble ramping of the RACH, and between final RACH preamble and RACH message part: Accuracy depending on size of the required power difference (table 6.7). The step in total transmitted power between final RACH preamble and RACH 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 (see table 6.1).

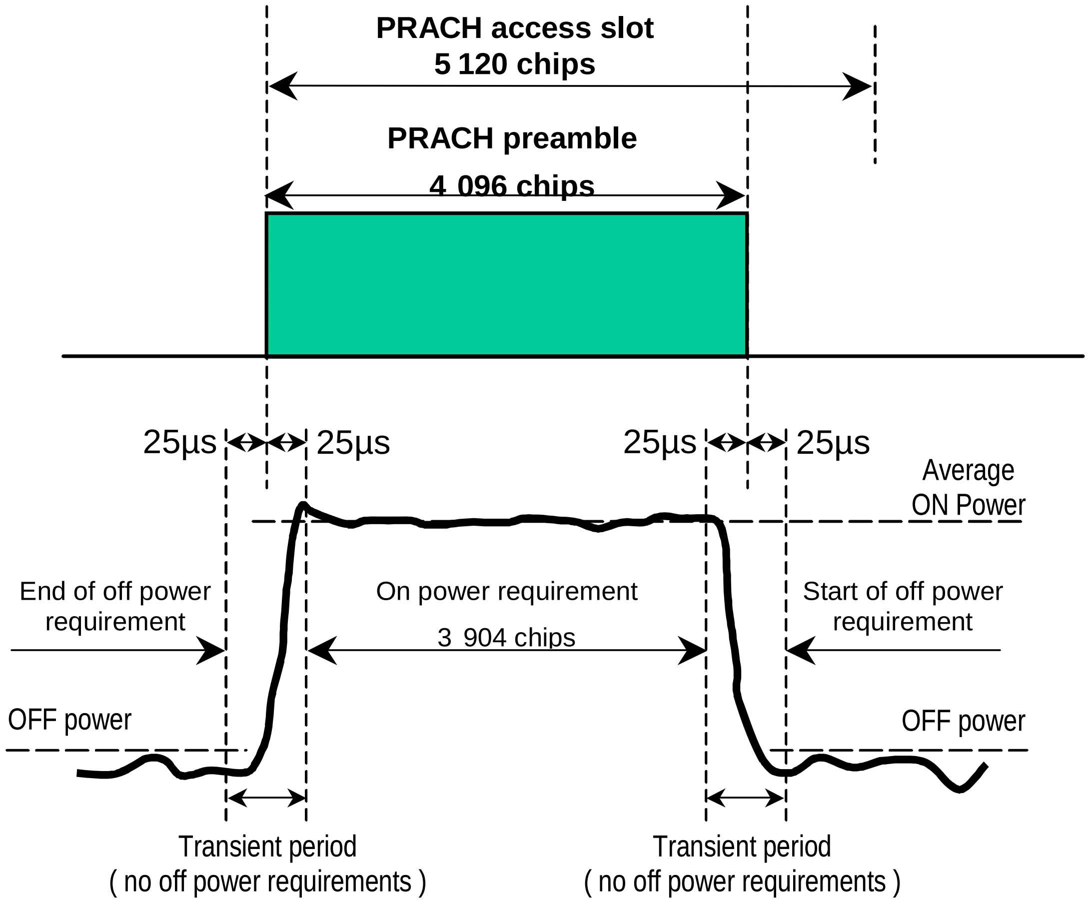

Figure 6.3: Transmit ON/OFF template for PRACH preambles

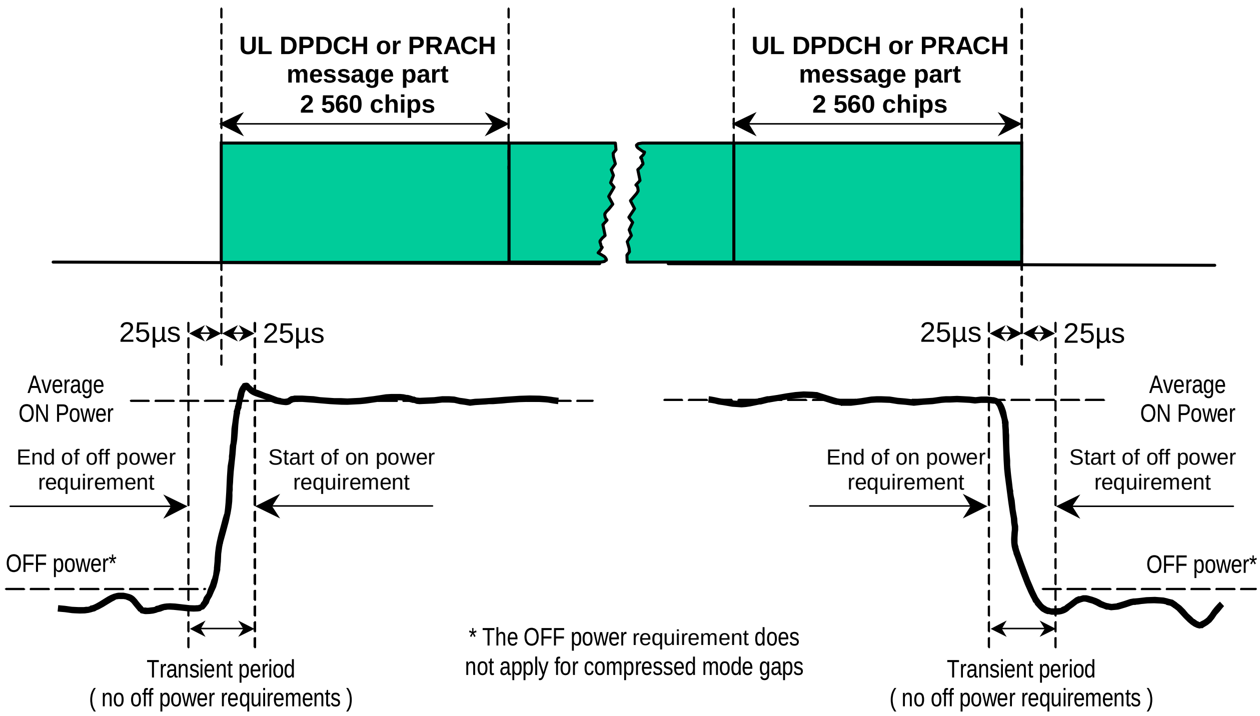

Figure 6.4: Transmit ON/OFF template for all other On/Off cases

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

Power step size (Up or down) (see note) ΔP [dB]	Transmitter power difference tolerance [dB]
0	± 1
1	± 1
2	± 1,5
3	± 2
4 ≤ Δ P ≤10	± 2,5
11 ≤ Δ P ≤15	± 3,5
16 ≤ Δ P ≤20	± 4,5
21 ≤ Δ P	± 6,5
NOTE: Power step size for RACH preamble ramping is from 1 dB 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 DPDCH is turned off, is a special case of variable data, which is used to minimize 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 mean power of the original (reference) timeslot and the mean power of the target timeslot, not including the transient duration. The transient duration is from 25 μs before the slot boundary to 25 μs after the slot boundary.

Table 6.8: Transmitter power step tolerance

Power step size (Up or down) ΔP [dB]	Transmitter power step tolerance [dB]
0	±0,5
1	±0,5
2	±1,0
3	±1,5
4 ≤ Δ P ≤10	±2,0B
11 ≤ Δ P ≤15	±3,0
16 ≤ Δ P ≤20	±4,0
21 ≤ Δ P	±6,0

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

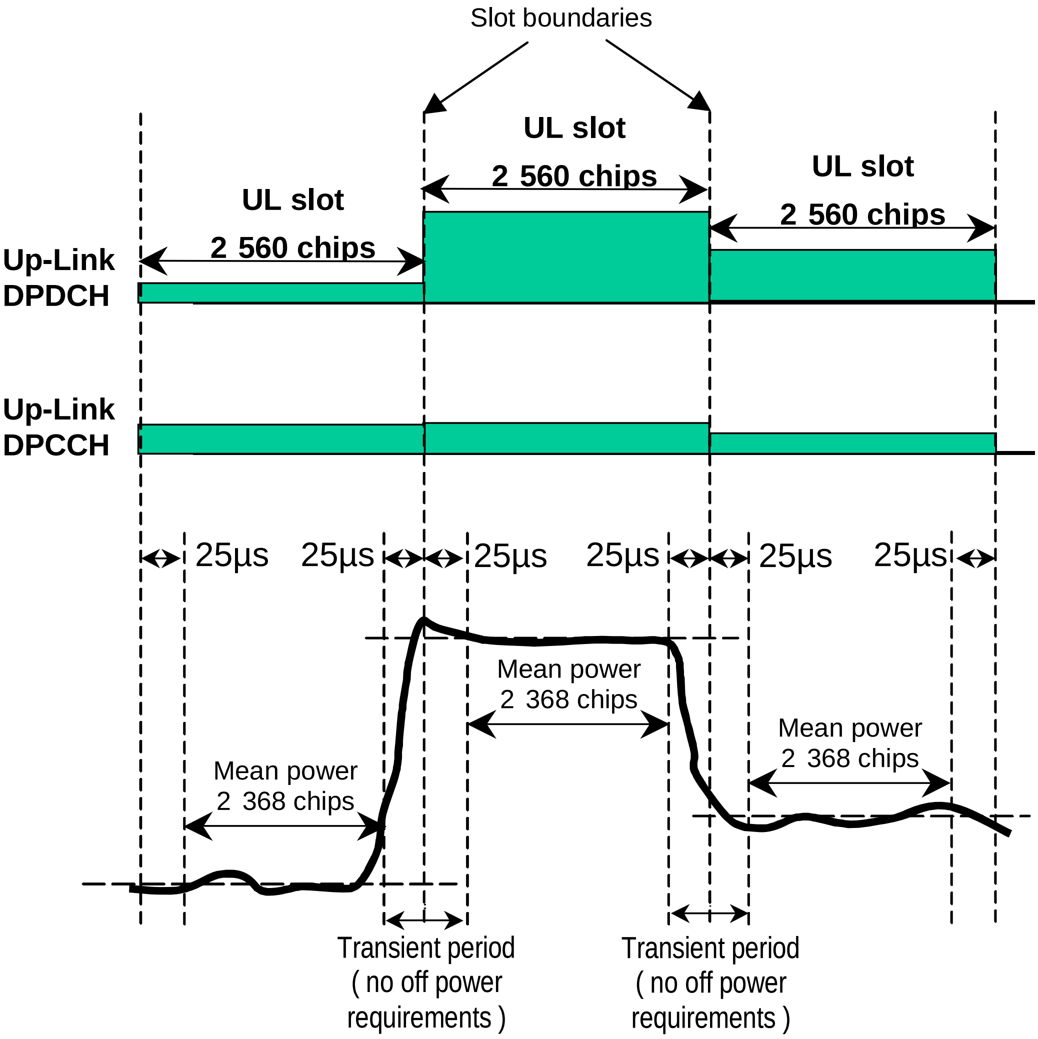

Figure 6.5: Transmit template during TFC change

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 the DPCCH follows the steps due to inner loop power control combined with additional steps of $10\mathrm{Log}_{10}(N_{pilot.prev} / N_{pilot.curr})$ 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. The power step is defined as the relative power difference between the mean power of the original (reference) timeslot and the 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 25 µs before the slot boundary to 25 µs after the slot boundary.

In addition to any power change due to the ratio $N_{pilot.prev}$ / $N_{pilot.curr}$, the mean power of the DPCCH in the first slot after a compressed mode transmission gap shall differ from the 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 101 851-4-1 [4].

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

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 difference between the mean power of the original (reference) timeslot before the transmission gap and the 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 25 µs before the slot boundary to 25 µs after the slot boundary.

The transmit power levels versus time shall meet the mask specified in figure 6.6.

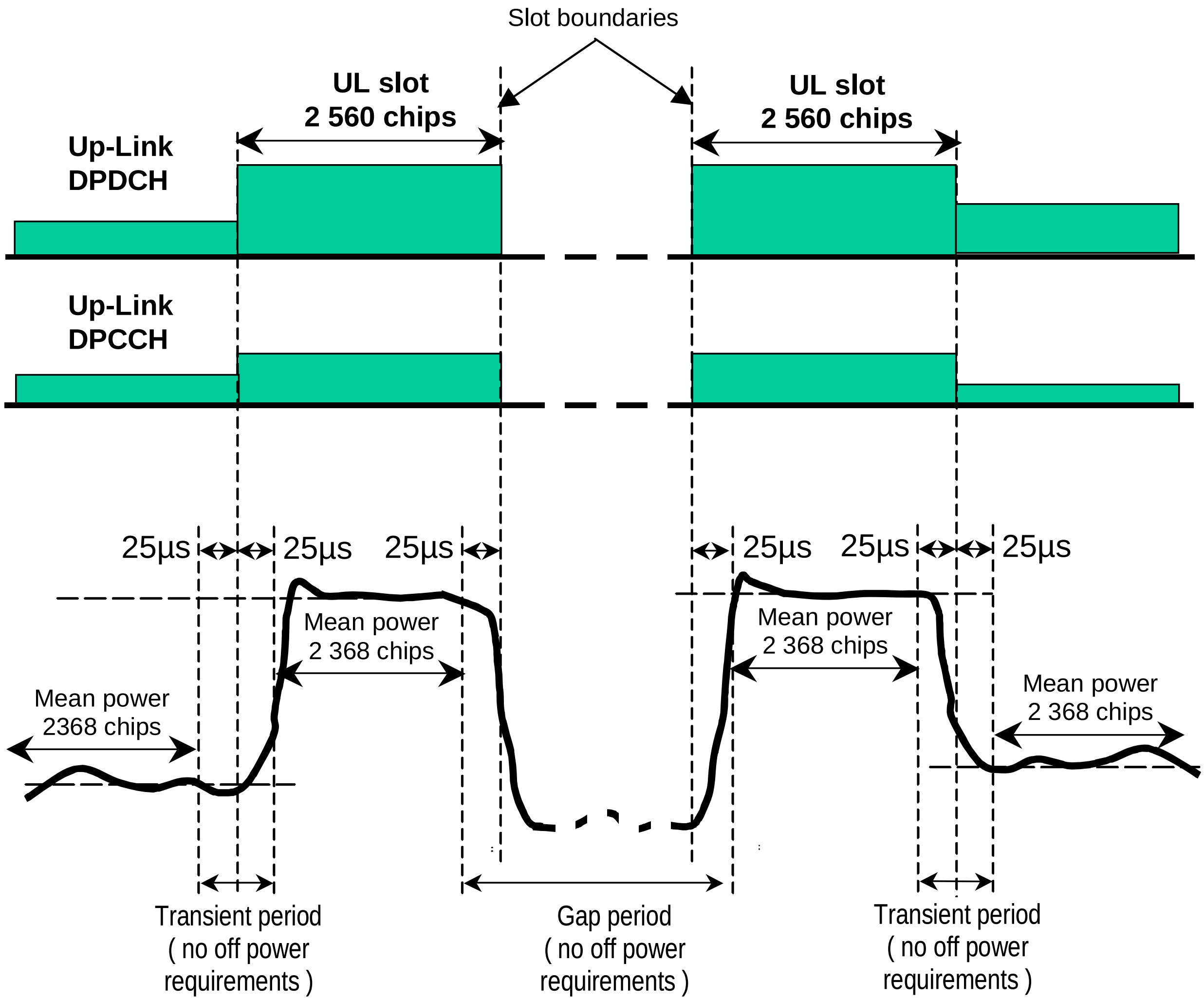

Figure 6.6: Transmit template during Compressed mode

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, centred 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.

6.6.2.1.1 Minimum requirement

The power of any UE emission shall not exceed the levels specified in table 6.10. The absolute requirement is based on a -50 dBm/3,84 MHz minimum power threshold for the UE. This limit is expressed for the narrower measurement bandwidths as -55,8 dBm/1 MHz and -71,1 dBm/30 kHz.

Table 6.10: Spectrum Emission Mask Requirement

Δf in MHz (see note 1)	Minimum requirement (see note 2)		Measurement bandwidth (see note 5)
	Relative requirement	Absolute requirement	
2,5 to 3,5	$\left\{-35-15\left(\frac{\Delta f}{MHz}-2{,}5\right)\right\} dBc$	-71,1 dBm	30 kHz (see note 3)
3,5 to 7,5	$\left\{-35-1\left(\frac{\Delta f}{MHz}-3{,}5\right)\right\} dBc$	-55,8 dBm	1 MHz (see note 4)
7,5 to 8,5	$\left\{-39-10\left(\frac{\Delta f}{MHz}-7{,}5\right)\right\} dBc$	-55,8 dBm	1 MHz (see note 4)
8,5 to 12,5	-49 dBc	-55,8 dBm	1 MHz (see note 4)

NOTE 1: Δf is the separation between the carrier frequency and the centre of the measurement bandwidth.
NOTE 2: The minimum requirement is calculated from the relative requirement or the absolute requirement, whichever is the higher power.
NOTE 3: The first and last measurement position with a 30 kHz filter is at Δf equals to 2,515 MHz and 3,485 MHz.
NOTE 4: The first and last measurement position with a 1 MHz filter is at Δf equals to 4 MHz and 12 MHz.
NOTE 5: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than 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.

6.6.2.2 Adjacent Channel Leakage power Ratio (ACLR)

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the RRC filtered mean power centred on the assigned channel frequency to the RRC filtered mean power centred on an adjacent channel frequency.

6.6.2.2.1 Minimum requirement

If the adjacent channel power is greater than -50 dBm 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
1, 2	+5 MHz or -5 MHz	43 dB
	+10 MHz or -10 MHz	55 dB
3	+5 MHz or -5 MHz	33 dB
	+10 MHz or -10 MHz	43 dB
4	+5 MHz or -5 MHz	43 dB
	+10 MHz or -10 MHz	55 dB

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

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 Recommendation SM.329 [13].

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 < 1 000 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 (see note)
	935 MHz < f ≤ 960 MHz	100 kHz	-79 dBm (see note)
	1 805 MHz ≤ f ≤ 1 880 MHz	100 kHz	-71 dBm (see note)
	1 893,5 MHz <f<1 919,6 MHz	300 kHz	-41 dBm
	2 110 MHz ≤ f ≤ 2 170 MHz	3,84 MHz	-60 dBm (see note)
	2 170 MHz ≤ f ≤ 2 200 MHz	3,84 MHz	-60 dBm (see note)
NOTE: 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 satellite receive band as an unwanted interfering signal. The UE intermodulation attenuation is defined by the ratio of the RRC filtered mean power of the wanted signal to the RRC filtered mean power of the intermodulation product when an interfering CW signal is added at a level below the wanted signal.

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

6.8 Transmit modulation

Transmit modulation defines the modulation quality for expected in-channel RF transmissions from the UE. The requirements apply to all transmissions including the PRACH pre-amble and message parts and all other expected transmissions. In cases where the mean power of the RF signal is allowed to change versus time e.g. PRACH, DPCH in compressed mode, change of TFC and inner loop power control, the EVM and Peak Code Domain Error requirements do not apply during the 25 us period before and after the nominal time when the power is expected to change.

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 minimize 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 except when the mean power between slots is expected to change whereupon the measurement interval is reduced by 25 µs at each end of the slot. For the PRACH preambles the measurement interval is 4 096 chips less 25 µs at each end of the burst (3 904 chips).

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 clause 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 timeslot except when the mean power between slots is expected to change whereupon the measurement interval is reduced by 25 µs at each end of the slot.

The requirement for peak code domain error is only applicable for multi-code DPDCH transmission and therefore does not apply for the PRACH preamble and message parts.

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 clause A.2.5.

6.8.4 Relative code domain error

The Relative Code Domain Error is computed by projecting the error vector (as defined in clause 6.8.2) onto the code domain. Only the code channels with non-zero betas in the composite reference waveform are considered for this requirement. The Relative Code Domain Error for every non-zero beta code in the domain is defined as the ratio of the mean power of the projection onto that non-zero beta code, to the mean power of the non-zero beta code in the composite reference waveform. This ratio is expressed in dB. The measurement interval is one timeslot except when the mean power between slots is expected to change whereupon the measurement interval is reduced by 25 µs at each end of the slot.

The Relative Code Domain Error is affected by both the spreading factor and beta value of the various code channels in the domain. The Effective Code Domain Power (ECDP) is defined to capture both considerations into one parameter. It uses the Nominal CDP ratio (as defined in clause 6.2.2), and is defined as follows for each used code, k, in the domain:

$ECDP_k$ = (Nominal CDP ratio)$_k$ + 10*log10(SF_k/256)

The requirements for Relative Code Domain Error are not applicable when either or both the following channel combinations occur:

- when the ECDP of any code channel is < -30dB;
- when the nominal code domain power of any code channel is < -20 dB.

The requirement for Relative Code Domain Error also does not apply for the PRACH preamble and message parts.

6.8.4.1 Minimum requirement

The Relative Code Domain Error shall meet the requirements in table 6.16 for the parameters specified in table 6.15.

Table 6.16: Relative Code Domain Error minimum requirement

ECDP dB	Relative Code Domain Error dB
-21 < ECDP	≤ -16
-30 ≤ ECDP ≤ -21	≤ -37 - ECDP
ECDP < -30	No requirement

6.8.5 Phase discontinuity for uplink DPCH

Phase discontinuity is the change in phase between any two adjacent timeslots. The EVM for each timeslot (excluding the transient periods of 25 us on either side of the nominal timeslot boundaries), shall be measured according to clause 6.8.2. The frequency, absolute phase, absolute amplitude and chip clock timing used to minimize the error vector are chosen independently for each timeslot. The phase discontinuity result is defined as the difference between the absolute phase used to calculate EVM for the preceding timeslot, and the absolute phase used to calculate EVM for the succeeding timeslot.

6.8.5.1 Minimum requirement

The rate of occurrence of any phase discontinuity on an uplink DPCH for the parameters specified in table 6.17 shall not exceed the values specified in table 6.18. Phase shifts that are caused by changes of the UL transport format combination (TFC) and compressed mode are not included. When calculating the phase discontinuity, the requirements for frequency error and EVM in clauses 6.3 and 6.8.2 for each timeslot shall be met.

Table 6.17: Parameters for Phase discontinuity

Parameter	Unit	Level
Power control step size	dB	1

Table 6.18: Phase discontinuity minimum requirement

Phase discontinuity Δθ in degrees	Maximum allowed rate of occurrence in Hz
Δθ ≤ 30	1 500
30 < Δθ ≤ 60	300
Δθ > 60	0

7 UE 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. For UEs with more than one receiver antenna connector the AWGN signals applied to each receiver antenna connector shall be uncorrelated.

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 recognized 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 (4,75 kbit/s) specified in clause A.3.2 and unless otherwise stated 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.

Table 7.1: Diversity characteristics

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 optionally in the UE. Possibility for downlink transmit diversity in the CGC.

7.3 Reference sensitivity level

The reference sensitivity level <REFSENS> is the minimum mean power received at the UE antenna port at which the Bit Error Ratio (BER) 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	-122	-106,7

7.4 Maximum input level

This is defined as the maximum mean power received at the UE antenna port, at which the specified BER performance shall be met.

7.4.1 Minimum requirement for DPCH reception

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)

NOTE: Since the spreading factor is large (10log(SF) = 24 dB), the majority of the total input signal consists of the OCNS interference. The structure of OCNS signal is defined in clause 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 UE shall fulfil the minimum requirement specified in table 7.4 for all values of an adjacent channel interferer up to -25 dBm.

However it is not possible to directly measure the ACS, instead the lower and upper range of test parameters are chosen in table 7.5 where the BER shall not exceed 0,001.

Table 7.4: Adjacent Channel Selectivity

Adjacent channel frequency relative to assigned channel frequency	Unit	ACS
+5 MHz or -5 MHz	dB	48
+10 MHz or -10 MHz	dB	55

Table 7.5: Test parameters for Adjacent Channel Selectivity

Parameter	Unit	Case 1
DPCH_Ec	dBm/3,84 MHz	<REFSENS> +14 dB
$\hat{I}_{or}$	dBm/3,84 MHz	<REF$\hat{I}_{or}$> +14 dB
I_{oac} mean power (modulated)	dBm	-41
F_{uw} (offset)	MHz	+5 or -5
UE transmitted mean power	dBm	20 (for Power class 3)

NOTE: The I_{oac} (modulated) signal consists of the common channels needed for tests as specified in table C.5. Table C.5 and 16 dedicated data channels as specified in table C.4.

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)

In-band blocking is defined for an unwanted interfering signal falling into the UE receive band or into the first 15 MHz below or above the UE receive band. The BER shall not exceed 0,001 for the parameters specified in table 7.6.

Table 7.6: In-band blocking

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	-44
F_{uw} offset		= ±10 MHz	≤-15 MHz & ≥15 MHz
F_{uw} (Band I operation)	MHz	2 162,5 ≤ f ≤ 2 207,5 (see note 2)	2 155 ≤ f ≤ 215
UE transmitted mean power	dBm	20 (for Power class 3)	

NOTE 1: $I_{blocking}$ (modulated) consists of the common channels needed for tests as specified in table 7.6 and 16 dedicated data channels as specified in table C.4.

NOTE 2: For each carrier frequency the requirement is valid for two frequencies, the carrier frequency ±10 MHz.

7.6.2 Minimum requirement (Out of-band blocking)

Out-of-band band blocking is defined for an unwanted interfering signal falling more than 15 MHz below or above the UE receive band. 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	2 110 <f < 2 155 2 215 <f < 2 260	2 085 <f ≤ 2 110 2 260 ≤ f <2 285	1< f ≤ 2 085 2 285 ≤ f<12 750

7.6.3 Minimum requirement (Narrow band blocking)

Narrow band blocking requirement is the 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.

The BER shall not exceed 0,001 for the parameters specified in table 7.8.

Table 7.8: Narrow band blocking characteristics

Parameter	Unit	Band II, IV, V, X	Band III, VIII
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)	

NOTE: $I_{blocking}$ (GMSK) is an interfering signal as defined in TS 145 004 [9].

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 clause 7.6.2 is not met.

7.7.1 Minimum requirement

The BER shall not exceed 0,001 for the parameters specified in table 7.9.

Table 7.9: 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)

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 receive 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 7.10.

Table 7.10: 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	-46	
F_{uw1} (offset)	MHz	10	-10
F_{uw2} (offset)	MHz	20	-20
UE transmitted mean power	dBm	20 (for Power class 3)	

NOTE: I_{ouw2} (modulated) consists of the common channels needed for tests as specified in table C.5 and 16 dedicated data channels as specified in table C.4.

7.8.2 Minimum requirement (Narrow band)

The BER shall not exceed 0,001 for the parameters specified in table 7.11.

Table 7.11: Receive intermodulation characteristics

Parameter	Unit	Band II, IV, V, X		Band III, VIII	
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_{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)			

NOTE: I_{ouw2} (GMSK) is an interfering signal as defined in TS 145 004 [9].

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 7.12. For the frequency bands specified in table 7.13 the spurious emissions shall not exceed the maximum level specified in table 7.13 in order to guarantee no degradation of performance of the systems deployed in these frequency bands (GSM, DCS1800, UMTS).

Table 7.12: General receiver spurious emission requirements

Frequency Band	Measurement Bandwidth	Maximum level
30 MHz ≤ f < 1 GHz	100 kHz	-57 dBm
1 GHz ≤ f ≤ 12,75 GHz	1 MHz	-47 dBm

Table 7.13: Additional receiver spurious emission requirements

Band	Frequency Band	Measurement Bandwidth	Maximum level	Note
I	860 MHz ≤ f ≤ 895 MHz	3,84 MHz	-60 dBm	
	921 MHz ≤ f < 925 MHz	100 kHz	-60 dBm (see note	
	925 MHz ≤ f ≤ 935 MHz	100 kHz 3,84MHz	-67 dBm (see note -60 dBm	
	935 MHz < f ≤ 960 MHz	100 kHz	-79 dBm (see note)	
	1 805 MHz ≤ f ≤ 1 880 MHz	100 kHz	-71 dBm (see note)	
	1 844,9 MHz ≤ f ≤ 1 879,9 MHz	3,84 MHz	-60 dBm	
	1 920 MHz ≤ f ≤ 1 980 MHz	3,84 MHz	-60 dBm	UTRAN UE transmit band
	1 980 MHz ≤ f ≤ 2 010 MHz	3,84 MHz	-60 dBm	S-UMTS UE transmit band
	2 110 MHz ≤ f ≤ 2 170 MHz	3,84 MHz	-60 dBm	UTRAN UE receive band
	2 170 MHz ≤ f ≤ 2 200 MHz	3,84 MHz	-60 dBm	S-UMTS UE receive band
	2 620 MHz ≤ f ≤ 2 690 MHz	3,84 MHz	-60 dBm	
NOTE: 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 7.12 are permitted for each UARFCN used in the measurement.				

7.10 Maximum Doppler

For further study.

8 Performance requirement

8.1 General

The performance requirements for the UE in this clause are specified for the measurement channels specified in annex A, the propagation conditions specified in annex B and the downlink physical channels specified in annex C.

Unless stated, downlink power control is OFF.

The performance requirements are specified at the UE antenna connector.

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.

For UE(s) with more than one receiver antenna connector the fading of the signals and the AWGN signals applied to each receiver antenna connector shall be uncorrelated. The levels of the test signal applied to each of the antenna connectors shall be as defined in the respective following clauses.

For a UE which supports optional enhanced performance requirements type1 for DCH (antenna diversity), the UE shall meet only the enhanced performance requirement type1. For those cases where the enhanced performance requirements type1 are not specified, the minimum performance requirements shall apply.

8.2 Demodulation of DCH in static propagation conditions

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).

8.2.1 Minimum requirement

For the parameters specified in table 8.1 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in table 8.2. These requirements are applicable for TFCS size 16.

Table 8.1: DCH parameters in static propagation conditions

Parameter	Unit	Test 1	Test 2	Test 3	Test 4	Test 5
Phase reference		P-CPICH				
$\hat{I}_{or}/I_{oc}$	dB	-1				
I_{oc}	dBm/3,84 MHz	-60				
Information Data Rate	kbit/s	1,2	4,75	64	128	384

Table 8.2: DCH requirements in static propagation conditions

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-23,2 dB	10^{-2}
2	-19,1 dB	10^{-2}
3	-12,5 dB	10^{-2}
4	-9,5 dB	10^{-2}
5	-5,3 dB	10^{-2}

8.3 Demodulation of DCH in multi-path fading conditions

8.3.1 Reception under ITU defined A, B, C channels and aeronautical

8.3.1.1 Minimum performance requirement - LOS

For the parameters specified in table 8.3 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in tables 8.4, 8.5 and 8.6. These requirements are applicable for TFCS size 16.

Table 8.3: DCH parameters in ITU A, B, C LOS propagation conditions

Parameter	Unit	Test 1	Test 2	Test 3	Test 4	Test 5
Phase reference		P-CPICH				
$\hat{I}_{or}/I_{oc}$	dB	-3	-3	-3	9	9
I_{oc}	dBm/3,84 MHz	-60				
UE speed	Km/h	3				
Information Data Rate	kbit/s	1.2	4.75	64	144	384
Parameter	**Unit**	**Test 6**	**Test 7**	**Test 8**	**Test 9**	**Test 10**
Phase reference		P-CPICH				
$\hat{I}_{or}/I_{oc}$	dB	-3	-3	-3	9	9
I_{oc}	dBm/3,84 MHz	-60				
UE speed	Km/h	250				
Information Data Rate	kbit/s	1.2	4.75	64	144	384

Table 8.4: DCH requirements in ITU A LOS propagation conditions

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER	Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-19,3 dB	10^{-2}	6	-18,5 dB	10^{-2}
2	-16 dB	10^{-2}	7	-15,3 dB	10^{-2}
3	-9,6 dB	10^{-2}	8	-9 dB	10^{-2}
4	-18,5 dB	10^{-2}	9	-18 dB	10^{-2}
5	-14 dB	10^{-2}	10	-13,5 dB	10^{-2}

Table 8.5: DCH requirements in ITU B LOS propagation conditions

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER	Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-18,9 dB	10^{-2}	6	-17,9 dB	10^{-2}
2	-15,6 dB	10^{-2}	7	-14,7 dB	10^{-2}
3	-9,1 dB	10^{-2}	8	-8,4 dB	10^{-2}
4	-18 dB	10^{-2}	9	-17,4 dB	10^{-2}
5	-13,2 dB	10^{-2}	10	-13 dB	10^{-2}

Table 8.6: DCH requirements in ITU C LOS propagation conditions

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER	Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-17,6 dB	10^{-2}	6	-16,6 dB	10^{-2}
2	-14 dB	10^{-2}	7	-13,1 dB	10^{-2}
3	-7,7 dB	10^{-2}	8	-7 dB	10^{-2}
4	-16,5 dB	10^{-2}	9	-16 dB	10^{-2}
5	-10,8 dB	10^{-2}	10	-11 dB	10^{-2}

8.3.1.2 Minimum performance requirement - NLOS

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

Table 8.7: DCH parameters in ITU A, B, C NLOS propagation conditions

Parameter	Unit	Test 1	Test 2	Test 3	Test 4	Test 5
Phase reference		P-CPICH				
$\hat{I}_{or}/I_{oc}$	dB	-3	-3	-3	9	9
I_{oc}	dBm/3,84 MHz	-60				
UE speed	Km/h	3				
Information Data Rate	kbit/s	1,2	4,75	64	144	384
Parameter	**Unit**	**Test 6**	**Test 7**	**Test 8**	**Test 9**	**Test 10**
Phase reference		P-CPICH				
$\hat{I}_{or}/I_{oc}$	dB	-3	-3	-3	9	9
I_{oc}	dBm/3,84 MHz	-60				
UE speed	Km/h	50				
Information Data Rate	kbit/s	1,2	4,75	64	144	384

Table 8.8: DCH requirements in ITU A NLOS propagation conditions

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER	Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-19,5 dB	10^{-2}	6	-27,4 dB	10^{-2}
2	-15,5 dB	10^{-2}	7	-23,7 dB	10^{-2}
3	-8 dB	10^{-2}	8	-16,7 dB	10^{-2}
4	-4,7 dB	10^{-2}	9	-13,4 dB	10^{-2}
5	-	10^{-2}	10	-6,5 dB	10^{-2}

Table 8.9: DCH requirements in ITU B NLOS propagation conditions

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER	Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-20,6 dB	10^{-2}	6	-27,7 dB	10^{-2}
2	-16,8 dB	10^{-2}	7	-24 dB	10^{-2}
3	-9,1 dB	10^{-2}	8	-16,9 dB	10^{-2}
4	-5,9 dB	10^{-2}	9	-13,7 dB	10^{-2}
5	-0,5 dB	10^{-2}	10	-7 dB	10^{-2}

Table 8.10: DCH requirements in ITU C NLOS propagation conditions

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER	Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-21,4 dB	10^{-2}	6	-29,8 dB	10^{-2}
2	-17,7 dB	10^{-2}	7	-26,7 dB	10^{-2}
3	-9,9 dB	10^{-2}	8	-16,4 dB	10^{-2}
4	-6,8 dB	10^{-2}	9	-13,1 dB	10^{-2}
5	-1,6 dB	10^{-2}	10	-7,1 dB	10^{-2}

8.3.1.3 Minimum performance requirement - Aeronautical

In all the cases of aeronautical reception, for the parameters specified in table 8.11 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in table 8.12. These requirements are applicable for TFCS size 16.

Table 8.11: DCH parameters in aeronautic propagation conditions

Parameter	Unit	Test 1	Test 2	Test 3	Test 4	Test 5
Phase reference		P-CPICH				
$\hat{I}_{or}/I_{oc}$	dB	9				
I_{oc}	dBm/3,84 MHz	-60				
Information Data Rate	kbit/s	1,2	4,75	64	144	384
Parameter	**Unit**	**Test 6**	**Test 7**	**Test 8**	**Test 9**	**Test 10**
Phase reference		P-CPICH				
$\hat{I}_{or}/I_{oc}$	dB	-3				
I_{oc}	dBm/3,84 MHz	-60				
Information Data Rate	kbit/s	1,2	4,75	64	144	384

Table 8.12: DCH requirements in aeronautic propagation conditions

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER	Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-29,4 dB	10^{-2}	6	-17,4 dB	10^{-2}
2	-26,4 dB	10^{-2}	7	-14,4 dB	10^{-2}
3	-19,9 dB	10^{-2}	8	-7,9 dB	10^{-2}
4	-17 dB	10^{-2}	9	-5 dB	10^{-2}
5	-12,8 dB	10^{-2}	10	-0,8 dB	10^{-2}

8.3.2 Reception of combined satellite and CGCs signals

This clause applies to the CGC deployment model where CGCs repeat satellite signals on the same scrambling code than the one allocated to the spot coverage area they belong.

For the parameters specified in table 8.13 the average downlink $\frac{DPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in table 8.14. These requirements are applicable for TFCS size 16.

Table 8.13: DCH parameters in combined satellite and CGC propagation conditions; S-Case 1

Parameter	Unit	Test 1	Test 2	Test 3	Test 4	Test 5
Phase reference		P-CPICH				
$\hat{I}_{or}/I_{oc}$	dB	9				
I_{oc}	dBm/3,84 MHz	-60				
Information Data Rate	kbit/s	1,2	4,75	64	144	384

Table 8.14: DCH requirements in combined satellite and CGC propagation conditions; S-Case 1

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-21,8 dB	10^{-2}
2	-18,1 dB	10^{-2}
3	-10,1 dB	10^{-2}
4	-6,9 dB	10^{-2}
5	-1,9 dB	10^{-2}

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. These requirements are applicable for TFCS size 16.

Table 8.15: DCH parameters in combined satellite and CGC propagation conditions; S-Case 2

Parameter	Unit	Test 6	Test 7	Test 8	Test 9	Test 10
Phase reference		P-CPICH				
$\hat{I}_{or}/I_{oc}$	dB	-3	-3	-3	3	6
I_{oc}	dBm/3,84 MHz	-60				
Information Data Rate	kbit/s	1,2	4,75	64	128	384

Table 8.16: DCH requirements in combined satellite and CGC propagation conditions; S-Case 2

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
6	-13 dB	10^{-2}
7	-9,3 dB	10^{-2}
8	-1,7 dB	10^{-2}
9	-	10^{-2}
10	-	10^{-2}

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. These requirements are applicable for TFCS size 16.

Table 8.17: DCH parameters in combined satellite and CGC propagation conditions; S-Case 3

Parameter	Unit	Test 11	Test 12	Test 13	Test 14	Test 15
Phase reference		P-CPICH				
$\hat{I}_{or}/I_{oc}$	dB	-3	-3	-3	3	6
I_{oc}	dBm/3,84 MHz	-60				
Information Data Rate	kbit/s	1,2	4,75	64	128	384

Table 8.18: DCH requirements in combined satellite and CGC propagation conditions; S-Case 3

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
11	-17 dB	10^{-2}
12	-13,5 dB	10^{-2}
13	-6,8 dB	10^{-2}
14	-3,2 dB	10^{-2}
15	-3,7 dB	10^{-2}

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. These requirements are applicable for TFCS size 16.

Table 8.19: DCH parameters in combined satellite and CGC propagation conditions; S-Case 4

Parameter	Unit	Test 16	Test 17	Test 18	Test 19	Test 20
Phase reference		P-CPICH				
$\hat{I}_{or}/I_{oc}$	dB	9				
I_{oc}	dBm/3,84 MHz	-60				
Information Data Rate	kbit/s	1,2	4,75	64	128	384

Table 8.20: DCH requirements in combined satellite and CGC propagation conditions; S-Case 4

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
16	-23,3 dB	10^{-2}
17	-18,5 dB	10^{-2}
18	-12,4 dB	10^{-2}
19	-8,8 dB	10^{-2}
20	-3 dB	10^{-2}

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. These requirements are applicable for TFCS size 16.

Table 8.21: DCH parameters in combined satellite and CGC propagation conditions; S-Case 5

Parameter	Unit	Test 21	Test 22	Test 23	Test 24	Test 25
Phase reference		P-CPICH				
$\hat{I}_{or}/I_{oc}$	dB	9				
I_{oc}	dBm/3,84 MHz	-60				
Information Data Rate	kbit/s	1,2	4,75	64	128	384

Table 8.22: DCH requirements in combined satellite and CGC propagation conditions; S-Case 5

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
21	-21,7 dB	10^{-2}
22	-18,3 dB	10^{-2}
23	-11,8 dB	10^{-2}
24	-7,9 dB	10^{-2}
25	-2,2 dB	10^{-2}

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. These requirements are applicable for TFCS size 16.

Table 8.23: DCH parameters in combined satellite and CGC propagation conditions; S-Case 6

Parameter	Unit	Test 26	Test 27	Test 28	Test 29	Test 30
Phase reference		P-CPICH				
$\hat{I}_{or}/I_{oc}$	dB	-3	-3	-3	3	6
I_{oc}	dBm/3,84 MHz	-60				
Information Data Rate	kbit/s	1,2	4,75	64	128	384

Table 8.24: DCH requirements in combined satellite and CGC propagation conditions; S-Case 6

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
26	-15,1 dB	10^{-2}
27	-10,3 dB	10^{-2}
28	-4,6 dB	10^{-2}
29	-0,6 dB	10^{-2}
30	-	10^{-2}

8.3.3 Reception of CGC only signals

In case of CGC signal reception without view of satellite signal, which means propagation environment fully terrestrial, requirements as specified in TS 125 101 [6] shall apply.

8.4 Demodulation of DCH in satellite diversity mode

8.4.1 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 tables 8.26, 8.27 and 8.28. These requirements are applicable for TFCS size 16.

Table 8.25: DCH parameters during satellite diversity

Parameter	Unit	Test 1	Test 2	Test 3	Test 4	Test 5
Phase reference		P-CPICH				
$\hat{I}_{or1}/I_{oc}$ and $\hat{I}_{or2}/I_{oc}$	dB	9				
I_{oc}	dBm/3,84 MHz	-60				
UE speed	Km/h	3				
Information Data Rate	kbit/s	1,2	4,75	64	144	384
Parameter	**Unit**	**Test 6**	**Test 7**	**Test 8**	**Test 9**	**Test 10**
Phase reference		P-CPICH				
$\hat{I}_{or1}/I_{oc}$ and $\hat{I}_{or2}/I_{oc}$	dB	9				
I_{oc}	dBm/3,84 MHz	-60				
UE speed	Km/h	50				
Information Data Rate	kbit/s	1,2	4,75	64	144	384

Table 8.26: DCH requirements during satellite diversity (ITU A NLOS)

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER	Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-25,5 dB	10^{-2}	6	-30,6 dB	10^{-2}
2	-20,8 dB	10^{-2}	7	-26 dB	10^{-2}
3	-12,9 dB	10^{-2}	8	-18,6 dB	10^{-2}
4	-9,7 dB	10^{-2}	9	-15,3 dB	10^{-2}
5	-4,9 dB	10^{-2}	10	-9,7 dB	10^{-2}

Table 8.27: DCH requirements during satellite diversity (ITU B NLOS)

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER	Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-26,2 dB	10^{-2}	6	-30,6 dB	10^{-2}
2	-21,4 dB	10^{-2}	7	-26,1 dB	10^{-2}
3	-13,5 dB	10^{-2}	8	-18,6 dB	10^{-2}
4	-10,4 dB	10^{-2}	9	-15,4 dB	10^{-2}
5	-5,8 dB	10^{-2}	10	-9,9 dB	10^{-2}

Table 8.28: DCH requirements during satellite diversity (ITU C NLOS)

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER	Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-26,2 dB	10^{-2}	6	-29,3 dB	10^{-2}
2	-21,5 dB	10^{-2}	7	-24,8 dB	10^{-2}
3	-13,7 dB	10^{-2}	8	-17,3 dB	10^{-2}
4	-10,6 dB	10^{-2}	9	-14,2 dB	10^{-2}
5	-6,2 dB	10^{-2}	10	-9,1 dB	10^{-2}

8.5 Demodulation of DCH in CGC Transmit diversity modes

In case of CGC signal reception without view of satellite signal, and in case CGCs implement Transmit diversity, requirements as specified in TS 125 101 [6] shall apply.

8.6 Demodulation in Handover conditions

Requirements for demodulation of DCH in inter-cell soft handover as specified in [6] shall apply.

8.7 Detection of Broadcast Channel (BCH)

8.7.1 Minimum requirement

For the parameters specified in tables 8.29, 8.30, 8.31 and 8.32, the average downlink $\frac{PCCPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in table 8.33. These requirements are applicable for TFCS size 16.

Table 8.29: BCH parameters in static and aeronautical propagation conditions

Parameter	Unit	Test 1	Test 20
Phase reference		P-CPICH	
$\hat{I}_{or}/I_{oc}$	dB	-1	-3
I_{oc}	dBm/3,84 MHz	-60	
Propagation condition	kbit/s	Static	Aeronautic
UE speed	km/h	-	800

Table 8.30: BCH parameters in ITU A, B, C LOS propagation conditions

Parameter	Unit	Test 2	Test 3	Test 4	Test 5	Test 6	Test 7
Phase reference		P-CPICH					
$\hat{I}_{or}/I_{oc}$	dB	-3					
I_{oc}	dBm/3,84 MHz	-60					
Propagation condition	kbit/s	ITU A LOS		ITU B LOS		ITU C LOS	
UE speed	Km/h	3	250	3	250	3	250

Table 8.31: BCH parameters in ITU A, B, C NLOS propagation conditions

Parameter	Unit	Test 8	Test 9	Test 10	Test 11	Test 12	Test 13
Phase reference		P-CPICH					
$\hat{I}_{or}/I_{oc}$	dB	-3					
I_{oc}	dBm/3,84 MHz	-60					
Propagation condition	kbit/s	ITU A NLOS		ITU B NLOS		ITU C NLOS	
UE speed	Km/h	3	50	3	50	3	50

Table 8.32: BCH parameters in combined satellite and CGC propagation conditions

Parameter	Unit	Test 14	Test 15	Test 16	Test 17	Test 18	Test 19
Phase reference		P-CPICH					
$\hat{I}_{or}/I_{oc}$	dB	-3	-3	-3	6	-3	-3
I_{oc}	dBm/3,84 MHz	-60					
Propagation condition	kbit/s	SCase1	Scase2	Scase3	Scase4	Scase5	Scase6

Table 8.33: BCH requirements

Test Number	$\frac{PCCPCH\_E_c}{I_{or}}$	BLER	Test Number	$\frac{PCCPCH\_E_c}{I_{or}}$	BLER
1	-18,7 dB	10^{-2}	11	-11,5 dB	10^{-2}
2	-15,8 dB	10^{-2}	12	-6,8 dB	10^{-2}
3	-14,8 dB	10^{-2}	13	-12,6 dB	10^{-2}
4	-15,3 dB	10^{-2}	14	-17,5 dB	10^{-2}
5	-13,8 dB	10^{-2}	15	-8,9 dB	10^{-2}
6	-13,7 dB	10^{-2}	16	-13,2 dB	10^{-2}
7	-11,6 dB	10^{-2}	17	-12,1 dB	10^{-2}
8	-3 dB	10^{-2}	18	-	10^{-2}
9	-11 dB	10^{-2}	19	-11,2 dB	10^{-2}
10	-4,3 dB	10^{-2}	20	-14,2 dB	10^{-2}

8.8 Demodulation of Paging Channel (PCH)

8.8.1 Minimum requirement

For the parameters specified in tables 8.34, 8.35, 8.36 and 8.37, the average downlink $\frac{SCCPCH\_E_c}{I_{or}}$ power ratio shall be below the specified value for the BLER shown in table 8.38. These requirements are applicable for TFCS size 16.

Table 8.34: PCH parameters in static and aeronautical propagation conditions

Parameter	Unit	Test 1	Test 20
Phase reference		P-CPICH	
$\hat{I}_{or}/I_{oc}$	dB	-1	-3
I_{oc}	dBm/3,84 MHz	-60	
Propagation condition	kbit/s	Static	Aeronautic
UE speed	km/h	-	800

Table 8.35: PCH parameters in ITU A, B, C LOS propagation conditions

Parameter	Unit	Test 2	Test 3	Test 4	Test 5	Test 6	Test 7
Phase reference		P-CPICH					
$\hat{I}_{or}/I_{oc}$	dB	-3					
I_{oc}	dBm/3,84 MHz	-60					
Propagation condition	kbit/s	ITU A LOS		ITU B LOS		ITU C LOS	
UE speed	Km/h	3	250	3	250	3	250

Table 8.36: PCH parameters in ITU A, B, C NLOS propagation conditions

Parameter	Unit	Test 8	Test 9	Test 10	Test 11	Test 12	Test 13
Phase reference		P-CPICH					
$\hat{I}_{or}/I_{oc}$	dB	-3					
I_{oc}	dBm/3,84 MHz	-60					
Propagation condition	kbit/s	ITU A NLOS		ITU B NLOS		ITU C NLOS	
UE speed	Km/h	3	50	3	50	3	50

Table 8.37: PCH parameters in combined satellite and CGC propagation conditions

Parameter	Unit	Test 14	Test 15	Test 16	Test 17	Test 18	Test 19
Phase reference		P-CPICH					
$\hat{I}_{or}/I_{oc}$	dB	-3	-3	-3	-3	-3	-3
I_{oc}	dBm/3,84 MHz	-60					
Propagation condition	kbit/s	SCase1	Scase2	Scase3	Scase4	Scase5	Scase6

Table 8.38: PCH requirements

Test Number	$\frac{SCCPCH\_E_c}{I_{or}}$	BLER	Test Number	$\frac{SCCPCH\_E_c}{I_{or}}$	BLER
1	-15,9 dB	10^{-2}	11	-7 dB	10^{-2}
2	-12,8 dB	10^{-2}	12	-3,3 dB	10^{-2}
3	-11,7 dB	10^{-2}	13	-8,4 dB	10^{-2}
4	-12,2 dB	10^{-2}	14	-13,9 dB	10^{-2}
5	-10,5 dB	10^{-2}	15	-5,8 dB	10^{-2}
6	-10,1 dB	10^{-2}	16	-9,9 dB	10^{-2}
7	-7,9 dB	10^{-2}	17	-9,2 dB	10^{-2}
8	-	10^{-2}	18	-	10^{-2}
9	-6,4 dB	10^{-2}	19	-8,3 dB	10^{-2}
10	-0,4 dB	10^{-2}	20	-11,4 dB	10^{-2}

8.9 Detection of Acquisition Indicator (AI)

The receiver characteristics of Acquisition Indicator (AI) are determined by the probability of false alarm Pfa and probability of correct detection Pd. Pfa is defined as a conditional probability of detection of AI signature given that a AI signature was not transmitted. Pd is defined as a conditional probability of correct detection of AI signature given that the AI signature is transmitted.

8.9.1 Minimum requirement

For the parameters specified in table 8.39 the Pfa and 1-Pd shall not the exceed the specified values in table 8.40. Power of downlink channels other than AICH is as defined in table C.3.

Table 8.39: Parameters for AI detection

Parameter	Unit	Test 1
Phase reference	-	P-CPICH
I_{oc}	dBm/3,84 MHz	-60
Number of other transmitted AI signatures on AICH	-	0
$\hat{I}_{or}/I_{oc}$	dB	-1
AICH_Ec/Ior	dB	-22,0
AICH Power Offset	dB	-12,0
Propagation condition	-	Static

NOTE: AICH_Ec/Ior can not be set. Its value is calculated from other parameters and it is given for information only. (AICH_Ec/Ior = AICH Power Offset + CPICH_Ec/Ior).

Table 8.40: Test requirements for AI detection

Test Number	Pfa	1-Pd
1	0,01	0,01

9 Performance requirements for Multimedia Broadcast Multicast Service (MBMS)

This clause defines the performance requirements for the channels associated to Multimedia Broadcast/Multicast Service (MBMS).

The performance requirements for the UE in this clause are specified for the measurement channels specified in annex A, the propagation conditions specified in annex B and the downlink physical channels specified in annex C.

The performance requirements are specified at the UE antenna connector.

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.

For UE(s) with more than one receiver antenna connector the fading of the signals and the AWGN signals applied to each receiver antenna connector shall be uncorrelated. The levels of the test signal applied to each of the antenna connectors shall be as defined in the respective clauses below.

9.1 Demodulation of MCCH

The receive characteristic of the MCCH is determined by the RLC SDU error rate (RLC SDU ER). The requirement is valid for all RRC states for which the UE has capabilities for MBMS.

9.1.1 Minimum requirement

For the parameters specified in table 9.1 the average downlink S-CCPCH_E_c/I_{or} power ratio shall be below the specified value for the RLC SDU ER shown in table 9.2.

Table 9.1: Parameters for MCCH detection

Parameter	**Unit**	**Test 1**	**Test 2**	**Test 3**	**Test 4**
Phase reference	-	P-CPICH			
I_{oc}	dBm/3,84 MHz	-60			
$\hat{I}_{or}/I_{oc}$	dB	-1			
MCCH Data Rate	kbit/s	7,6			
Propagation condition	-	ITU A, LOS, 3 km/h	ITU B, LOS, 3 km/h	ITU A, NLOS, 3 km/h	ITU B, NLOS, 3 km/h
Parameter	**Unit**	**Test 5**	**Test 6**	**Test 7**	**Test 8**
Phase reference	-	P-CPICH			
I_{oc}	dBm/3,84 MHz	-60			
$\hat{I}_{or}/I_{oc}$	dB	-1			
	kbit/s	7,6			
Propagation condition	-	ITU A, LOS, 50 km/h	ITU B, LOS, 50 km/h	ITU A, NLOS, 50 km/h	ITU B, NLOS, 50 km/h

Table 9.2: Test requirements for MCCH detection

Test Number	S-CCPCH_Ec/Ior (dB)	RLC SDU ER
1	-18,6	0,01
2	-18,1	0,01
3	-5,8	0,01
4	-7,3	0,01
5	-18,5	0,01
6	-18	0,01
7	-14,3	0,01
8	-14,7	0,01

9.2 Demodulation of MTCH

The receive characteristic of the MTCH is determined by RLC SDU error rate (RLC SDU ER). RLC SDU ER is specified for each individual data rate of the MTCH. The requirement is valid for all RRC states for which the UE has capabilities for MBMS.

9.2.3 Minimum requirement

For the parameters specified in table 9.3 the average downlink S-CCPCH_E_c /I_{or} power ratio shall be below the specified value for the RLC SDU ER shown in table 9.4.

Table 9.3: Parameters for MTCH detection

Parameter	**Unit**	**Test 1**	**Test 2**	**Test 3**	**Test 4**
Phase reference	-	P-CPICH			
I_{oc}	dBm/3,84 MHz	-60			
$\hat{I}_{or}/I_{oc}$	dB	9			
MCCH Data Rate	kbit/s	128			
Propagation condition	-	ITU A, LOS, 3 km/h	ITU B, LOS, 3 km/h	ITU A, NLOS, 3 km/h	ITU B, NLOS, 3 km/h
Parameter	**Unit**	**Test 5**	**Test 6**	**Test 7**	**Test 8**
Phase reference	-	P-CPICH			
I_{oc}	dBm/3,84 MHz	-60			
$\hat{I}_{or}/I_{oc}$	dB	9			
	kbit/s	128			
Propagation condition	-	ITU A, LOS, 250 km/h	ITU B, LOS, 250 km/h	ITU A, NLOS, 50 km/h	ITU B, NLOS, 50 km/h
Parameter	**Unit**	**Test 9**	**Test 10**	**Test 11**	**Test 12**
Phase reference	-	P-CPICH			
I_{oc}	dBm/3,84 MHz	-60			
$\hat{I}_{or}/I_{oc}$	dB	9			
MCCH Data Rate	kbit/s	256			
Propagation condition	-	ITU A, LOS, 3 km/h	ITU B, LOS, 3 km/h	ITU A, NLOS, 3 km/h	ITU B, NLOS, 3 km/h
Parameter	**Unit**	**Test 13**	**Test 14**	**Test15**	**Test 16**
Phase reference	-	P-CPICH			
I_{oc}	dBm/3,84 MHz	-60			
$\hat{I}_{or}/I_{oc}$	dB	9			
	kbit/s	256			
Propagation condition	-	ITU A, LOS, 250 km/h	ITU B, LOS, 250 km/h	ITU A, NLOS, 50 km/h	ITU B, NLOS, 50 km/h

Table 9.4: Test requirements for MTCH detection

Test Number	S-CCPCH_Ec/Ior (dB)	RLC SDU ER
1	-19.5 dB	0,01
2	-19,2 dB	0,01
3	-10.5 dB	0,01
4	-11,3 dB	0,01
5	-18.9 dB	0,01
6	-18,4 dB	0,01
7	-17.8 dB	0,01
8	-17,8 dB	0,01
9	-16.4 dB	0,01
10	-15,8 dB	0,01
11	-1.6 dB	0,01
12	-3,1 dB	0,01
13	-16.1 dB	0,01
14	-15,7 dB	0,01
15	-9.4 dB	0,01
16	-9,8 dB	0,01

Annex A (normative): Measurement channels

A.1 General

The measurement channels in this annex are defined to derive the requirements in clauses 6, 7, 8 and 9. The measurement channels represent example configuration of radio access bearers for different data rates.

The measurement channels for 1,2 kbit/s and 4,75 kbit/s shall be supported by any UE both in up- and downlink. Support for other measurement channels is depending on the UE Radio Access capabilities.

A.2 Uplink reference measurement channel

A.2.2 UL reference measurement channel (1,2 kbit/s)

The parameters for the 1, kbit/s UL reference measurement channel are specified in tables A.1 and A.2. The channel coding for information is shown in figure A.1.

Table A.1: UL reference measurement channel physical parameters (1,2 kbit/s)

Parameter	Unit	Level
Information bit rate	kbit/s	1.2
DPDCH	kbit/s	15
DPCCH	kbit/s	15
DPCCH Slot Format #i	-	0
DPCCH/DPDCH power ratio	dB	-4,4
TFCI	-	On
Repetition	%	233

Table A.2: UL reference measurement channel, transport channel parameters (1,2 kbit/s)

Parameters	DTCH	DCCH
Transport Channel Number	1	1
Transport Block Size	96	0
Transport Block Set Size	96	0
Transmission Time Interval	80 ms	-
Type of Error Protection	Convolutional coding	-
Coding Rate	1/3	-
Rate Matching attribute	256	-
Size of CRC	16	-

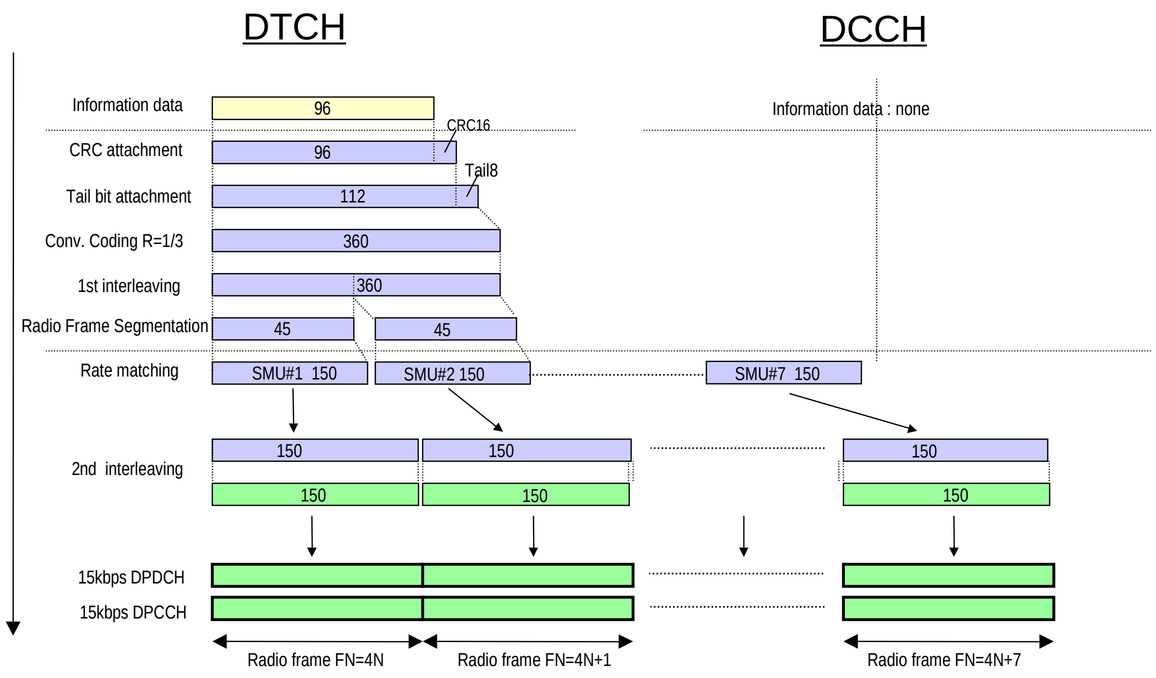

Figure A.1: Channel coding of UL reference measurement channel (1,2 kbit/s)

A.2.3 UL reference measurement channel (4,75 kbit/s)

The parameters for the 4.75 kbit/s UL reference measurement channel are specified in tables A.3 and A.4. The channel coding for information is shown in figure A.2.

Table A.3: UL reference measurement channel physical parameters (4,75 kbit/s)

Parameter	Unit	Level
Information bit rate	kbit/s	4,75
DPDCH	kbit/s	30
DPCCH	kbit/s	15
DPCCH Slot Format #i	-	1
DPCCH/DPDCH power ratio	dB	-2,69
TFCI	-	On
Repetition	%	45

Table A.4: UL reference measurement channel, transport channel parameters (4,75 kbit/s)

Parameters	DTCH	DCCH
Transport Channel Number	1	2
Transport Block Size	95	30
Transport Block Set Size	95	30
Transmission Time Interval	20 ms	40 ms
Type of Error Protection	Convolution coding	Convolutional coding
Coding Rate	1/3	½
Rate Matching attribute	256	256
Size of CRC	16	16

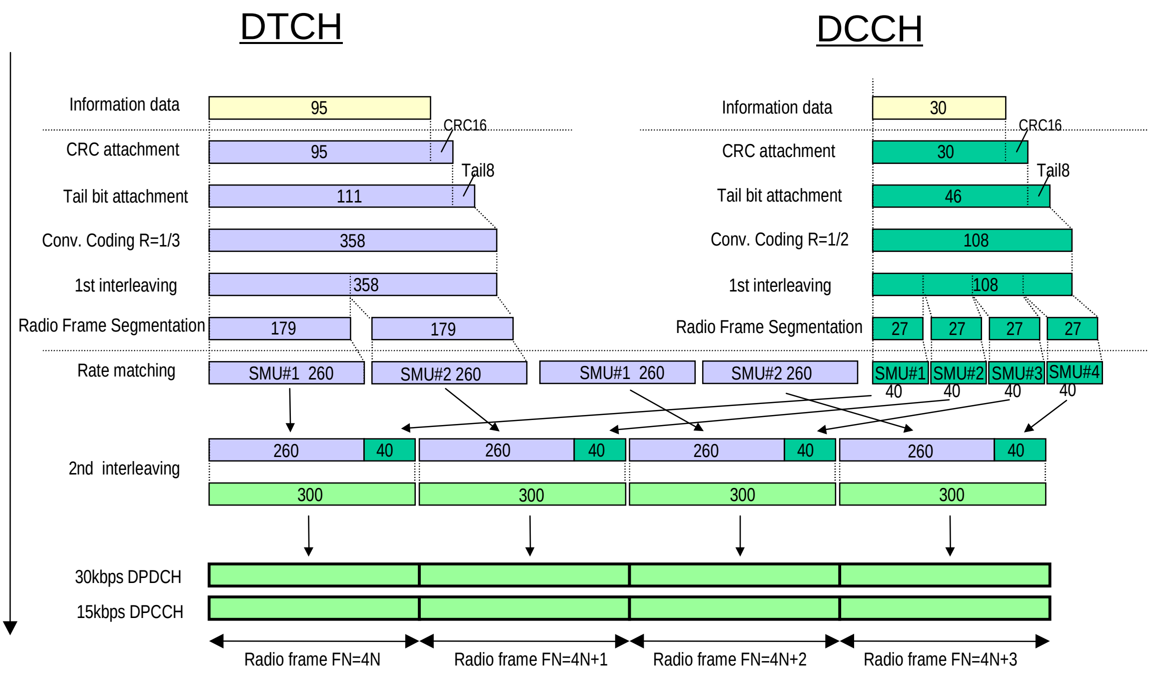

Figure A.2: Channel coding of UL reference measurement channel (4,75 kbit/s)

A.3 Downlink reference measurement channel

A.3.1 DL reference measurement channel (1,2 kbit/s)

This test service is data service at 1,2 kbit/s. The parameters for the 1,2 kbit/s speech service are specified in table A.5. the channel coding is shown in figure A.3 for information.

Table A.5: Parameters for 1.2 kbit/s test service; Downlink

Parameter	**Unit**	**Level**
Information bit rate	kbit/s	1,2
DPCH	ksps	15
Slot Format #i	-	
TFCI	-	On
Power offsets PO1, PO2 and PO3	dB	0
Puncturing	%	16,67
Parameter	**DTCH**	**DCCH**
Transport Channel Number	1	-
Transport Block Size	24	-
Transport Block Set Size	24	-
Transmission Time Interval	20 ms	-
Type of Error Protection	Convolutional Coding	-
Coding Rate	$^{1}/_{3}$	-
Rate Matching attribute	256	-
Size of CRC	16	-
Position of TrCH in radio frame	Fixed	-

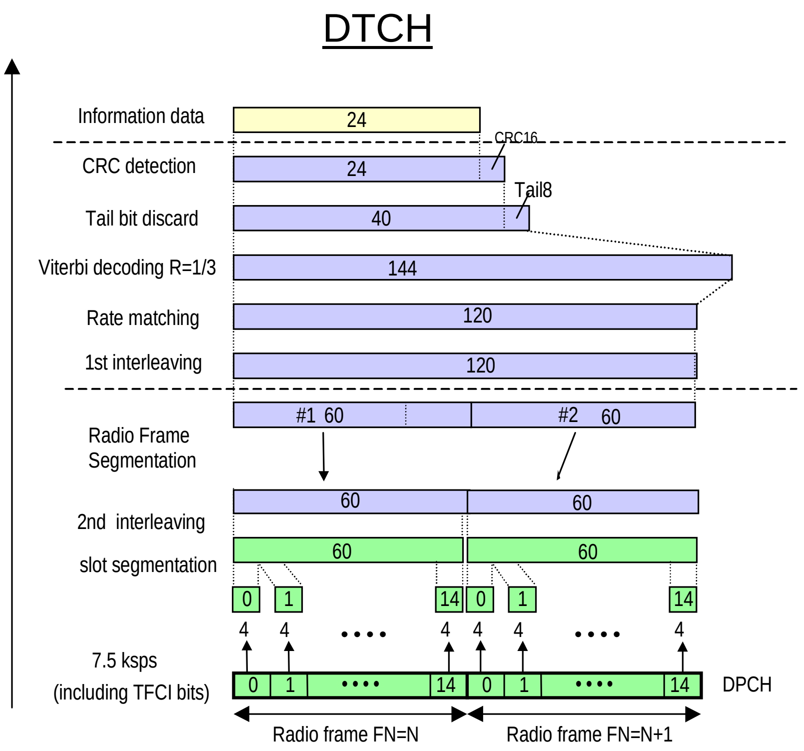

Figure A.3: Channel coding and multiplexing example for 1,2 kbit/s data; Downlink

A.3.2 DL reference measurement channel (4,75 kbit/s)

This test service is 3GPP standardized AMR speech service at 4,75 kbit/s. The parameters for the 4,75 kbit/s speech service are specified in table A.6 the channel coding is shown in figure A.4 for information.

Table A.6: Parameters for 4,75 kbit/s test service; Downlink

Parameter	Unit	Level
Information bit rate	kbit/s	4,75
DPCH	ksps	15
Slot Format #i	-	5
TFCI	-	On
Power offsets PO1, PO2 and PO3	dB	0
Puncturing	%	26,6
Parameter	**DTCH**	**DCCH**
Transport Channel Number	1	2
Transport Block Size	95	30
Transport Block Set Size	95	30
Transmission Time Interval	20 ms	40 ms
Type of Error Protection	Convolutional Coding	Convolutional Coding
Coding Rate	$^1/_3$	½
Rate Matching attribute	256	256
Size of CRC	16	12
Position of TrCH in radio frame	fixed	Fixed

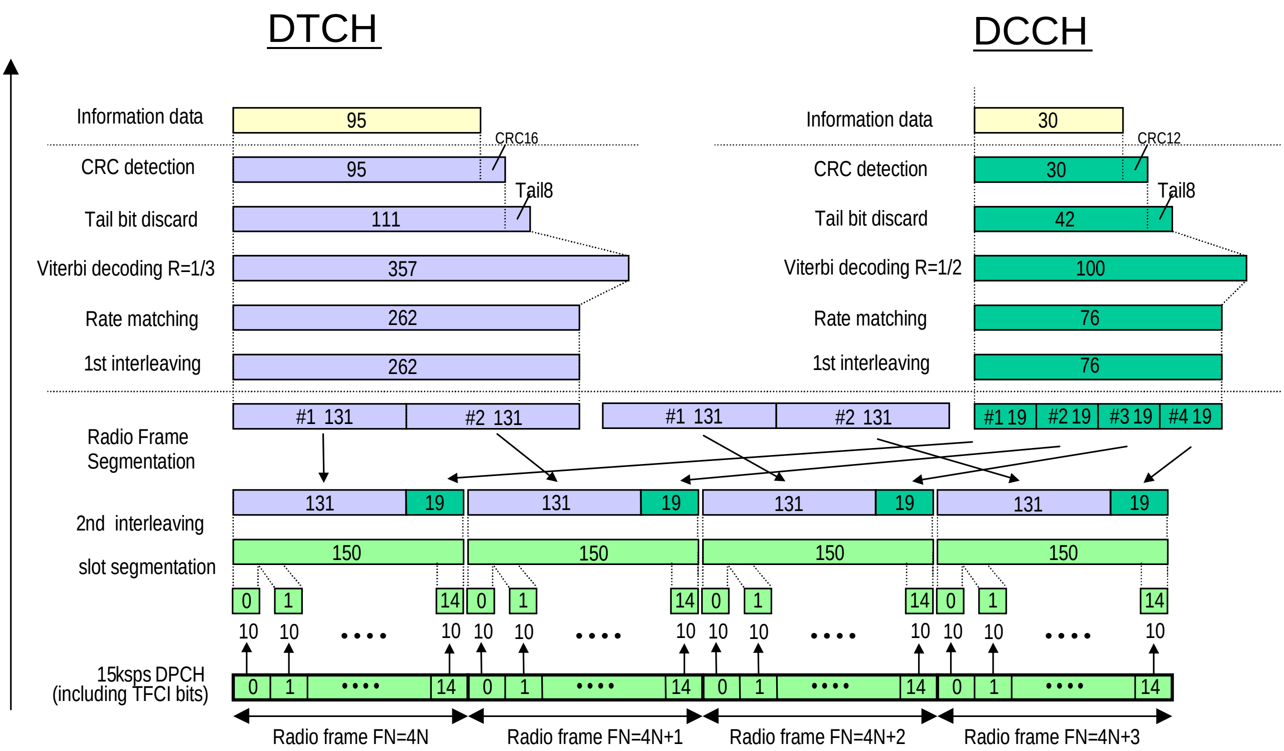

Figure A.4: Channel coding and multiplexing example for 4,75 kbit/s data; Downlink

A.3.3 DL reference measurement channel (64 kbit/s)

The parameters for the DL reference measurement channel for 64 kbit/s are specified tables A.7and A.8. The channel coding is shown for information in figure A.5.

Table A.7: DL reference measurement channel physical parameters (64 kbit/s)

Parameter	Unit	Level
Information bit rate	kbit/s	64
DPCH	ksps	120
Slot Format #i	-	13
TFCI	-	On
Power offsets PO1, PO2 and PO3	dB	0
Repetition	%	2,9

Table A.8: DL reference measurement channel, transport channel parameters (64 kbit/s)

Parameter	DTCH	DCCH
Transport Channel Number	1	2
Transport Block Size	1 280	100
Transport Block Set Size	1 280	100
Transmission Time Interval	20 ms	40 ms
Type of Error Protection	Turbo Coding	Convolutional Coding
Coding Rate	1/3	1/3
Rate Matching attribute	256	256
Size of CRC	16	12
Position of TrCH in radio frame	fixed	fixed

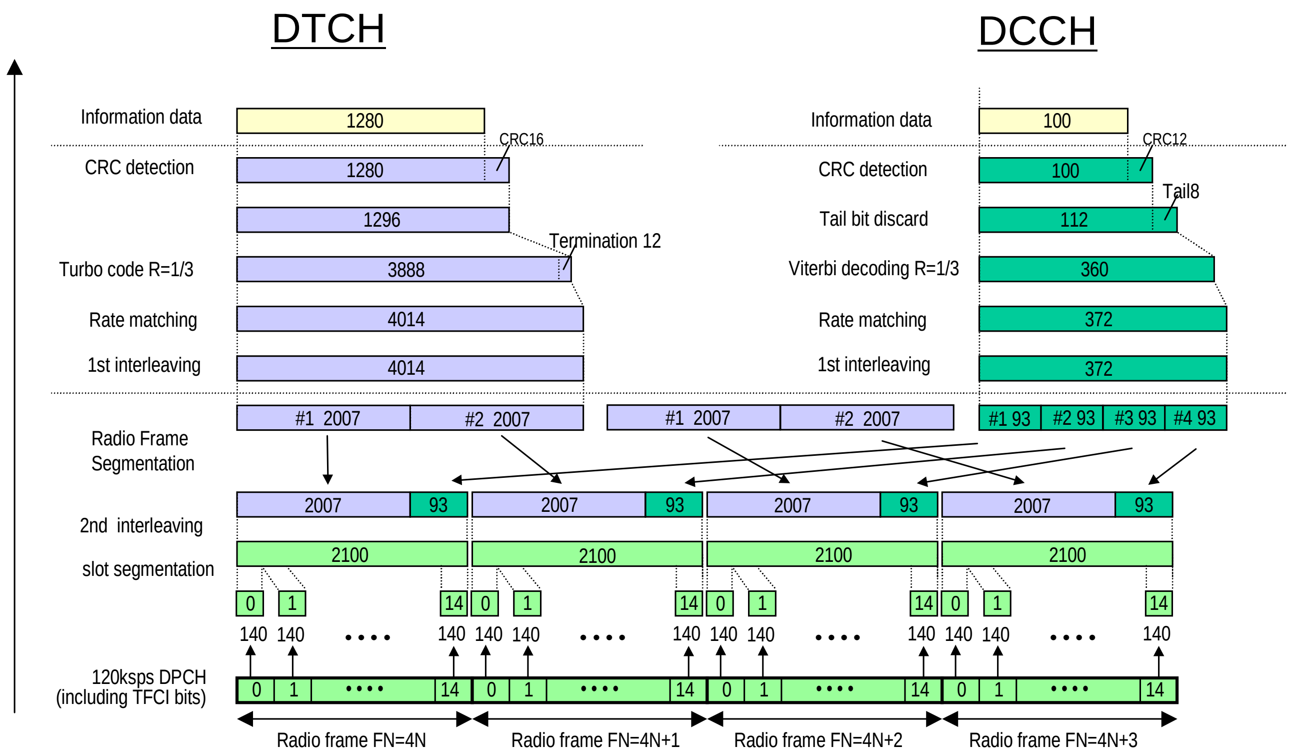

Figure A.5: Channel coding of DL reference measurement channel (64 kbit/s)

A.3.4 DL reference measurement channel (144 kbit/s)

The parameters for the DL measurement channel for 144 kbit/s are specified in tables A.9 and A.10. The channel coding is shown for information in figure A.6.

Table A.9: DL reference measurement channel physical parameters (144 kbit/s)

Parameter	Unit	Level
Information bit rate	kbit/s	144
DPCH	ksps	240
Slot Format #i	-	14
TFCI	-	On
Power offsets PO1, PO2 and PO3	dB	0
Puncturing	%	2,7

Table A.10: DL reference measurement channel, transport channel parameters (144 kbit/s)

Parameter	DTCH	DCCH
Transport Channel Number	1	2
Transport Block Size	2 880	100
Transport Block Set Size	2 880	100
Transmission Time Interval	20 ms	40 ms
Type of Error Protection	Turbo Coding	Convolutional Coding
Coding Rate	1/3	1/3
Rate Matching attribute	256	256
Size of CRC	16	12
Position of TrCH in radio frame	fixed	fixed

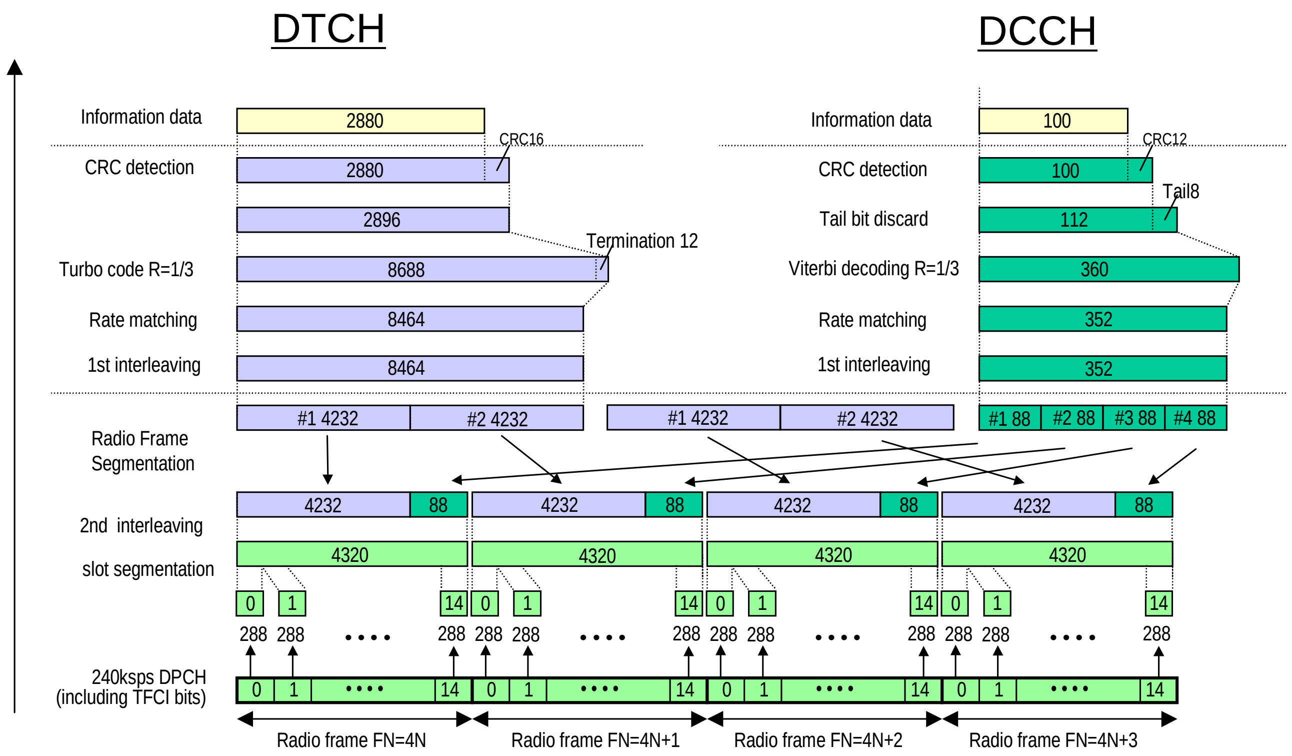

Figure A.6: Channel coding of DL reference measurement channel (144 kbit/s)

A.3.5 DL reference measurement channel (384 kbit/s)

The parameters for the DL measurement channel for 384 kbit/s are specified in tables A.11 and A.12. The channel coding is shown for information in figure A.7.

Table A.11: DL reference measurement channel, physical parameters (384 kbit/s)

Parameter	Unit	Level
Information bit rate	kbit/s	384
DPCH	ksps	480
Slot Format # i	-	15
TFCI		On
Power offsets PO1, PO2 and PO3	dB	0
Puncturing	%	22

Table A.12: DL reference measurement channel, transport channel parameters (384 kbit/s)

Parameter	DTCH	DCCH
Transport Channel Number	1	2
Transport Block Size	3840	100
Transport Block Set Size	3840	100
Transmission Time Interval	10 ms	40 ms
Type of Error Protection	Turbo Coding	Convolutional Coding
Coding Rate	1/3	1/3
Rate Matching attribute	256	256
Size of CRC	16	12
Position of TrCH in radio frame	fixed	Fixed

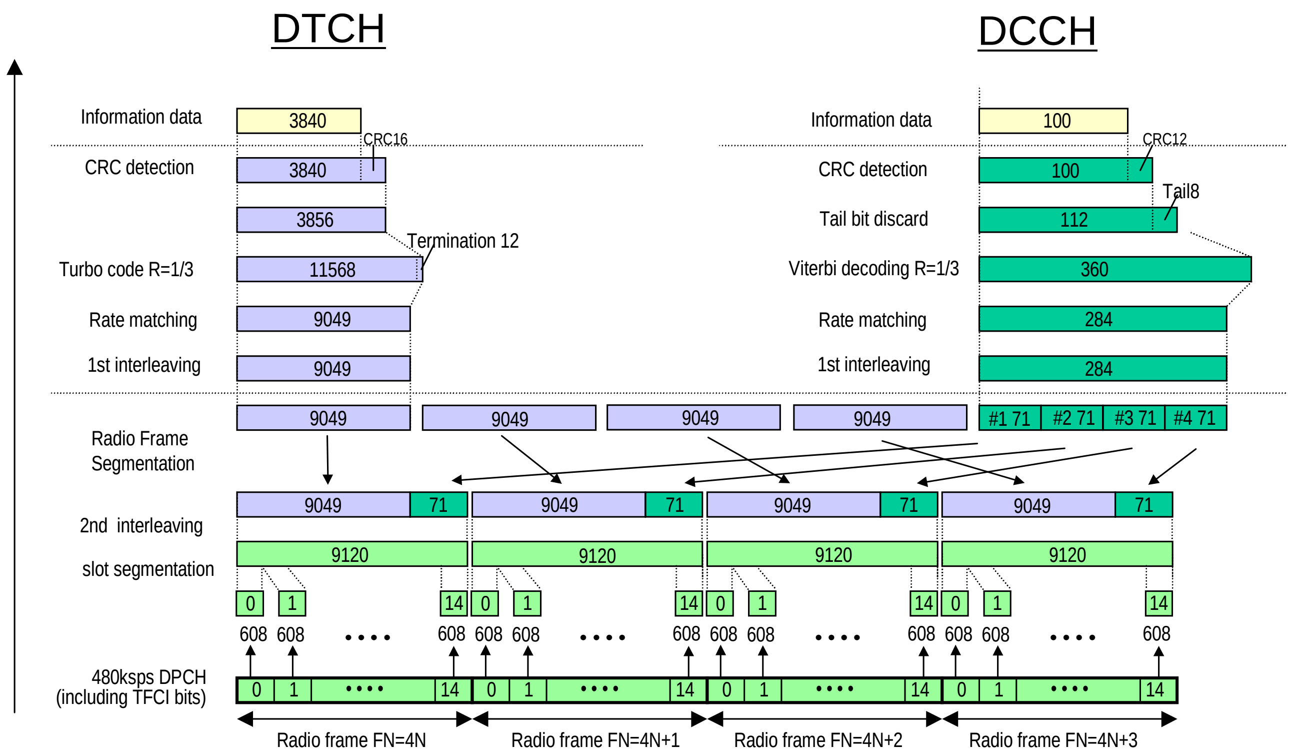

Figure A.7: Channel coding of DL reference measurement channel (384 kbit/s)

A.4 DL reference parameters for PCH tests

The parameters for the PCH test service are specified in table A.13.

Table A.13: Parameters for PCH test service

Parameter	
Information bit rate	24 kbit/s
S-CCPCH	30 ksps
Slot Format #i	4
TFCI	OFF
TFCI/Pilot to Data fields Power offsets	0 dB
Repetition	13,6 %
Transport Channel Number	1
Transport Block Size	240
Transport Block Set Size	240
Transmission Time Interval	10 ms
Type of Error Protection	Convolutional Coding
Coding Rate	1/2
Rate Matching attribute	256
Size of CRC	16
Position of TrCH in radio frame	fixed

A.5 DL reference parameters for MBMS tests

A.5.1 MCCH

The parameters for the MCCH demodulation tests are specified in tables A.14 and A.15.

Table A.14: Physical channel parameters for S-CCPCH

Parameter	Unit	Level
Channel bit rate	kbit/s	30
Channel symbol rate	ksps	15
Slot Format #i	-	2
TFCI	-	ON
Power offsets of TFCI and Pilot fields relative to data field	dB	0

Table A.15: Transport channel parameters for S-CCPCH

Parameter	MCCH
User Data Rate	7,6 kbit/s
Transport Channel Number	1
Transport Block Size	72
Transport Block Set Size	72
RLC SDU block size	4088
Transmission Time Interval	10 ms
Repetition period	640 ms
Modification period	1 280 ms
Type of Error Protection	Convolutional Coding
Coding Rate	1/3
Rate Matching attribute	256
Size of CRC	16
Position of TrCH in radio frame	Flexible

A.5.2 MTCH

The parameters for the MTCH demodulation tests are specified in tables A.16 and A.17.

Table A.16: Physical channel parameters for S-CCPCH

Parameter	Unit	Level	Level
User Data Rate	**kpbs**	**256**	**128**
Channel bit rate	kbit/s	960	480
Channel symbol rate	ksps	480	240
Slot Format #i	-	14	12
TFCI	-	ON	ON
Power offsets of TFCI and Pilot fields relative to data field	dB	0	0

Table A.17: Transport channel parameters for S-CCPCH

Parameter	**MTCH**		
User Data Rate	**256 kbit/s**	**128 kbit/s 40 ms TTI**	**128 kbit/s, 80 ms TTI**
Transport Channel Number	1	1	1
Transport Block Size	2 560	2 560	2 560
Transport Block Set Size	10 240	5 120	10 240
Nr of transport blocks/TTI	4	2	4
RLC SDU block size	10 160	5 072	10 160
Transmission Time Interval	40 ms	40 ms	80 ms
Type of Error Protection	Turbo	Turbo	Turbo
Rate Matching attribute	256	256	256
Size of CRC	16	16	16
Position of TrCH in radio frame	Flexible	Flexible	Flexible

Annex B (normative): Propagation conditions

B.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 Multi-path fading propagation condition

B.2.1 Satellite channels

Table B.1: Channel model A (10 % delay spread values)

Tap number	Relative tap delay value (ns)	Tap amplitude distribution	Parameter of amplitude distribution (dB)	Average amplitude with respect to free space propagation	Rice factor (dB)	Doppler spectrum
1	0	LOS: Rice NLOS: Rayleigh	10 log *c* 10 log P_m	0,0 -7,3	10 -	Rice Classic
2	100	Rayleigh	10 log P_m	-23,6	-	Classic
3	180	Rayleigh	10 log P_m	-28,1	-	Classic

Table B.2: Channel model B (50 % delay spread values)

Tap number	Relative tap delay value (ns)	Tap amplitude distribution	Parameter of amplitude distribution(dB)	Average amplitude with respect to free space propagation	Rice factor (dB)	Doppler spectrum
1	0	LOS: Rice NLOS: Rayleigh	10 log *c* 10 log P_m	0,0 -9,5	7 -	Rice Classic
2	100	Rayleigh	10 log P_m	-24,1	-	Classic
3	250	Rayleigh	10 log P_m	-25,1	-	Classic

Table B.3: Channel model C (90 % delay spread values)

Tap number	Relative tap delay value (ns)	Tap amplitude distribution	Parameter of amplitude distribution(dB)	Average amplitude with respect to free space propagation	Rice factor (dB)	Doppler spectrum
1	0	LOS: Rice NLOS: Rayleigh	10 log *c* 10 log P_m	0,0 -12,1	3 -	Rice Classic
2	60	Rayleigh	10 log P_m	-17,0	-	Classic
3	100	Rayleigh	10 log P_m	-18,3	-	Classic
4	130	Rayleigh	10 log P_m	-19,1	-	Classic
5	250	Rayleigh	10 log P_m	-22,1	-	Classic

B.2.2 Combined Satellite and CGC channels

This clause applies to the CGC deployment model where CGCs repeat satellite signals on the same scrambling code than the one allocated to the spot coverage area they belong.

Table B.4: Path delay profiles; Combined Satellite and CGCs test cases

S-Case 1 speed 3km/h		S-Case 2 speed 3 km/h		S-Case 3 speed 120 km/h		S-Case 4 speed 250 km/h		S-Case 5 speed 120 km/h		S-Case 6 speed 250 km/h	
Relative Delay [ns]	Average Power [dB]	Relative Delay [ns]	Average Power [dB]	Relative Delay [ns]	Average Power [dB]	Relative Delay [ns]	Average Power [dB]	Relative Delay [ns]	Average Power [dB]	Relative Delay [ns]	Average Power [dB]
0	0	0	0	0	0	0	0	0	-3	0	-3
1 042	-10	1 042	0	260	-3	260	-3	260	-3	260	-3
		26 563	0	521	-6	521	-6	521	-9	521	-9
				781	-9	781	-9	1 042	-3	1 042	-3
								1 302	-3	1 302	-3
								1 562	-3	1 562	-3
								1 823	0	1 823	0
								2 083	0	2 083	0

Annex C (normative): Downlink Physical Channels

C.1 General

This annex specifies the downlink physical channels that are needed for setting a connection and channels that are needed during a connection.

C.2 Connection set-up

Table C.1 describes the downlink Physical Channels that are required for connection set up.

Table C.1: Downlink Physical Channels required for connection set-up

Physical Channel
P-CPICH
P-CCPCH
SCH
S-CCPCH
PICH
AICH
DPCH

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 clause 7.4.

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 clause 7.4 and clause 6.4.4.

Table C.3: Downlink Physical Channels transmitted during a connection (see note)

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	When BCH performance is tested the P-CCPCH_Ec/Ior is test dependent
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. When BCH performance is tested the DPCH is not transmitted.
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 tables C.4.
NOTE: 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.		

Table C.4: DPCH Channelization Code and relative level settings for OCNS signal

Channelization Code at SF=128	Relative Level setting (dB) (see note 1)	DPCH Data
2	-1	The DPCH data for each channelization code shall be uncorrelated with each other and with any wanted signal over the period of any measurement.
11	-3	
17	-3	
23	-5	
31	-2	
38	-4	
47	-8	
55	-7	
62	-4	
69	-6	
78	-5	
85	-9	
94	-10	
125	-8	
113	-6	
119	0	
NOTE 1: The relative level setting specified in dB refers only to the relationship between the OCNS channels. The level of the OCNS channels relative to the Ior of the complete signal is a function of the power of the other channels in the signal with the intention that the power of the group of OCNS channels is used to make the total signal add up to 1. NOTE 2: The DPCH Channelization Codes and relative level settings are chosen to simulate a signal with realistic Peak to Average Ratio.		

C.4 W-CDMA Modulated Interferer

Table C.5 describes the downlink Channels that are transmitted as part of the W-CDMA modulated interferer.

Table C.5: Spreading Code, Timing offsets and relative level settings for W-CDMA Modulated Interferer signal channels

Channel Type	Spreading Factor	Channelization Code	Timing offset ($x256T_{chip}$)	Power	NOTE
P-CCPCH	256	1	0	P-CCPCH_Ec/Ior = -10 dB	
SCH	256	-	0	SCH_Ec/Ior = -10 dB	The SCH power shall be divided equally between Primary and Secondary Synchronous channels
P-CPICH	256	0	0	P-CPICH_Ec/Ior = -10 dB	
PICH	256	16	16	PICH_Ec/Ior = -15 dB	
OCNS	See table C.4.			Necessary power so that total transmit power spectral density of Node B (Ior) adds to one	OCNS interference consists of the dedicated data channels. as specified in table C.4.

Annex D (normative): UE Environmental conditions

D.1 General

The requirements in this clause apply to all types of UE(s).

D.2 Environmental requirements

D.2.1 Temperature

The UE shall fulfil all the requirements in the full temperature range of:

Table D.1

+15°C to +35°C	for normal conditions (with relative humidity of 25 % to 75 %)
-10°C to +55°C	for extreme conditions (see IEC publications 68-2-1 [14] and 68-2-2 [15])

Outside this temperature range the UE, if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined for extreme operation.

D.2.2 Voltage

The UE shall fulfil all the requirements in the full voltage range, i.e. the voltage range between the extreme voltages.

The manufacturer shall declare the lower and higher extreme voltages and the approximate shutdown voltage. For the equipment that can be operated from one or more of the power sources listed below, the lower extreme voltage shall not be higher, and the higher extreme voltage shall not be lower than that specified below.

Table D.2

Power source	Lower extreme voltage	Higher extreme voltage	Normal conditions voltage
AC mains	0,9 * nominal	1,1 * nominal	nominal
Regulated lead acid battery	0,9 * nominal	1,3 * nominal	1,1 * nominal
Non regulated batteries: Leclanché / lithium Mercury/nickel and cadmium	 0,85 * nominal 0,90 * nominal	 Nominal Nominal	 Nominal Nominal

Outside this voltage range the UE if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined for extreme operation. In particular, the UE shall inhibit all RF transmissions when the power supply voltage is below the manufacturer declared shutdown voltage.

D.2.3 Vibration

The UE shall fulfil all the requirements when vibrated at the following frequency/amplitudes.

Table D.3

Frequency	ASD (Acceleration Spectral Density) random vibration
5 Hz to 20 Hz	0,96 m^2/s^3
20 Hz to 500 Hz	0,96 m^2/s^3 at 20 Hz, thereafter -3 dB/Octave

Outside the specified frequency range the UE, if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined for extreme operation.

Annex E (informative): Change History

V0.0.1	September 2004	Creation. Performances results from TR 102 058. Transmission characteristics from 3GPP TS 25.101 (with modified power class 4)
V0.0.2	March 2007	Clauses 4, 6 and 7, annex D completed. Added : Performance for detection of AI (clause 8.9), Performance results from TR 102 277 for MBMS (clause 9), uplink reference channels (annex A.2), MBMS reference channels (annex A.5), downlink physical channels (annex C).
V0.0.3	May 2007	Revision as requested at S-UMTS#32 see Su32TD11. Abbreviations completed. Version for approval at S-UMTS#33 meeting.
V0.0.4	May 2007	Comments collected during SUMTS#33 have been implemented
V0.05	June 2007	Comments collected during SES#71 have been implemented
V0.06	June 2007	Figure A1 corrected and clause 7.9 clarified according to SES comments

History

Document history		
V2.1.1	January 2008	Publication