

# ETSI TS 125 101 V3.19.0 (2006-12)

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*Technical Specification*

**Universal Mobile Telecommunications System (UMTS);  
User Equipment (UE) radio transmission and reception (FDD)  
(3GPP TS 25.101 version 3.19.0 Release 1999)**

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## Foreword

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# 1 Scope

The present document establishes the minimum RF characteristics of the FDD mode of UTRA for the User Equipment (UE).

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# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] (void)
- [2] ITU-R Recommendation SM.329-8: "Spurious emissions".
- [3] (void)
- [4] 3GPP TS 25.433: "UTRAN Iub Interface NBAP Signalling".
- [5] ETSI ETR 273: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement of radiated methods of measurement (using test sites) and evaluation of the corresponding measurement uncertainties; Part 1: Uncertainties in the measurement of mobile radio equipment characteristics; Sub-part 2: Examples and annexes".
- [6] (void)
- [7] (void)
- [8] (void)
- [9] 3GPP TS 25.307: "Requirements on User Equipments (UEs) supporting a release-independent frequency band".

## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

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

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

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

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

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

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

**RRC filtered mean power:** The mean power as measured through a root raised cosine filter with roll-off factor  $\alpha$  and a bandwidth equal to the chip rate of the radio access mode.

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

NOTE 2: The roll-off factor  $\alpha$  is defined in section 6.8.1.

### 3.2 Abbreviations

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

ACLR	Adjacent Channel Leakage power Ratio
ACS	Adjacent Channel Selectivity
AICH	Acquisition Indication Channel
BER	Bit Error Ratio
BLER	Block Error Ratio
CW	Continuous Wave (un-modulated signal)
DCH	Dedicated Channel, which is mapped into Dedicated Physical Channel.
DL	Down Link (forward link)
DTX	Discontinuous Transmission
DPCCCH	Dedicated Physical Control Channel
DPCH	Dedicated Physical Channel
DPCH_ $E_c$	Average energy per PN chip for DPCH.
$\frac{DPCH\_E_c}{I_{or}}$	The ratio of the transmit energy per PN chip of the DPCH to the total transmit power spectral density at the Node B antenna connector.
DPDCH	Dedicated Physical Data Channel
EIRP	Effective Isotropic Radiated Power
$E_c$	Average energy per PN chip.

$\frac{E_c}{I_{or}}$	The ratio of the average transmit energy per PN chip for different fields or physical channels to the total transmit power spectral density.
FACH	Forward Access Channel
FDD	Frequency Division Duplex
FDR	False transmit format Detection Ratio. A false Transport Format detection occurs when the receiver detects a different TF to that which was transmitted, and the decoded transport block(s) for this incorrect TF passes the CRC check(s).
$F_{uw}$	Frequency of unwanted signal. This is specified in bracket in terms of an absolute frequency(s) or a frequency offset from the assigned channel frequency.
Information Data Rate	Rate of the user information, which must be transmitted over the Air Interface. For example, output rate of the voice codec.
$I_o$	The total received power spectral density, including signal and interference, as measured at the UE antenna connector.
$I_{oc}$	The power spectral density (integrated in a noise bandwidth equal to the chip rate and normalized to the chip rate) of a band limited white noise source (simulating interference from cells, which are not defined in a test procedure) as measured at the UE antenna connector.
$I_{or}$	The total transmit power spectral density (integrated in a bandwidth of $(1+\alpha)$ 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 $(1+\alpha)$ times the chip rate and normalized to the chip rate) of the downlink signal as measured at the UE antenna connector.
MER	Message Error Ratio
Node B	A logical node responsible for radio transmission / reception in one or more cells to/from the User Equipment. Terminates the Iub interface towards the RNC
OCNS	Orthogonal Channel Noise Simulator, a mechanism used to simulate the users or control signals on the other orthogonal channels of a downlink link.
OCNS_ $E_c$	Average energy per PN chip for the OCNS.
$\frac{OCNS\_E_c}{I_{or}}$	The ratio of the average transmit energy per PN chip for the OCNS to the total transmit power spectral density.
P-CCPCH	Primary Common Control Physical Channel
PCH	Paging Channel
$P-CCPCH \frac{E_c}{I_o}$	The ratio of the received P-CCPCH energy per chip to the total received power spectral density at the UE antenna connector.
$\frac{P-CCPCH\_E_c}{I_{or}}$	The ratio of the average transmit energy per PN chip for the P-CCPCH to the total transmit power spectral density.
P-CPICH	Primary Common Pilot Channel
PICH	Paging Indicator Channel
PPM	Parts Per Million
RACH	Random Access Channel
SCH	Synchronization Channel consisting of Primary and Secondary synchronization channels
$S-CCPCH$	Secondary Common Control Physical Channel.
$S-CCPCH\_E_c$	Average energy per PN chip for S-CCPCH.
SIR	Signal to Interference ratio
SSDT	Site Selection Diversity Transmission
STTD	Space Time Transmit Diversity
TDD	Time Division Duplexing
TFC	Transport Format Combination
TFCI	Transport Format Combination Indicator
TPC	Transmit Power Control
TSTD	Time Switched Transmit Diversity
UE	User Equipment
UL	Up Link (reverse link)
UTRA	UMTS Terrestrial Radio Access

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## 4 General

### 4.1 Relationship between Minimum Requirements and Test Requirements

The Minimum Requirements given in this specification make no allowance for measurement uncertainty. The test specification 34.121 Annex F defines Test Tolerances. These Test Tolerances are individually calculated for each test. The Test Tolerances are used to relax the Minimum Requirements in this specification to create Test Requirements.

The measurement results returned by the test system are compared - without any modification - against the Test Requirements as defined by the shared risk principle.

The Shared Risk principle is defined in ETR 273 Part 1 sub-part 2 section 6.5.

### 4.2 Power Classes

For UE power classes 1 and 2, a number of RF parameter are not specified. It is intended that these are part of a later release.

### 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 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 -30dBm if no acceptable cell can be found by the UE.

### 4.4 RF requirements in later releases

The standardisation of new frequency bands may be independent of a release. However, in order to implement a UE that conforms to a particular release but supports a band of operation that is specified in a later release, it is necessary to specify some extra requirements. TS 25.307 [9] specifies requirements on UEs supporting a frequency band that is independent of release.

NOTE: For terminals conforming to the 3GPP release of the present document, some RF requirements in later releases may be mandatory independent of whether the UE supports the bands specified in later releases or not. The set of requirements from later releases that is also mandatory for UEs conforming to the 3GPP release of the present document is determined by regional regulation.

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## 5 Frequency bands and channel arrangement

### 5.1 General

The information presented in this subclause is based on a chip rate of 3.84 Mcps.

NOTE: Other chip rates may be considered in future releases.

## 5.2 Frequency bands

UTRA/FDD is designed to operate in either of the following paired bands:

- (a) 1920 - 1980 MHz: Up-link (UE transmit, Node B receive)  
2110 - 2170 MHz: Down-link (Node B transmit, UE receive)
- (b)\* 1850 - 1910 MHz: Up-link (UE transmit, Node B receive)  
1930 - 1990 MHz: Down-link (Node B transmit, UE receive)

\* Used in Region 2.

Additional allocations in ITU region 2 are FFS.

Deployment in other frequency bands is not precluded.

## 5.3 TX-RX frequency separation

- (a) UTRA/FDD is designed to operate with the following TX-RX frequency separation

**Table 5.0: TX-RX frequency separation**

Frequency Band	TX-RX frequency separation
For operation in frequency band as defined in subclause 5.2 (a)	190 MHz
For operation in frequency band as defined in subclause 5.2 (b)	80 MHz.

- (b) UTRA/FDD can support both fixed and variable transmit to receive frequency separation.
- (c) The use of other transmit to receive frequency separations in existing or other frequency bands shall not be precluded.

## 5.4 Channel arrangement

### 5.4.1 Channel spacing

The nominal channel spacing is 5 MHz, but this can be adjusted to optimise 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 UTRA Absolute Radio Frequency Channel Number (UARFCN). The values are defined as follows:

**Table 5.1: UARFCN definition**

Uplink	$N_u = 5 * F_{\text{uplink}}$	$0.0 \text{ MHz} \leq F_{\text{uplink}} \leq 3276.6 \text{ MHz}$ where $F_{\text{uplink}}$ is the uplink frequency in MHz
Downlink	$N_d = 5 * F_{\text{downlink}}$	$0.0 \text{ MHz} \leq F_{\text{downlink}} \leq 3276.6 \text{ MHz}$ where $F_{\text{downlink}}$ is the downlink frequency in MHz

**Table 5.1b: UARFCN definition (Band b, region 2, Additional Channels)**

Uplink	$N_u = 5 * ((F_{\text{uplink}} - 100\text{kHz}) - 1850)$	1852.5, 1857.5, 1862.5, 1867.5, 1872.5, 1877.5, 1882.5, 1887.5, 1892.5, 1897.5, 1902.5, 1907.5
Downlink	$N_d = 5 * ((F_{\text{downlink}} - 100\text{kHz}) - 1850)$	1932.5, 1937.5, 1942.5, 1947.5, 1952.5, 1957.5, 1962.5, 1967.5, 1972.5, 1977.5, 1982.5, 1987.5

## 5.4.4 UARFCN

The following UARFCN range shall be supported for each paired band

**Table 5.2: UTRA Absolute Radio Frequency Channel Number**

Frequency Band	Uplink UE transmit, Node B receive	Downlink UE receive, Node B transmit
For operation in frequency band as defined in subclause 5.2 (a)	9612 to 9888	10562 to 10838
For operation in frequency band as defined in subclause 5.2 (b)	9262 to 9538, And for additional channels in table 5.1b: 12, 37, 62, 87, 112, 137, 162, 187, 212, 237, 262, 287	9662 to 9938 And for additional channels in table 5.1b: 412, 437, 462, 487, 512, 537, 562, 587, 612, 637, 662, 687

# 6 Transmitter characteristics

## 6.1 General

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

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

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

## 6.2 Transmit power

### 6.2.1 UE maximum output power

The following Power Classes define the nominal maximum output power. The nominal power defined is the 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. The period of measurement shall be at least one timeslot.

**Table 6.1: UE Power Classes**

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

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

## 6.3 Frequency Error

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

**Table 6.2: Frequency Error**

AFC	Frequency stability
ON	within $\pm 0.1$ PPM

## 6.4 Output power dynamics

Power control is used to limit the interference level.

### 6.4.1 Open loop power control

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

#### 6.4.1.1 Minimum requirement

The UE open loop power is defined as the mean power in a timeslot or ON power duration, whichever is available.

**Table 6.3: Open loop power control tolerance**

Conditions	Tolerance
Normal conditions	$\pm 9$ dB
Extreme conditions	$\pm 12$ dB

### 6.4.2 Inner loop power control in the uplink

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

#### 6.4.2.1 Power control steps

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

##### 6.4.2.1.1 Minimum requirement

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

- (a) The transmitter output power step due to inner loop power control shall be within the range shown in Table 6.4.
- (b) The transmitter average output power step due to inner loop power control shall be within the range shown in Table 6.5. Here a TPC\_cmd group is a set of TPC\_cmd values derived from a corresponding sequence of TPC commands of the same duration.

The inner loop power step is defined as the relative power difference between the 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 $\mu$ s before the slot boundary to 25 $\mu$ s after the slot boundary.

**Table 6.4: Transmitter power control range**

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

**Table 6.5: Transmitter aggregate power control range**

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

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

### 6.4.3 Minimum output power

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

#### 6.4.3.1 Minimum requirement

The minimum output power is defined as 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 TS 25.214. The thresholds  $Q_{out}$  and  $Q_{in}$  specify at what DPCCH quality levels the UE shall shut its power off and when it shall turn its power on respectively. The thresholds are not defined explicitly, but are defined by the conditions under which the UE shall shut its transmitter off and turn it on, as stated in this subclause.

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

#### 6.4.4.1 Minimum requirement

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



acceptable level  $Q_{in}$ . When the UE estimates the DPCCH quality over the last 160 ms period to be better than a threshold  $Q_{in}$ , the UE shall again turn its transmitter on within 40 ms.

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

### 6.4.4.2 Test case

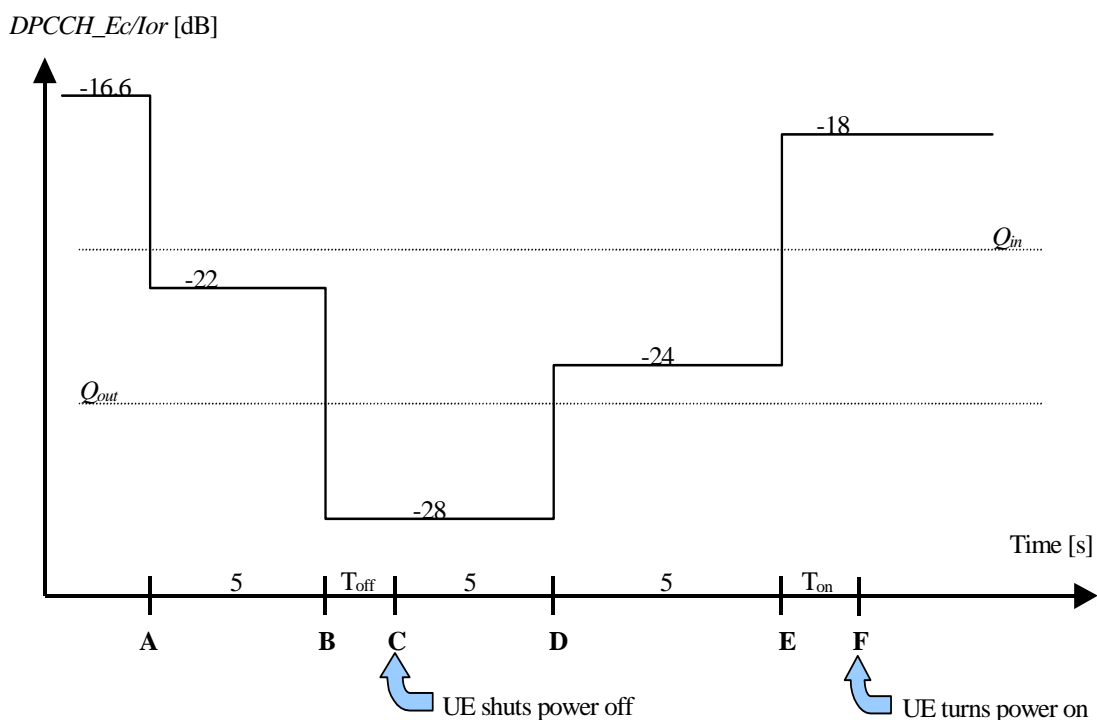
This subclause specifies a test case, which provides additional information for how the minimum requirement should be interpreted for the purpose of conformance testing.

The quality levels at the thresholds  $Q_{out}$  and  $Q_{in}$  correspond to different signal levels depending on the downlink conditions DCH parameters. For the conditions in Table 6.6, a signal with the quality at the level  $Q_{out}$  can be generated by a DPCCH\_Ec/Ior ratio of -25 dB, and a signal with  $Q_{in}$  by a DPCCH\_Ec/Ior ratio of -21 dB. The DL reference measurement channel (12.2) kbps specified in subclause A.3.1 and with static propagation conditions. The downlink physical channels, other than those specified in Table 6.6, are as specified in Table C.3 of Annex C.

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

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

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



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

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

1. The UE shall not shut its transmitter off before point B.
2. The UE shall shut its transmitter off before point C, which is  $T_{\text{off}} = 200$  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  $T_{\text{on}} = 200$  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 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. Possible ON/OFF scenarios are RACH ,CPCH or UL compressed mode.

#### 6.5.2.1 Minimum requirement

The transmit power levels versus time shall meet the mask specified in figure 6.2 for PRACH preambles and CPCH preambles, and the mask in figure 6.3 for all other cases. The off signal is defined as the RRC filtered mean power. The on signal is defined as the mean power.

The specification depends on each possible case.

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

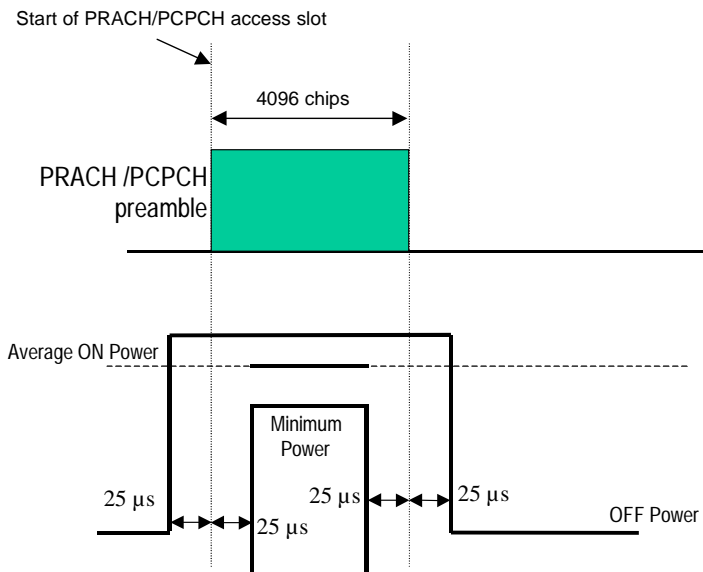


Figure 6.2: Transmit ON/OFF template for PRACH preambles and CPCH preambles

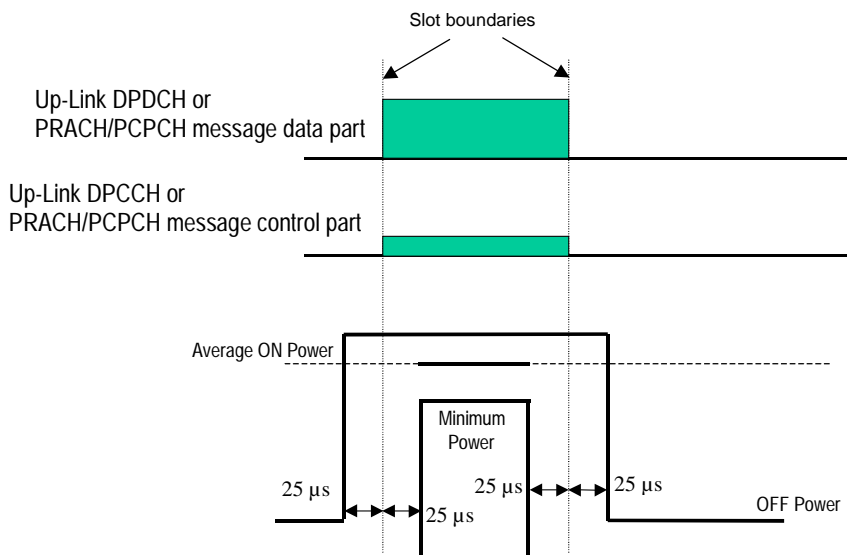


Figure 6.3: Transmit ON/OFF template for all other On/Off cases

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

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

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

### 6.5.3 Change of TFC

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

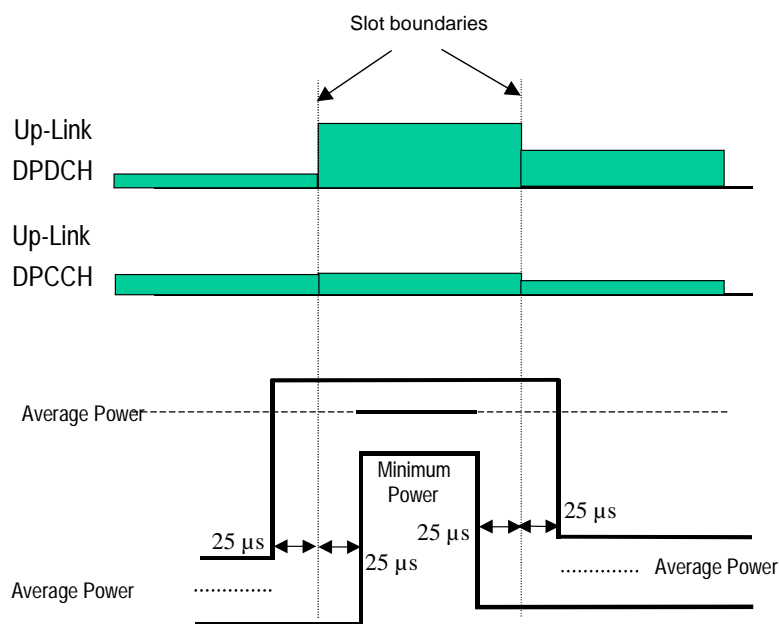
#### 6.5.3.1 Minimum requirement

A change of output power is required when the TFC, and thereby the data rate, is changed. The ratio of the amplitude between the DPDCH codes and the DPCCH code will vary. The power step due to a change in TFC shall be calculated in the UE so that the power transmitted on the DPCCH shall follow the inner loop power control. The step in total transmitted power (DPCCH + DPDCH) shall then be rounded to the closest integer dB value. A power step exactly half-way between two integer values shall be rounded to the closest integer of greater magnitude. The accuracy of the power step, given the step size, is specified in Table 6.8. The power change due to a change in TFC is defined as the relative power difference between the 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 25µs before the slot boundary to 25µs after the slot boundary.

**Table 6.8: Transmitter power step tolerance**

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

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



**Figure 6.4: Transmit template during TFC change**

## 6.5.4 Power setting in uplink compressed mode

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

### 6.5.4.1 Minimum requirement

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

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

The resulting step in total transmitted power (DPCCH + DPDCH) shall then be rounded to the closest integer dB value. A power step exactly half-way between two integer values shall be rounded to the closest integer of greatest magnitude. The accuracy of the power step, given the step size, is specified in Table 6.8 in subclause 6.5.3.1. The power step is defined as the relative power difference between the 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 25µs before the slot boundary to 25µs after the slot boundary.

In addition to any power change due to the ratio  $N_{\text{pilot,prev}} / N_{\text{pilot,curr}}$ , 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  $\Delta_{\text{RESUME}}$ , where  $\Delta_{\text{RESUME}}$  is calculated as described in clause 5.1.2.3 of TS 25.214.

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

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

Power difference (Up or down) $\Delta P$ [dB]	Transmitter power step tolerance after a transmission gap [dB]
$\Delta P \leq 2$	+/- 3
3	+/- 3
$4 \leq \Delta P \leq 10$	+/- 3.5
$11 \leq \Delta P \leq 15$	+/- 4
$16 \leq \Delta P \leq 20$	+/- 4.5
$21 \leq \Delta P$	+/- 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 25µs before the slot boundary to 25µs after the slot boundary.

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

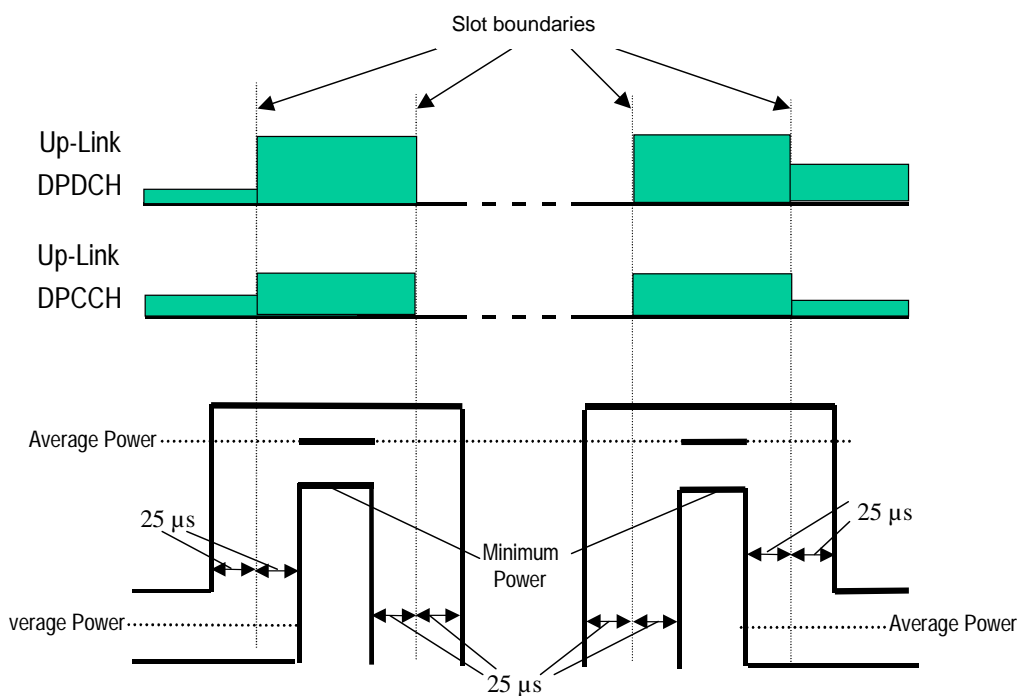


Figure 6.5: Transmit template during Compressed mode

## 6.6 Output RF spectrum emissions

### 6.6.1 Occupied bandwidth

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

### 6.6.2 Out of band emission

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

#### 6.6.2.1 Spectrum emission mask

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

##### 6.6.2.1.1 Minimum requirement

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

**Table 6.10: Spectrum Emission Mask Requirement**

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

### 6.6.2.2 Adjacent Channel Leakage power Ratio (ACLR)

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

#### 6.6.2.2.1 Minimum requirement

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

**Table 6.11: UE ACLR**

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

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

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

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

### 6.6.3 Spurious emissions

Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emission, intermodulation products and frequency conversion products, but exclude out of band emissions.

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

### 6.6.3.1 Minimum requirement

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

**Table 6.12: General spurious emissions requirements**

Frequency Bandwidth	Measurement Bandwidth	Minimum requirement
$9 \text{ kHz} \leq f < 150 \text{ kHz}$	1 kHz	-36 dBm
$150 \text{ kHz} \leq f < 30 \text{ MHz}$	10 kHz	-36 dBm
$30 \text{ MHz} \leq f < 1000 \text{ MHz}$	100 kHz	-36 dBm
$1 \text{ GHz} \leq f < 12.75 \text{ GHz}$	1 MHz	-30 dBm

**Table 6.13: Additional spurious emissions requirements**

Paired band	Frequency Bandwidth	Measurement Bandwidth	Minimum requirement
For operation in frequency bands as defined in subclause 5.2(a)	$1884.5 \text{ MHz} < f < 1919.6 \text{ MHz}$	300 kHz	-41 dBm
	$925 \text{ MHz} \leq f \leq 935 \text{ MHz}$	100 kHz	-67 dBm *
	$935 \text{ MHz} < f \leq 960 \text{ MHz}$	100 kHz	-79 dBm *
	$1805 \text{ MHz} \leq f \leq 1880 \text{ MHz}$	100 kHz	-71 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 6.12 are permitted for each UARFCN used in the measurement			

## 6.7 Transmit intermodulation

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

### 6.7.1 Minimum requirement

User Equipment(s) transmitting in close vicinity of each other can produce intermodulation products, which can fall into the UE, or Node B receive band as an unwanted interfering signal. The UE intermodulation attenuation is defined by the ratio of the 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	5MHz	10MHz
Interference CW Signal Level	-40dBc	
Intermodulation Product	-31dBc	-41dBc



## 6.8 Transmit modulation

### 6.8.1 Transmit pulse shape filter

The transmit pulse shaping filter is a root-raised cosine (RRC) with roll-off  $\alpha = 0.22$  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  $\alpha = 0.22$  and the chip duration is

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

### 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  $\alpha = 0,22$ . Both waveforms are then further modified by selecting the frequency, absolute phase, absolute amplitude and chip clock timing so as to minimise the error vector. The EVM result is defined as the square root of the ratio of the mean error vector power to the mean reference power expressed as a %. The measurement interval is one timeslot.

#### 6.8.2.1 Minimum requirement

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

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

Parameter	Unit	Level
UE Output Power	dBm	$\geq -20$
Operating conditions		Normal conditions
Power control step size	dB	1

### 6.8.3 Peak code domain error

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

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

#### 6.8.3.1 Minimum requirement

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

## 7 Receiver characteristics

### 7.1 General

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

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

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

### 7.2 Diversity characteristics

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

**Table 7.1: Diversity characteristics for UTRA/FDD**

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

### 7.3 Reference sensitivity level

The reference sensitivity level is the minimum 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**

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

### 7.4 Maximum input level

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

## 7.4.1 Minimum requirement

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

**Table 7.3: Maximum input level**

Parameter	Unit	Level
$\frac{DPCH\_Ec}{I_{or}}$	dB	-19
$\hat{I}_{or}$	dBm/3.84 MHz	-25
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)

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

## 7.5 Adjacent Channel Selectivity (ACS)

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

### 7.5.1 Minimum requirement

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

**Table 7.4: Adjacent Channel Selectivity**

Power Class	Unit	ACS
3	dB	33
4	dB	33

**Table 7.5: Test parameters for Adjacent Channel Selectivity**

Parameter	Unit	Level
DPCH_Ec	dBm/3.84 MHz	-103
$\hat{I}_{or}$	dBm/3.84 MHz	-92.7
$I_{oac}$ mean power (modulated)	dBm	-52
$F_{uw}$ (offset)	MHz	+5 or -5
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)

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

## 7.6 Blocking characteristics

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

## 7.6.1 Minimum requirement

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

**Table 7.6: In-band blocking**

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

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

**Table 7.7: Out of band blocking**

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

## 7.7 Spurious response

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

### 7.7.1 Minimum requirement

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

**Table 7.8: Spurious Response**

Parameter	Unit	Level
DPCH_Ec	dBm/3.84 MHz	-114
$\hat{I}_{or}$	dBm/3.84 MHz	-103.7
$I_{blocking}$ (CW)	dBm	-44
$F_{uw}$	MHz	Spurious response frequencies
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)

## 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 7.9.

**Table 7.9: Receive intermodulation characteristics**

Parameter	Unit	Level	
DPCH_Ec	dBm/3.84 MHz	-114	
$\hat{I}_{or}$	dBm/3.84 MHz	-103.7	
$I_{ouw1}$ (CW)	dBm	-46	
$I_{ouw2}$ mean power (modulated)	dBm	-46	
$F_{uw1}$ (offset)	MHz	10	-10
$F_{uw2}$ (offset)	MHz	20	-20
UE transmitted mean power	dBm	20 (for Power class 3) 18 (for Power class 4)	

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

## 7.9 Spurious emissions

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

### 7.9.1 Minimum requirement

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

**Table 7.10: General receiver spurious emission requirements**

Frequency Band	Measurement Bandwidth	Maximum level	Note
$30\text{MHz} \leq f < 1\text{GHz}$	100 kHz	-57 dBm	
$1\text{GHz} \leq f \leq 12.75\text{GHz}$	1 MHz	-47 dBm	

**Table 7.11: Additional receiver spurious emission requirements**

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

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## 8 Performance requirement

### 8.1 General

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

### 8.2 Demodulation in static propagation conditions

#### 8.2.1 Demodulation of Paging Channel (PCH)

##### 8.2.1.1 Minimum requirement

Minimum requirements for PCH will be defined in future releases.

#### 8.2.2 Demodulation of Forward Access Channel (FACH)

##### 8.2.2.1 Minimum requirement

Minimum requirements for FACH will be defined in future releases.

## 8.2.3 Demodulation of Dedicated Channel (DCH)

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

### 8.2.3.1 Minimum requirement

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

**Table 8.5: DCH parameters in static propagation conditions**

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

**Table 8.6: DCH requirements in static propagation conditions**

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

## 8.3 Demodulation of DCH in multi-path fading propagation conditions

### 8.3.1 Single Link Performance

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

#### 8.3.1.1 Minimum requirement

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

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

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

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

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

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

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

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

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

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

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



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

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

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

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

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

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

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

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

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

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

## 8.4 Demodulation of DCH in moving propagation conditions

### 8.4.1 Single link performance

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

#### 8.4.1.1 Minimum requirement

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

**Table 8.15: DCH parameters in moving propagation conditions**

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

**Table 8.16: DCH requirements in moving propagation conditions**

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

## 8.5 Demodulation of DCH in birth-death propagation conditions

### 8.5.1 Single link performance

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

### 8.5.1.1 Minimum requirement

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

**Table 8.17: DCH parameters in birth-death propagation conditions**

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

**Table 8.18: DCH requirements in birth-death propagation conditions**

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

## 8.6 Demodulation of DCH in downlink Transmit diversity modes

### 8.6.1 Demodulation of DCH in open-loop transmit diversity mode

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

#### 8.6.1.1 Minimum requirement

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

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

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

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

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

## 8.6.2 Demodulation of DCH in closed loop transmit diversity mode

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

### 8.6.2.1 Minimum requirement

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

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

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

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

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

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

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

### 8.6.3.1 Minimum requirements

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

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

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

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

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

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

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER
1	-6.0 dB	$10^{-2}$
2	-5.0 dB	$10^{-2}$
3	-10.5 dB	$10^{-2}$
4	-9.2 dB	$10^{-2}$

## 8.7 Demodulation in Handover conditions

### 8.7.1 Demodulation of DCH in Inter-Cell Soft Handover

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

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

#### 8.7.1.1 Minimum requirement

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

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

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

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

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

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

### 8.7.2.1 Minimum requirement

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

For Test 1, the sequence of uplink power changes between adjacent slots shall be as shown in Table 8.28 over the 4 consecutive slots more than 99% of the time. Note that this case is without an additional noise source  $I_{oc}$ .

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

**Table 8.27: Parameters for TPC command combining**

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

**Table 8.28: Test requirements for Test 1**

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

**Table 8.28A: Requirements for Test 2**

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

## 8.7.3 Combining of reliable TPC commands from radio links of different radio link sets

### 8.7.3.1 Minimum requirement

Test 1 verifies that the UE follows only the reliable TPC commands in soft handover. Test 2 verifies that the UE follows all the reliable TPC commands in soft handover.

Test parameters are specified in Table 8.28B. Before the start of the tests, the UE transmit power shall be initialised to -15 dBm. An actual UE transmit power may vary from the target level of -15 dBm due to inaccurate UE output power step.

During tests 1 and 2 the UE transmit power samples, which are defined as the mean power over one timeslot, shall stay 90% of the time within the range defined in Table 8.28C.

**Table 8.28B: Parameters for reliable TPC command combining**

Parameter	Unit	Test 1	Test 2
Phase reference	-	P-CPICH	
DPCH_Ec/Ior1	dB	Note 1	Note 1 & Note 3
DPCH_Ec/Ior2	dB	DPCH_Ec/Ior1 - 10	DPCH_Ec/Ior1 + 6
DPCH_Ec/Ior3	dB	DPCH_Ec/Ior1 - 10	-
$\hat{I}_{or1}/I_{oc}$	dB	-1	-1
$\hat{I}_{or2}/I_{oc}$	dB	-1	-1
$\hat{I}_{or3}/I_{oc}$	dB	-1	-
$I_{oc}$	dBm/3.84 MHz	-60	
Power-Control-Algorithm	-	Algorithm 1	
Cell 1 TPC commands	-	Note 2	Note 2
Cell 2 TPC commands	-	"1"	"1"
Cell 3 TPC commands	-	"1"	-
Information data Rate	kbps	12.2	
Propagation condition	-	Static	
Note 1: The DPCH_Ec/Ior1 is set at the level corresponding to 5% TPC error rate.			
Note 2: The uplink power control from cell1 shall be such that the UE transmit power would stay at -15 dBm.			
Note 3: The maximum DPCH_Ec/Ior1 level in cell1 is -9 dB.			

**Table 8.28C: Test requirements for reliable TPC command combining**

Parameter	Unit	Test 1	Test 2
UE output power	dBm	-15 ± 5 dB	-15 ± 3 dB

## 8.8 Power control in downlink

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

### 8.8.1 Power control in the downlink, constant BLER target

#### 8.8.1.1 Minimum requirements

For the parameters specified in Table 8.29 the downlink  $\frac{DPCH\_Ec}{I_{or}}$  power ratio measured values, which are

averaged over one slot, shall be below the specified value in Table 8.30 more than 90% of the time. BLER shall be as shown in Table 8.30. Power control in downlink is ON during the test.

**Table 8.29: Test parameter for downlink power control**

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

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

**Table 8.30: Requirements in downlink power control**

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

## 8.8.2 Power control in the downlink, initial convergence

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

### 8.8.2.1 Minimum requirements

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

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



**Table 8.31: Test parameters for downlink power control**

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
Target quality value on DTCH	BLER	0.01	0.01	0.1	0.1
Initial DPCH_Ec/Ior	dB	-5.9	-25.9	-3	-22.8
Information Data Rate	kbps	12.2	12.2	64	64
$\hat{I}_{or}/I_{oc}$	dB	-1			
$I_{oc}$	dBm/3.84 MHz	-60			
Propagation condition		Static			
Maximum_DL_Power	dB	7			
Minimum_DL_Power	dB	-18			
DL Power Control step size, $\Delta_{TPC}$	dB	1			
Limited Power Increase	-	"Not used"			

**Table 8.32: Requirements in downlink power control**

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

## 8.8.3 Power control in downlink, wind up effects

### 8.8.3.1 Minimum requirements

This test is run in three stages where stage 1 is for convergence of the power control loop, in stage two the maximum downlink power for the dedicated channel is limited not to be higher than the parameter specified in Table 8.33. All parameters used in the three stages are specified in Table 8.33. The downlink  $\frac{DPCH\_E_c}{I_{or}}$  power ratio measured values,

which are averaged over one slot, during stage 3 shall be lower than the value specified in Table 8.34 more than 90% of the time.

Power control of the UE is ON during the test.

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

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

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

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

## 8.9 Downlink compressed mode

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

### 8.9.1 Single link performance

The receiver single link performance of the Dedicated Traffic Channel (DCH) in compressed mode is determined by the Block Error Ratio (BLER) and transmitted DPCH\_Ec/I<sub>or</sub> power in the downlink.

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

#### 8.9.1.1 Minimum requirements

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

Downlink power control is ON during the test. Uplink TPC commands shall be error free.

**Table 8.35: Test parameter for downlink compressed mode**

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

**Table 8.36: Requirements in downlink compressed mode**

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
$\frac{DPCH\_E_c}{I_{or}}$	dB	-14.6	No requirements	-15.2	No requirements
Measured quality of compressed and recovery frames	BLER	No requirements	<0.001	No requirements	<0.001
Measured quality on DTCH	BLER	0.01 ± 30 %			

## 8.10 Blind transport format detection

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

### 8.10.1 Minimum requirement

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

**Table 8.37: Test parameters for Blind transport format detection**

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

**Table 8.38: The Requirements for DCH reception in Blind transport format detection**

Test Number	$\frac{DPCH\_E_c}{I_{or}}$	BLER	FDR
1	-17.7 dB	$10^{-2}$	$10^{-4}$
2	-17.8 dB	$10^{-2}$	$10^{-4}$
3	-18.4 dB	$10^{-2}$	$10^{-4}$
4	-13.0 dB	$10^{-2}$	$10^{-4}$
5	-13.2 dB	$10^{-2}$	$10^{-4}$
6	-13.8 dB	$10^{-2}$	$10^{-4}$

\* The value of DPCH\_Ec/Ior, Ioc, and Ior/Ioc are defined in case of DPCH is transmitted

NOTE: In this test, 9 different Transport Format Combinations (Table 8.39) are sent during the call set up procedure, so that the UE has to detect the correct transport format from these 9 candidates.

**Table 8.39: Transport format combinations informed during the call set up procedure in the test**

	1	2	3	4	5	6	7	8	9
DTCH	12.2k	10.2k	7.95k	7.4k	6.7k	5.9k	5.15k	4.75k	1.95k
DCCH	2.4k								

## Annex A (normative): Measurement channels

### A.1 General

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

The measurement channel for 12.2 kbps 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 UL reference measurement channel

#### A.2.1 UL reference measurement channel (12.2 kbps)

The parameters for the 12.2 kbps UL reference measurement channel are specified in Table A.1 and Table A.2. The channel coding for information is shown in figure A.1.

**Table A.1: UL reference measurement channel physical parameters (12.2 kbps)**

Parameter	Unit	Level
Information bit rate	kbps	12.2
DPDCH	kbps	60
DPCCH	kbps	15
DPCCH Slot Format #i	-	0
DPCCH/DPDCH power ratio	dB	-5.46
TFCI	-	On
Repetition	%	23
NOTE:	Slot Format #2 is used for closed loop tests in subclause 8.6.2. Slot Format #2 and #5 are used for site selection diversity transmission tests in subclause 8.6.3	

**Table A.2: UL reference measurement channel, transport channel parameters (12.2 kbps)**

Parameters	DTCH	DCCH
Transport Channel Number	1	2
Transport Block Size	244	100
Transport Block Set Size	244	100
Transmission Time Interval	20 ms	40 ms
Type of Error Protection	Convolution Coding	Convolution Coding
Coding Rate	1/3	1/3
Rate Matching attribute	256	256
Size of CRC	16	12

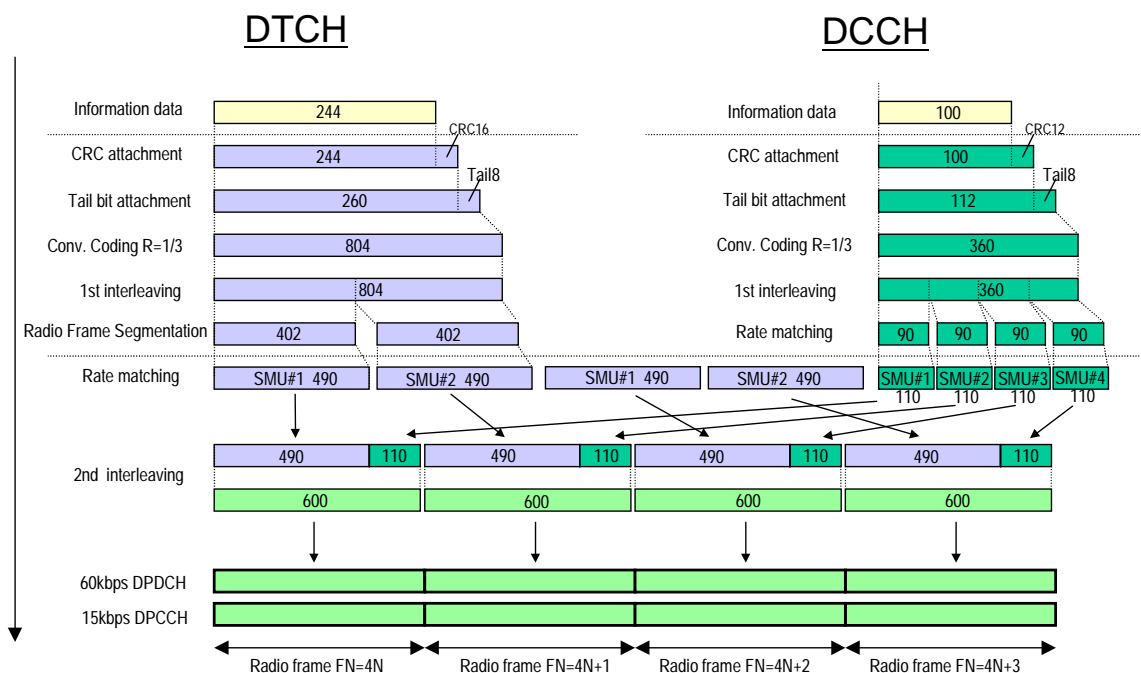


Figure A.1 (Informative): Channel coding of UL reference measurement channel (12.2 kbps)

### A.2.2 UL reference measurement channel (64 kbps)

The parameters for the 64 kbps UL reference measurement channel are specified in Table A.3 and Table A.4. The channel coding for information is shown in figure A.2. This measurement channel is not currently used in TS 25.101 but can be used for future requirements.

Table A.3: UL reference measurement channel (64 kbps)

Parameter	Unit	Level
Information bit rate	kbps	64
DPDCH	kbps	240
DPCCH	kbps	15
DPCCH Slot Format #i	-	0
DPCCH/DPDCH power ratio	dB	-9.54
TFCI	-	On
Repetition	%	18

Table A.4: UL reference measurement channel, transport channel parameters (64 kbps)

Parameter	DTCH	DCCH
Transport Channel Number	1	2
Transport Block Size	1280	100
Transport Block Set Size	1280	100
Transmission Time Interval	20 ms	40 ms
Type of Error Protection	Turbo Coding	Convolution Coding
Coding Rate	1/3	1/3
Rate Matching attribute	256	256
Size of CRC	16	12

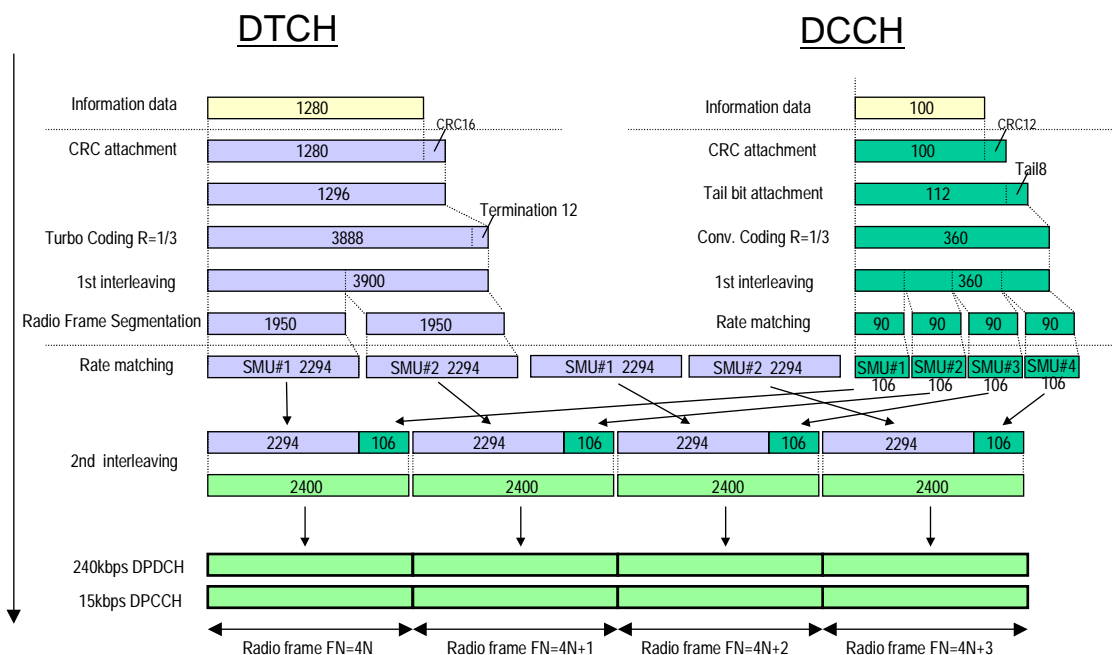


Figure A.2 (Informative): Channel coding of UL reference measurement channel (64 kbps)

### A.2.3 UL reference measurement channel (144 kbps)

The parameters for the 144 kbps UL reference measurement channel are specified in Table A.5 and Table A.6. The channel coding for information is shown in Figure A.3. This measurement channel is not currently used in the present document but can be used for future requirements.

Table A.5: UL reference measurement channel (144 kbps)

Parameter	Unit	Level
Information bit rate	kbps	144
DPDCH	kbps	480
DPCCH	kbps	15
DPCCH Slot Format #i	-	0
DPCCH/DPDCH power ratio	dB	-11.48
TFCI	-	On
Repetition	%	8

Table A.6: UL reference measurement channel, transport channel parameters (144kbps)

Parameters	DTCH	DCCH
Transport Channel Number	1	2
Transport Block Size	2880	100
Transport Block Set Size	2880	100
Transmission Time Interval	20 ms	40 ms
Type of Error Protection	Turbo Coding	Convolution Coding
Coding Rate	1/3	1/3
Rate Matching attribute	256	256
Size of CRC	16	12

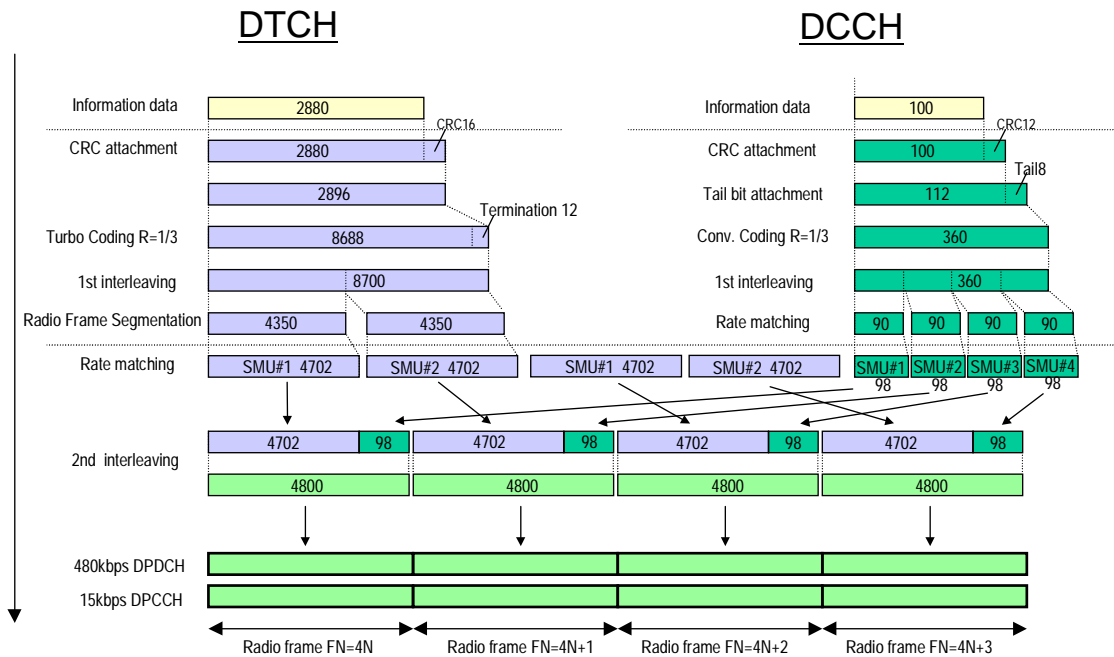


Figure A.3 (Informative): Channel coding of UL reference measurement channel (144 kbps)

### A.2.4 UL reference measurement channel (384 kbps)

The parameters for the 384 kbps UL reference measurement channel are specified in Table A.7 and Table A.8. The channel coding for information is shown in Figure A.4. This measurement channel is not currently used in TS 25.101 but can be used for future requirements.

Table A.7: UL reference measurement channel (384 kbps)

Parameter	Unit	Level
Information bit rate	kbps	384
DPDCH	kbps	960
DPCCH	kbps	15
DPCCH Slot Format #1	-	0
DPCCH/DPDCH power ratio	dB	-11.48
TFCI	-	On
Puncturing	%	18

Table A.8: UL reference measurement channel, transport channel parameters (384 kbps)

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	Convolution Coding
Coding Rate	1/3	1/3
Rate Matching attribute	256	256
Size of CRC	16	12

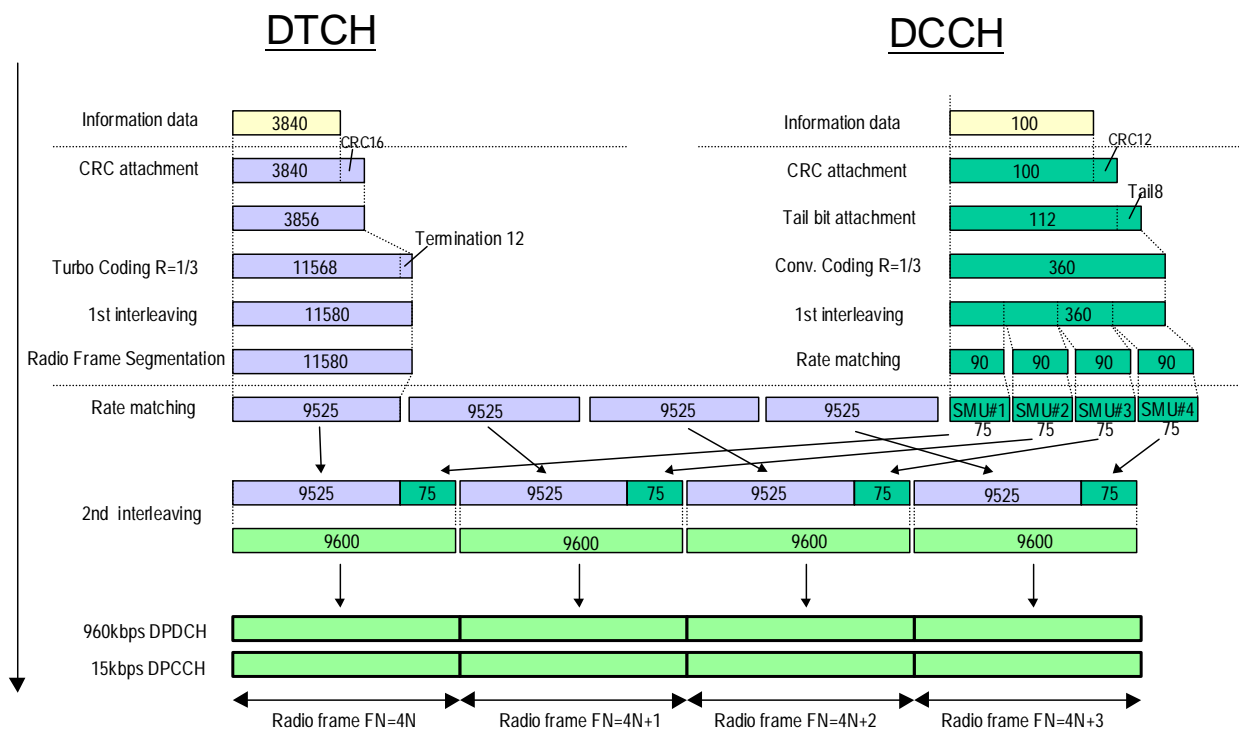


Figure A.4 (Informative): Channel coding of UL reference measurement channel (384 kbps)

### A.2.5 UL reference measurement channel (768 kbps)

The parameters for the UL measurement channel for 768 kbps are specified in Table A.9 and Table A.10.

Table A.9: UL reference measurement channel, physical parameters (768 kbps)

Parameter	Unit	Level
Information bit rate	kbps	2*384
DPDCH <sub>1</sub>	kbps	960
DPDCH <sub>2</sub>	kbps	960
DPCCH	kbps	15
DPCCH Slot Format #i	-	0
DPCCH/DPDCH power ratio	dB	-11.48
TFCI	-	On
Puncturing	%	18

Table A.10: UL reference measurement channel, transport channel parameters (768 kbps)

Parameter	DTCH	DCCH
Transport Channel Number	1	2
Transport Block Size	3840	100
Transport Block Set Size	7680	100
Transmission Time Interval	10 ms	40 ms
Type of Error Protection	Turbo Coding	Convolution Coding
Coding Rate	1/3	1/3
Rate Matching attribute	256	256
Size of CRC	16	12



## A.3 DL reference measurement channel

### A.3.1 DL reference measurement channel (12.2 kbps)

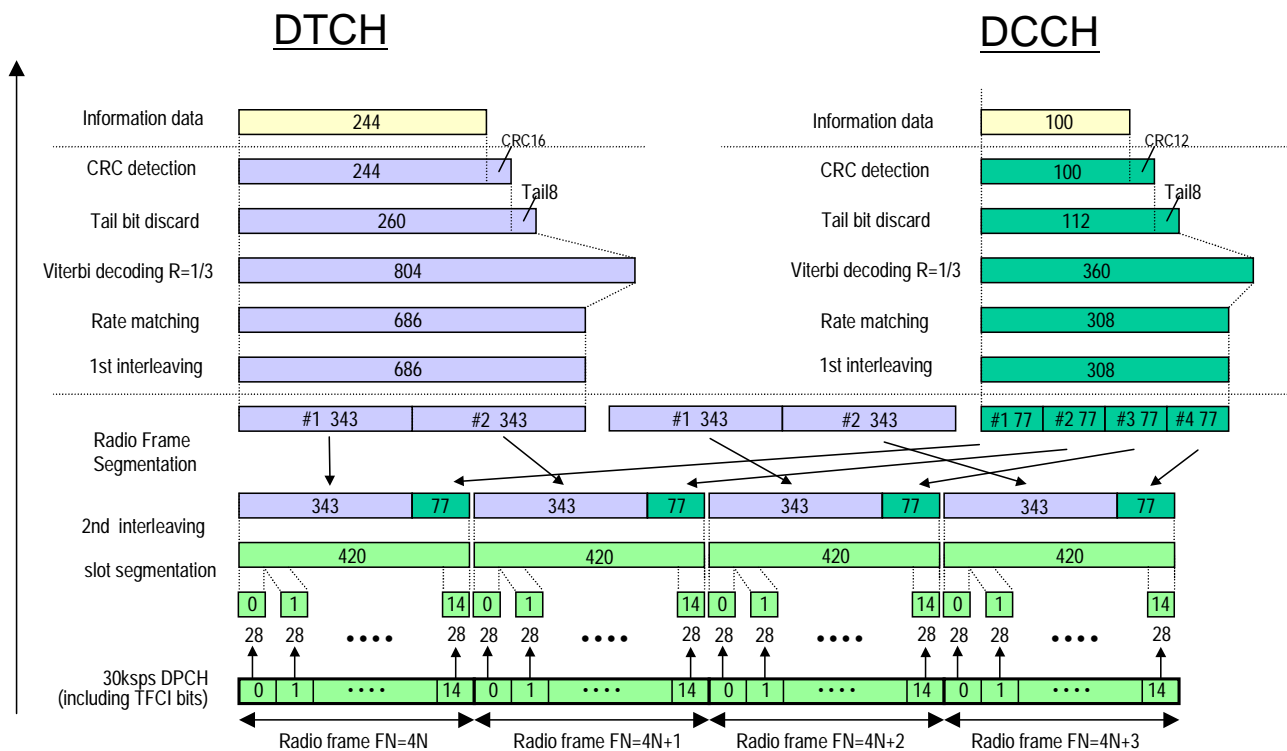
The parameters for the 12.2 Kbps DL reference measurement channel are specified in Table A.11 and Table A.12. The channel coding is shown for information in figure A.5.

**Table A.11: DL reference measurement channel physical parameters (12.2 kbps)**

Parameter	Unit	Level
Information bit rate	kbps	12.2
DPCH	ksps	30
Slot Format #1	-	11
TFCI	-	On
Power offsets PO1, PO2 and PO3	dB	0
Puncturing	%	14.7

**Table A.12: DL reference measurement channel, transport channel parameters (12.2 kbps)**

Parameter	DTCH	DCCH
Transport Channel Number	1	2
Transport Block Size	244	100
Transport Block Set Size	244	100
Transmission Time Interval	20 ms	40 ms
Type of Error Protection	Convolution Coding	Convolution 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 (Informative): Channel coding of DL reference measurement channel (12.2 kbps)**

### A.3.2 DL reference measurement channel (64 kbps)

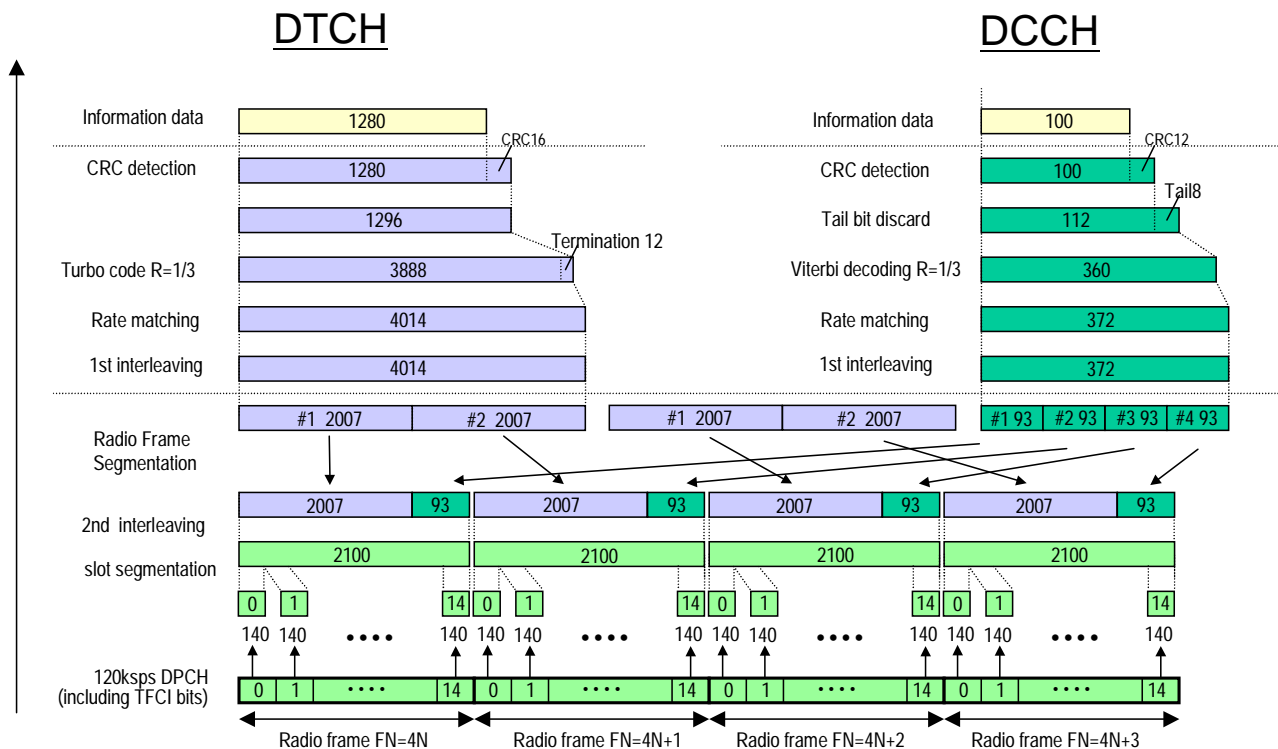
The parameters for the DL reference measurement channel for 64 kbps are specified in Table A.13 and Table A.14. The channel coding is shown for information in Figure A.6.

**Table A.13: DL reference measurement channel physical parameters (64 kbps)**

Parameter	Unit	Level
Information bit rate	kbps	64
DPCH	ksps	120
Slot Format #i	-	13
TFCI	-	On
Power offsets PO1, PO2 and PO3	dB	0
Repetition	%	2.9

**Table A.14: DL reference measurement channel, transport channel parameters (64 kbps)**

Parameter	DTCH	DCCH
Transport Channel Number	1	2
Transport Block Size	1280	100
Transport Block Set Size	1280	100
Transmission Time Interval	20 ms	40 ms
Type of Error Protection	Turbo Coding	Convolution 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 (Informative): Channel coding of DL reference measurement channel (64 kbps)**

### A.3.3 DL reference measurement channel (144 kbps)

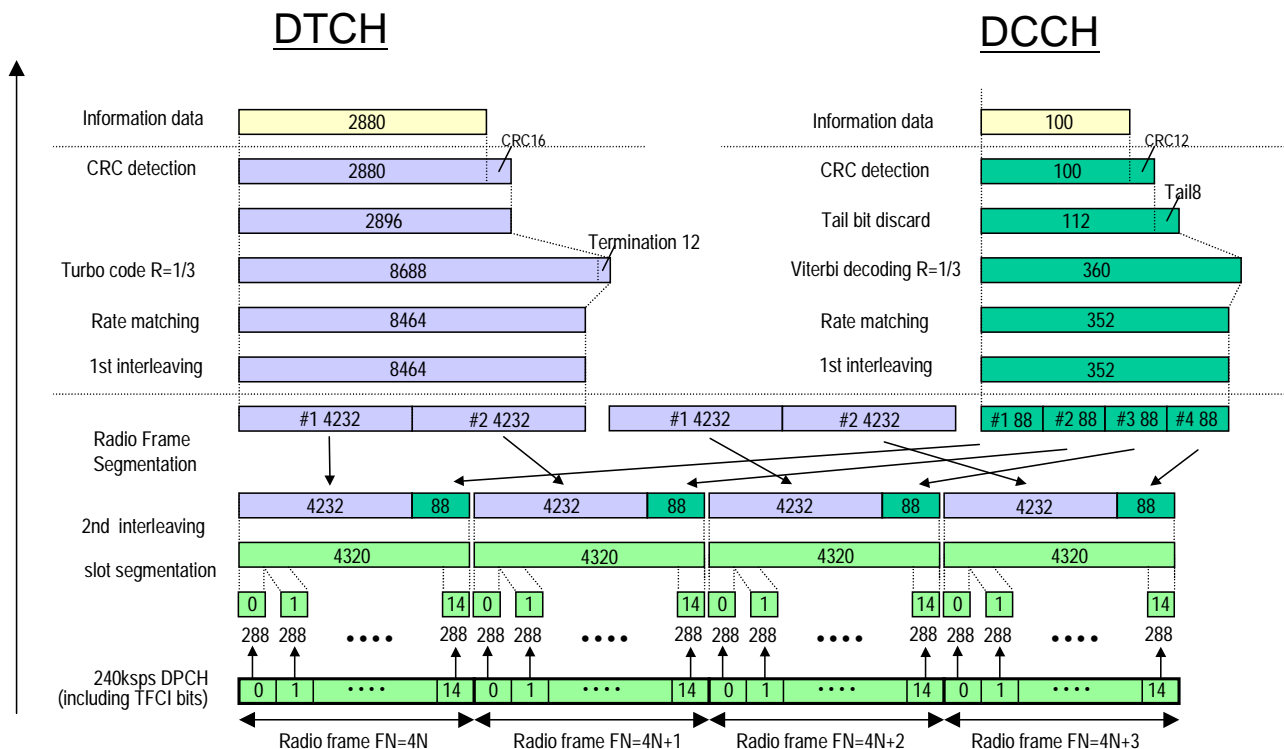
The parameters for the DL measurement channel for 144 kbps are specified in Table A.15 and Table A.16. The channel coding is shown for information in Figure A.7.

**Table A.15: DL reference measurement channel physical parameters (144 kbps)**

Parameter	Unit	Level
Information bit rate	kbps	144
DPCH	ksps	240
Slot Format #1	-	14
TFCI	-	On
Power offsets PO1, PO2 and PO3	dB	0
Puncturing	%	2.7

**Table A.16: DL reference measurement channel, transport channel parameters (144 kbps)**

Parameter	DTCH	DCCH
Transport Channel Number	1	2
Transport Block Size	2880	100
Transport Block Set Size	2880	100
Transmission Time Interval	20 ms	40 ms
Type of Error Protection	Turbo Coding	Convolution 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 (Informative): Channel coding of DL reference measurement channel (144 kbps)**

### A.3.4 DL reference measurement channel (384 kbps)

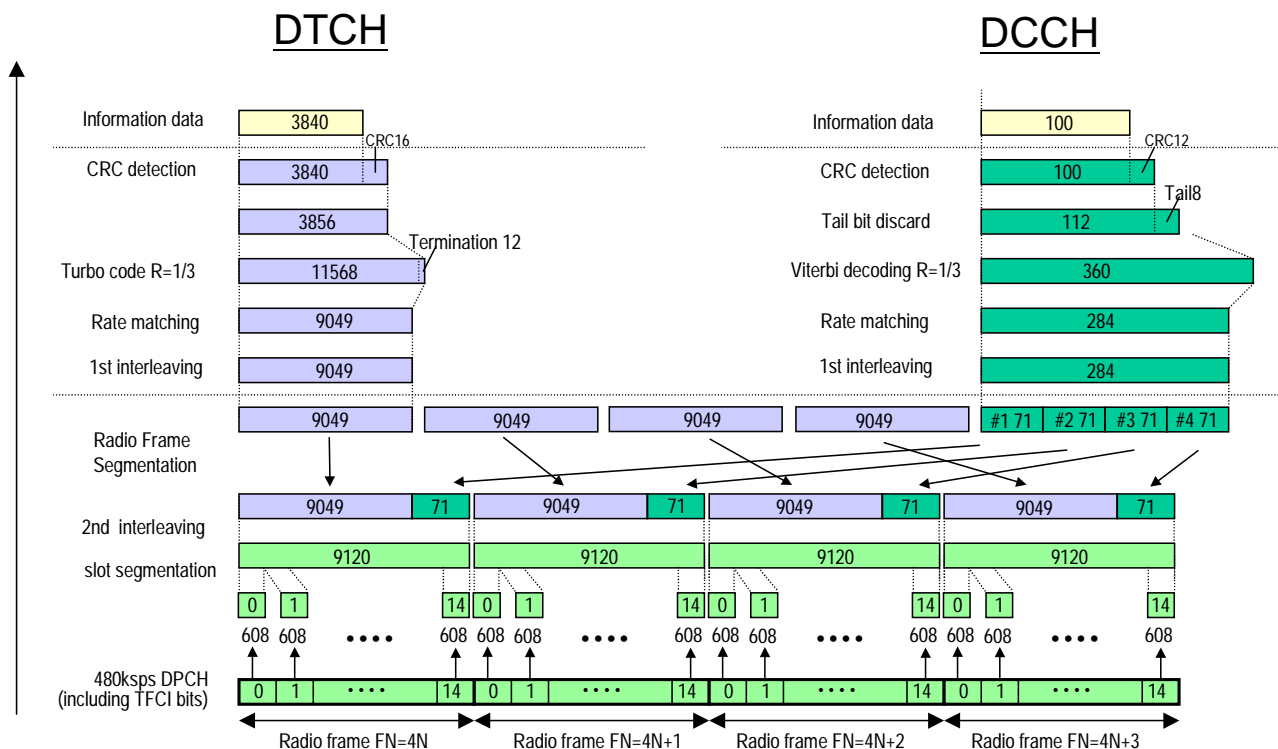
The parameters for the DL measurement channel for 384 kbps are specified in Table A.17 and Table A.18. The channel coding is shown for information in Figure A.8

**Table A.17: DL reference measurement channel, physical parameters (384 kbps)**

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

**Table A.18: DL reference measurement channel, transport channel parameters (384 kbps)**

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	Convolution 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.8 (Informative): Channel coding of DL reference measurement channel (384 kbps)**

# A.4 DL reference measurement channel for BTFD performance requirements

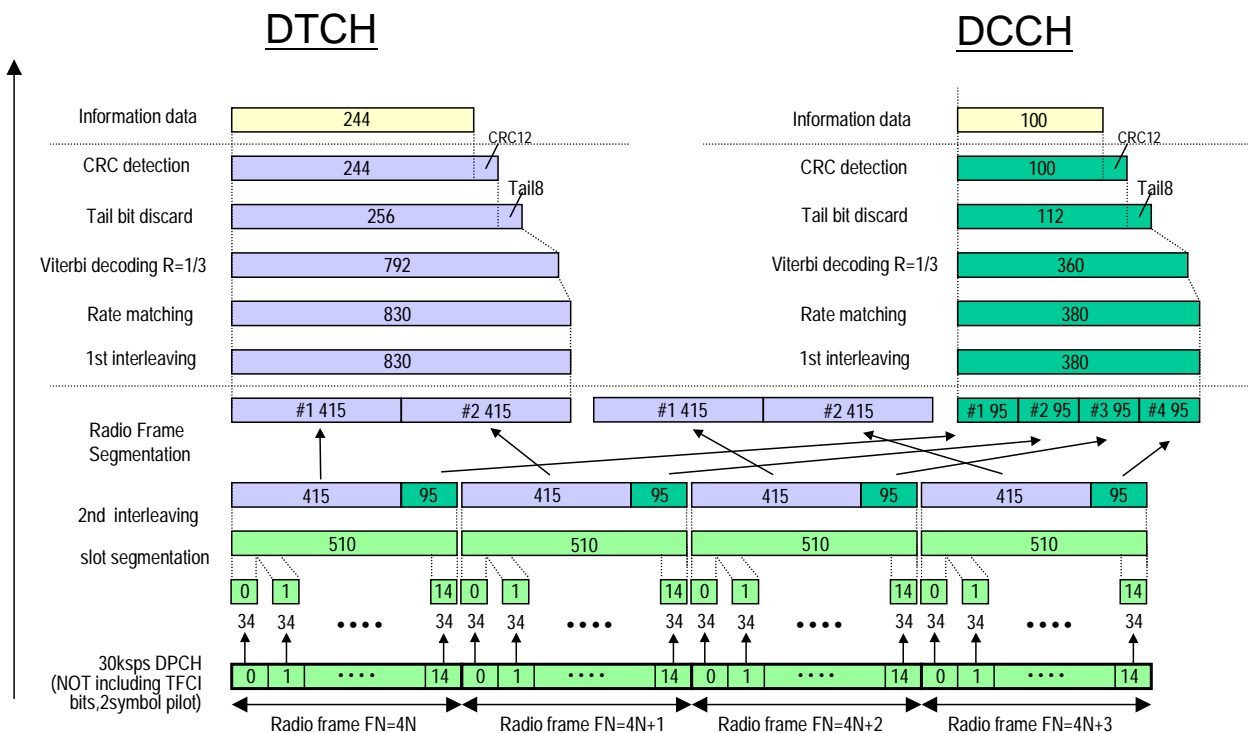
The parameters for DL reference measurement channel for BTFD are specified in Table A.19 and Table A.20. The channel coding for information is shown in figures A.9, A.10, and A.11.

**Table A.19: DL reference measurement channel physical parameters for BTFD**

Parameter	Unit	Rate 1	Rate 2	Rate 3
Information bit rate	kbps	12.2	7.95	1.95
DPCH	ksps	30		
Slot Format # i	-	8		
TFCI	-	Off		
Power offsets PO1, PO2 and PO3	dB	0		
Repetition	%	5		

**Table A.20: DL reference measurement channel, transport channel parameters for BTFD**

Parameter	DTCH			DCCH
	Rate 1	Rate 2	Rate 3	
Transport Channel Number	1			2
Transport Block Size	244	159	39	100
Transport Block Set Size	244	159	39	100
Transmission Time Interval	20 ms			40 ms
Type of Error Protection	Convolution Coding			Convolution Coding
Coding Rate	1/3			1/3
Rate Matching attribute	256			256
Size of CRC	12			12
Position of TrCH in radio frame	fixed			fixed



**Figure A.9 (Informative): Channel coding of DL reference measurement channel for BTFD (Rate 1)**

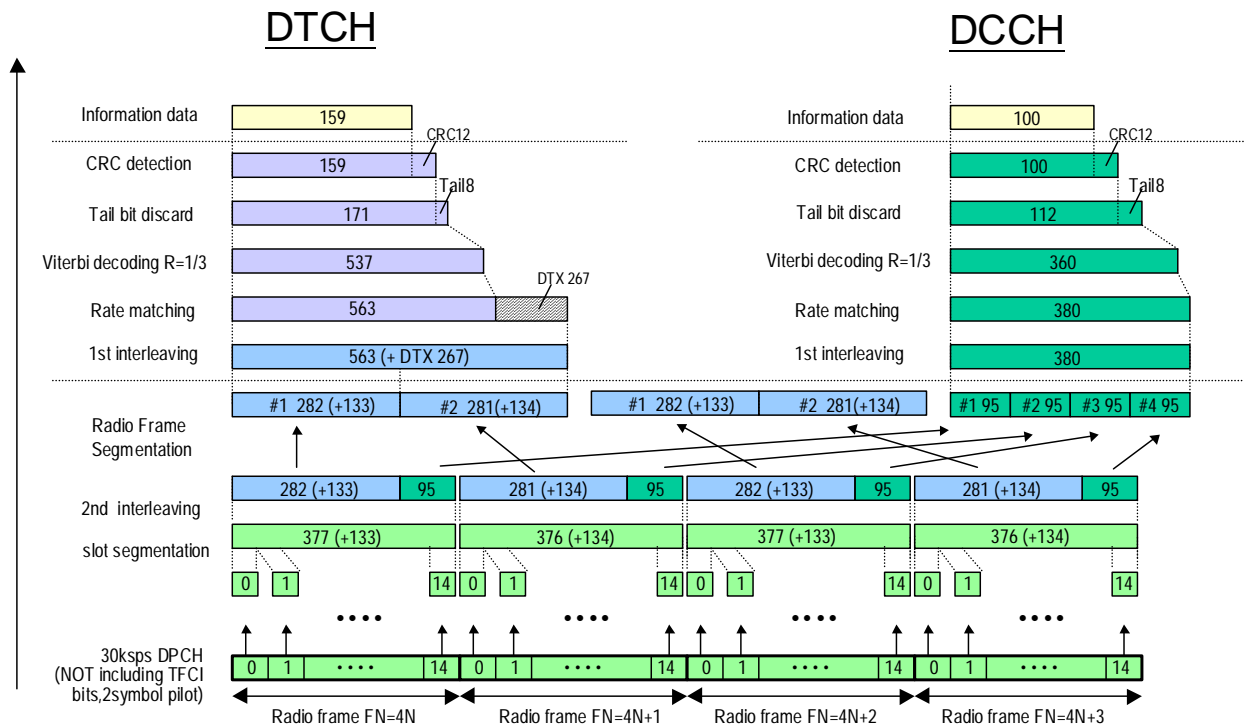


Figure A.10 (Informative): Channel coding of DL reference measurement channel for BTFD (Rate 2)

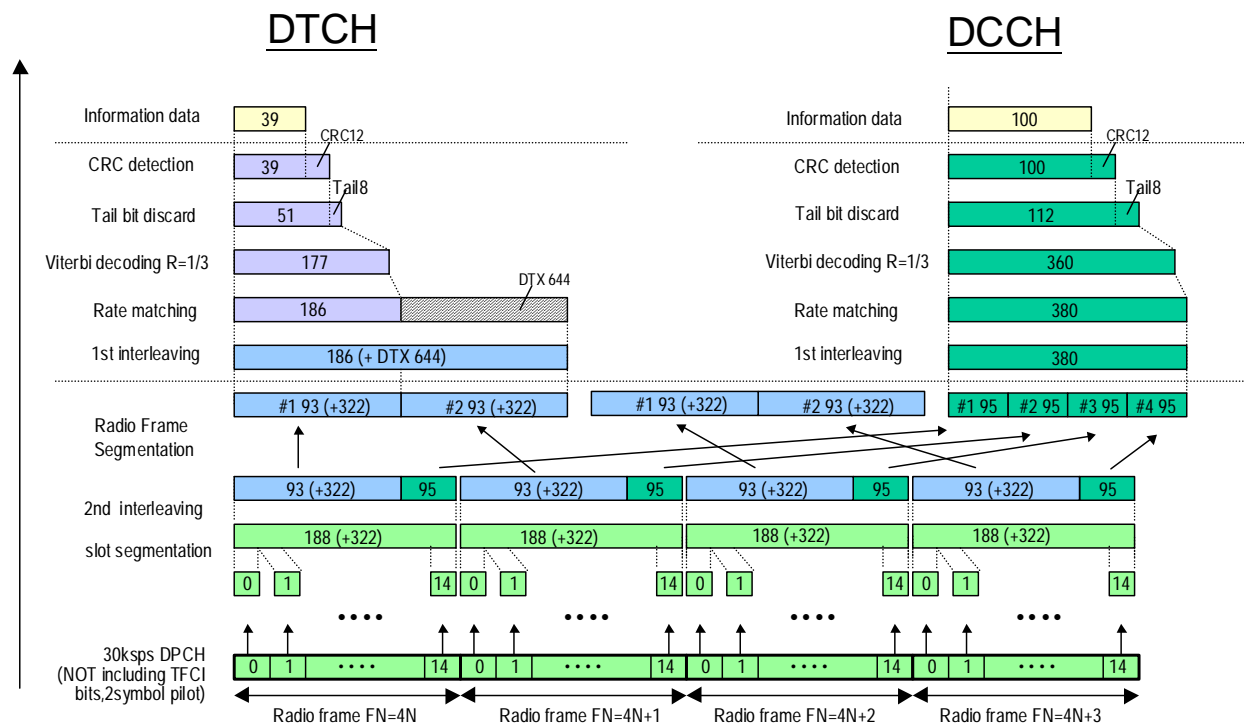


Figure A.11 (Informative): Channel coding of DL reference measurement channel for BTFD (Rate 3)

## A.5 DL reference compressed mode parameters

Parameters described in Table A.21 are used in some test specified in TS 25.101 while parameters described in Table A.22 are used in some tests specified in TS 25.133.

Set 1 parameters in Table A.21 are applicable when compressed mode by spreading factor reduction is used in downlink. Set 2 parameters in Table A.21 are applicable when compressed mode by puncturing is used in downlink.

**Table A.21: Compressed mode reference pattern 1 parameters**

Parameter	Set 1	Set 2	Note
TGSN (Transmission Gap Starting Slot Number)	11	11	
TGL1 (Transmission Gap Length 1)	7	7	
TGL2 (Transmission Gap Length 2)	-	-	Only one gap in use.
TGD (Transmission Gap Distance)	0	0	Only one gap in use.
TGPL1 (Transmission Gap Pattern Length)	4	4	
TGPL2 (Transmission Gap Pattern Length)	-	-	Only one pattern in use.
TGPRC (Transmission Gap Pattern Repetition Count)	NA	NA	Defined by higher layers
TGCFN (Transmission Gap Connection Frame Number):	NA	NA	Defined by higher layers
UL/DL compressed mode selection	DL & UL	DL & UL	2 configurations possible DL & UL / DL
UL compressed mode method	SF/2	SF/2	
DL compressed mode method	SF/2	Puncturing	
Downlink frame type and Slot format	11B	11A	
Scrambling code change	No	No	
RPP (Recovery period power control mode)	0	0	
ITP (Initial transmission power control mode)	0	0	

**Table A.22: Compressed mode reference pattern 2 parameters**

Parameter	Set 1	Set 2	Set 3	Note
TGSN (Transmission Gap Starting Slot Number)	4	4	10	
TGL1 (Transmission Gap Length 1)	7	7	10	
TGL2 (Transmission Gap Length 2)	-	-	-	Only one gap in use.
TGD (Transmission Gap Distance)	0	0	0	
TGPL1 (Transmission Gap Pattern Length)	3	12	11	
TGPL2 (Transmission Gap Pattern Length)	-	-	-	Only one pattern in use.
TGPRC (Transmission Gap Pattern Repetition Count)	NA	NA	NA	Defined by higher layers
TGCFN (Transmission Gap Connection Frame Number):	NA	NA	NA	Defined by higher layers
UL/DL compressed mode selection	DL & UL	DL & UL	DL & UL	2 configurations possible. DL & UL / DL
UL compressed mode method	SF/2	SF/2	SF/2	
DL compressed mode method	SF/2	SF/2	Puncturing	
Downlink frame type and Slot format	11B	11B	11A	
Scrambling code change	No	No	No	
RPP (Recovery period power control mode)	0	0	0	
ITP (Initial transmission power control mode)	0	0	0	

# Annex B (normative): Propagation conditions

## B.1 (void)

## B.2 Propagation Conditions

### B.2.1 Static propagation condition

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

### B.2.2 Multi-path fading propagation conditions

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

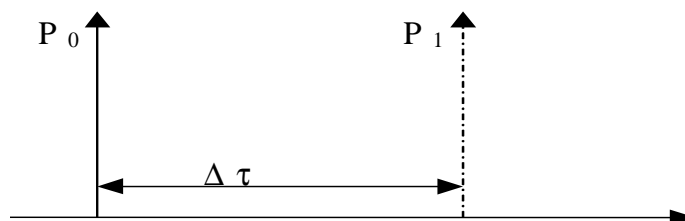
**Table B.1: Propagation Conditions for Multi path Fading Environments**

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

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

### B.2.3 Moving propagation conditions

The dynamic propagation conditions for the test of the baseband performance are non fading channel models with two taps. The moving propagation condition has two tap, one static, Path0, and one moving, Path1. The time difference between the two paths is according Equation (B.1). The taps have equal strengths and equal phases.



**Figure B.1: The moving propagation conditions**

$$\Delta \tau = B + \frac{A}{2} (1 + \sin(\Delta \omega \cdot t)) \tag{B.1}$$



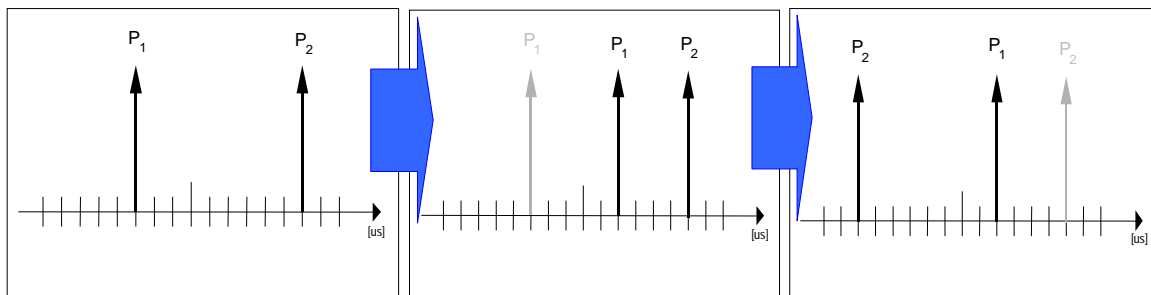
The parameters in the equation are shown in the following table.

**Table B.2**

<b>A</b>	5 $\mu$ s
<b>B</b>	1 $\mu$ s
<b><math>\Delta\omega</math></b>	$40 \cdot 10^{-3} \text{ s}^{-1}$

## B.2.4 Birth-Death propagation conditions

The dynamic propagation conditions for the test of the base band performance is a non fading propagation channel with two taps. The moving propagation condition has two taps, Path1 and Path2 which alternate between 'birth' and 'death'. The positions the paths appear are randomly selected with an equal probability rate and is shown in Figure B.2.



**Figure B.2: Birth death propagation sequence**

- 1) Two paths, Path1 and Path2 are randomly selected from the group  $[-5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5]$   $\mu$ s. The paths have equal magnitudes and equal phases.
- 2) After 191 ms, Path1 vanishes and reappears immediately at a new location randomly selected from the group  $[-5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5]$   $\mu$ s but excludes the point Path 2. The magnitudes and the phases of the tap coefficients of Path 1 and Path 2 shall remain unaltered.
- 3) After an additional 191 ms, Path2 vanishes and reappears immediately at a new location randomly selected from the group  $[-5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5]$   $\mu$ s but excludes the point Path 1. The magnitudes and the phases of the tap coefficients of Path 1 and Path 2 shall remain unaltered.

The sequence in 2) and 3) is repeated.

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## 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.

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### 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 subclause 7.4 (Maximum input level).

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

Physical Channel	Power ratio
P-CPICH	$P\text{-CPICH\_Ec} / DPCH\_Ec = 7 \text{ dB}$
P-CCPCH	$P\text{-CCPCH\_Ec} / DPCH\_Ec = 5 \text{ dB}$
SCH	$SCH\_Ec / DPCH\_Ec = 5 \text{ dB}$
PICH	$PICH\_Ec / DPCH\_Ec = 2 \text{ dB}$
DPCH	Test dependent power

## C.3.2 Measurement of Performance requirements

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

**Table C.3: Downlink Physical Channels transmitted during a connection<sup>1</sup>**

Physical Channel	Power ratio	NOTE
P-CPICH	$P\text{-CPICH\_Ec/Ior} = -10 \text{ dB}$	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	$S\text{-CPICH\_Ec/Ior} = -10 \text{ dB}$	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	$P\text{-CCPCH\_Ec/Ior} = -12 \text{ dB}$	
SCH	$SCH\_Ec/Ior = -12 \text{ dB}$	This power shall be divided equally between Primary and Secondary Synchronous channels
PICH	$PICH\_Ec/Ior = -15 \text{ dB}$	
DPCH	Test dependent power	When S-CPICH is the phase reference in a test condition, the phase of DPCH shall be 180 degrees offset from the phase of P-CPICH.
OCNS	Necessary power so that total transmit power spectral density of Node B (Ior) adds to one <sup>1</sup>	OCNS interference consists of 16 dedicated data channels as specified in table C.6.

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

### C.3.3 Connection with open-loop transmit diversity mode

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

**Table C.4: Downlink Physical Channels transmitted during a connection<sup>1</sup>**

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

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

### C.3.4 Connection with closed loop transmit diversity mode

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

**Table C.5: Downlink Physical Channels transmitted during a connection<sup>1</sup>**

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

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

**Table C.6: DPCH Channelization Code and relative level settings for OCNS signal**

Channelization Code at SF=128	Relative Level setting (dB) (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: 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.7 describes the downlink Channels that are transmitted as part of the W-CDMA modulated interferer.

**Table C.7: Spreading Code, Timing offsets and relative level settings for W-CDMA Modulated Interferer signal channels**

Channel Type	Spreading Factor	Channelization Code	Timing offset ( $\times 256T_{\text{chip}}$ )	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.6			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.6.

## Annex D (normative): Environmental conditions

### D.1 General

This normative annex specifies the environmental requirements of the UE. Within these limits the requirements of the present documents shall be fulfilled.

### D.2 Environmental requirements

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

#### 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 and 68-2-2)

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 in TS 25.101 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 & 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 in TS 25.101 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**

<b>Frequency</b>	<b>ASD (Acceleration Spectral Density) random vibration</b>
5 Hz to 20 Hz	0,96 m <sup>2</sup> /s <sup>3</sup>
20 Hz to 500 Hz	0,96 m <sup>2</sup> /s <sup>3</sup> 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 in TS 25.101 for extreme operation

## Annex E (informative): UE capabilities (FDD)

This annex provides the UE capabilities related to TS 25.101.

### NOTES:

This annex shall be aligned with TR25.926, UE Radio Access Capabilities regarding FDD RF parameters. These RF UE Radio Access capabilities represent options in the UE, that require signalling to the network.

In addition there are options in the UE that do not require any signalling. They are designated as UE baseline capabilities, according to TR 21.904, Terminal Capability Requirements.

Table E.1 provides the list of UE radio access capability parameters and possible values for TS 25.101.

**Table E.1: RF UE Radio Access Capabilities**

	<b>UE radio access capability parameter</b>	<b>Value range</b>
FDD RF parameters	UE power class (TS 25.101, subclause 6.2.1)	3, 4
	Tx/Rx frequency separation for frequency band a) (TS 25.101, subclause 5.3)	190 MHz, 174.8-205.2 MHz, 134.8-245.2 MHz
	Not applicable if UE is not operating in frequency band a)	

Table E.2 provides the UE baseline implementation capabilities for TS 25.101.

**Table E.2: UE RF Baseline Implementation Capabilities**

<b>UE implementation capability</b>	<b>Value range</b>
Radio frequency bands (25.101 subclause 5.2)	a), b), a+b)



## Annex F (informative): Change History

TSG	Doc	CR	R	Subject	Cat	Curr	New
06	RP-99772	0001	2	Correction of UE Measurement Channels Rev.2	F	3.0.0	3.1.0
06	RP-99772	0003		Modifications for Receiver Characteristics	F	3.0.0	3.1.0
06	RP-99772	0004		Corrections to Tx Diversity testing assumptions	F	3.0.0	3.1.0
06	RP-99771	0005		UE DL performance requirements	D	3.0.0	3.1.0
06	RP-99772	0006	1	Corrections to Annex C Down link Physical Channels	F	3.0.0	3.1.0
06	RP-99772	0007		Proposal for ACLR/ACS specifications for class 3	F	3.0.0	3.1.0
06	RP-99773	0008		Addition of propagation condition to inner and outer loop PC tests in downlink	B	3.0.0	3.1.0
06	RP-99772	0009		Clarification of Uplink inner loop power control requirements	C	3.0.0	3.1.0
06	RP-99773	0010		Modifications to demodulation test parameters and requirements in inter-cell soft handover	B	3.0.0	3.1.0
06	RP-99772	0011		Power setting of DPCH	C	3.0.0	3.1.0
06	RP-99771	0012		Editorial changes to 25.101v3.0.0	D	3.0.0	3.1.0
06	RP-99826	0013		Update of UE RF capabilities	F	3.0.0	3.1.0
06	RP-99772	0014		Update of ITU Region 2 Specific Specifications and proposed universal channel numbering	C	3.0.0	3.1.0
06	RP-99772	0015		Performance requirements for demodulation of DCH in Site Selection Diversity Transmission mode for Subclause 8.6.3 of 25.101v3.0.0	F	3.0.0	3.1.0
06	RP-99830	0016	1	Change of propagation conditions	F	3.0.0	3.1.0
06	RP-99772	0017		CR for minimum requirements for UE power class 1 and 2 in 25.101	F	3.0.0	3.1.0
06	RP-99772	0018		Downlink Inner loop power control	C	3.0.0	3.1.0
06	RP-99773	0019		Performance requirements in downlink compressed mode	B	3.0.0	3.1.0
07	RP-000015	0020		Clarifications to measurement channels	F	3.1.0	3.2.0
07	RP-000015	0021		Power measurement definitions for wanted signal (in-channel signal)	D	3.1.0	3.2.0
07	RP-000015	0022		Change of propagation conditions for Case 2	F	3.1.0	3.2.0
07	RP-000015	0023		Editorial corrections	D	3.1.0	3.2.0
07	RP-000015	0024		Birth-Death tap delays	F	3.1.0	3.2.0
07	RP-000015	0025		Out-of-synchronization handling of the UE	C	3.1.0	3.2.0
07	RP-000015	0026		UE Modulation performance requirements	F	3.1.0	3.2.0
07	RP-000015	0027		Measurement channel for UE PCDE test	F	3.1.0	3.2.0
07	RP-000015	0028		CR for performance requirement of BTFD	F	3.1.0	3.2.0
07	RP-000015	0029		CPCH	B	3.1.0	3.2.0
07	RP-000015	0030		Clarification of ACLR	D	3.1.0	3.2.0
07	RP-000015	0031		Correction for reference measurement channel in TS 25.101	F	3.1.0	3.2.0
07	RP-000015	0032		Modifications to requirements for power control steps in uplink	F	3.1.0	3.2.0
07	RP-000015	0033		Performance requirement	F	3.1.0	3.2.0
07	RP-000015	0034		Power Control in downlink, constant BLER target	F	3.1.0	3.2.0
07	RP-000015	0035		UE Minimum TX power change	F	3.1.0	3.2.0
07	RP-000015	0036		Performance requirements for demodulation of DCH in Site Selection Diversity Transmission mode	F	3.1.0	3.2.0
07	RP-000015	0037		Reference compressed mode patterns	F	3.1.0	3.2.0
07	RP-000015	0038		384kbps measurement channel is replaced with 10ms TTI	F	3.1.0	3.2.0
07	RP-000015	0039		Modification to the handling of measurement equipment uncertainty	F	3.1.0	3.2.0
				Correction to figure A6		3.2.0	3.2.1
				Correction to version number in title/header (April 2000)		3.2.1	3.2.2
08	RP-000204	0040	1	A test for UE's SIR target setting in a call set up	F	3.2.2	3.3.0
08	RP-000204	0041	1	Reception of TPC commands in a soft handover	F	3.2.2	3.3.0
08	RP-000204	0042		DCH requirement for 64 kbps measurement channel in birth-death propagation condition	F	3.2.2	3.3.0
08	RP-000204	0043		Power control in the downlink, constant BLER target	F	3.2.2	3.3.0
08	RP-000204	0044		Value update for 384 kbps measurement channel requirements	F	3.2.2	3.3.0

08	RP-000204	0045	1	CR for demodulation of DCH	F	3.2.2	3.3.0
08	RP-000204	0046		Correction for measurement channel in TS 25.101	F	3.2.2	3.3.0
08	RP-000204	0047		Editorial CR on section 8.6.3 of TS25.101 v3.2.0	D	3.2.2	3.3.0
08	RP-000204	0048		Correction of frequency numbering scheme	F	3.2.2	3.3.0
08	RP-000204	0049		Correction - Propagation conditions	F	3.2.2	3.3.0
08	RP-000204	0050		Compressed mode tests	F	3.2.2	3.3.0
08	RP-000204	0051		Correction of Out-of-sync criteria	F	3.2.2	3.3.0
08	RP-000204	0052		Editorial corrections for TS25.101.	F	3.2.2	3.3.0
08	RP-000204	0053		Clarification of the specification on Peak Code Domain Error (PCDE)	F	3.2.2	3.3.0
08	RP-000204	0054		Transients for uplink power steps	F	3.2.2	3.3.0
08	RP-000204	0055		Power setting for uplink compressed mode and RACH preambles	F	3.2.2	3.3.0
08	RP-000204	0056		UE interfering signal definition	F	3.2.2	3.3.0
08	RP-000204	0057		Downlink Power Control, wind up effects	F	3.2.2	3.3.0
08	RP-000204	0058		Use of P-CPICH and S-CPICH for performance requirements	F	3.2.2	3.3.0
08	RP-000204	0059		Performance of Closed Loop Diversity mode 2 and Mode 1	F	3.2.2	3.3.0
08	RP-000204	0060		Removal of brackets from Inter-Cell SHO test case	F	3.2.2	3.3.0
08	RP-000204	0061		Editorial corrections on moving propagation conditions	F	3.2.2	3.3.0
08				Correct page numbering problem and other minor editorials		3.3.0	3.3.1
09	RP-000394	0071		Downlink power control, wind up effects	F	3.3.1	3.4.0
09	RP-000394	0072		Inclusion of OCNS definition for performance tests	F	3.3.1	3.4.0
09	RP-000394	0063		Corrections to DL compressed mode tests in TS 25.101	F	3.3.1	3.4.0
09	RP-000394	0064		Combining of TPC commands in soft handover	F	3.3.1	3.4.0
09	RP-000394	0065		Clarifications for power steps in RACH/CPCH message transmission	F	3.3.1	3.4.0
09	RP-000394	0066		Editorial corrections for TS 25.101	F	3.3.1	3.4.0
09	RP-000394	0067		Corrections to power control	F	3.3.1	3.4.0
09	RP-000394	0068		Corrections for compressed mode patterns	F	3.3.1	3.4.0
09	RP-000394	0069		Editorial modification for BTFD measurement channels	F	3.3.1	3.4.0
09	RP-000394	0075		Editorial modification to Annex A.5 of TS 25.101	F	3.3.1	3.4.0
09	RP-000394	0076		Tap magnitudes and phases for Birth-Death propagation conditions	F	3.3.1	3.4.0
09	RP-000394	0073		Removal of confidence levels	F	3.3.1	3.4.0
09	RP-000394	0074		Corrections to all tests with power control ON in TS 25.101	F	3.3.1	3.4.0
09	RP-000394	0070		Definition of period for frequency error	F	3.3.1	3.4.0
09	RP-000394	0077		UE emission mask measurement filter definition correction for TS 25.101	F	3.3.1	3.4.0
09	RP-000394	0078		Handling of measurement uncertainties in UE radio conformance testing (FDD)	F	3.3.1	3.4.0
09				Re-inclusion of reference [4] which had been accidentally deleted.		3.4.0	3.4.1
10	R4-000885	0079		Proposed CR to TS 25.101 on subclause 7.8 RX Intermodulation	F	3.4.1	3.5.0
10	R4-000901	0080		Corrections to DL compressed mode tests in TS 25.101	F	3.4.1	3.5.0
10	R4-000902	0081		Correction to DL 384 kbps and BTFD measurement channels	F	3.4.1	3.5.0
10	R4-000917	0082		Compressed mode, proposal for specification	F	3.4.1	3.5.0
10	R4-000973	0082		RX spurious emissions	F	3.4.1	3.5.0
10	R4-000982	0084		Correction for 25.101 concerning the channel number calculation	F	3.4.1	3.5.0
10	R4-000990	0085		Definition of multi-code OCNS signal for receiver and performance tests	F	3.4.1	3.5.0
11	RP-010085	0086		CR to 25.101 for Test Tolerances	F	3.5.0	3.6.0
11	RP-010085	0087		Proposed CR to TS 25.101 on subclause 3.2 Abbreviations	F	3.5.0	3.6.0
11	RP-010085	0088		Correction of version number of the ITU-R Recommendation SM.329	F	3.5.0	3.6.0
11	RP-010085	0089		REL 99 Corrections	F	3.5.0	3.6.0
11	RP-010085	0090		Tx power during measurement on Rx characteristics	F	3.5.0	3.6.0
11	RP-010085	0091		Removal of square brackets and TBDs from TS 25.101	F	3.5.0	3.6.0
11	RP-010085	0092		Correction of Definition of multi-code OCNS signal	F	3.5.0	3.6.0
11	RP-010085	0093		Performance requirement for 250km/h	F	3.5.0	3.6.0
11	RP-010085	0094		TS25.101 Rel 99 Clarification of UARFCN (channel number)	F	3.5.0	3.6.0

12	RP-010347	0099		Correction for SSDD test parameters	F	3.6.0	3.7.0
12	RP-010347	0103		UL DPCCH slot format for performance tests	F	3.6.0	3.7.0
12	RP-010347	0107		Terminology for power definition	F	3.6.0	3.7.0
12	RP-010347	0109		out of synchronization handling	F	3.6.0	3.7.0
12	RP-010347	0111		Clarification of limits for inner loop power control	F	3.6.0	3.7.0
12	RP-010347	0113		UE EVM definition	F	3.6.0	3.7.0
12	RP-010347	0115		CR on the Modification to OCNS code channels to allow for 384 kbps allocation	F	3.6.0	3.7.0
13	RP-010614	0118		Compressed mode, correction of reference pattern 1, Set1	F	3.7.0	3.8.0
13	RP-010614	0120		DL Power Control Step Size in performance requirements	F	3.7.0	3.8.0
13	RP-010614	0122		Correction for test numbers in fading propagation tests	F	3.7.0	3.8.0
13	RP-010614	0124		Correction of frequency range for receiver spurious emission requirements	F	3.7.0	3.8.0
13	RP-010614	0126		UE Maximum Output Power	F	3.7.0	3.8.0
13	RP-010614	0128		Clarification of definition of Df	F	3.7.0	3.8.0
13	RP-010614	0130		CR to TS25.101 for clarification of modulated interferer	F	3.7.0	3.8.0
14	RP-010777	0133		Clarification on 25.101 sec 8.8.2 averaging method.	F	3.8.0	3.9.0
14	RP-010777	0136		Correction of power control in downlink, initial convergence	F	3.8.0	3.9.0
14	RP-010777	0139		UMTS 1900 corrections to TS 25.101v380	F	3.8.0	3.9.0
15	RP-020014	0154	1	Power setting for uplink compressed mode	F	3.9.0	3.10.0
15	RP-020014	0157	1	Correction of power terms and definitions	F	3.9.0	3.10.0
15	RP-020014	0158	1	Correction of power spectral density	F	3.9.0	3.10.0
16	RP-020279	0165		Addition of a set of Compressed mode reference pattern 2 parameters for FDD-TDD test cases in 25.133	F	3.10.0	3.11.0
16	RP-020279	0167	1	Control and monitoring function of UE requirement	F	3.10.0	3.11.0
16	RP-020279	0178		Compressed mode performance requirements	F	3.10.0	3.11.0
18	RP-020778	0194		Correction for TPC combining test case 1	F	3.11.0	3.12.0
19	RP-030025	0217		The Closed Loop Timing Adjustment Mode parameter for the transmit diversity performance requirements	F	3.12.0	3.13.0
19	RP-030025	0224		Downlink power control during compressed mode tests	F	3.12.0	3.13.0
20	RP-030207	0235	1	Problems with "Out of sync" in Initial convergence test	F	3.13.0	3.14.0
20	RP-030207	0240	1	Correction of SSDD performance requirements	F	3.13.0	3.14.0
20	RP-030415	0261	1	Problems with "Out of sync" in Initial Convergence test	F	3.14.0	3.15.0
20	RP-030590	0300	1	Correction of W-CDMA modulated interferer definition	F	3.15.0	3.16.0
20	RP-040044	0335	1	Minimum requirements for TPC combining in soft Handover	F	3.16.0	3.17.0
20	RP-050489	0432	1	Modification of the protection band for PHS	F	3.17.0	3.18.0
34	RP-060809	0539		RF requirements in later releases	F	3.18.0	3.19.0

## History

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