

# ETSI TS 125 102 V3.13.0 (2006-10)

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*Technical Specification*

**Universal Mobile Telecommunications System (UMTS);  
User Equipment (UE) radio transmission and reception (TDD)  
(3GPP TS 25.102 version 3.13.0 Release 1999)**

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Reference

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## Foreword

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# Foreword

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# 1 Scope

This document establishes the minimum RF characteristics of the TDD 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.
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- [1] ETSI ETR 273-1-2: " 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"
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## 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\_Ec, Ec, and P-CCPCH\_Ec) and others defined in terms of PSD (Io, Ioc, Ior and  $\hat{I}$ or). There also exist quantities that are a ratio of energy per chip to PSD (DPCH\_Ec/Ior, Ec/Ior 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 a transmit timeslot excluding the guard period.

**Mean Power:** When applied to a 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 a transmit timeslot excluding the guard period unless otherwise stated.

**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.

**Nominal Maximum Output Power:** This is the nominal power defined by the UE power class. The period of measurement shall be a transmit timeslot excluding the guard period.

**Received Signal Code Power (RSCP):** Given only signal power is received, the RRC filtered mean power of the received signal after despreading and combining.



**Interference Signal Code Power (ISCP):** Given only interference power is received, the RRC filtered mean power of the received signal after despreading to the code and combining. Equivalent to the RSCP value but now only interference is received instead of signal.

NOTE 1: The RRC filtered mean power of a perfectly modulated 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 Symbols

(void)

## 3.3 Abbreviations

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

ACIR	Adjacent Channel Interference Ratio
ACLR	Adjacent Channel Leakage power Ratio
ACS	Adjacent Channel Selectivity
BS	Base Station
CW	Continuous wave (unmodulated signal)
DL	Down link (forward link)
DPCH	Dedicated physical channel
DPCH_Ec	Average energy per PN chip for DPCH
$\frac{\text{DPCH\_Ec}}{I_{or}}$	The ratio of the average energy per PN chip of the DPCH to the total transmit power spectral density of the downlink at the BS antenna connector
$\frac{\sum \text{DPCH\_Ec}}{I_{or}}$	The ratio of the sum of DPCH_Ec for one service in case of multicode to the total transmit power spectral density of the downlink at the BS antenna connector
EIRP	Effective Isotropic Radiated Power
FDD	Frequency Division Duplexing
FER	Frame Error Ratio
Fuw	Frequency of unwanted signal. This is specified in bracket in terms of an absolute frequency(s) or frequency offset from the assigned channel frequency.
Ioc	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 other cells) as measured at the UE antenna connector.
Ior	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 BS 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
PPM	Parts Per Million
RSSI	Received Signal Strength Indicator
SCTD	Space Code Transmit Diversity
SIR	Signal to Interference ratio
TDD	Time Division Duplexing
TPC	Transmit Power Control
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 34.122 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 modifications - 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 4, 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.

---

## 5 Frequency bands and channel arrangement

### 5.1 General

The information presented in this section 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/TDD is designed to operate in the following bands;

- a) 1900 – 1920 MHz: Uplink and downlink transmission  
2010 – 2025 MHz: Uplink and downlink transmission
- b)\* 1850 – 1910 MHz: Uplink and downlink transmission  
1930 – 1990 MHz: Uplink and downlink transmission
- c)\* 1910 – 1930 MHz: Uplink and downlink transmission

\* Used in ITU Region 2

Additional allocations in ITU region 2 are FFS.

Deployment in existing or other frequency bands is not precluded.

## 5.3 TX–RX frequency separation

No TX-RX frequency separation is required as Time Division Duplex (TDD) is employed. Each TDMA frame consists of 15 timeslots where each timeslot can be allocated to either transmit or receive.

## 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 carrier frequency must be a multiple of 200 kHz.

### 5.4.3 Channel number

The carrier frequency is designated by the UTRA absolute radio frequency channel number (UARFCN). The value of the UARFCN in the IMT2000 band is defined as follows:

$$N_i = 5 * F \quad 0.0 \text{ MHz} \leq F \leq 3276.6 \text{ MHz}$$

where F is the carrier frequency in MHz

### 5.4.4 UARFCN

The following UARFCN range shall be supported for each band.

**Table 5.1: UTRA Absolute Radio Frequency Channel Number**

Frequency Band	Frequency Range	UARFCN Uplink and Downlink transmission
For operation in frequency band as defined in subclause 5.2 (a)	1900-1920 MHz 2010-2025 MHz	9512 to 9588 10062 to 10113
For operation in frequency band as defined in subclause 5.2 (b)	1850-1910 MHz 1930-1990 MHz	9262 to 9538 9662 to 9938
For operation in frequency band as defined in subclause 5.2 (c)	1910-1930 MHz	9562 to 9638

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## 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 this specification. It is recognised that different requirements and test methods are likely to be required for the different types of UE.

All the parameters in section 6 are defined using the UL reference measurement channel (12.2 kbps) specified in Annex A.2.1.

## 6.2 Transmit power

### 6.2.1 User Equipment 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 a transmit timeslot excluding the guard period.

**Table 6.1: UE power classes**

Power Class	Nominal Maximum output power	Tolerance
1	+30 dBm	+1 dB / -3 dB
2	+24 dBm	+1 dB / -3 dB
3	+21 dBm	+2 dB / -2 dB
4	+10 dBm	+4 dB / -4 dB

NOTE 1: For multi-code operation the nominal maximum output power will be reduced by the difference of peak to average ratio between single and multi-code transmission.

NOTE 2: The tolerance allowed for the nominal maximum power applies even at the multi-code transmission mode

NOTE 3: For UE using directive antennas for transmission, a class dependent limit will be placed on the maximum EIRP (Equivalent Isotropic Radiated Power).

## 6.3 UE frequency stability

The UE modulated carrier frequency shall be accurate to within  $\pm 0.1$  PPM observed over a period of one timeslot compared to carrier frequency received from the BS. These signals will have an apparent error due to BS frequency error and Doppler shift. In the later case, signals from the BS 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 stability**

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 Uplink power control

Uplink power control is the ability of the UE transmitter to sets its output power in accordance with measured downlink path loss, values determined by higher layer signalling and path loss weighting parameter  $\alpha$  as defined in TS 25.331. The output power is defined as the RRC filtered mean power of the transmit timeslot.

#### 6.4.1.1 Initial Accuracy

The UE power control initial accuracy error shall be less than  $\pm 9$  dB under normal conditions and  $\pm 12$  dB under extreme conditions.

### 6.4.1.2 Differential accuracy, controlled input

The power control differential accuracy, controlled input, is defined as the error in the UE transmitter power step as a result of a step in  $SIR_{TARGET}$  when the path loss weighting parameter  $\alpha=0$ . The step in  $SIR_{TARGET}$  shall be rounded to the closest integer dB value. The power control error resulting from a change in  $I_{BTS}$  or DPCH Constant Value shall not exceed the values defined in Table 6.3.

**Table 6.3: Transmitter power step tolerance as a result of control power step**

$\Delta SIR_{TARGET}$ [dB]	Transmitter power step tolerance [dB]
$\Delta SIR_{TARGET} \leq 1$	$\pm 0.5$
$1 < \Delta SIR_{TARGET} \leq 2$	$\pm 1$
$2 < \Delta SIR_{TARGET} \leq 3$	$\pm 1.5$
$3 < \Delta SIR_{TARGET} \leq 10$	$\pm 2$
$10 < \Delta SIR_{TARGET} \leq 20$	$\pm 4$
$20 < \Delta SIR_{TARGET} \leq 30$	$\pm 6$
$30 < \Delta SIR_{TARGET}$	$\pm 9^{(1)}$
NOTE 1: Value is given for normal conditions. For extreme conditions value is $\pm 12$	

### 6.4.1.3 Differential accuracy, measured input

The power control differential accuracy, measured input, is defined as the error in UE transmitter power step change as a result of a step change in path loss  $L_{PCCPCH}$ .

The error shall not exceed the sum of the following two errors:

- The power control error, resulting from a change in the path loss ( $\Delta L_{PCCPCH}$ ), the same tolerances as defined in table 6.3 shall apply,
- and the errors in the PCCPCH RSCP measurement as defined in TS 25.123.

## 6.4.2 Minimum output power

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

### 6.4.2.1 Minimum requirement

The minimum output power is defined as the mean power in one time slot excluding the guard period. The minimum output power shall be less than  $-44$  dBm.

## 6.4.3 Out-of-synchronisation handling of output power

The UE shall monitor the DPCH quality in order to detect a loss of the signal on Layer 1, as specified in TS 25.224. The thresholds  $Q_{out}$ ,  $Q_{in}$ ,  $Q_{sbout}$  and  $Q_{sbin}$  specify at what DPCH quality levels the UE shall shut its power off and when it shall turn its power on, respectively. The thresholds are not defined explicitly, but are defined by the conditions under which the UE shall shut its transmitter off and turn it on, as stated in this clause.

### 6.4.3.1 Requirement for continuous transmission

#### 6.4.3.1.1 Minimum requirement

When the UE estimates the DPCH 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 DPCH quality exceeds an acceptable level  $Q_{in}$ . When the UE estimates the DPCH 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".

6.4.3.1.2 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 in case of continuous transmission.

The conditions for the continuous test case are as follows:

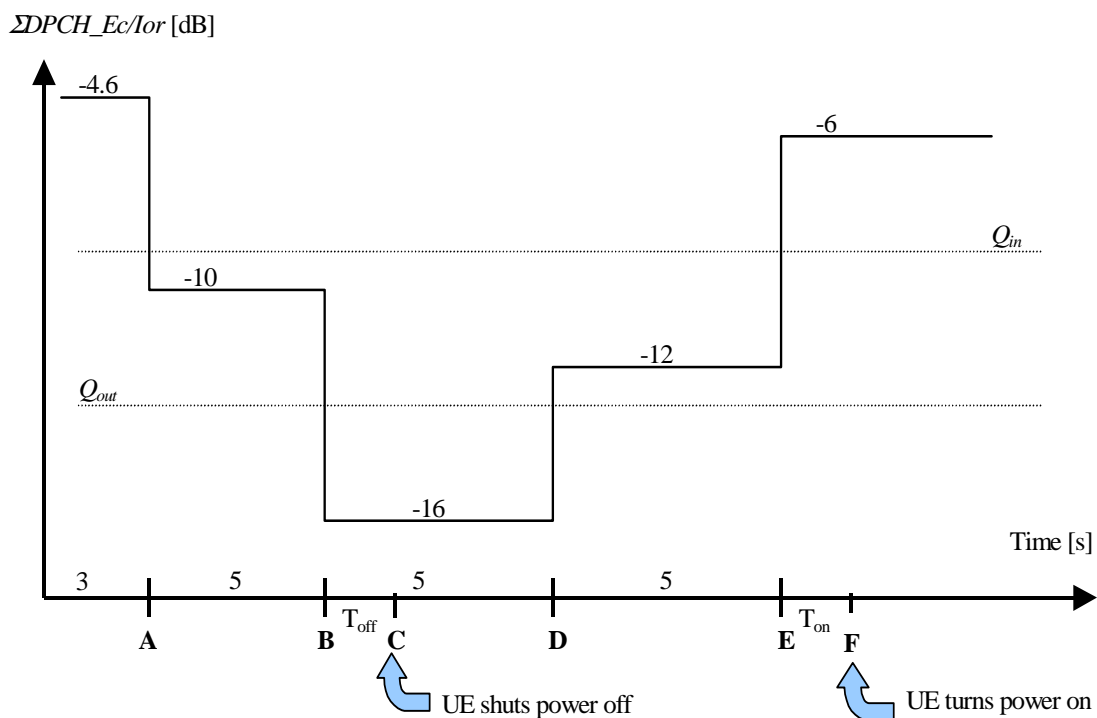
The handover triggering level shall be set very high to ensure that the beacon channel power never exceeds the value of 10dB above it. Therefore the averaging time for signal quality will always be 160 milliseconds.

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 6.4, a signal with the quality at the level  $Q_{out}$  can be generated by a  $\Sigma DPCH\_Ec/I_{or}$  ratio of -13 dB, and a signal with  $Q_{in}$  by a  $\Sigma DPCH\_Ec/I_{or}$  ratio of -9 dB. In this test, the DL reference measurement channel (12.2) kbps specified in subclauseA.2.2, where the CRC bits are replaced by data bits, and with static propagation conditions is used.

**Table 6.4: DCH parameters for the Out-of-synch handling test case– continuous transmission**

Parameter	Unit	Value
$\hat{I}_{or}/I_{oc}$	dB	-1
$I_{oc}$	dBm/3.84 MHz	-60
$\frac{\Sigma DPCH\_E_c}{I_{or}}$	dB	See figure 6.1
Information Data Rate	kbps	13
TFCI	-	On

Figure 6.1 shows an example scenario where the  $\Sigma DPCH\_Ec/I_{or}$  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.



**Figure 6.1: Test case for out-of-synch handling in the UE.– continuous transmission**

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.

### 6.4.3.2 Requirement for discontinuous transmission

#### 6.4.3.2.1 Minimum requirement

During DTX, there are periods when the UE will receive no data from the UTRAN. As specified in TS 25.224, in order to keep synchronization, Special Bursts shall be transmitted by the UTRAN during these periods of no data.

During these periods, the conditions for when the UE shall shut its transmitter on or off are defined by the power level of the received Special Bursts.

When the UE does not detect at least one special burst with a quality above a threshold  $Q_{\text{sout}}$  over the last 160 ms period, the UE shall shut its transmitter off within 40 ms. The UE shall not turn its transmitter on again until the special burst quality exceeds an acceptable level  $Q_{\text{sbin}}$ . When the UE estimates the special burst quality to be better than a threshold  $Q_{\text{sbin}}$  over the last 160 ms, 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".

#### 6.4.3.2.2 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 in case of discontinuous transmission.

The conditions for the discontinuous test case are as follows:

The handover triggering level shall be set very high to ensure that the beacon channel power never exceeds the value of 10dB above it. Therefore the averaging time for signal quality will always be 160 milliseconds.

The UTRAN transmits Special Bursts as specified in TS 25.224. The Special Burst Scheduling Parameter, SBSP = 4, which means that UTRAN sends a Special Burst at every fourth frame with no data. Therefore, the UTRAN sends a Special Burst in the first frame without data transmission, followed by 3 frames with no transmission; followed by a Special Burst, etc.

The DCH parameters are shown in Table 6.4A.

The quality levels at the thresholds  $Q_{\text{sout}}$  and  $Q_{\text{sbin}}$  correspond to different signal levels depending on the downlink conditions DCH parameters. For the conditions in Table 6.4A, a signal with the quality at the level  $Q_{\text{sout}}$  can be generated by a DPCH\_Ec/I<sub>or</sub> ratio during received special bursts of -16 dB, and a signal with  $Q_{\text{sbin}}$  by a DPCH\_Ec/I<sub>or</sub> ratio during received special bursts of -12 dB.

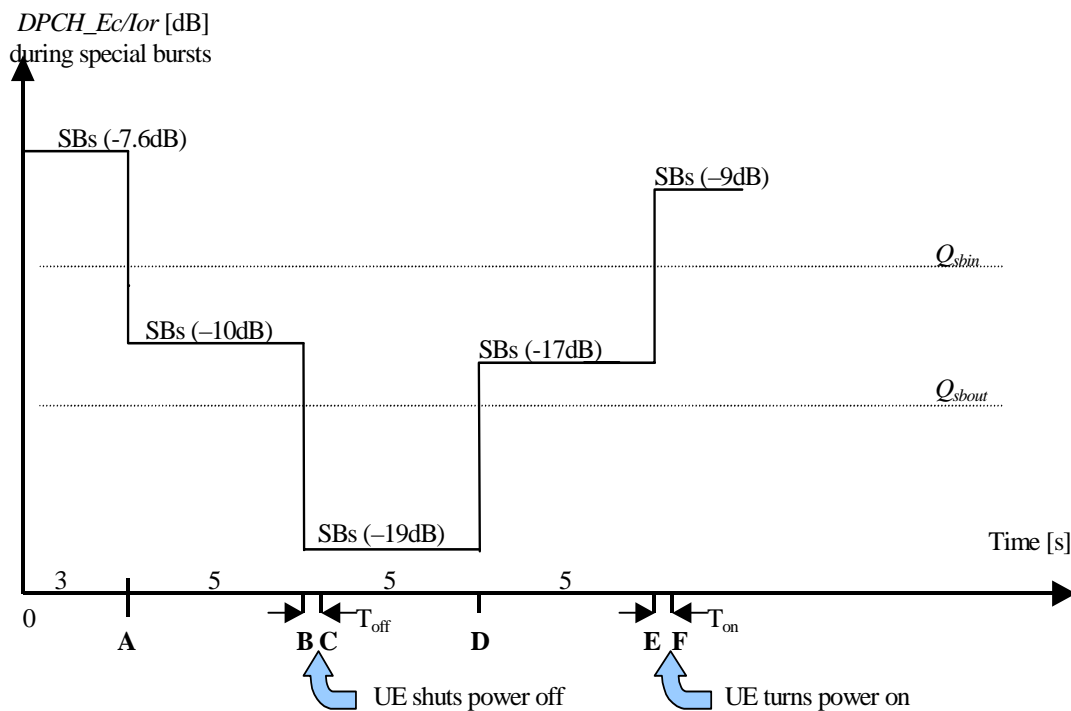
**Table 6.4A: DCH parameters for the Out-of-synch handling test case– discontinuous transmission**

Parameter	Unit	Value
$\hat{I}_{or}/I_{oc}$	dB	1.1
$I_{oc}$	dBm/3.84 MHz	-60
$\frac{DPCH\_Ec}{I_{or}}$	dB	See figure 6.1A
Bits/burst (including TFCI bits)	bits	244
TFCI	-	On

Figure 6.1A shows an example scenario where the special burst quality varies from a level above  $Q_{sbin}$ , down to a level below  $Q_{sbout}$  where the UE shall shut its power off and then back up to a level above  $Q_{sbin}$  where the UE shall turn the power back on.

While the normal data is transmitted using two channelization codes, the Special Burst is transmitted with only one channelization code. Therefore the total energy per chip during Special Bursts is 3 dB lower than for continuous data transmission. The Special Bursts are represented by "SBs" in Figure 6.1A.

During the period of 3 frames with no data, the UE will receive a very low power, which is not shown in the figure. The power shown in the figure is the power of the Special Burst.



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

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

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

## 6.5 Transmit ON/OFF power

### 6.5.1 Transmit OFF power

Transmit OFF power is defined as the RRC filtered mean power measured over one chip when the transmitter is off. The transmit OFF power state is when the UE does not transmit.

#### 6.5.1.1 Minimum Requirement

The requirement for transmit OFF power shall be less than  $-65$  dBm.



## 6.5.2 Transmit ON/OFF Time mask

The time mask transmit ON/OFF defines the ramping time allowed for the UE between transmit OFF power and transmit ON power.

### 6.5.2.1 Minimum Requirement

The transmit power level versus time shall meet the mask specified in figure 6.2, where the transmission period refers to the burst without guard period for a single transmission slot, and to the period from the beginning of the burst in the first transmission slot to the end of the burst without guard period in the last transmission timeslot for consecutive transmission slots.

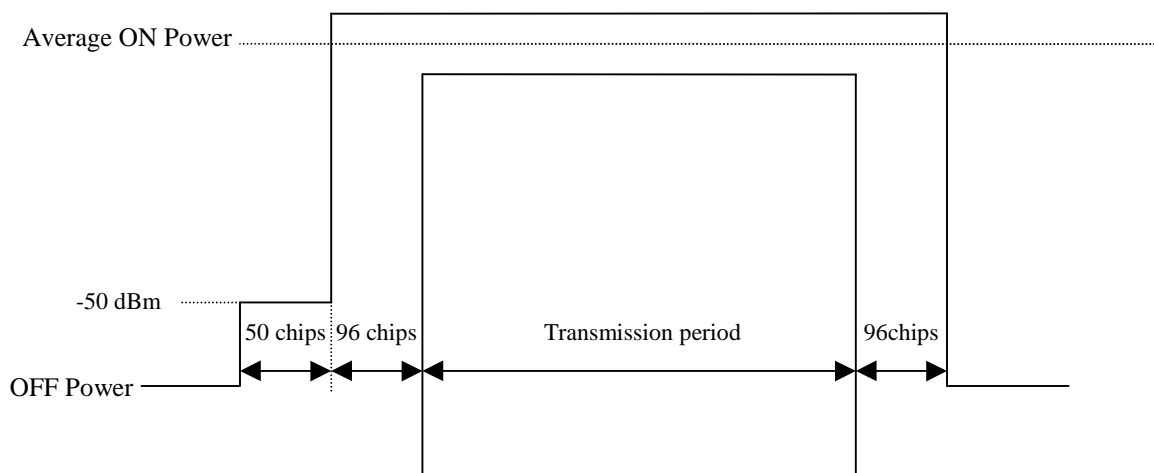


Figure 6.2: Transmit ON/OFF template

## 6.6 Output RF spectrum emissions

### 6.6.1 Occupied bandwidth

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

### 6.6.2 Out of band emission

Out of band emissions are unwanted emissions immediately outside the nominal channel resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. This out of band emission limit is specified in terms of a spectrum emission mask and adjacent channel leakage power ratio (ACLR).

#### 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 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 6.5.

**Table 6.5: Spectrum Emission Mask Requirement**

$\Delta f^*$ in MHz	Minimum requirement	Measurement bandwidth
2.5 - 3.5	$\left\{ -35 - 15 \cdot \left( \frac{\Delta f}{MHz} - 2.5 \right) \right\} dBc$	30 kHz **
3.5 - 7.5	$\left\{ -35 - 1 \cdot \left( \frac{\Delta f}{MHz} - 3.5 \right) \right\} dBc$	1 MHz ***
7.5 - 8.5	$\left\{ -39 - 10 \cdot \left( \frac{\Delta f}{MHz} - 7.5 \right) \right\} dBc$	1 MHz ***
8.5 - 12.5	-49 dBc	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 $-50dBm/3.84$ MHz or the minimum requirement presented in this table which ever is the 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 RRC filtered mean power is greater than  $-50dBm$  then the ACLR shall be higher than the value specified in Table 6.6.

**Table 6.6: UE ACLR**

Power Class	adjacent channel	ACLR limit
2, 3	UE channel $\pm 5$ MHz	33 dB
2, 3	UE channel $\pm 10$ MHz	43 dB

NOTES:

- 1) The requirement shall still be met in the presence of switching transients.
- 2) The ACLR requirements reflect what can be achieved with present state of the art technology.
- 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.

### 6.6.3.1 Minimum Requirement

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

**Table 6.7A: 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 6.7B: Additional Spurious emissions requirements**

Frequency Bandwidth	Measurement Bandwidth	Minimum requirement
$925 \text{ MHz} \leq f \leq 935 \text{ MHz}$	100 KHz	-67 dBm (note 1)
$935 \text{ MHz} < f \leq 960 \text{ MHz}$	100 KHz	-79 dBm (note 1)
$1805 \text{ MHz} \leq f \leq 1880 \text{ MHz}$	100 KHz	-71 dBm (note 1)
$1884.5 \text{ MHz} \leq f \leq 1919.6 \text{ MHz}$	300kHz	-41 dBm (note 2)
NOTE 1: 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 6.7A are permitted for each UARFCN used in the measurement.		
NOTE 2: Applicable for transmission in 2010-2025 MHz as defined in subclause 5.2 (a).		

## 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 BS 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 carrier spacing 5 MHz is prescribed in Table 6.8.

**Table 6.8: Transmit Intermodulation**

Interference Signal Frequency Offset	5MHz	10MHz
Interference Signal Level	-40 dBc	
Minimum Requirement	-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:

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

### 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. See Annex B of TS 34.122 for further details.

#### 6.8.2.1 Minimum Requirement

The Error Vector Magnitude shall not exceed 17.5 % for the parameters specified in Table 6.9.

**Table 6.9: Test 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

This specification is applicable for multi-code transmission only.

The code domain error is computed by projecting the error vector power onto the code domain at a specific spreading factor. The error power for each code is defined as the ratio to the mean power of the reference waveform expressed in dB. And the Peak Code Domain Error is defined as the maximum value for Code Domain Error. The measurement interval is one timeslot.

#### 6.8.3.1 Minimum Requirement

The peak code domain error shall not exceed -21 dB at spreading factor 16 for the parameters specified in Table 6.9.

The requirements are defined using the UL reference measurement channel specified in subclause A.2.7.

## 7 Receiver characteristics

### 7.1 General

Unless detailed the receiver characteristic are specified at the antenna connector of the UE. For UE 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 this specification. It is recognised that different requirements and test methods are likely to be required for the different types of UE.

All the parameters in Section 7 are defined using the DL reference measurement channel specified in Annex A.2.2.

### 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/TDD:

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

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 base station and optionally in the mobile stations. Possibility for downlink transmit diversity in the base station.

### 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 Requirements

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

**Table 7.2: Test parameters for reference sensitivity**

Parameter	Level	Unit
$\frac{\Sigma DPCH_{Ec}}{I_{or}}$	0	dB
$\hat{I}_{or}$	-105	dBm/3.84 MHz

### 7.4 Maximum input level

The maximum input level 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 Requirements

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

**Table 7.3: Maximum input level**

Parameter	Level	Unit
$\frac{\Sigma DPCH\_Ec}{I_{or}}$	-7	dB
$\hat{I}_{or}$	-25	dBm/3.84 MHz

## 7.5 Adjacent Channel Selectivity (ACS)

Adjacent Channel Selectivity is a measure of a receiver's ability to receive a wanted signal at its assigned channel frequency in the presence of 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 receiver 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
2	dB	33
3	dB	33

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

Parameter	Unit	Level
$\frac{\Sigma DPCH\_Ec}{I_{or}}$	dB	0
$\hat{I}_{or}$	dBm/3.84 MHz	-91
$I_{oac}$ mean power (modulated)	dBm	-52
$F_{uw}$ offset	MHz	+5 or -5

## 7.6 Blocking characteristics

The blocking characteristics is a measure of the receiver 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, table 7.7 and table 7.7a. For table 7.7 and 7.7a up to 24 exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size. Additional requirement in table 7.7a is applied for Band a) UE operating on 2010-2025MHz.

Table 7.6: In-band blocking

Parameter	Level		Unit
$\frac{\Sigma DPCH\_Ec}{I_{or}}$	0		dB
$\hat{I}_{or}$	-102		dBm/3.84 MHz
$I_{ouw}$ mean power (modulated)	-56 (for $F_{uw}$ offset $\pm 10$ MHz)	-44 (for $F_{uw}$ offset $\pm 15$ MHz)	dBm

Table 7.7: Out of band blocking

Parameter	Band 1	Band 2	Band 3	Unit
$\frac{\Sigma DPCH\_Ec}{I_{or}}$	0	0	0	dB
$\hat{I}_{or}$	-102	-102	-102	dBm/3.84 MHz
$I_{ouw}$ (CW)	-44	-30	-15	dBm
$F_{uw}$ For operation in frequency bands as defined in subclause 5.2(a)	1840 <f < 1885 1935 <f < 1995 2040 <f < 2085	1815 <f < 1840 2085 <f < 2110	1 < f < 1815 2110 < f < 12750	MHz
$F_{uw}$ For operation in frequency bands as defined in subclause 5.2(b)	1790 < f < 1835 2005 < f < 2050	1765 < f < 1790 2050 < f < 2075	1 < f < 1765 2075 < f < 12750	MHz
$F_{uw}$ For operation in frequency bands as defined in subclause 5.2(c)	1850 < f < 1895 1945 < f < 1990	1825 < f < 1850 1990 < f < 2015	1 < f < 1825 2015 < f < 12750	MHz
NOTE 1: For operation referenced in 5.2(a), from 1885 <f < 1900 MHz, 1920 <f < 1935 MHz, 1995 <f < 2010 MHz and 2025 <f < 2040 MHz, the appropriate in-band blocking in table 7.6 or adjacent channel selectivity in section 7.5.1 shall be applied.				
NOTE 2: For operation referenced in 5.2(b), from 1835 < f < 1850 MHz and 1990 < f < 2005 MHz, the appropriate in-band blocking in table 7.6 or adjacent channel selectivity in section 7.5.1 shall be applied.				
NOTE 3: For operation referenced in 5.2(c), from 1895 < f < 1910 MHz and 1930 < f < 1945 MHz, the appropriate in-band blocking in table 7.6 or adjacent channel selectivity in section 7.5.1 shall be applied.				

Table 7.7a: Additional Out of band blocking

Parameter	Band 1	Band 2	Band 3	Unit
$\frac{\Sigma DPCH\_Ec}{I_{or}}$	0	0	0	dB
$\hat{I}_{or}$	-102	-102	-102	dBm/3.84 MHz
$I_{ouw}$ (CW)	-44	-30	-15	dBm
$F_{uw}$ For operation in frequency bands in 2010-2025 MHz as defined in subclause 5.2(a)	1840 <f < 1995 2040 <f < 2085	1815 <f < 1840 2085 <f < 2110	1 < f < 1815 2110 < f < 12750	MHz
NOTE 1: Additional requirement is applied for Band a) UE operating on 2010-2025MHz.				

## 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	Level	Unit
$\frac{\Sigma DPCH - Ec}{I_{or}}$	0	dB
$\hat{I}_{or}$	-102	dBm/3.84 MHz
$I_{ouw} (CW)$	-44	dBm
$F_{uw}$	Spurious response frequencies	MHz

## 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 Requirements

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

**Table 7.9: Receive intermodulation characteristics**

Parameter	Level	Unit
$\frac{\Sigma DPCH - Ec}{I_{or}}$	0	dB
$\hat{I}_{or}$	-102	dBm/3.84 MHz
$I_{ouw1} (CW)$	-46	dBm
$I_{ouw2}$ mean power (modulated)	-46	dBm
$F_{uw1} (CW)$	$\pm 10$	MHz
$F_{uw2}$ (modulated)	$\pm 20$	MHz



## 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 spurious emission shall not exceed:

**Table 7.10: Receiver spurious emission requirements**

Band	Maximum level	Measurement Bandwidth	Note
30 MHz – 1 GHz	-57 dBm	100 kHz	
1 GHz – 1.9 GHz and 1.92 GHz – 2.01 GHz and 2.025 GHz – 2.11 GHz	-47 dBm	1 MHz	With the exception of frequencies between 12.5MHz below the first carrier frequency and 12.5MHz above the last carrier frequency used by the UE.
1.9 GHz – 1.92 GHz and 2.01 GHz – 2.025 GHz and 2.11 GHz – 2.170 GHz	-60 dBm	3.84 MHz	With the exception of frequencies between 12.5MHz below the first carrier frequency and 12.5MHz above the last carrier frequency used by the UE.
2.170 GHz – 12.75 GHz	-47 dBm	1 MHz	

## 8 Performance requirement

### 8.1 General

The performance requirements for the UE in this section are specified for the measurement channels specified in Annex A and the propagation condition specified in Annex B.

**Table 8.1: Summary of UE performance targets**

Test Chs.	Information Data Rate	Static	Multi-path Case 1	Multi-path Case 2	Multi-path Case 3
		Performance metric			
DCH	12.2 kbps	BLER < 10 <sup>-2</sup>	BLER < 10 <sup>-2</sup>	BLER < 10 <sup>-2</sup>	BLER < 10 <sup>-2</sup>
	64 kbps	BLER < 10 <sup>-1</sup> , 10 <sup>-2</sup>	BLER < 10 <sup>-1</sup> , 10 <sup>-2</sup>	BLER < 10 <sup>-1</sup> , 10 <sup>-2</sup>	BLER < 10 <sup>-1</sup> , 10 <sup>-2</sup> , 10 <sup>-3</sup>
	144 kbps	BLER < 10 <sup>-1</sup> , 10 <sup>-2</sup>	BLER < 10 <sup>-1</sup> , 10 <sup>-2</sup>	BLER < 10 <sup>-1</sup> , 10 <sup>-2</sup>	BLER < 10 <sup>-1</sup> , 10 <sup>-2</sup> , 10 <sup>-3</sup>
	384 kbps	BLER < 10 <sup>-1</sup> , 10 <sup>-2</sup>	BLER < 10 <sup>-1</sup> , 10 <sup>-2</sup>	BLER < 10 <sup>-1</sup> , 10 <sup>-2</sup>	BLER < 10 <sup>-1</sup> , 10 <sup>-2</sup> , 10 <sup>-3</sup>
BCH	12.3 kbps		BLER < 10 <sup>-2</sup>		

## 8.2 Demodulation in static propagation conditions

### 8.2.1 Demodulation of DCH

The performance requirement of DCH in static propagation conditions is determined by the maximum Block Error Ratio (BLER). The BLER is specified for each individual data rate of the DCH. DCH is mapped into the Dedicated Physical Channel (DPCH).

#### 8.2.1.1 Minimum requirement

For the parameters specified in Table 8.2 the BLER should not exceed the piece-wise linear BLER curve specified in Table 8.3. These requirements are applicable for TFCS size 16.

**Table 8.2: DCH parameters in static propagation conditions**

Parameters	Unit	Test 1	Test 2	Test 3	Test 4
$\frac{\Sigma DPCH \cdot E_c}{I_{or}}$	dB	-6	-3	0	0
$I_{oc}$	dBm/3.84 MHz	-60			
Cell Parameter*		0,1			
DPCH Channelization Codes*	C(k,Q)	C(i,16) i=1,2	C(i,16) i=1 . .5	C(i,16) i=1 . .9	C(i,16) i=1 . .8
OCNS Channelization Code*	C(k,Q)	C(3,16)	C(6,16)	-	-
Information Data Rate	kbps	12.2	64	144	384
*Note: Refer to TS 25.223 for definition of channelization codes and cell parameter.					

**Table 8.3: Performance requirements in AWGN channel**

Test Number	$\frac{\hat{I}_{or}}{I_{oc}}$ [dB]	BLER
1	1.1	$10^{-2}$
2	3.5	$10^{-1}$
	3.8	$10^{-2}$
3	3.4	$10^{-1}$
	3.6	$10^{-2}$
4	2.7	$10^{-1}$
	3.0	$10^{-2}$

## 8.3 Demodulation of DCH in multipath fading conditions

### 8.3.1 Multipath fading Case 1

The performance requirement of DCH is determined by the maximum Block Error Ratio (BLER). The BLER is specified for each individual data rate of the DCH. DCH is mapped into the Dedicated Physical Channel (DPCH).

#### 8.3.1.1 Minimum requirement

For the parameters specified in Table 8.4 the BLER should not exceed the piece-wise linear BLER curve specified in Table 8.5. These requirement are applicable for TFCS size 16.

**Table 8.4: DCH parameters in multipath Case 1 channel**

Parameters	Unit	Test 1	Test 2	Test 3	Test 4
$\frac{\Sigma DPCH - E_c}{I_{or}}$	DB	-6	-3	0	0
$I_{oc}$	dBm/3.84 MHz	-60			
Cell Parameter*		0,1			
DPCH Channelization Codes*	C(k,Q)	C(i,16) i=1,2	C(i,16) i=1 . . 5	C(i,16) i=1 . . 9	C(i,16) i=1 . . 8
OCNS Channelization Code*	C(k,Q)	C(3,16)	C(6,16)	-	-
Information Data Rate	kbps	12.2	64	144	384
*Note: Refer to TS 25.223 for definition of channelization codes and cell parameter.					

**Table 8.5: Performance requirements in multipath Case 1 channel**

Test Number	$\frac{\hat{I}_{or}}{I_{oc}}$ [dB]	BLER
1	13.9	$10^{-2}$
2	13.7	$10^{-1}$
	19.8	$10^{-2}$
3	14.1	$10^{-1}$
	20.6	$10^{-2}$
4	13.8	$10^{-1}$
	20.0	$10^{-2}$

### 8.3.2 Multipath fading Case 2

The performance requirement of DCH is determined by the maximum Block Error Ratio (BLER). The BLER is specified for each individual data rate of the DCH. DCH is mapped into the Dedicated Physical Channel (DPCH).

#### 8.3.2.1 Minimum requirement

For the parameters specified in Table 8.6 the BLER should not exceed the piece-wise linear BLER curve specified in Table 8.7. These requirements are applicable for TFCS size 16.

**Table 8.6: DCH parameters in multipath Case 2 channel**

Parameters	Unit	Test 1	Test 2	Test 3	Test 4
$\frac{\Sigma DPCH - E_c}{I_{or}}$	dB	-3	0	0	0
$I_{oc}$	dBm/3.84 MHz	-60			
Cell Parameter*		0,1			
DPCH Channelization Codes*	C(k,Q)	C(i,16) i=1,2	C(i,16) i=1 . . 5	C(i,16) i=1 . . 9	C(i,16) i=1 . . 8
OCNS Channelization Code*	C(k,Q)	C(3,16)	-	-	-
Information Data Rate	kbps	12.2	64	144	384
*Note: Refer to TS 25.223 for definition of channelization codes and cell parameter.					

**Table 8.7: Performance requirements in multipath Case 2 channel**

Test Number	$\frac{\hat{I}_{or}}{I_{oc}}$ [dB]	BLER
1	5.8	$10^{-2}$
2	5.7	$10^{-1}$
	9.2	$10^{-2}$
3	9.3	$10^{-1}$
	12.7	$10^{-2}$
4	8.8	$10^{-1}$
	12.0	$10^{-2}$

### 8.3.3 Multipath fading Case 3

The performance requirement of DCH is determined by the maximum Block Error Ratio (BLER). The BLER is specified for each individual data rate of the DCH. DCH is mapped into the Dedicated Physical Channel (DPCH).

#### 8.3.3.1 Minimum requirement

For the parameters specified in Table 8.8 the BLER should not exceed the piece-wise linear BLER curve specified in Table 8.9. These requirements are applicable for TFCS size 16.

**Table 8.8: DCH parameters in multipath Case 3 channel**

Parameters	Unit	Test 1	Test 2	Test 3	Test 4
$\frac{\Sigma DPCH - E_c}{I_{or}}$	dB	-3	0	0	0
$I_{oc}$	dBm/3.84 MHz	-60			
Cell Parameter*		0,1			
DPCH Channelization Codes*	C(k,Q)	C(i,16) i=1,2	C(i,16) i=1..5	C(i,16) i=1..9	C(i,16) i=1..8
OCNS Channelization Code*	C(k,Q)	C(3,16)	-	-	-
Information Data Rate	kbps	12.2	64	144	384

\*Note: Refer to TS 25.223 for definition of channelization codes and cell parameter.

**Table 8.9: Performance requirements in multipath Case 3 channel**

Test Number	$\frac{\hat{I}_{or}}{I_{oc}}$ [dB]	BLER
12.2 kbps	4.8	$10^{-2}$
64 kbps	5.8	$10^{-1}$
	8.5	$10^{-2}$
	10.7	$10^{-3}$
144 kbps	10.3	$10^{-1}$
	13.3	$10^{-2}$
	16.0	$10^{-3}$
384 kbps	8.9	$10^{-1}$
	11.5	$10^{-2}$
	13.6	$10^{-3}$

## 8.4 Base station transmit diversity mode

### 8.4.1 Demodulation of BCH in SCTD mode

The performance requirement of BCH is determined by the maximum Block Error Rate (BLER). The BLER is specified for the BCH. BCH is mapped into the Primary Common Control Physical Channel (P-CCPCH).

#### 8.4.1.1 Minimum requirement

For the parameters specified in Table 8.10 the BLER should not exceed the BLER specified in Table 8.11.

NOTE: This requirement doesn't need to be tested.

**Table 8.10: P-CCPCH parameters in multipath Case 1 channel**

Parameters	Unit	Test 1
$\frac{PCCPCH\_E_c}{I_{or}}$	dB	-3
I	dBm/3.84 MHz	-60
Information Data Rate	Kbps	12.3

**Table 8.11: Performance requirements in multipath Case 1 channel**

Test Number	$\frac{\hat{I}_{or}}{I_{oc}}$ [dB]	BLER
1	8.4	$10^{-2}$

## 8.5 Power control in downlink

Power control in the downlink is the ability of the UE receiver to converge to the required link quality set by the network while using minimum downlink power.

### 8.5.1 Minimum requirements

For the parameters specified in Table 8.12 the downlink  $\hat{I}_{or}/I_{oc}$  averaged over one timeslot shall be below the specified value in Table 8.13 more than 90% of the time. BLER shall be as shown in Table 8.13. Downlink power control is ON during the test.

**Table 8.12: Test parameters for downlink power control**

Parameter	Unit	Test 1
$\frac{DPCH\_E_c}{I_{or}}$	dB	0
$I_{oc}$	dBm/3.84 MHz	-60
Information Data Rate	kbps	12.2
Target quality value on DTCH	BLER	0.01
Propagation condition		Case 1
DL Power Control step size, $\Delta_{TPC}$	dB	1
Maximum_DL_power *	dB	0
Minimum_DL_power *	dB	-27
*Note: Refer to TS 25.224 for description and definition		

**Table 8.13: Requirements for downlink power control**

Parameter	Unit	Test 1
$\hat{I}_{or} / I_{oc}$	dB	8.5
Measured quality on DTCH	BLER	0.01±30%

## 8.6 Uplink Power Control

Power control in the uplink is the ability of the UE to converge to the required link quality set by the network while using minimum uplink power.

### 8.6.1 Test Conditions

During period T1, the PCCPCH and a second Beacon Channel are transmitted in the DL in designated slots within each frame and at the same power level.

The UE transmits, using the channel of TS25.105, Annex A.2.1 UL reference measurement channel (12.2 kbps) in one UL slot. For different parts of the test, different UL slots will be designated.

The values of table 8.14, period T1 shall be selected. Then, with the received PCCPCH and Beacon power set at -60 dBm, the value of DPCH constant value shall be adjusted so that the mean UE output power is 5 dBm. These conditions are held steady during period T1.

Periods T1 and T2 are each 5 seconds long.

**Table 8.14: UL Power Control Test Conditions**

		Period T1	Period T2
$I_{BTS}$ all slots	dBm	-60	
PCCPCH Power -Broadcast	dBm	18	
PCCPCH power - Received	dBm	-60	-70
Mean UE transmit power	dBm	5	According to tables 8.15 and 8.16
$SIR_{TARGET}$	dB	6	
$I_{oc}$ in PCCPCH and Beacon Slots	dBm	-60	
IE (information element) Alpha	As defined in 25.331	1.0	
PCCPCH slot position	Integer 0-14	0	
Beacon slot position	Integer 0-14	8	

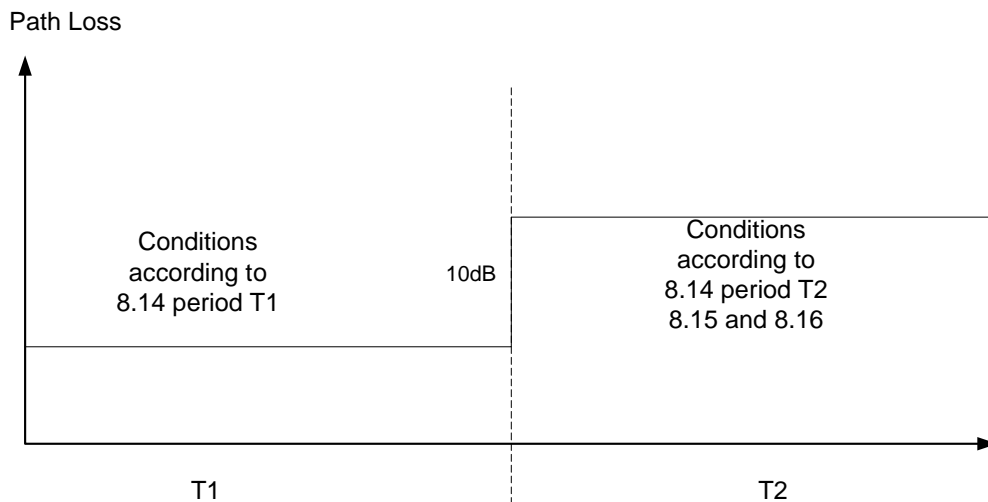


Figure 8.1

### 8.6.2 Performance

At the end of period T1, the PCCPCH and Beacon Received power shall be simultaneously decreased by 10 dB. These conditions are summarized in table 8.14, period T2.

For the first frame including the change in received power the UE output power shall satisfy the values in table 8.15.

For the 20<sup>th</sup> frame after the change in received power the UE output power shall satisfy the values in table 8.16.

**Table 8.15: Required UE Output Power, Frame Containing Power Level Change**

Parameter	Units	Value	
UL transmission slot position		1,9	7,14
UE output power	dBm	15 ±4.0	5 ±0.5

**Table 8.16: Required UE Output Power, 20 Frames after Power Level Change**

Parameter	Units	Value	
UL transmission slot position		1,9	7,14
UE output power	dBm	15 ±4.0	15 ±4.0

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## Annex A (normative): Measurement channels

### A.1 General

Void

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### A.2 Reference measurement channel

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

Table A.1

Parameter	Value
Information data rate	12.2 kbps
RU's allocated	2 RU
Midamble	512 chips
Interleaving	20 ms
Power control	2 Bit/user
TFCI	16 Bit/user
Inband signalling DCCH	2 kbps
Puncturing level at Code rate 1/3 : DCH / DCCH	10% / 0%



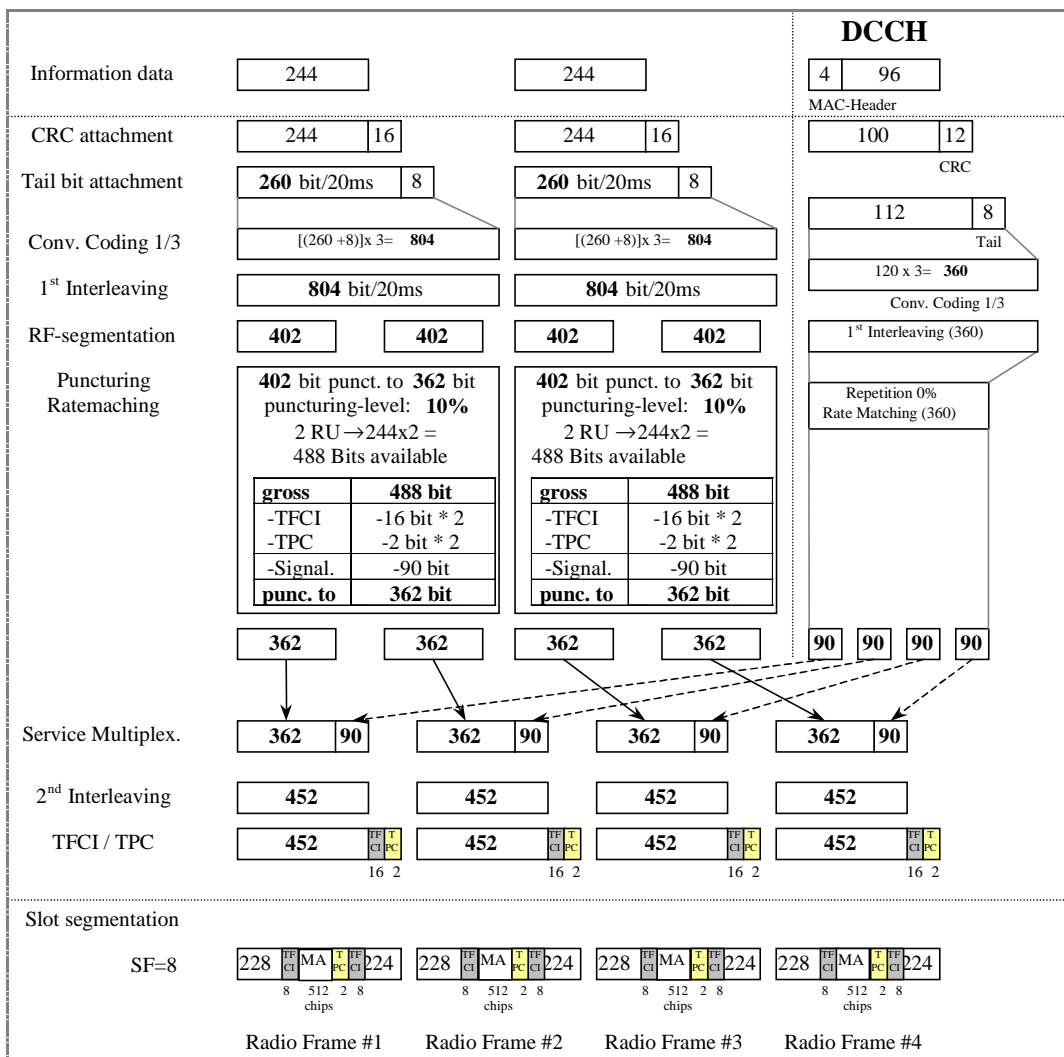


Figure A.1

### A.2.2 DL reference measurement channel (12.2 kbps)

Table A.2

Parameter	Value
Information data rate	12.2 kbps
RU's allocated	2 RU
Midamble	512 chips
Interleaving	20 ms
Power control	0 Bit/user
TFCI	16 Bit/user
Inband signalling DCCH	2 kbps
Puncturing level at Code rate 1/3 : DCH / DCCH	5% / 0 %

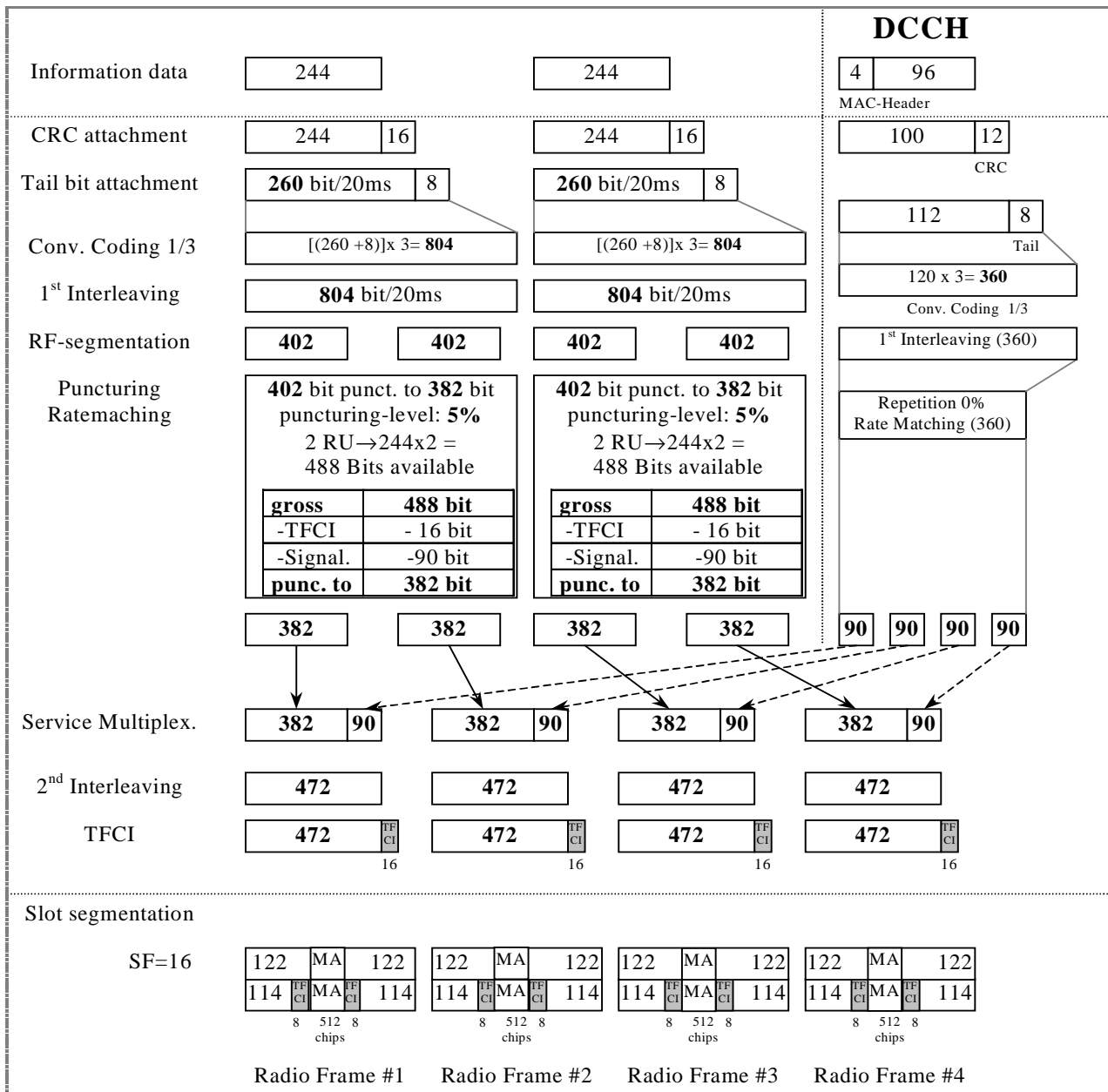


Figure A.2

### A.2.3 DL reference measurement channel (64 kbps)

Table A.3

Parameter	Value
Information data rate	64 kbps
RU's allocated	5 codes SF16 = 5RU
Midamble	512 chips
Interleaving	20 ms
Power control	0 Bit/user
TFCI	16 Bit/user
Inband signalling DCCH	2 kbps
Puncturing level at Code rate : 1/3 DCH / 1/2 DCCH	41.1% / 10%

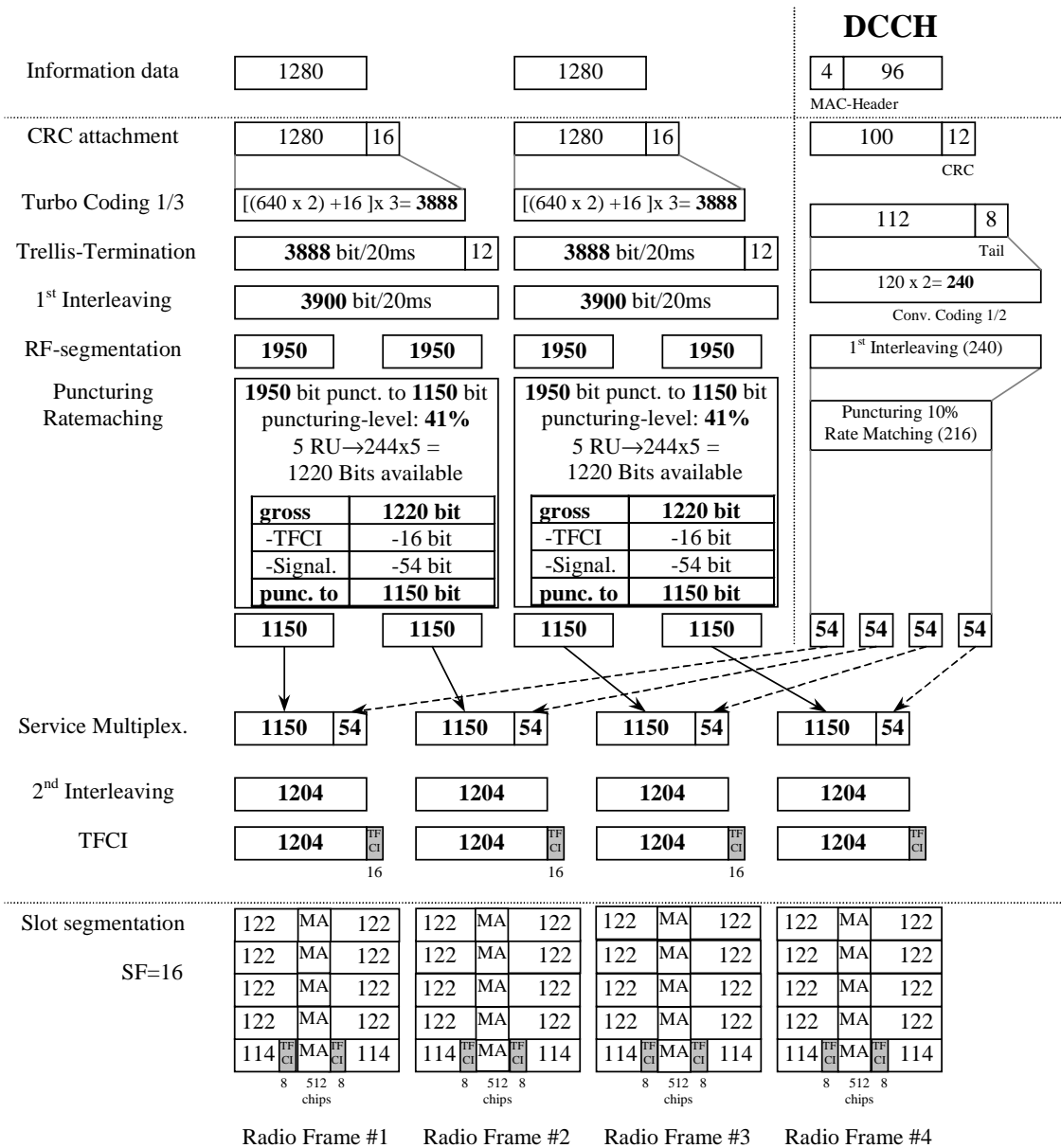


Figure A.3

### A.2.4 DL reference measurement channel (144 kbps)

Table A.4

Parameter	Value
Information data rate	144 kbps
RU's allocated	9 codes SF16 = 9RU
Midamble	256 chips
Interleaving	20 ms
Power control	0 Bit/user
TFCI	16 Bit/user
Inband signalling DCCH	2 kbps
Puncturing level at Code rate: 1/3 DCH / 1/2 DCCH	44.5% / 16.6%

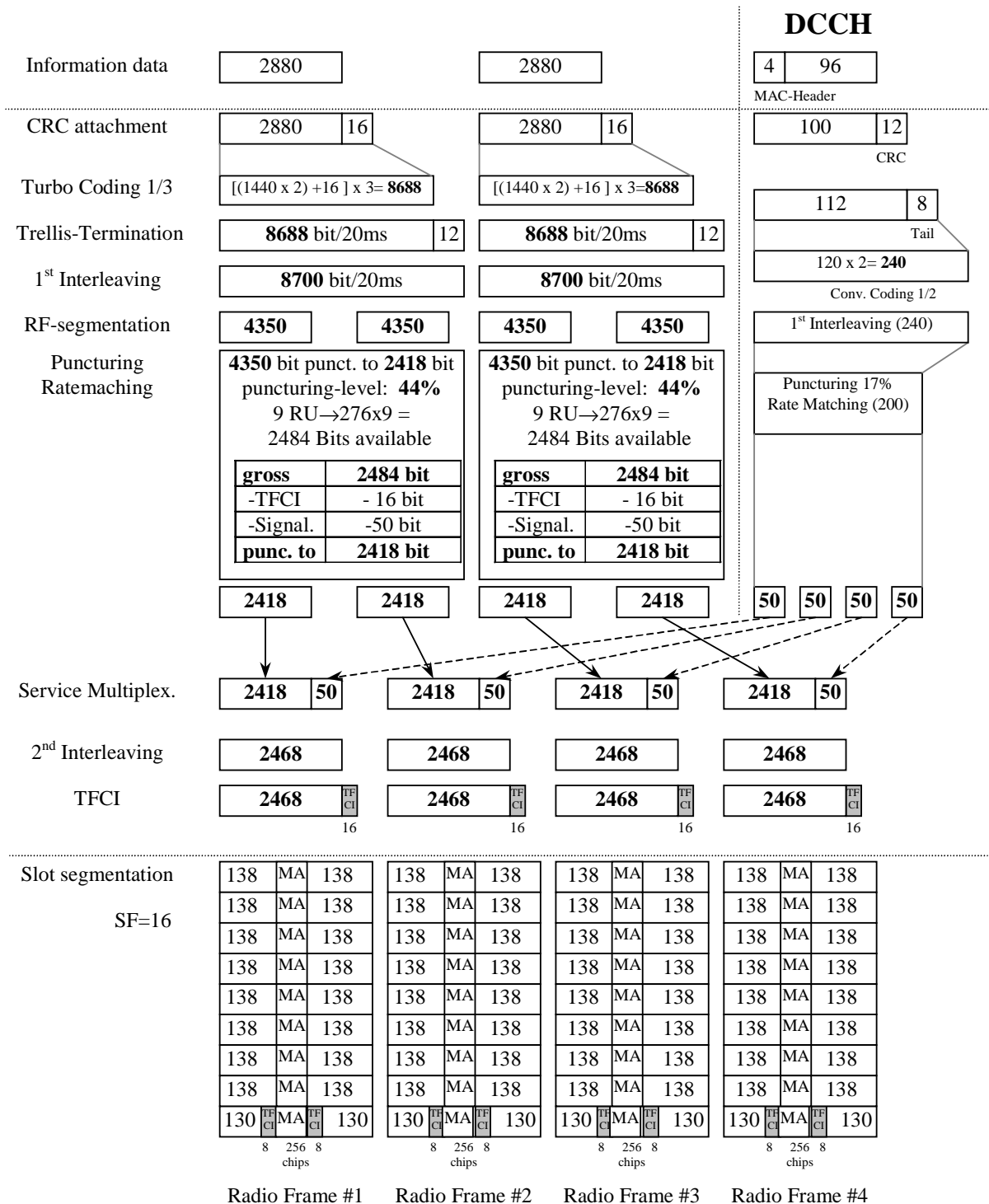


Figure A.4

### A.2.5 DL reference measurement channel (384 kbps)

Table A.5

Parameter	Value
Information data rate	384 kbps
RU's allocated	8*3TS = 24RU
Midamble	256 chips
Interleaving	20 ms
Power control	0 Bit/user
TFCI	16 Bit/user
Inband signalling DCCH	2 kbps
Puncturing level at Code rate : 1/3 DCH / 1/2 DCCH	43.4% / 15.3%

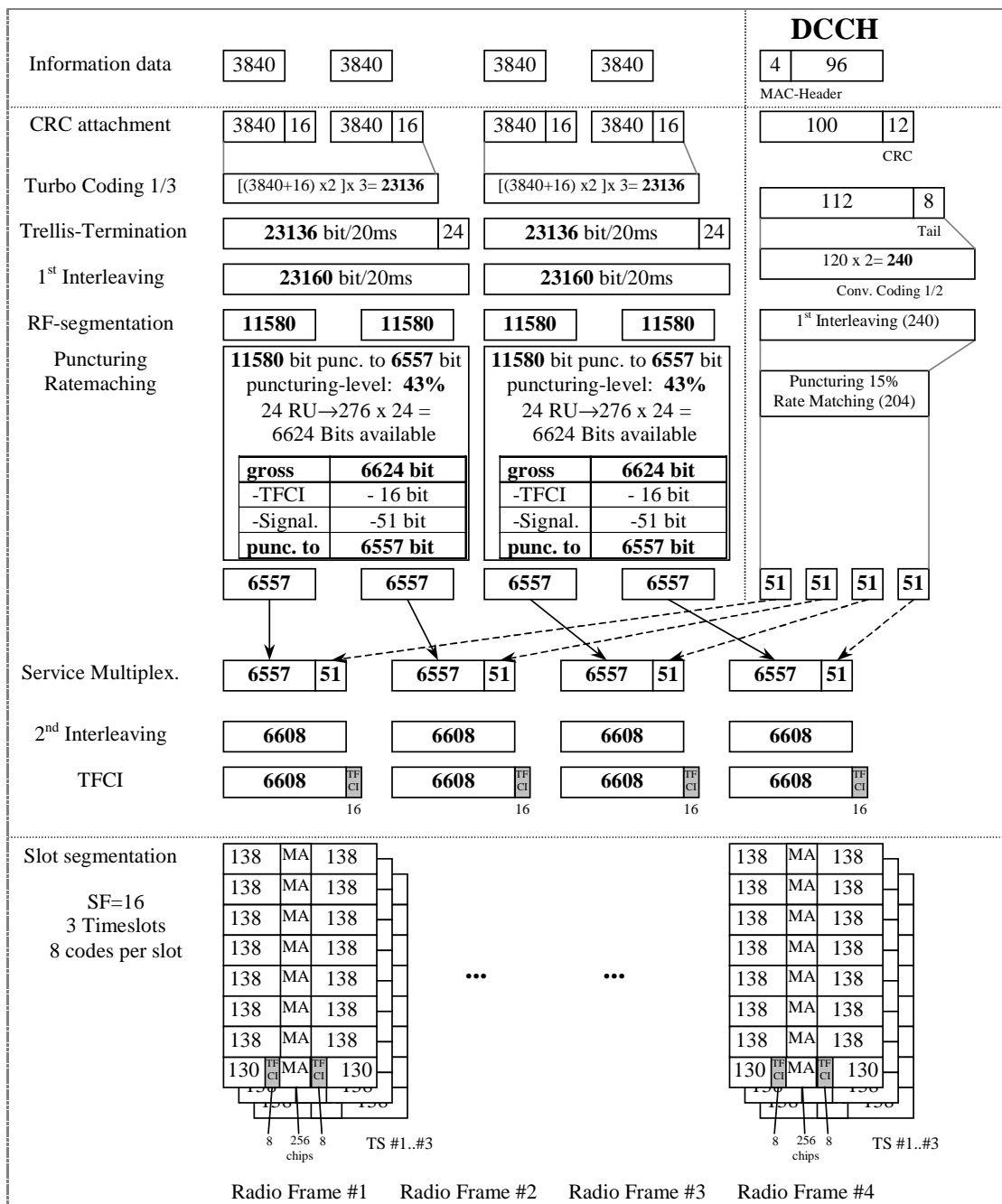


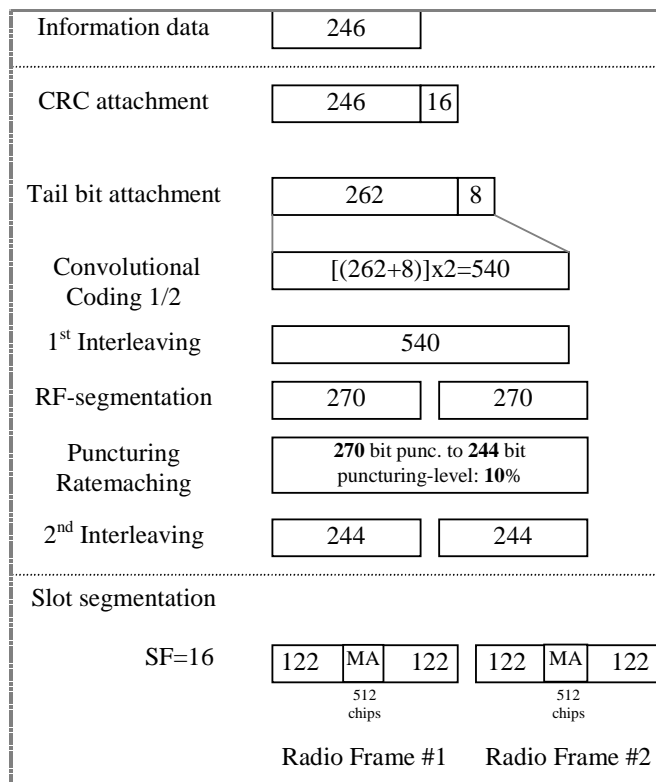
Figure A.5

## A.2.6 BCH reference measurement channel

[mapped to 1 code SF16]

**Table A.6**

Parameter	Value
Information data rate:	12.3 kbps
RU's allocated	1 RU
Midamble	512 chips
Interleaving	20 ms
Power control	0 bit
TFCI	0 bit
Puncturing level	10%



**Figure A.6**

## A.2.7 UL multi code reference measurement channel (12.2 kbps)

**Table A.7**

Parameter	Value
Information data rate	12.2 kbps
RU's allocated	2 RU
Midamble	512 chips
Interleaving	20 ms
Power control	2 Bit/user
TFCI	16 Bit/user
Inband signalling DCCH	2 kbps
Puncturing level at Code rate 1/3 : DCH / DCCH	5% / 0 %

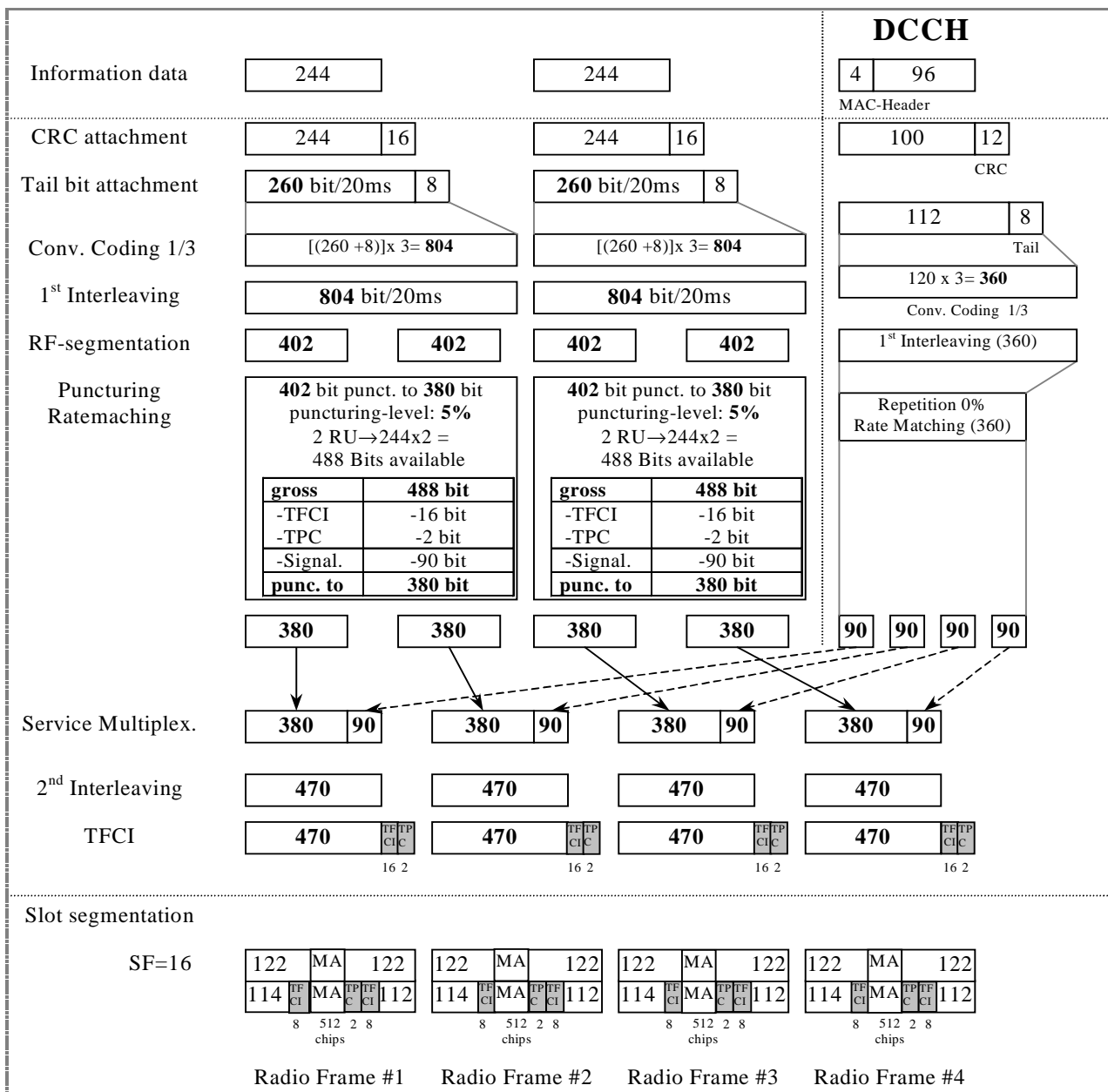


Figure A.7

## Annex B (normative): Propagation conditions

### B.1 Static propagation condition

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

### B.2 Multi-path fading propagation conditions

Table B.1 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 50 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]
0	0	0	0	0	0	0	0
976	-10	976	0	260	-3	976	-10
		12000	0	521	-6		
				781	-9		

\*NOTE: Case 4 is only used in TS 25.123.



## Annex C (normative): Environmental conditions

### C.1 General

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

### C.2 Environmental requirements for the UE

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

#### C.2.1 Temperature

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

**Table C.1**

+15°C – +35°C	for normal conditions (with relative humidity of 25 % to 75 %);
-10°C - +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 S25.102 for extreme operation.

#### C.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 C.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	0,85 * nominal	Nominal	Nominal
Mercury/nickel cadmium	0,90 * 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 S4.01A for extreme operation. In particular, the UE shall inhibit all RF transmissions when the power supply voltage is below the manufacturer declared shutdown voltage.

## C.2.3 Vibration

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

**Table C.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 S4.01A for extreme operation.

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## Annex D (informative): Terminal capabilities (TDD)

This section provides the UE capabilities related to 25.102.

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

Table D.1 provides the list of UE radio access capability parameters and possible values for 25.102.

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

	<b>UE radio access capability parameter</b>	<b>Value range</b>
TDD RF parameters	UE power class (25.102 section 6.2.1)	2, 3
	Radio frequency bands (25.102 section 5.2)	a) lower band, a) upper band, a), b), c)

## Annex E (informative): Change request history

**Table E.1: Change History**

Event	RAN Doc	CR	R	Subject	Cat	Curr	New	WI
RP-06	RP-99775	001		Corrections to 25.102 version 3.0.0	F	3.0.0	3.1.0	
RP-06	RP-99774	004		Open item list in Annex D of 25.102v3.0.0	D	3.0.0	3.1.0	
RP-06	RP-99775	003		Receiver spurious emissions for UE TDD	C	3.0.0	3.1.0	
RP-06	RP-99775	002		TDD Uplink Power control requirements	F	3.0.0	3.1.0	
RP-06	RP-99775	005		Change of propagation conditions recommendations	C	3.0.0	3.1.0	
RP-06	RP-99776	006		Performance Requirements	B	3.0.0	3.1.0	
RP-06	RP-99775	007		Corrections to 25.102 v.3.0.0	F	3.0.0	3.1.0	
RP-06	RP-99774	008		Editorial changes to 25.102v3.0.0	D	3.0.0	3.1.0	
RP-06	RP-99776	009		Peak Code Domain Error	B	3.0.0	3.1.0	
RP-06	RP-99775	010		TDD uplink power control requirements	C	3.0.0	3.1.0	
RP-06	RP-99775	011		Update of ITU Region 2 Specific Specifications and proposed universal channel numbering	C	3.0.0	3.1.0	
RP-06	RP-99776	012		Transmit Template, should to shall	B	3.0.0	3.1.0	
RP-06	RP-99775	013		UE power classes	F	3.0.0	3.1.0	
RP-06	RP-99775	014		Update of UE RF capabilities	F	3.0.0	3.1.0	
RP-07	RP-000016	015		Description of Signal Levels for Receiver Characteristics	D	3.1.0	3.2.0	
RP-07	RP-000016	016		Editorial corrections	D	3.1.0	3.2.0	
RP-07	RP-000016	017		Spurious emission correction	F	3.1.0	3.2.0	
RP-07	RP-000016	018		Performance requirement for base station transmit diversity mode	C	3.1.0	3.2.0	
RP-07	RP-000016	019		Corrections for UE TDD Blocking Requirements	F	3.1.0	3.2.0	
RP-07	RP-000016	020		Correction to the UL power control "differential accuracy, measured input" requirement	F	3.1.0	3.2.0	
RP-07	RP-000016	021		Clarification of ACLR	F	3.1.0	3.2.0	
RP-07	RP-000016	022		Clock Accuracy	C	3.1.0	3.2.0	
RP-07	RP-000016	023		Peak Code Domain Error	C	3.1.0	3.2.0	
RP-07	RP-000016	024		Modulation Accuracy	C	3.1.0	3.2.0	
RP-07	RP-000016	025		Out-of-synchronization handling of the UE in TS 25.102	C	3.1.0	3.2.0	
RP-08	RP-000205	026		Correction of DL measurement channels for TDD-mode	F	3.2.0	3.3.0	
RP-08	RP-000205	027		Reference Measurement Channel for UE Peak Code Domain Error	F	3.2.0	3.3.0	
RP-08	RP-000205	028		Correction for Uplink power control	F	3.2.0	3.3.0	
RP-08	RP-000205	029		UE TDD P-CCPCH Block STTD performance requirements	F	3.2.0	3.3.0	
RP-08	RP-000205	030		Modification to the handling of UE TDD Measurement Uncertainty	F	3.2.0	3.3.0	
RP-08	RP-000205	031		Clarification of the specification on Peak Code Domain Error (PCDE)	F	3.2.0	3.3.0	
RP-09	RP-000395	032		Performance requirements with TFCl decoding for TDD UE	F	3.3.0	3.4.0	
RP-09	RP-000395	033		Performance test for UE power control in downlink	F	3.3.0	3.4.0	
RP-09	RP-000395	034		Definition of period for frequency error	F	3.3.0	3.4.0	
RP-09	RP-000395	035		Handling of measurement uncertainties in UE radio conformance testing (TDD)	F	3.3.0	3.4.0	
RP-10	R4-000788	036		Correction for 25.102 concerning UE maximum output power classes	F	3.4.0	3.5.0	
RP-10	R4-000789	037		Correction for 25.102 concerning the coexistence of TDD and FDD in the same band	F	3.4.0	3.5.0	
RP-10	R4-000830	038		Correction of Out-of-Sync criteria in 25.102	F	3.4.0	3.5.0	
RP-10	R4-000939	039		Clarification of the mentioned parameter alpha	F	3.4.0	3.5.0	
RP-10	R4-000982	040		Correction for 25.102 concerning the channel number calculation	F	3.4.0	3.5.0	
RP-11	RP-010086	041		Relationship between Minimum Requirements and Test Tolerances.	F	3.5.0	3.6.0	

RP-11	RP-010086	042		Requirements for out-of-synchronisation handling of output power during DTX	F	3.5.0	3.6.0	
RP-11	RP-010086	043		UE Power Control Accuracy	F	3.5.0	3.6.0	
RP-11	RP-010086	044		Correction of version number of the ITU-R Recommendation SM.329	F	3.5.0	3.6.0	
RP-12	RP-010348	048		Correction of signal descriptions in Receiver Characteristics section.	F	3.6.0	3.7.0	
RP-12	RP-010348	050		UE EVM definition	F	3.6.0	3.7.0	
RP-12	RP-010348	052		Clarification of UARFCN channel number	F	3.6.0	3.7.0	
RP-12	RP-010348	054		CR for UE Performance Requirements	F	3.6.0	3.7.0	
RP-12	RP-010348	056		Performance Test for Uplink Power Control	F	3.6.0	3.7.0	
RP-12	RP-010348	058		Corrections and note status changes from informative to normative	F	3.6.0	3.7.0	
RP-12	RP-010348	064		BCH performance requirement	F	3.6.0	3.7.0	
RP-13	RP-010615	067		Power and ACLR definition corrections	F	3.7.0	3.8.0	
RP-13	RP-010615	069		Out of synchronisation handling	F	3.7.0	3.8.0	
RP-13	RP-010615	071		Correction of frequency range for receiver spurious emissions	F	3.7.0	3.8.0	
RP-13	RP-010615	073		Clarification in Spectrum emission mask section	F	3.7.0	3.8.0	
RP-14	RP-010778	081		Tx On/Off Test Requirements for Discontinuous Transmission	F	3.8.0	3.9.0	
RP-14	RP-010778	083		Downlink power control - performance requirement for constant BLER target, 3.84 Mcps TDD option	F	3.8.0	3.9.0	
RP-15	RP-020015	086	1	Replacement of Block STTD by Space Code Transmit Diversity (SCTD)	F	3.9.0	3.10.0	
RP-15	RP-020015	088		UL reference measurement channel (12.2 kbps) puncturing rate and bit length correction	F	3.9.0	3.10.0	
RP-16	RP-020280	095		Correction of power terms and definitions	F	3.10.0	3.11.0	
RP-16	RP-020280	100	1	Correction of DL power control test for testability	F	3.10.0	3.11.0	
RP-16	RP-020280	102		Addition of Test Case 4 to support 1G intra-frequency fading test case	F	3.10.0	3.11.0	
RP-16	RP-020280	103	1	Control and monitoring function of UE requirement	F	3.10.0	3.11.0	
RP-17	RP-020473	118		Correction to 3.84 Mcps TDD option downlink power control requirements	F	3.11.0	3.12.0	
RP-33	RP-060516	0181	1	Out of band blocking for 3.84 Mcps TDD UE operating in 2010-2025 MHz of band (a) in Japan.	F	3.12.0	3.13.0	TEI
RP-33	RP-060517	0186		Clarification of Tx spurious emission level from 3.84 Mcps TDD UE into PHS band.	F	3.12.0	3.13.0	TEI

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## History

<b>Document history</b>		
V3.1.0	January 2000	Publication
V3.2.0	March 2000	Publication
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V3.4.0	October 2000	Publication
V3.5.0	December 2000	Publication
V3.6.0	March 2001	Publication
V3.7.0	June 2001	Publication
V3.8.0	September 2001	Publication
V3.9.0	December 2001	Publication
V3.10.0	March 2002	Publication
V3.11.0	June 2002	Publication
V3.12.0	September 2002	Publication
V3.13.0	October 2006	Publication