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Technical Specification

China Wireless Telecommunication Standard (CWTS); Working Group 1 (WG1); TD-SCDMA (UE); Radio Transmission and Reception

CWTS

Contents

1 Scope

This document establishes the minimum RF characteristics of TD-SCDMA for the User Equipment (UE).

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, subsequent revisions do apply.

3 Definitions, symbols and abbreviations

3.1 Definitions

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

Power setting	The value of the control signal, which determines the desired transmitter output power. Typically, the power setting would be altered in response to power control commands.
Maximum power setting	The highest value of the power control setting which can be used.
Maximum output power	This refers to the measure of power when averaged over the transmitting timeslot at the maximum power setting.
Peak power	The instantaneous power of the RF envelope which is not expected to be exceeded for [99.9%] of the time.
Maximum peak power	The peak power observed when operating at a given maximum output power.
Average transmitting power	The average transmitter output power obtained over any specified time interval, including periods with no transmission. *<Editors: This definition would be relevant when considering realistic deployment scenarios where the power control setting may vary. >*
Maximum average transmitting power	The average transmitter output power obtained over any specified time interval, including periods with no transmission, when the transmitting timeslots are at the maximum power setting. *<Editors: The average power at the maximum power setting would also be consistent with defining a long term average power. >*
Received Signal Code Power (RSCP)	Given only signal power is received, the average power of the received signal after despreading and combining.
Interference Signal Code Power (ISCP)	Given only interference power is received, the average 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.

3.2 Symbols

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

<Symbol><Explanation>

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
CW	Continuous Wave (unmodulated signal)
DL	Downlink (forward link)
EIRP	Effective Isotropic Radiated Power
FDD	Frequency Division Duplexing
FER	subFrame Error Rate
PPM	Parts Per Million
RSSI	Received Signal Strength Indicator
SIR	Signal to Interference ratio
TDD	Time Division Duplexing
TD-SCDMA	Time Division Synchronous SCDMA
TPC	Transmitting Power Control
UE	User Equipment
UL	Uplink (reverse link)
UTRA	UMTS Terrestrial Radio Access

4 General

4.1 Measurement uncertainty

The requirements given in this specification do not include measurement uncertainties related to conformance testing as used e.g. in regulatory testing or production testing. Conformance testing is specified in [reference to the appropriate document].

5 Frequency bands and channel arrangement

5.1 General

The information presented in this section is based on a chiprate of 1.28Mcps.

5.2 Frequency bands

TD-SCDMA is designed to operate in the following bands:

Unpaired frequency band around 2GHz band
Deployment of TDD in the paired band is an open item.
Deployment in 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 subframe consists of 7 main timeslots where all main timeslots (at least the first one) before the single switching point are allocated DL and all main timeslots (at least the last one) after the single switching point are allocated UL.

5.4 Channel arrangement

5.4.1 Channel spacing

The nominal channel spacing is 1.6 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 TD-SCDMA absolute radio frequency channel number.

6 Transmitter characteristics

6.1 General

Unless detailed the transmitter characteristics 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 Transmitting power

6.2.1 UE maximum output power

The following Power Classes define the maximum output power;

Power Class	Maximum output power	Tolerance
1	[+33] dBm	[+1dB /-3dB]
2	[+27] dBm	[+1dB /-3dB]
3	[+24] dBm	[+1dB /-3dB]
4	[+21] dBm	[+1dB /-3dB]
5	[+10] dBm	[+1dB /-3dB]

Table 1. UE power classes.

Note
1. The maximum output power refers to the measure of power when averaged over the useful part of the transmitting timeslot at the maximum power control setting.
2. The maximum output power shall be specified with respect to a defined reference condition (power control status, type of timeslot {physical channel} and averaging method). The reference conditions are FFS.
3. For multi-code operation the maximum output power will be reduced by the difference of peak to average ratio between single and multi-code transmission. The error of the maximum average power is below the prescribed value even at the multi-code transmission mode <new text is required to clarify this sentence>
4. Power class 5 is envisaged for unlicensed operation.
5. For UE using directive antennas for transmission, a class dependent limit will be placed on the maximum EIRP (Effective Isotropic Radiated Power).

6.3 UE frequency stability

The UE modulated carrier frequency shall be accurate to within ±[0.1] PPM compared to carrier frequency received from the Node B. These signals will have an apparent error due to Node B frequency error and Doppler shift. In the later case, signals from the Node B must be averaged over sufficient time that errors due to noise or interference are allowed for within the above ±[0.1] PPM figure.

AFC	Frequency stability

ON	within ± [0.1] PPM

Table 2. UE frequency stability.

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 set its output power to a specified value. For the TDD mode the reciprocity of the channel allows accurate estimation of the required open loop transmitting power.

The UE open loop power control error shall be less than [+/-9] dB under normal conditions and +/- 12dB under extreme conditions.

6.4.2 Closed loop power control

Closed loop power control is the ability of the UE transmitter to adjust its output power in accordance with the TPC symbols received in the DL.

6.4.3 Power control step

The power control step is the minimum step change in the UL transmitter output power in response to a TPC symbols from the Node B.

6.4.3.1 Minimum requirement

UL power control step: [1 - 3 dB]

Tolerance: ±3dB

6.4.4 Power control cycles per second

The maximum and minimum rate of change for the UL transmitter power control step.

6.4.4.1 Minimum requirement

The rate of change for the UL transmitter power control step is 200Hz.

6.4.5 Minimum transmit output power

The minimum controlled output power of the UE is when the power control setting is set to a minimum value. This is when both the closed loop and open loop power control indicate a minimum transmitting output power is required.

6.4.5.1 Minimum requirement

The minimum transmitting output power shall be better than [–44 dBm /1.6MHz].

6.4.6 Power control dynamic range

The power control dynamic range is the difference between the maximum and the minimum output power for a specified reference condition

6.4.6.1 Minimum requirement

UL power control dynamic range : 80 dB maximum depending to the Tx power class of the UE

6.5 Transmitting OFF power

Transmitting OFF power state is when the UE does not transmit. This parameter is defined as the maximum output transmit power within the channel bandwidth when the transmitter is OFF.

6.5.1 Minimum requirement

The minimum requirement of transmitting OFF power shall be better than −65 dBm measured with a filter that has a Root-Raised Cosine (RRC) filter response with a roll off α=0.22 and a bandwidth equal to the chip rate.

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 for transmitted spectrum and is centered on the assigned channel frequency. The occupied channel bandwidth is about 1.6 MHz based on a chiprate of 1.28 Mcps.

6.6.2 Out of band emissions

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. These out of band emissions 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 terminal is requirement that applies to frequencies which are between 0.8 and 5MHz from a carrier frequency. The out of channel emission is specified relative to the UE output power in a 1.6 MHz bandwidth.

6.6.2.1.1 Minimum Requirement

The power of the 21dBm power class 4 UE emission shall not exceed the levels specified in table 4.

Table 4 : Spectrum Emission Mask Requirement

Frequency offset from carrier f	Minimum requirement	Measurement bandwidth
0.8 – 1.25 MHz	-30 -15*(Δf – 0.8) dBc	30 kHz *
1.25 - 2.5 MHz	-30- 1*(Δf-1.3) dBc	1 MHz *
2.5 – 3.2 MHz	-35 - 10*(Δf – 2.5) dBc	1 MHz *
3.2 - 5 MHz	-45 dBc	1 MHz *

Note

1. The first and last measurement position with a 30 kHz filter is 0.815 MHz and 1.235 MHz

2. The first and last measurement position with a 1 MHz filter is 1.3 MHz and 5 MHz

6.6.2.2 Adjacent Channel Leakage power Ratio (ACLR)

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the transmitted power to the power measured after a receiving filter in the adjacent channels(s). Both the transmitted power and the received power are measured with a filter response that is [normally rectangular] with a noise power bandwidth equal to the chiprate (1.28MHz).

6.6.2.2.1 Minimum requirements

The ACLR shall be better than the value specified in Table 5.

Table 5 :UE ACLR

Power Class	UE channel	ACLR limit
4	± 1.6 MHz	-33 dB or –50 dBm which ever is higher
4	± 3.2 MHz	-43 dB or –50 dBm which ever is higher

Note

1. The ACPR due to switching transients shall not exceed the limits in the above table.
2. The possibility is being considered of dynamically relaxing the ACP requirements for User Equipment(s) under conditions when this would not lead to significant interference (with respect to other system scenario or UMTS operators). This would be carried out under network control, primarily to facilitate reduction in UE power consumption.

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 excluding out of band emissions.

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

6.6.3.1 Minimum requirements

These requirements are only applicable for frequencies which are greater than 5 MHz away from the UE center carrier frequency.

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

Table 6. Spurious emissions requirements

Frequency Bandwidth	**Resolution Bandwidth**	**Minimum requirement**

925MHz f 935MHz	100kHz	-67dBm*
935MHz < f 960MHz	100kHz	-79dBm*
1805 MHz f 1880 MHz	100 kHz	-71dBm*

Table 6b. Spurious emissions regional requirements

* 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 ?? are permitted for each UARFCN used in the measurement.

6.7 Transmitting intermodulation

The transmitting 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 requirements

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 output power of the wanted signal to the output power of the intermodulation product when an interfering CW signal is added at a level below the wanted signal. Both the wanted signal power and the intermodulation product power are measured with a filter response that is root-raised cosine (RRC) with roll-off α=0.22 and with a bandwidth equal to the chip rate.
The requirement of transmitting intermodulation for carrier spacing 1.6MHz is prescribed in the Table 7

below.

Interference signal frequency offset	1.6MHz	3.2MHz
Interference signal level	[-40]dBc	
Minimum requirement of intermodulation products	[-35] dBc	[-45] dBc

Table 7. Transmitting intermodulation attenuation.

Note: This requirement is applicable to the 21 dBm power class 4 UE.

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 =0.22 in the frequency domain. The impulse response filter $RC_0(t)$ is

$$RC_0(t) = \frac{\sin(p\,\frac{t}{T_c}(1-a)) + 4a\,\frac{t}{T_c}\cos(p\,\frac{t}{T_c}(1+a))}{p\,\frac{t}{T_c}(1-(4a\,\frac{t}{T_c})^2)}$$

where the roll-off factor $a = 0.22$ and the chip duration: $T_c = \frac{1}{Chiprate} = 0.78125ms$

6.8.2 Modulation accuracy

The modulation accuracy is a measure of the difference between the measured waveform and the theoretical modulated waveform (the error vector). It is the square root of the ratio of the mean error vector power to the mean reference signal power expressed as a %. The measurement interval is one timeslot.

6.8.2.1 Minimum requirement

The modulation accuracy shall not be worse than 17.5 %.

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 the maximum 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 [ ] dB.

7. Receiver characteristics

7.1 General

Unless detailed the receiver characteristics 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 8 : Diversity characteristics for 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 combing 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 is the minimum receiver input power measured at the antenna port at which the BIT Error Rate BER does not exceed a specific value.

7.3.1 Minimum Requirements

Table 9 : Reference sensitivity level

Data rate	UE reference sensitivity level (dBm)	FER/BER
12.2 kbps	[-105] dBm	BER shall not exceed 0.001

7.4 Maximum input level

This is defined as the maximum receiver input power 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 10.

Table 10: Maximum input level

Parameter	Level	Unit
$\frac{DPCH\_Ec}{I_{or}}$	-7	dB
$\hat{I}_{or}$	-25	dBm/1.28 MHz

7.5 Adjacent Channel Selectivity (ACS)

Adjacent Channel Selectivity is a measure of the capability of the UE receiver to receive a wanted signal at its assigned channel frequency in the presence of adjacent channel signal at a given frequency offset from the center 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 BER shall not exceed 0.001 for the parameters specified in Table 11.

Table 11: Adjacent Channel Selectivity

Power Class	ACS	Units
4	[33]	dB

Parameter	Level	Unit
Data rate	12.2	kbps
Wanted signal	[ ]	dBm
Interfering signal	[ ]	dBm
Fuw (Modulated)	1.6	MHz

7.6 Blocking characteristics

The blocking characteristics is a measure of the receiver ability to receive a wanted signal at is assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels. 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 12 and table 13. For table 13 up to 24 exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size.

Table 12: In-band blocking

Parameter	Offset	Offset	Unit
Wanted Signal Level	<REFSENS> + 3 dB	<REFSENS> + 3 dB	dBm/1.28MHz
Unwanted Signal Level (modulated)	-56	-44	dBm/1.28 MHz
Blocking offset	3.2<|f-fo|<5	|f-fo|≥5	MHz

Table 13: Out of band blocking

Parameter	Band 1	Band 2	Band 3	Unit
Wanted Signal Level	<REFSENS> + 3 dB	<REFSENS> + 3 dB	<REFSENS> + 3 dB	dBm/1.28 MHz
Unwanted Signal Level (CW)	-44	-30	-15	dBm
Blocking offset	1840 <f <1885 1935 <f <1995 2040 <f <2095	1815 <f <1840 2095 <f <2120	1< f <1815 2120< f <12750	MHz

Note: On frequency regions 1885 <f< 1900 MHz, 1920 <f< 1935 MHz, 1995 <f< 2010 MHz and 2025<f< 2040 MHz, the appropriate in-band blocking or adjacent channel selectivity in section 7.5.1 shall be applied.

7.7 Spurious response characteristics

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 14.

Table 14: Spurious Response

Parameter	Level	Unit
Wanted Signal Level	<REFSENS> + 3 dB	dBm/1.28 MHz
Unwanted Signal Level (CW)	-44	dBm
Fcw	Spurious response frequencies	MHz

7.8 Intermodulation response 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 UE 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 static reference performance as specified in clause 7.3.1 should be met when the following signals are applied to the receiver;

The BER shall not exceed 0.001 for the parameters specified in table 15.

Table 15: Receive intermodulation characteristics

Parameter	Level	Unit
Wanted Signal Level	<REFSENS> + 3 dB	dBm/1.28 MHz
I_{ouw1}	-46	dBm
I_{ouw2}	-46	dBm/1.28MHz
Fuw1 (CW)	3.2	MHz
Fuw2 (Modulated)	6.4	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 spurious emission shall be:

1. Less than [-60dBm/ 1.28MHz] at the mobile station antenna connector, for frequencies within the UE receive band.
2. Less than [-57dBm/100kHz] at the mobile station antenna connector, for frequencies band from 9kHz to 1GHz.
3. Less than [-47dBm/100kHz] at the mobile station antenna connector, for frequencies band from 1GHz to 12.75GHz.

8 Performance requirements

8.1 General

The performance requirements for the UE in this section is specified for the measurement channels specified in Annex A and the test environments specified in Annex B.

8.2 Dynamic reference sensitivity performance

The minimum required dynamic reference sensitivity performance is specified according to the traffic rate and the propagation conditions.

8.2.1 Demodulation in AWGN Channel

The performance requirement in AWGN channel is determined by the Eb/I0 required for BER=10-3, 10-6. The BER is calculated for each of the possible data services.

8.2.1.1 Single link performance

The required Eb/I0 is described in Table 13.

Table 13: Eb/I0 required for BER=10-3, 10-6

Data services (BER)	Data rates (kbps)	Required E_b/I_0
Speech (10^{-3})	8	T.B.D.
Long Constrained Delay data bearer services (10^{-6})	64 2048	T.B.D. T.B.D.
Unconstrained Delay Data bearer services (10^{-6})	64 2048	T.B.D. T.B.D.

8.2.1.2 Multi link performance

The required Eb/I0 is described in Table 14.

Table 14: Eb/I0 required for BER=10-3, 10-6

Data services (BER)	Number of active links	Data rates (kbps)	Required E_b/I_0

Speech (10^{-3})	16	8	T.B.D.
Long Constrained Delay data bearer services (10^{-6})	16		T.B.D.
Unconstrained Delay Data bearer services (10^{-6})	16		T.B.D.

< The definition of the multi-link performance requirement is for further study >

8.2.2 Performance in multipath fading channels

The performance requirement of reverse link with/without TPC in multipath fading channels is determined by the Eb/I0 required for BER=10-3, 10-6. The BER is calculated for each of the possible data services.

8.2.2.1 Single link performance

8.2.2.1.1 Performance without TPC

The required Eb/I0 is described in Table 15.

Table 15: Eb/I0 required for BER=10-3, 10-6

Data services (BER)	Indoor (A), 3km/h		Pedestrian (A), 3km/h		Vehicular (A), 120km/h	
	Data rates	Required E_b/I_0	Data rates	Required E_b/I_0	Data rates	Required E_b/I_0
Speech (10^{-3})	8kbps	T.B.D.	8kbps	T.B.D.	8kbps	T.B.D.
Long Constrained Delay data bearer services (10^{-6})	64kbps 2048kbps	T.B.D. T.B.D.	64kbps 384kbps	T.B.D. T.B.D.	64kbps 144kbps 384kbps	T.B.D. T.B.D. T.B.D.
Unconstrained Delay Data bearer services (10^{-6})	64kbps 2048kbps	T.B.D. T.B.D.	64kbps 384kbps	T.B.D. T.B.D.	64kbps 144kbps 384kbps	T.B.D. T.B.D. T.B.D.

8.2.2.1.2 Performance with TPC

The required Eb/I0 is described in Table 16.

Table 16: Eb/I0 required for BER=10-3, 10-6

Data services (BER)	Indoor (A), 3km/h		Pedestrian (A), 3km/h		Vehicular (A), 120km/h	
	Data rates	Required E_b/I_0	Data rates	Required E_b/I_0	Data rates	Required E_b/I_0
Speech (10^{-3})	8kbps	T.B.D.	8kbps	T.B.D.	8kbps	T.B.D.

Long Constrained Delay data bearer services (10^{-6})	64kbps 2048kbps	T.B.D. T.B.D.	64kbps 384kbps	T.B.D. T.B.D.	64kbps 144kbps 384kbps	T.B.D. T.B.D. T.B.D.
Unconstrained Delay Data bearer services (10^{-6})	64kbps 2048kbps	T.B.D. T.B.D.	64kbps 384kbps	T.B.D. T.B.D.	64kbps 144kbps 384kbps	T.B.D. T.B.D. T.B.D.

8.2.2.2 Multi link performance

The required Eb/I0 is described in Table 17.

Table 17: Eb/I0 required for BER=10-3, 10-6

Data services (BER)	Number of active links	Data rates (kbps)	Required E_b/I_0
Speech (10^{-3})	N	8	T.B.D.

< The definition of the multi-link performance requirement is for further study >

8.3 Rx synchronisation characterisitics

8.3.1 Synchronisation performance

8.3.1.1 Search of other Cells

Search of other cells test is used to check whether the UE correctly searches and measures other Node B(s) during the specified operation.

8.3.1.1.1 Minimum requirement

TBD

8.3.2 Inter-Frequency Handover.

The UE has to have the ability to make an Inter-frequency handover. This type of handover can happen within a Node B or between two Node B(s). In TDD mode, the UE will use different time slot to measure the Node B operated at the other carrier frequency and to perform the procedure for inter-frequency handover. The related RF specification is the switch time of synthesiser from one carrier to the other.

8.3.2.1 Minimum requirement

The switch time of frequency synthesiser in UE from one carrier frequency to the other carrier frequency in the operation band is limited into 20us.

8.4 Timing requirements

8.4.1 Synchronization

The timing of the UE is determined during specified operation. Basically, the accuracy of timing in an UE is the same level of the frequency stability.

8.4.1.1 Minimum requirement

The accuracy of timing in an UE is the same level of the frequency stability. That is 0.1ppm.

Annex A (normative): Transmitting power levels versus time

When the transmitter in an UE is enable or disable, the transmitting power level will go up or down respectively within a period of 20us. The specification for transmitting power level versus time is shown in Figure A-1 below.

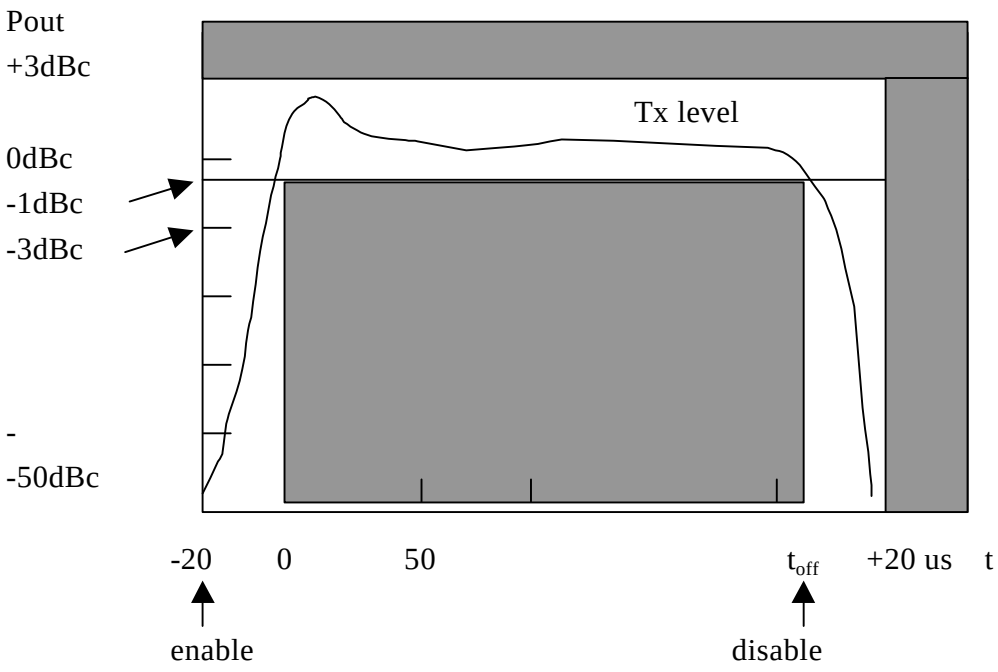

Figure A-1 The transmitting power level versus time, 0dBc means the nominal Tx power level

Annex B (normative): Propagation conditions

B.1 Test environments

The UE is measured in different environments i.e., static, indoor, outdoor to indoor and pedestrian, and vehicular environments. Each of these environments is modelled by typical channel models that are defined in this section.

Table B1 details the test services, the information data and the propagation conditions

Table B1: Test Environments for UE Performance Specifications

Test Services	Information Data Rate	Static	Multipath Case 1	Multipath Case 2	Multipath Case 3
		Performance metric			
Paging Message			-	-	-
FACH Message			-	-	-
Circuit Switched Services	12.2 kbps	BLER <	BLER <	BLER <	BLER <
	64 kbps	BLER <	BLER <	BLER <	BLER <
	144 kbps	BLER <	BLER <	BLER <	BLER <
	384 kbps	BLER <	BLER <	BLER <	BLER <
	2048 kbps	BLER <	-	-	-
Packet Switched Data	TBD	TBD	TBD	TBD	TBD

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 B2 shows propagation conditions that are used for the performance measurements in multi-path fading environment. All taps have classical Doppler spectrum.

ITU channel models[1] are used for the performance measurements in multipath fading channels. The channel models for indoor, indoor to outdoor and pedestrian, and for vehicular environments are depicted in Table B2 and Table B3 for 2 kinds of channel.

Case 1 (Indoor, 3km/h)		Case 2 (Indoor to Outdoor and Pedestrian, 3km/h)		Case 3 (Vehicular, 120km/h)	
Relative Delay [ns]	**Average Power [dB]**	**Relative Delay [ns]**	**Average Power [dB]**	**Relative Delay [ns]**	**Average Power [dB]**
0	0.0	0	0.0	0	0.0
50	-3.0	110	-9.7	310	-1.0
110	-10.0	190	-19.2	710	-9.0
170	-18.0	410	-22.8	1090	-10.0
290	-26.0			1730	-15.0
310	-32.0			2510	-20.0

Table B2 Channel models for Channel A

Case 1 (Indoor, 3km/h)		Case 2 (Indoor to Outdoor and Pedestrian, 3km/h)		Case 3 (Vehicular, 120km/h)	
Relative Delay [ns]	**Average Power [dB]**	**Relative Delay [ns]**	**Average Power [dB]**	**Relative Delay [ns]**	**Average Power [dB]**
0	0.0	0	0.0	0	-2.5
100	-3.6	200	-0.9	300	-0.0
200	-7.2	800	-4.9	8900	-12.8
300	-10.8	1200	-8.0	12900	-10.0
500	-18.0	2300	-7.8	17100	-25.2
700	-25.2	3700	-23.9	20000	-16.0

Table B3 Channel models for Channel B

[1] These channel models are the same that were used in simulations and evaluations of the system presented in ITU-R M.1225 1998"

Annex C (normative): Environmental conditions

C.1 General

This normative annex specifies the environmental requirements of the UE. Within these limits the requirements of these 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:

[+15]°C – [+35]° C for normal conditions (with relative humidity of 25 % to 75 %);

[-10]°C – [+55]°C for small UE units 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 S4.01A (?) 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.

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 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:

Frequency	**ASD (Acceleration Spectral Density) random vibration**
5 Hz to 20 Hz	0.96 m^2/s^3
20 Hz to 500 Hz	0.96 m^2/s^3 at 20 Hz, thereafter -3 dB/Octave

Outside the specified frequency range the UE, if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in S4.01A (?) for extreme operation.

History

Document history		
Version	Date	Description
V0.1.0	1999-05	Document created based on the 3GPP S25.102 V1.0.0 and the discussion between Siemens and CATT.
V1.0.0	1999-07	Revised with 3GPP S25.102 V1.1.0
V1.1.0	1999-08-06	Based on the discussion on CWTS#2 meeting in CUPT
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