

# S4.02A V1.0.1 (1999-04)

---

*Technical Specification*

**3<sup>rd</sup> Generation Partnership Project (3GPP);  
Technical Specification Group (TSG) RAN WG4;  
UTRA (UE) TDD; Radio Transmission and Reception**

---

**3GPP**

---

Reference

<Workitem> (<Shortfilename>.PDF)

---

Keywords

<keyword[, keyword]>

**3GPP**

---

Postal address

---

Office address

---

Internet

secretariat@3gpp.org  
Individual copies of this deliverable  
can be downloaded from  
<http://www.3gpp.org>

---

**Copyright Notification**

No part may be reproduced except as authorized by written permission.  
The copyright and the foregoing restriction extend to reproduction in all media.

©  
All rights reserved.

# Contents

Intellectual Property Rights .....	5
1 Scope .....	6
2 References .....	6
3 Definitions, symbols and abbreviations .....	7
3.1 Definitions.....	7
3.2 Symbols.....	7
3.3 Abbreviations .....	8
General.....	8
4.1 Measurement uncertainty .....	8
<b>5 Frequency bands and channel arrangement.....</b>	<b>9</b>
<b>5.1 General.....</b>	<b>9</b>
<b>5.2 Frequency bands .....</b>	<b>9</b>
<b>5.3 TX–RX frequency separation .....</b>	<b>9</b>
<b>5.4 Channel arrangement .....</b>	<b>9</b>
5.4.1 Channel spacing .....	9
5.4.2 Channel raster.....	9
5.4.3 Channel number.....	9
6 Transmitter characteristics .....	10
<b>6.1 General.....</b>	<b>10</b>
<b>6.2 Transmit power .....</b>	<b>10</b>
6.2.1 User Equipment maximum output power .....	10
<b>6.3 UE frequency stability .....</b>	<b>10</b>
<b>6.4 Output power dynamics .....</b>	<b>11</b>
6.4.1 Open loop power control.....	11
6.4.2 Closed loop power control .....	11
6.4.3 Power control steps .....	11
<b>6.4.3.1 Minimum Requirements.....</b>	<b>11</b>
6.4.4 Power control cycles per second .....	11
<b>6.4.4.1 Minimum Requirement .....</b>	<b>11</b>
6.4.5 Minimum transmit output power .....	11
<b>6.4.5.1 Minimum requirement .....</b>	<b>11</b>
<b>6.5 Transmit ON/OFF ratio .....</b>	<b>11</b>
6.5.1 Minimum Requirement.....	11
<b>6.6 DTX.....</b>	<b>12</b>
<b>6.6.1 Minimum Requirements.....</b>	<b>12</b>
<b>6.7 Output RF spectrum emissions .....</b>	<b>12</b>
6.7.1 Occupied bandwidth.....	12
6.7.2 Out of band emission.....	12
6.7.2.1 Spectrum emission mask .....	12
6.7.2.2 Adjacent Channel Leakage power Ratio (ACLR) .....	12
6.7.2.2.1 Minimum requirement .....	12
6.7.3 Spurious emissions .....	13
6.7.3.1 Minimum Requirement.....	13
<b>6.8 Transmit intermodulation .....</b>	<b>14</b>
6.8.1 Minimum requirement .....	14
<b>6.9 Modulation Accuracy .....</b>	<b>14</b>
<b>6.9.1 Minimum Requirement .....</b>	<b>14</b>
<b>7 Receiver characteristics .....</b>	<b>15</b>
<b>7.1 General.....</b>	<b>15</b>
<b>7.2 Diversity characteristics .....</b>	<b>15</b>
<b>7.3 Static reference sensitivity level .....</b>	<b>15</b>
7.3.1 Minimum Requirements .....	15

<b>7.4</b>	<b>Maximum input level</b> .....	15
7.4.1	Minimum Requirements .....	16
<b>7.5</b>	<b>Adjacent Channel Selectivity (ACS)</b> .....	16
<b>7.5.1</b>	<b>Minimum Requirement</b> .....	16
<b>7.6</b>	<b>Blocking characteristics</b> .....	16
<b>7.6.1</b>	<b>Minimum Requirement</b> .....	16
<b>7.7</b>	<b>Spurious response</b> .....	16
<b>7.8</b>	<b>Intermodulation characteristics</b> .....	17
<b>7.8.1</b>	<b>Minimum Requirements</b> .....	17
<b>7.9</b>	<b>Spurious emissions</b> .....	17
<b>7.9.1</b>	<b>Minimum Requirement</b> .....	17
<b>8</b>	<b>Performance requirement</b> .....	18
<b>8.1</b>	<b>General</b> .....	18
8.1.1	Test Environments.....	18
<b>8.2</b>	<b>Dynamic reference sensitivity performance</b> .....	18
8.2.1	Demodulation in non fading Channel.....	19
8.2.1.1	Demodulation of Paging Channel.....	19
8.2.1.1.1	Minimum requirement.....	19
8.2.1.2	Demodulation of Forward Access Channel .....	19
<b>8.2.1.2.1</b>	<b>Minimum Requirements</b> .....	19
8.2.1.3	Demodulation of Dedicated Traffic Channel.....	19
<b>8.2.1.3.1</b>	<b>Minimum Requirements</b> .....	19
8.2.2	Demodulation of DCH in Multi-path Fading Channel .....	19
8.2.2.1	Single Link Performance .....	19
<b>8.2.2.1.1</b>	<b>Minimum Requirements</b> .....	19
8.2.2.2	Multi Link Performance .....	19
<b>8.2.2.2.1</b>	<b>Minimum Requirements</b> .....	19
<b>8.3</b>	<b>Rx synchronisation characteristics</b> .....	20
8.3.1	Synchronization Performance.....	20
8.3.1.1	Search of other Cells .....	20
<b>8.3.1.1.1</b>	<b>Minimum requirements</b> .....	20
8.3.2	Inter-Frequency Handover.....	20
<b>8.3.2.1</b>	<b>Minimum Requirements</b> .....	20
<b>8.4</b>	<b>Timing requirements</b> .....	20
8.4.1	Synchronization.....	20
<b>8.4.1.1</b>	<b>Minimum Requirements</b> .....	20
Annex A (normative): Transmit power levels versus time.....		21
Annex B (normative): Propagation conditions .....		22
B.1	Test Environments.....	22
B.2	Channel Models.....	22
B.3	Measurement Configurations ( to be deleted in future revisions).....	23
<b>Annex C (normative): Environmental conditions</b> .....		24
C.1	General .....	24
C.2	Environmental requirements for the UE.....	24
C.2.1	Temperature .....	24
C.2.2	Voltage .....	24
C.2.3	Vibration .....	25
History .....		26

---

## Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETR 314: "Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards", which is available **free of charge** from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<http://www.etsi.fr/ipr>).

Pursuant to the ETSI Interim IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETR 314 (or the updates on <http://www.etsi.fr/ipr>) which are, or may be, or may become, essential to the present document.

---

## 1 Scope

This document establishes the minimum RF characteristics of the TDD mode of UTRA for the User Equipment (UE). ~~<editor—the current version only covers the UE (mobile station aspects)>~~

---

## 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.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

## 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 transmit 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 transmit 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 power	The average transmitter output power obtained over any specified time interval, including periods with no transmission, when the transmit time slots 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>
<u>Received Signal Code Power (RSCP)</u>	<u>Given only signal power is received, the average power of the received signal after despreading and combining.</u>
<u>Interference Signal Code Power (ISCP)</u>	<u>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</u>

### 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:

ACPR	Adjacent Channel Power Ratio
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)
EIRP	<del>Equivalent</del> Effective Isotropic Radiated Power
FDD	Frequency Division Duplexing
FER	Frame Error Rate
PPM	Parts Per Million
RSSI	Received Signal Strength Indicator
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

---

## 4 StatusGeneral

~~The main objective of this section is to provide summary of the approval status of the various section of this document. The level of progress is defined as follows;~~

- ~~— No proposal exists~~
- ~~— A proposal(s) exists but no working assumption has been made~~
- ~~— A working assumption has been made.~~
- ~~— This section is assumed to be finalised.~~

Section number	Section description	Status

### 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 chip rate of 4.096 Mcps.

Note

1. 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  
Deployment of TDD in the 1920-1980 MHz 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 frame consists of 16 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 optimize 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).

## 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.](#)

### 6.2 Transmit power

#### 6.2.1 User Equipment 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]
6	[ 0 ] 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 transmit 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 for further study.
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 classes 5 and 6 are envisaged for unlicensed operation.
5. 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 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.

AFC	Frequency stability
ON	within $\pm [0.1]$ PPM

### 6.4 Output power dynamics

Power control is used to limit the interference level.

### 6.4.1 Open loop power control

Open loop power control is the ability of the UE transmitter to 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 transmit power.

The UE open loop power control error shall be less than  $[+/-9]$ dB.

### 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 downlink.

### 6.4.3 Power control steps

The power control step is the minimum step change in the UL transmitter output power in response to a TPC message.

#### 6.4.3.1 Minimum Requirements

The mobile station transmitter shall have the capability of setting power with a step of  $[1 - 3]$  dB.

### 6.4.4 Power control cycles per second

The 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 as follows:  $[100 - 800]$  Hz.

The minimum rate of  $[100]$  Hz is to ensure that every frame is power controlled. The maximum rate may differ for open and closed loop power control.

### 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 indicates a minimum transmit output power is required.

#### 6.4.5.1 Minimum requirement

The minimum transmit power shall be better than is  $[-44]$  dBm /4.096MHz].

## 6.5 Transmit ON/OFF ratio

Transmit ON/OFF ratio is defined as the ratio of the maximum output transmit power within the channel bandwidth with the transmitter ON and OFF.

### 6.5.1 Minimum Requirement

The minimum requirement of transmitting ON/OFF ratio is  $[-50]$  dBm /4.096MHz].

## 6.6 DTX

DTX is a function with the object of minimizing interference of UE against other UE. It can minimize transmitting power from UE, when voice information, user information or control information is not present.

## 6.6.1 Minimum Requirements

The transmitting power ratio and the timing is for further study:

## 6.7 Output RF spectrum emissions

### 6.7.1 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 less than 5 MHz based on a chip rate of 4.096 Mcps.

### 6.7.2 Out of band emission

Out of band emissions are unwanted emissions immediately outside the [channel] bandwidth resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. This out of band emission limit can be specified in terms of a spectrum emission mask or adjacent channel power ratio for the transmitter.

#### 6.7.2.1 Spectrum emission mask

The emission mask will be different for the type of UE(s) and may depend on the power class, single / multi-code allocation slotted mode, etc.

#### 6.7.2.2 Adjacent $\epsilon$ Channel Leakage power $\neq$ Ratio (ACPRACLR)

Adjacent  $\epsilon$ Channel Leakage power  $\neq$ Ratio (ACPRACLR) is the ratio of the transmitted power to the power measured after a receive filter in the adjacent channel(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 chip rate. within a reference bandwidth of [4.096 MHz] to the power measured within a reference bandwidth of [4.096 MHz] centered on the adjacent(s) channel(s).

##### 6.7.2.2.1 ACPR $m$ Minimum requirement

UE channel	<u>ACPR</u> <u>ACL</u> R limit
$\pm$ First adjacent channel	[ ] dB
$\pm$ Second adjacent channel	[ ] dB

Table 3, UE ACPRACLR

Note

1. The ACPR due to switching transients shall not exceed the limits in the above table. In order to ensure that switching transients due to slotted or DTX mode does not degrade the ACPR value the reference measurement conditions are an item for further study.
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.
3. This item is for further study and is based on system scenario and implementation

### 6.7.3 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. is an item for further study. Guidance can be taken from the applicable tables from ITU-R Recommendations SM.329 and from the ERC Recommendations that are currently under progress.

### 6.7.3.1 Minimum Requirement

The minimum requirement is shown in Table xx

Frequency Bandwidth	Resolution 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
$1 \text{ GHz} \leq f < 11 \text{ GHz}$	1 MHz	-36 dBm
$9 \text{ kHz} \leq f < 30 \text{ MHz}$	1 kHz (for $9 \text{ kHz} < f < 150 \text{ kHz}$ ) 10 kHz (for $150 \text{ kHz} < f < 30 \text{ MHz}$ )	{ -36 dBm }
$30 \text{ MHz} \leq f < 1 \text{ GHz}$	100 kHz	{ -36 dBm }
$1 \text{ GHz} \leq f < (f_c - \text{NB} * 14.5) \text{ MHz}$ {except for $1893.5 \text{ MHz} \leq f \leq 1919.6 \text{ MHz}$ }	1 MHz	{ -30 dBm }
$(f_c - \text{NB} * 14.5) \text{ MHz} \leq f < (f_c + \text{NB} * 14.5) \text{ MHz}$ {except for $(f_c - \text{NB} * 2.5) \text{ MHz} \leq f < (f_c + \text{NB} * 2.5) \text{ MHz}$ and $1893.5 \text{ MHz} \leq f \leq 1919.6 \text{ MHz}$ }	300 kHz	{ -36 dBm }
$(f_c + \text{NB} * 14.5) \text{ MHz} \leq f < 11 \text{ GHz}$	1 MHz	{ -30 dBm }

Table xx Minimum Requirement for spurious Spurious emissions requirements

Frequency Bandwidth	Resolution Bandwidth	Minimum requirement
$1893.5 \text{ MHz} < f < 1910 \text{ MHz}$	300 kHz	-40 dBm

Table xx Spurious emissions regional requirements

#### Notes

1) NB — Necessary Bandwidth (5 MHz)

2)  $f_c$  — Center frequency of the carrier.

3)  $f$  — frequency to be prescribed.

4) [The minimum requirement -40 dBm is applied to  $1893.5 \text{ MHz} \leq f \leq 1919.6 \text{ MHz}$  for further study and need to take account of other regional requirements]

## 6.8 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.

### 6.8.1 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 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.

The requirement of transmitting intermodulation for carrier spacing 5 MHz is prescribed in the Table 5.1.1.6.1 below.

Interference Signal Frequency Offset	5MHz	10MHz
Interference Signal Level	[-40]dBc	
Minimum Requirement	[-35dBc]	[-45]dBc

Table 5.1.1.6.1 Minimum Requirement for Transmitting Intermodulation

## 6.9 Modulation Accuracy

~~Modulation accuracy is the ability of the transmitter to generate the ideal signal. The difference between the measured and the theoretical modulated waveform is the modulation accuracy.~~

~~The modulation accuracy is defined by the rms. value of errors in signaling points, i.e. the square root of the value which is obtained by dividing the sum of squared errors over a slot by the number of symbols. 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.~~

### 6.9.1 Minimum Requirement

~~The waveform quality factor, the rms. value of vector errors shall be [12.5%] or less. The modulation accuracy shall not exceed [ ] %.~~

## 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.](#)

### 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:

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.

Table 6, Diversity characteristics for UTRA/TDD.

### 7.3 Static 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

Data rate	UE reference sensitivity level (dBm)	[FER/BER]

Note

1. Definition of the user channel needs to be clarified

### 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 static [FER/BER] reference performance as specified in section 7.3.1 shall be met over a receiver input range of [ ] dB above the specified reference sensitivity level.

## 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 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 static reference performance as specified in section 7.3.1 should be met when the following signals are applied to the receiver;

- A wanted signal at the assigned channel frequency, 3dB above the static reference level
- A modulated interfering adjacent channel signal with a level of [ ] dBm

## 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 static reference performance as specified in section 7.3.1 should be met when the following signals are applied to the receiver;

- A wanted signal at the assigned channel frequency, 3dB above the static reference level
- A CW interfering signal at [frequency(s)] offset from the assigned channel below a level of [ ] dBm

## 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. <only applies to out of band text required>

The static reference performance as specified in clause [ ] should be met when the following signals are applied to the receiver;

- A wanted signal at the assigned channel frequency, 3 dB above the static reference level.
- A CW interfering signal below a level of [ ] dBm.
- The number of allowed spurious responses is an item for further study.

## 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**

## **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/4.096MHz] 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 requirement

### 8.1 General

Performance requirements are specified for a number of test environments and multi-path channels.

#### 8.1.1 Test Environments

The UE is specified in a number of 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 Annex B.

The UE shall be able to receive different channels transmitted from BS for it. These channels may have different bit rates and different BER/FER requirements. Table 5.4.1-1 describes shortly test environments.

Test Services	Static	Indoor Office 3 km/h	Outdoor to Indoor and Pedestrian 3 km/h	Vehicular 120 km/h
	Information Data Rate,  Performance metric	Information Data Rate,  Performance metric	Information Data Rate,  Performance metric	Information Data Rate,  Performance metric
Paging Message	TBD	-	-	-
FACH Message	TBD			
Speech	TBD	TBD	TBD	TBD
Circuit Switched Data	TBD	TBD	TBD	TBD
Packet Switched Data	TBD	TBD	TBD	TBD

Table 5.4.1-1 Test Environments for MS Performance Specifications

### 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 non fading Channel

### 8.2.1.1 Demodulation of Paging Channel

#### 8.2.1.1.1 Minimum requirement

### 8.2.1.2 Demodulation of Forward Access Channel

#### 8.2.1.2.1 Minimum Requirements

### 8.2.1.3 Demodulation of Dedicated Traffic Channel

#### 8.2.1.3.1 Minimum Requirements

## 8.2.2 Demodulation of DCH in Multi-path Fading Channel

### 8.2.2.1 Single Link Performance

The receive characteristic of the Dedicated Traffic Channel (DTCH) in the non-fading fading environments is determined by the average bit error rate (BER). BER is specified for the each individual data rate specified of the DTCH. DTCH is mapped into the Dedicated Physical Channel (DPCH).

#### 8.2.2.1.1 Minimum Requirements

### 8.2.2.2 Multi Link Performance

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

#### 8.2.2.2.1 Minimum Requirements

## **8.3 Rx synchronisation characteristics**

### **8.3.1 Synchronization 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 BS(s) during the specified operation.

##### **8.3.1.1.1 Minimum requirements**

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 BS or between two BS(s). Currently [ARIB Vol. 3] does not define requirements for Inter-frequency handover. <This item is ffs>

#### **8.3.2.1 Minimum Requirements**

TBD

## **8.4 Timing requirements**

### **8.4.1 Synchronization**

The timing of the UE is determined during specified operation.

#### **8.4.1.1 Minimum Requirements**

TBD

---

## Annex A (normative): Transmit power levels versus time

## 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 .

The UE shall be able to receive different channels transmitted from BS for it. These channels may have different bit rates and different BER/FER requirements. Table B1 describes shortly test environments.

Test Services	Static	Indoor Office 3 km/h	Outdoor to Indoor and Pedestrian 3 km/h	Vehicular 120 km/h
	Information Data Rate, Performance metric	Information Data Rate, Performance metric	Information Data Rate, Performance metric	Information Data Rate, Performance metric
Paging Message				
FACH Message				
Speech				
Circuit Switched Data	64, 384, 2048 kbps, BER < 10 <sup>-6</sup>	64, 384 kbps BER < 10 <sup>-6</sup>	64, 384 kbps BER < 10 <sup>-6</sup>	64, 144 kbps BER < 10 <sup>-6</sup>
Packet Switched Data	TBD	TBD	TBD	TBD

Table B1 Test Environments for UE Performance Specifications

### B.2 Channel Models

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

Modified ITU channel models<sup>1</sup> are used for the performance measurements in multi-path fading channels. The channel models for indoor, indoor to outdoor and pedestrian, and for vehicular environments are depicted in Table B2

<sup>1</sup> These channel models are the same that were used in simulations and evaluations of the system presented in "Japan's Proposal for Candidate Radio Transmission Technology on IMT-2000, W-CDMA, June 1998"

Indoor		Indoor to Outdoor and Pedestrian		Vehicular	
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
244	-9.6	244	-12.5	244	-2.4
488	-33.5	488	-24.7	488	-6.5
				732	-9.4
				976	-12.7
				1220	-13.3
				1708	-15.4
				1952	-25.4

Table B2 Channel Models for Non-Static Environments

### B.3 Measurement Configurations ( to be deleted in future revisions)

In all measurements the UE should transmit with maximum power while receiving signals from the BS. Transmission power control is always disabled during the measurements. Chip rate is specified to be 4.096 MHz.

## 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:

$+15^{\circ}\text{C} - +35^{\circ}\text{C}$  for normal conditions (with relative humidity of 25 % to 75 %);

$-10^{\circ}\text{C} - +55^{\circ}\text{C}$  for small UE units extreme conditions (see IEC publications 68-2-1 and 68-2-2)

$-20^{\circ}\text{C} - +55^{\circ}\text{C}$  For other 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	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:

<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.

## History

Document history		
V0.0.1	1999-02-01	Document created based on S4.01A v0.0.2 "UTRA (UE) FDD, radio transmission and reception"
V0.0.2	1999-02-25	Editorial update after WG4#2 for distribution on the e-mail reflector.
<u>V1.0.0</u>	<u>1999-03-02</u>	<u>Version presented to TSG RAN for information (identical to version 0.0.2)</u>
<u>V1.0.1</u>	<u>1999-04-13</u>	<u>Update according to decisions at TSG RAN WG4#3 in Tokyo, Japan, sent to WG4 e-mail reflector for comments</u>
<p>Editor for UMTS S4.02(UE) is:</p> <p><u>Meik Kottkamp</u></p> <p><u>Siemens AG</u></p> <p><u>Tel: +49 89 722 36223</u></p> <p><u>Fax: +49 89 722 24450</u></p> <p><u>E-Mail: meik.kottkamp@icn.siemens.de</u></p> <p>This document is written in Microsoft Word 7</p>		