TSG RAN ~~Working Group 4 (Radio)~~ #2
TSGR#2-(99)114
2 - 4 March 99, Fort Lauderdale

Source: **RAN WG 4 Chairman**
Agenda item: 6.4

3GPP TSG RAN WG4
S4.01Av0.0.3 (1999-02)

UTRA (UE) FDD; Radio transmission and reception

3GPP

Contents

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Foreword

1 Scope

This document establishes the minimum RF characteristics of the FDD mode of UTRA.

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.

[1]

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. <Editor: 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. <Editor: The average power at the maximum power setting would also be consistent with defining a long term average power>

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
BS	Base Station
CW	Continuous wave (unmodulated signal)
DL	Down link (forward link)
EIRP	Equivalent 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

3.4 CDMA Terms

Chip Rate	Chip rate of W-CDMA system, equals to 4.096 M chips per second.
CPCH	Common Physical Channel.
$CPCH\_E_c$	Average energy per PN chip for CPCH.
$Data\_E_c$	Average energy per PN chip for the DATA fields in the DPCH.
$Data\ \frac{E_c}{I_o}$	The ratio of the received energy per PN chip for the DATA fields of the DPCH to the total received power spectral density at the UE antenna connector.
$\frac{Data\_E_c}{I_{or}}$	The ratio of the average transmit energy per PN chip for the DATA fields of the DPCH to the total transmit power spectral density.
DPCH	Dedicated Physical Channel
$DPCH\_E_c$	Average energy per PN chip for DPCH.
$\frac{DPCH\_E_c}{I_{or}}$	The ratio of the received energy per PN chip of the DPCH to the total received power spectral density at the UE antenna connector.
DTCH	Dedicated Traffic Channel, which is mapped into Dedicated Physical Channel. DTCH contains the user data.
E_b	Average energy per information bit for the Perch Channel, DPCH CPCH, PCH, and for FACH at the UE antenna connector.
$\frac{E_b}{N_t}$	The ratio of combined received energy per information bit to the effective noise power spectral density for the Perch Channel, DPCH CPCH, PCH, and for the FACH at the UE antenna connector. Following items are calculated as overhead: pilot, TPC, RI, CRC, tail, repetition, convolution coding and Turbo coding.
E_c	Average energy per PN chip.

$\frac{E_c}{I_{or}}$	The ratio of the average transmit energy per PN chip for different fields or physical channels to the total transmit power spectral density.
FACH	Forward Access Channel
Information Data Rate	Rate of the user information, which must be transmitted over the Air Interface. For example, output rate of the voice codec.
I_o	The total received power spectral density, including signal and interference, as measured at the UE antenna connector.
I_{oc}	The power spectral density of a band limited white noise source (simulating interference from other cells) as measured at the UE antenna connector.
I_{or}	The total transmit power spectral density of the Forward link at the base station antenna connector.
$\hat{I}_{or}$	The received power spectral density of the Forward link as measured at the UE antenna connector.
N_t	The effective noise power spectral density at the UE antenna connector.
OCNS	Orthogonal Channel Noise Simulator, a mechanism used to simulate the users or control signals on the other orthogonal channels of a Forward link.
$OCNS\_E_c$	Average energy per PN chip for the OCNS.
$\frac{OCNS\_E_c}{I_{or}}$	The ratio of the average transmit energy per PN chip for the OCNS to the total transmit power spectral density.
PCH	Paging Channel
$Perch\ \frac{E_c}{I_o}$	The ratio of the received Perch Channel energy per chip to the total received power spectral density at the UE antenna connector.
$\frac{Perch\_E_c}{I_{or}}$	The ratio of the average transmit energy per PN chip for the Perch Channel to the total transmit power spectral density.
$Pilot\_E_c$	Average energy per PN chip for the Pilot field in the DPCH.
$Pilot\ \frac{E_c}{I_o}$	The ratio of the received energy per PN chip for the Pilot field of the DPCH to the total received power spectral density at the UE antenna connector.
$\frac{Pilot\_E_c}{I_{or}}$	The ratio of the average transmit energy per PN chip for the Pilot field of the DPCH to the total transmit power spectral density.
RI_E_c	Average energy per PN chip for the Rate Information field in the DPCH.
$RI\ \frac{E_c}{I_o}$	The ratio of the received energy per PN chip for the Rate Information field of the DPCH to the total received power spectral density at the UE antenna connector.
$\frac{RI\_E_c}{I_{or}}$	The ratio of the average transmit energy per PN chip for the Rate Information field of the DPCH to the total transmit power spectral density.
TPC_E_c	Average energy per PN chip for the Transmission Power Control field in the DPCH.
$TPC\ \frac{E_c}{I_o}$	The ratio of the received energy per PN chip for the Transmission Power Control field of the DPCH to the total received power spectral density at the UE antenna connector.
$\frac{TPC\_E_c}{I_{or}}$	The ratio of the average transmit energy per PN chip for the Transmission Power Control field of the DPCH to the total transmit power spectral density.

3.5 CDMA Equations

The equations listed below describe the relationship between various parameters under different conditions.

3.5.1 BS Transmission Power

Transmit power of the Base Station is normalized to 1 and can be presented as

$$\frac{Perch\_E_c}{I_{or}}+\frac{Pilot\_E_c}{I_{or}}+\frac{TPC\_E_c}{I_{or}}+\frac{RI\_E_c}{I_{or}}+\frac{DATA\_E_c}{I_{or}}+\frac{CPCH\_E_c}{I_{or}}+\frac{OCNS\_E_c}{I_{or}}=1.$$

Dedicated Physical Channel consists of four different fields. Therefore, it can be shown that

$$\frac{DPCH\_E_c}{I_{or}} = \frac{Pilot\_E_c}{I_{or}} + \frac{TPC\_E_c}{I_{or}} + \frac{RI\_E_c}{I_{or}} + \frac{DATA\_E_c}{I_{or}} .$$

Hence, transmit power of Base Station can be presented also as

$$\frac{Perch\_E_c}{I_{or}} + \frac{DPCH\_E_c}{I_{or}} + \frac{CPCH\_E_c}{I_{or}} + \frac{OCNS\_E_c}{I_{or}} = 1 .$$

3.5.2 Rx Signal Strength for UE Not in Handoff (non-fading Channel)

For Perch channel we get

$$Perch\ \frac{E_c}{I_o} = \frac{\frac{Perch\_E_c}{I_{or}}}{\frac{I_{oc}}{\hat{I}_{or}} + 1}$$

and for a Dedicated Physical Channel

$$DPCH\ \frac{E_c}{I_o} = \frac{\frac{DPCH\_E_c}{I_{or}}}{\frac{I_{oc}}{\hat{I}_{or}} + 1} .$$

For the Common Physical Channel we get

$$CPCH\ \frac{E_c}{I_o} = \frac{\frac{CPCH\_E_c}{I_{or}}}{\frac{I_{oc}}{\hat{I}_{or}} + 1} .$$

E_b/N_t for the Perch channel is given as

$$Perch\ \frac{E_b}{N_t} = \frac{\frac{Perch\_E_c}{I_{or}} \times \frac{Chip\ Rate}{Information\ Data\ Rate}}{\frac{I_{oc}}{\hat{I}_{or}}} .$$

The same for Dedicated Traffic Channels is given as

$$DTCH\ \frac{E_b}{N_t} = \frac{\frac{DPCH\_E_c}{I_{or}} \times \frac{Chip\ Rate}{Information\ Data\ Rate}}{\frac{I_{oc}}{\hat{I}_{or}}} ,$$

Similar equations can be derived for the Paging Channel and for the Forward Access Channel. For the Paging Channel we get

$$PCH\ \frac{E_b}{N_t} = \frac{\frac{CPCH\_E_c}{I_{or}} \times \frac{Chip\ Rate}{Paging\ Data\ Rate}}{\frac{I_{oc}}{\hat{I}_{or}}} ,$$

and the same for FACH is given as

$$FACH\ \frac{E_b}{N_t} = \frac{\frac{CPCH\_E_c}{I_{or}} \times \frac{Chip\ Rate}{Control\ Data\ Rate}}{\frac{I_{oc}}{\hat{I}_{or}}} .$$

3.5.3 Rx Strength for UE Not in Handoff (Non-fading Channel)

Let us assume that the sum of the channel tap powers is equal to one in multi-path channel with L taps, i.e.,

$$\sum_{i=1}^{L} a_i^{\,2} = 1\,,$$

where a_i represent the complex channel coefficient of the tap i. When assuming that a receiver combines all the multi-paths E_b/N_t for Perch channel is given as

$$Perch\,\frac{E_b}{N_t} = \frac{Perch\_E_c}{I_{or}} \times \frac{Chip\ Rate}{Information\ Data\ Rate} \times \sum_{i=1}^{L} \frac{a_i^{\,2}}{\frac{I_{oc}}{\hat{I}_{or}} + \left(1 - a_i^{\,2}\right)}\,.$$

As an example E_b/N_t for Perch channel in Indoor channel is

$$Perch\,\frac{E_b}{N_t} = \frac{Perch\_E_c}{I_{or}} \times \frac{Chip\ Rate}{Information\ Data\ Rate} \times \left(\frac{0.900824}{\frac{I_{oc}}{\hat{I}_{or}} + 0.099176} + \frac{0.098773}{\frac{I_{oc}}{\hat{I}_{or}} + 0.901227} + \frac{0.000402}{\frac{I_{oc}}{\hat{I}_{or}} + 0.999598} \right).$$

Using the same assumptions, E_b/N_t for Dedicated Traffic Channels is given as

$$DTCH\,\frac{E_b}{N_t} = \frac{DPCH\_E_c}{I_{or}} \times \frac{Chip\ Rate}{Information\ Data\ Rate} \times \sum_{i=1}^{L} \frac{a_i^{\,2}}{\frac{I_{oc}}{\hat{I}_{or}} + \left(1 - a_i^{\,2}\right)}\,.$$

3.5.4 Rx Signal Strength for UE in two-way Handover

When the received power from each cell is $\hat{I}_{or}$ we get for each Perch Channel

$$Perch\,\frac{E_c}{I_o} = \frac{\frac{Perch\_E_c}{I_{or}}}{\frac{I_{oc}}{\hat{I}_{or}} + 2}\,.$$

If the power received from cell 1 and cell 2 are $\hat{I}_{or1}$ and $\hat{I}_{or2}$, respectively, then

$$Perch\,\frac{E_c}{I_o}(Cell\ 1) = \frac{\frac{Perch\_E_c}{I_{or1}}}{\frac{I_{oc}}{\hat{I}_{or1}} + \frac{\hat{I}_{or2}}{\hat{I}_{or1}} + 1}$$

and

$$Perch\,\frac{E_c}{I_o}(Cell\ 2) = \frac{\frac{Perch\_E_c}{I_{or2}}}{\frac{I_{oc}}{\hat{I}_{or2}} + \frac{\hat{I}_{or1}}{\hat{I}_{or2}} + 1}\,.$$

Similarly,

$$DTCH\,\frac{E_b}{N_t} = \frac{DPCH\_E_c}{I_{or}} \times \frac{Chip\ Rate}{Information\ Data\ Rate} \times \sum_{i=1}^{L} \frac{2a_i^{\,2}}{\frac{I_{oc}}{\hat{I}_{or}} + 1 + \left(1 - a_i^{\,2}\right)}$$

4 if the channel is non-static.

Status

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**
5.1	General	Final draft
5.2	Frequency band	Final draft
5.3	Tx-Rx frequency separation	Final draft
5.4	Channel arrangement	Final draft. Working assumption channel raster = 200 kHz
6.2.	Transmit power	Final draft ❑ Working assumption is one UE power class should be +21 dBm ❑ Need for power class 5 and 6 is FSS ❑ Tolerance is FFS ❑ All the User Equipment(s) employing the above power classes shall meet the applicable RF emission specification(s). The means for meeting such specification such as limiting the long-term average power and associated control mechanism are items for further study
6.6.2.2	Adjacent channel power ratio	This value is FFS based on system scenario and implementation
6.6.3	Spurious emission	This value is FFS
6.8	Modulation accuracy	This value is FFS to provide a single definition
7.2	Diversity characteristics	Working assumption is there are three forms of diversity; time, frequency and antenna
7.4	Maximum input range	Requirement changed to specify maximum input level rather than dynamic range.
7.7	Spurious response	The number of allowed out of band spurious response is FFS
8	Performance requirement	This section is FFS

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

(a) 1920 – 1980MHz: Up-link (Mobile transmit, base receive)
2110 – 2170MHz: Down-link (Base transmit, mobile receive)

(b) [FFS; for deployment in ITU Region 2]

Deployment in other frequency bands is not precluded.

5.3 TX–RX frequency separation

(a) The minimum transmit to receive frequency separation is [134.8 MHz] and the maximum value is [245.2 MHz] when operating in the paired band defined in sub-clause 5.2 (a). A possible value is 190 MHz
(b) UTRA/FDD can support both fixed and variable transmit to receive frequency separation. [The specific limits are yet to be determined]
(c) The use of other transmit to receive frequency separations in other frequency bands shall not be precluded.

5.4 Channel arrangement

5.4.1 Channel spacing

The nominal channel spacing is 5 MHz, but this can be adjusted to 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.

6.2 Transmit power

6.2.1 UE maximum output power

The following Power Classes define the maximum output power;

Table 1:UE Power Classes

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]

Note

1. The maximum output power refers to the measure of power when averaged over the transmit timeslot at the maximum power control setting.
2. The tolerance of the maximum output power is below the prescribed value even for the multi-code transmission mode
3. The need for power classes 5 and 6 is for further study.
4. For UE using directive antennas for transmission, a class dependent limit will be placed on the maximum Equivalent Isotropic Radiated Power (EIRP).

6.3 Frequency stability

The UE carrier frequency shall be accurate to within ±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 ±0.1PPM figure.

Table 2: Frequency stability

AFC	Frequency stability
ON	within ± 0.1 PPM

6.4 Output power dynamics

Power control is used to limit the interference level

6.4.1 Open loop power control

Open loop power control is the ability of the UE transmitter to sets its output power to a specific value

The 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 down-link.

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 requirement

The UE transmitter shall have the capability of setting the closed loop output power with a step size of 1 dB.

(a) The tolerance of the transmitter output power due to closed loop power control shall be within the range shown in Table 3.
(b) The average rate of change in mean power shall be greater than [8.0] dB per [10] slots and less than [12.0] dB per [10] slots
(c) Following the reception of a valid power control bit, the mean output power of the UE shall be within [0.3] dB of its final value in less than [62.5] us from the beginning of the next slot.

Table 3: Transmitter power control tolerance

TPC Symbol in the forward-link	Transmitter power control tolerance	
	Lower	Upper
11	+[0.5]dB	+[1.5]dB
00	-[0.5]dB	-[1.5]dB

6.4.4 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 transmit output power is required.

6.4.4.1 Minimum requirement

The minimum transmit power is –44 dBm /4.096MHz

6.4.5 Power control cycles per second

The maximum rate of change for the UL/DL transmitter power control step.
Up link (UL) 1.6 kHz
Down link (DL) 1.6 kHz

6.5 Transmit OFF power

This 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 is –50 dBm /4.096 MHz

6.6 DTX

DTX is used to minimize the interference between UE(s) by reducing the UE transmit power when voice information, user information or control information is not present. Under DTX control, the DTX requirements is defined in terms of the transmitting power ratio and timing as follows:
(a) Both DPDCH and DPCCH transmission is ON in the reverse link.
(b) In case of no information after (a), DPDCH transmission is OFF
(c) In case synchronism is out of range after section (b), DPCCH transmission is OFF in the reverse link.

6.6.1 Minimum requirement

The transmitting power ratio and the timing should be in the range indicated in figure 1

Figure 1; DTX 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, centered on the assigned channel frequency. The occupied channel bandwidth is less than 5 MHz based on a chip rate of 4.096 Mcps.

6.6.2 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.

6.6.2.1 Spectrum emission mask

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

6.6.2.2 Adjacent channel power ratio (ACPR)

Adjacent channel power ratio (ACPR) is the ratio of the transmitted power 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).

6.6.2.2.1 Minimum requirement

Table 4:UE ACPR

UE channel	ACPR limit
± First adjacent channel	[35] dB
± Second adjacent channel	[45] dB

Note

1. The ACPR due to switching transients shall not exceed the limits in table 4. 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

6.6.3 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 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.

6.6.3.1 Minimum requirement

Table 5: Spurious emissions requirements

Frequency Bandwidth	**Resolution Bandwidth**	**Minimum requirement**
9kHz ≤ f < 30MHz	1kHz(for 9kHz<f<150kHz) 10kHz (for 150kHz < f <30MHz)	-36dBm
30MHz ≤ f < 1GHz	100kHz	-36dBm
1GHz ≤ f < (fc-NB*14.5)MHz [except for 1893.5MHz ≤ f ≤ 1919.6MHx]	1MHz	-30dBm
(fc-NB*14.5) MHz ≤ f < (fc+NB*14.5)MHz [except for (fc-NB*2.5) MH ≤ f < (fc+NB*2.5) MHz and 1893.5MHz ≤ f ≤ 1919.6MHz]	300kHz	-36dBm
(fc+NB*14.5)MHz ≤ f < 11GHz	1MHz	-30dBm

Note

1. NB Necessary Bandwidth (5 MHz)
2. fc- Center frequency of the carrier.
3. f Frequency to be prescribed.
4. [The minimum requirement of –40 dBm applied to 1893.5MHz ≤ f ≤ 1919.6 MHz is for further study and need to take into account other regional requirements]

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 output power of the wanted signal to the output power of the intermodulation product when an interfering signal is added at a level below the wanted signal. The requirement of transmitting intermodulation for a carrier spacing of 5 MHz is prescribed in Table 6

Table 6: Transmit Intermodulation

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

6.8 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. In addition, the Modulation accuracy can also defined by the waveform quality factor Rho

6.8.1 Minimum requirement

The waveform quality factor, Rho shall be greater than [0.9444] and the rms. value of vector errors shall be [12.5%] R.M.S or less. The origin offset is at least [-20] dBc or less.

7.0 Receiver characteristics

7.1 General

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

7.2 Diversity characteristics

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

Table 6: Diversity characteristics for UTRA/FDD

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

7.3 Static reference sensitivity level

The static 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 requirement

The BER shall not exceed 0.001 for the parameters specified in table 7

Table 7: Test parameters for static reference sensitivity

Parameter	Level	Unit
$\frac{Perch\_Ec}{I_{or}}$	[-1]	dB
$\frac{DPCH\_Ec}{I_{or}}$	[-7 (*)]	dB
$\hat{I}_{or}$	[-110]	dBm/4.096 MHz
User bit rate	[12.2]	kbps
Channel symbol rate	[32]	ksps
Rate information	On	

Note

1. Definition of the user channel needs to 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 requirement

The BER shall not exceed 0.001 for the parameters specified in table 8

Table 8: Maximum input power

Parameter	Level	Unit
User bit rate	[12.2]	kbps
Channel symbol rate	[32]	ksps
$\frac{Perch\_Ec}{I_{or}}$	[-10]	dB
$\frac{DPCH\_Ec}{I_{or}}$	[-19]	dB
$\frac{OCNS\_Ec}{I_{or}}$	[-0.52]	dB
$\hat{I}_{or}$	[-25]	dBm/4.096MHz
Rate Information	on	

Note
1. Since the spreading factor is large (10log(SF)=21dB), the majority of the total input signal consists of the OCNS interference. <Change OCNS definition>
2. Measurement channel is based on mapping of a 12.2 kbps voice channel

7.5 Adjacent channel selectivity

Adjacent Channel Selectivity is a measure of a receiver's ability to receive a W-CDMA signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the center frequency of the assigned channel.

7.5.1 Minimum requirement

The BER shall not exceed 0.001 for the parameters specified in table 9.

Table 9: Adjacent channel selectivity

Parameter	Level	Unit
User bit rate	[12.2]	kbps
Channel symbol rate	[32]	ksps
$\frac{Perch\_Ec}{I_{or}}$	[-1]	dB
$\frac{DPCH\_Ec}{I_{or}}$	[-7]	dB
$\hat{I}_{or}$	[-93]	dBm/4.096MHz
I_{oac}	[-52]	dBm/4.096MHz
Fuw	[5]	MHz

Note
1. *Measurement channel is based on mapping of a 12.2 kbps voice channel

7.6 Blocking characteristics

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

7.6.1 Minimum requirement

The BER shall not exceed 0.001 for the parameters specified in table 10 and table 11

Table 10: In-band blocking

Parameter	**Level**	**Unit**
User bit rate	[12.2]	Kbps
Channel symbol rate	[32]	Ksps
$\frac{Perch\_Ec}{I_{or}}$	[-1]	dB
$\frac{DPCH\_Ec}{I_{or}}$	[-7 (*)]	dB
$\hat{I}_{or}$	[-107]	dBm/4.096MHz
$I_{blocking}$ modulated	[-44]	dBm/4.096MHz
Blockng offset	[>15]	MHz
Rate Information	On	

Table 11: Out of band blocking

Parameter	**Band 1**	**Band 2**	**Unit**
User bit rate	[12.2]	[12.2]	Kbps
Channel symbol rate	[32]	[32]	Ksps
$\frac{Perch\_Ec}{I_{or}}$	[-1]	[-1]	dB
$\frac{DPCH\_Ec}{I_{or}}$	[-7 (*)]	[-7 (*)]	dB
$\hat{I}_{or}$	[-107]	[-107]	DBm/4.096M Hz
$I_{blocking}$ tone	[-30]	[-15]	dBm
Blocking offset	[2025<f<2070 2210<f<225]5	[f<2025 f>2255]	MHz
Rate Information	On	On	

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.

7.7.1 Minimum requirement

TBD

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 receiver a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.

7.8.1 Minimum requirement

The BER shall not exceed 0.001 for the parameters specified in table 12.

Table 12: Receive intermodulation characteristics

Parameter	**Level**	**Unit**
User bit rate	[12.2]	kbps
Channel symbol rate	[32]	ksps
$\frac{Perch\_Ec}{I_{or}}$	[-1]	dB
$\frac{DPCH\_Ec}{I_{or}}$	[-7 (*)]	dB
$\hat{I}_{or}$	[-107]	dBm/4.096MHz
I_{ouw1}	[-46]	dBm
I_{ouw2}	[-46]	dBm/4.096MHz
Fuw1 (CW)	[10]	MHz
Fuw2 (Modulated)	[20]	MHz
Rate Information	[On]	

Note: Measurement channel is based on mapping of a 12.2 kbps voice channel.

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:

(a) Less than -60dBm/4.096 MHz at the UE antenna connector, for frequencies within the UE receive band.
(b) Less than -57dBm/100 kHz at the UE antenna connector, for frequencies band from 9kHz to 1GHz.
(c) Less than -47dBm/100 kHz at the UE 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 modeled by typical channel models that are defined Annex B

The UE shall be able to receive a number of different channels transmitted from the BS. These channels may have different bit rates and different BER/FER requirements. Table 13 describes the UE test environment.

Table 13: UE test environment

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	128 kbps MER $<10^{-2}$	-	-	-
FACH Message	128 kbps MER $<10^{-2}$	-	-	-
Speech	12.2 kbps BER $<10^{-3}$	12.2 kbps BER $<10^{-3}$	12.2 kbps BER $<10^{-3}$	12.2 kbps BER $<10^{-3}$
Circuit Switched Data	64, 384, 2048 kbps, BER $< 10^{-6}$	64, 384 kbps BER $< 10^{-6}$	64, 384 kbps BER $< 10^{-6}$	64, 384 kbps BER $< 10^{-6}$
Packet Switched Data	TBD	TBD	TBD	TBD

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

The receive characteristics of the paging channel in the non-fading environment is determined by the Paging message error rate (MER). MER is measured at the data rate specified for the paging channel.

The UE sleep mode has an upper limit after which it must up wake up and demodulate the paging channel and associated paging messages.

Note

1. Definition of paging channel
2. Definition of MER

8.2.1.1.1 Minimum requirement

(a) The actual $PCH \;\; E_b/N_t$ shall be within ± 0.2 dB of the value indicated in Table 14

(b) The MER shall not exceed the piece-wise linear MER curve specified by the points Table 15

Table 14 Paging channel in a non fading channel

Parameter	Unit	Value
$\frac{Perch\_E_c}{I_{or}}$	dB	
$\frac{DPCH\_E_c}{I_{or}}$	dB	
$\frac{CPCH\_E_c}{I_{or}}$	dB	
$\hat{I}_{or}/I_{oc}$	dB	-1
I_{oc}	dBm/4.096 MHz	-60
Paging Data Rate	??	
$PCH \quad E_b/N_t$	dB	

Table 15: Paging channel reception in AWGN

$PCH \quad E_b/N_t$	MER
TBD	TBD
TBD	TBD
TBD	TBD

8.2.2.2 Demodulation of Forward Access Channel

The receive characteristics of the Forward Access Channel (FACH) in the non fading environment are determined by the average message error rate (MER). MER is measured at data rate specified for FACH.

8.2.2.2.1 Minimum requirement

(a) The actual $FACH \quad E_b/N_t$ shall be within ± 0.2 dB of the value indicated in table 16

(b) The MER shall not exceed the piece-wise linear MER curve specified by the points in table 17

Table 16: Test Parameters for Forward Access Channel Reception in an AWGN Channel.

Parameter	Unit	Value
$\frac{Perch\_E_c}{I_{or}}$	dB	
$\frac{DPCH\_E_c}{I_{or}}$	dB	
$\frac{CPCH\_E_c}{I_{or}}$	dB	
$\hat{I}_{or}/I_{oc}$	dB	-1
I_{oc}	dBm/4.096 MHz	-60
Control Data Rate	??	
$FACH \quad E_b/N_t$	dB	

Table 17: Test Requirements for Forward Access Channel Reception in AWGN.

$FACH \quad E_b/N_t$	MER
TBD	TBD
TBD	TBD
TBD	TBD

8.2.2.3 Demodulation of Dedicated Traffic Channel

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

8.2.2.3.1 Minimum requirement

(a) The actual $DTCH \quad E_b/N_t$ used in the test shall be within ± 0.2 dB of the value indicated in table 18 and table 19 <editor is this correct ?>.

(b) The BER shall not exceed the piece-wise linear BER curve specified by the points in table 20

Table 18: Test Parameters for DTCH Reception in an AWGN Channel.

arameter	**Unit**	**Test 1**	**Test 2**	**Test 3**	**Test 4**
$\frac{erch\_E_c}{I_{or}}$	dB				
$\frac{PCH\_E_c}{I_{or}}$	dB				
$\hat{I}_{or}/I_{oc}$	dB	-1			
I_{oc}	dBm/4.096 MHz	-60			
nformation Data Rate	kbps	12.2	12.2	64	64
Channel mbol Rate	ksps	32	32	128	128
Rate nformation	-	off	on	off	on
$TCH \quad E_b/N$	dB				

Table 19: Test Parameters for DTCH Reception in an AWGN Channel.

Parameter	**Unit**	**Test 5**	**Test 6**	**Test 7**	**Test 8**
$\frac{Perch\_E_c}{I_{or}}$	dB				
$\frac{DPCH\_E_c}{I_{or}}$	dB				
$\hat{I}_{or}/I_{oc}$	dB	-1			
I_{oc}	dBm/4.096 MHz	-60			
Information Data Rate	kbps	384	384	2048	2048
Channel Symbol Rate	ksps	512	512	3*1024[1]	3*1024
Rate Information	-	off	on	off	on
$DTCH \quad E_b/N_t$	dB				

[1] Multi-code transmission with 3 different codes each having 1024 ksps channel symbol rate.

Table 20: Test Requirements for DTCH Reception in AWGN

Test Number	$DTCH\ E_b/N_t$	BER
1	TBD	TBD
	TBD	TBD
	TBD	TBD
2	TBD	TBD
	TBD	TBD
	TBD	TBD
3	TBD	TBD
	TBD	TBD
	TBD	TBD
4	TBD	TBD
	TBD	TBD
	TBD	TBD
5	TBD	TBD
	TBD	TBD
	TBD	TBD
6	TBD	TBD
	TBD	TBD
	TBD	TBD
7	TBD	TBD
	TBD	TBD
	TBD	TBD
8	TBD	TBD
	TBD	TBD
	TBD	TBD

8.3 Demodulation of DTCH in Multi-path Fading Channel

8.3.1 Single Link Performance

The receive characteristics of the Dedicated Traffic Channel (DTCH) in different multi-path fading environments are determined by the average bit error rate (BER) values. BER is measured for the each of the individual data rate specified for the DPCH. DTCH is mapped into in Dedicated Physical Channel (DPCH).

8.3.1.1 Minimum requirement

(a) The actual $DTCH\ E_b/N_t$ used shall be within ± 0.2 dB of the value indicated in Table 21,Table 22, Table 23 and Table 24.

(b) The BER shall not exceed the piece-wise linear BER curve specified by the points in Table 25, Table 26 and Table 27

Table 21. Test Parameters for DTCH Reception in a Multi-path Channel (Indoor Environment).

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
$\frac{Perch\_E_c}{I_{or}}$	dB				
$\frac{DPCH\_E_c}{I_{or}}$	dB				
$\hat{I}_{or}/I_{oc}$	dB	5?			
I_{oc}	dBm/4.096 MHz	-60			
Information Data Rate	kbps	12.2	12.2	64	64
Channel Symbol Rate	ksps	32	32	128	128
Rate Information	-	off	on	off	on
$DTCH\quad E_b/N_t$	dB				

Table 22 Test Parameters for DCH Reception in a Multi-path Channel (Indoor Environment).

Parameter	Unit	Test 5	Test 6	Test 7	Test 8
$\frac{Perch\_E_c}{I_{or}}$	dB				
$\frac{DPCH\_E_c}{I_{or}}$	dB				
$\hat{I}_{or}/I_{oc}$	dB	5?			
I_{oc}	dBm/4.096 MHz	-60			
Information Data Rate	kbps	384	384	2048	2048
Channel Symbol Rate	ksps	512	512	3*1024	3*1024
Rate Information	-	off	on	off	on
$DTCH\quad E_b/N_t$	dB				

Table 23. Test parameters for DCH reception in Multi-path Channel model (Indoor to outdoor and Pedestrian Environment

Parameter	Unit	Test 9	Test 10	Test 11	Test 12	Test 13	Test 14
$\frac{Perch\_E_c}{I_{or}}$	dB						
$\frac{DPCH\_E_c}{I_{or}}$	dB						
$\hat{I}_{or}/I_{oc}$	dB	5?					
I_{oc}	dBm/4.096 MHz	-60					
Information Data Rate	kbps	12.2	12.2	64	64	384	384
Channel Symbol Rate	ksps	32	32	128	128	512	512
Rate Information	-	off	on	off	on	off	on
$DTCH\quad E_b/N_t$	dB						

Table 24 Test Parameters for DCH in a Multi-path Channel (Vehicular Environment)

Parameter	Unit	Test 15	Test 16	Test 17	Test 18	Test 19	Test 20
$\frac{Perch\_E_c}{I_{or}}$	dB						
$\frac{DPCH\_E_c}{I_{or}}$	dB						
$\hat{I}_{or}/I_{oc}$	dB	5?					
I_{oc}	dBm/4.096 MHz	-60					
Information Data Rate	kbps	12.2	12.2	64	64	384	384
Channel Symbol Rate	ksps	32	32	128	128	512	512
Rate Information	-	off	on	off	on	off	on
$DTCH\ \ E_b/N_t$	dB						

Table 25 Test Parameters for DCH in a Multi-path Channel (Vehicular Environment)

Test Number	$DTCH\ \ E_b/N_t$	BER
1	TBD	TBD
	TBD	TBD
	TBD	TBD
2	TBD	TBD
	TBD	TBD
	TBD	TBD
3	TBD	TBD
	TBD	TBD
	TBD	TBD
4	TBD	TBD
	TBD	TBD
	TBD	TBD
5	TBD	TBD
	TBD	TBD
	TBD	TBD
6	TBD	TBD
	TBD	TBD
	TBD	TBD
7	TBD	TBD
	TBD	TBD
	TBD	TBD
8	TBD	TBD
	TBD	TBD
	TBD	TBD

Table 26: Test Requirements for DCH Reception in a Multi-path Channel (Indoor to Outdoor and Pedestrian environment).

Test Number	DTCH E_b/N_t	BER
9	TBD	TBD
	TBD	TBD
	TBD	TBD
10	TBD	TBD
	TBD	TBD
	TBD	TBD
11	TBD	TBD
	TBD	TBD
	TBD	TBD
12	TBD	TBD
	TBD	TBD
	TBD	TBD
13	TBD	TBD
	TBD	TBD
	TBD	TBD
14	TBD	TBD
	TBD	TBD
	TBD	TBD

Table 27. Test Requirements for DCH Reception in a Multi-path Channel (Vehicular Environment).

Test Number	DTCH E_b/N_t	BER
15	TBD	TBD
	TBD	TBD
	TBD	TBD
16	TBD	TBD
	TBD	TBD
	TBD	TBD
17	TBD	TBD
	TBD	TBD
	TBD	TBD
18	TBD	TBD
	TBD	TBD
	TBD	TBD
19	TBD	TBD
	TBD	TBD
	TBD	TBD
20	TBD	TBD
	TBD	TBD
	TBD	TBD

8.4 Inter-Cell Soft Handover Performance

The bit error rate characteristics of UE is determined during an inter-cell soft handover. During the soft handover a UE receives signals from different Base Stations. A UE has to be able to demodulate two Perch channels and to combine the energy of DTCH channels. Delay profiles of signals received from different Base Stations are assumed to be the same but time shifted by 2440 ns (10 chips).

The receive characteristics of the different channels during inter-cell handover are determined by the average bit error rate (BER) values.

8.4.1 Minimum requirement

(a) The actual $DTCH \quad E_b/N_t$ used in the test shall be within ± 0.2 dB of the value indicated in Table 28

(b) The BER shall not exceed the piece-wise linear BER curve specified by the points in Table 29

Table 28: Test Parameters for DTCH Reception in a Multi-path Channel during a Soft Handoff (Vehicular Environment).

Parameter	Unit	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6
$\frac{Perch\_E_c}{I_{or}}$	dB						
$\frac{DPCH\_E_c}{I_{or}}$	dB						
$\hat{I}_{or1}/I_{oc}$ and $\hat{I}_{or2}/I_{oc}$	dB	5?					
I_{oc}	dBm/4.096 MHz	-60					
Information Data Rate	kbps	12.2	12.2	64	64	384	384
Channel Symbol Rate	ksps	32	32	128	128	512	512
Rate Information	-	off	on	off	on	off	on
$DTCH\ \ E_b/N_t$	dB						

Table 29 Test Requirements for DTCH Reception in a Multi-path Channel during a Soft Handoff (Vehicular Environment).

Test Number	$DTCH\ \ E_b/N_t$	BER
1	TBD	TBD
	TBD	TBD
	TBD	TBD
2	TBD	TBD
	TBD	TBD
	TBD	TBD
3	TBD	TBD
	TBD	TBD
	TBD	TBD
4	TBD	TBD
	TBD	TBD
	TBD	TBD
5	TBD	TBD
	TBD	TBD
	TBD	TBD
6	TBD	TBD
	TBD	TBD
	TBD	TBD

8.5 Rx synchronisation characterisitics

8.5.1 Synchronization Performance

8.5.1.1 Search of other Cells

Search for other cells is used to check whether the UE correctly searches and measures other BS(s) during the specified operation.

8.5.1.1.1. Minimum requirement

TBD

Table 30 Test Parameters for the Search of other Cells

Parameter	Unit	Channel 1		Channel 2	
		Time 1	Time 2	Time 1	Time 2
$Perch\ \frac{E_c}{I_{or}}$	dB				
$\hat{I}_{or}/I_{oc}$	dB				
I_{oc}	dBm/4.096 MHz	-60			
$Perch\ \frac{E_c}{I_o}$	dB				

8.5.2 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>.

8.5.2.1 Minimum requirement

TBD

8.6 Timing characteristics

8.6.1 Synchronization

The timing of the MS is determined during specified operation

8.6.1.1 Minimum requirement

TBD

8.6.2 Channel Timing Dependencies

The channel timing of the UE is determined during the specified operation. Relative timing between different code channels transmitted and received at the mobile station. This includes relative frame and slot timing requirements between the forward and reverse links, as well as among different channels.
Possible items to be covered are:
- Long code timing offsets for each downlink physical channel
- Requirements for accuracy

8.6.2.1 Minimum requirement

TBD

8.6.3 Reception Timing

The reception timing of the MS is determined during the specified operation.

8.6.3.1 Minimum requirement

TBD

Annex A (normative): Transmit power levels versus time

Annex B (normative): Propagation conditions

B.1 Test Environments

Each of these environments static, indoor, out-door to indoor and pedestrian, and vehicular environments. is modeled by typical channel models that are defined in this section

These channels may have different bit rates and different BER/FER requirements. Table B1 describes these requirements..

Table B1: Test Environments for UE Performance Specifications

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	128 kbps MER $<10^{-2}$	-	-	-
FACH Message	128 kbps MER $<10^{-2}$	-	-	-
Speech	12.2 kbps BER $<10^{-3}$	12.2 kbps BER $<10^{-3}$	12.2 kbps BER $<10^{-3}$	12.2 kbps BER $<10^{-3}$
Circuit Switched Data	64, 384, 2048 kbps, BER $< 10^{-6}$	64, 384 kbps BER $< 10^{-6}$	64, 384 kbps BER $< 10^{-6}$	64, 384 kbps BER $< 10^{-6}$
Packet Switched Data	TBD	TBD	TBD	TBD

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[2] 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

Table B2: Channel Models for Non-Static Environments

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

[2] 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"

B.3 Measurement Configurations

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.

It as assumed that fields inside DPCH have the same energy per PN chip. Also, if the power of CPCH is not specified in the test parameter table, it should be set to zero. The power of OCNS should be adjusted so that the power ratios (Ec/Ior) of all specified forward channels add up to one.

Configurations for different scenarios are shown below.

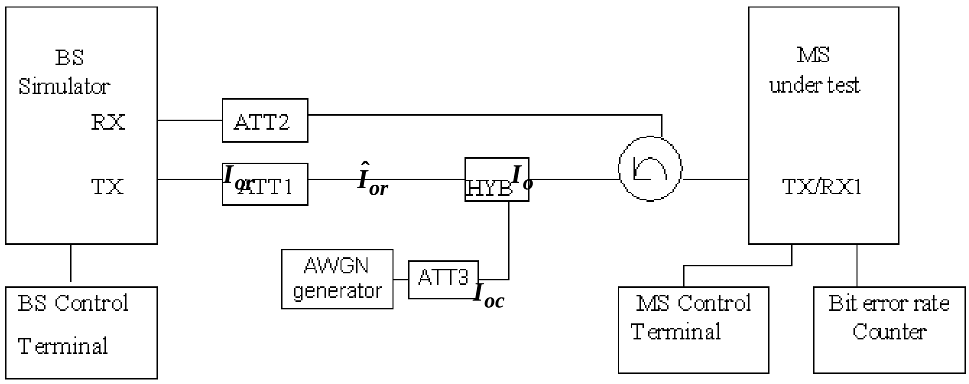

Figure B1 Configuration in Static Channel.

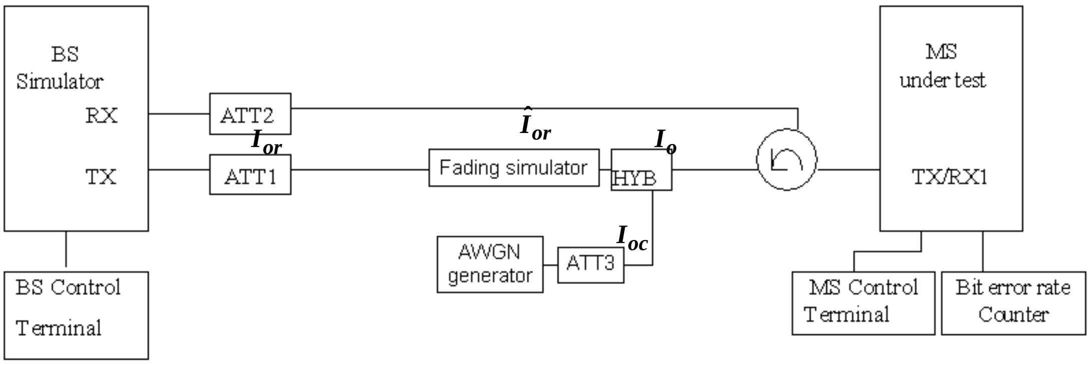

Figure B2 Configuration in Multi-path Fading Channel.

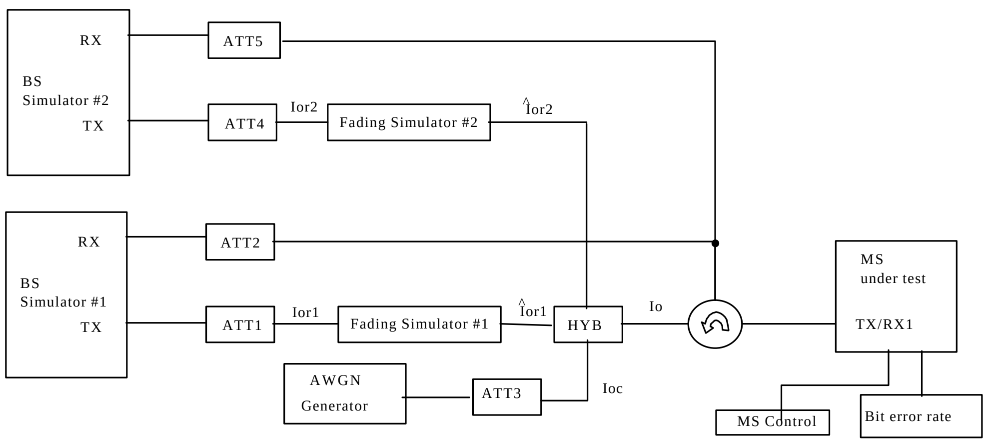

Figure B3 Configuration for Soft Handoff.

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

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)
[-20]°C - [+55]°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 - 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

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History

Document history		
V0.0.1	1999-02-01	Merged document from (ARIB) Specification of Mobile Station for 3G Mobile System ver 1.0-1.0) and (ETSI) XX06v0.4.01 UTRA FDD; Radio transmission and reception.
V0.0.2	1999-16-02	First pass merged document presented to meeting
V0.0.3	1999-24-02	2nd pass merged document incorporating changes from WG4 meeting #2. Sent to reflector for comment.

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This document is written in Microsoft Word 7