TSG RAN Working Group 4 (Radio) **R4-99029**

Meeting #2
Date 15th-19th February
Location: Turin, Italy

Source: Ericsson~~ETSI STC SMG2 –LI3GPP TSG RAN WG4~~

3GPP TSG RAN WG4
S4.01Bv0.0.1 (1999-02)

~~UTRA FDD;~~ Radio transmission and reception (FDD)

Merge between Base Station relevant ~~parts of~~parts of ETSI UMTS XX.06V0.4.1 (1999-01) and ARIB Volume 5 Ver. 1.0 – 0.1;

Note on this document

This document is created by merging the text of the ARIB Volume 5 specification (Version 1.0 – 0.1) into the ETSI UMTS XX.06 specification (Version 0.4.1), considering the BS parts only. The merging is based on the list of clauses created in the last TSG RAN WG4 meeting as the output of the BS ad hoc group (Tdoc .

The merging has been performed by adding all text in Volume 5 to the ETSI document, excluding sections 1 (introduction), 2 (General), 3 (EMC), and 7, 8 and 9 which did not contain any text. Sections 4 (Safety) and 5 (O&M) have been appended at the end of the document for information. They will most likely not be merged into this "Radio transmission and reception (FDD)" specification.

The ARIB text has been marked at each instance with an introductory comment in brackets {}, stating the source section in Volume 5, together with some editor's comments on the merging. In order to distinguish between the two sources of the text, the ARIB input is displayed in green, using "Arial" as font, while the ETSI text is in the original "Times New Roman".

Contents

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.

Foreword

This ETSI Technical Report (TR) has been produced by ETSI Special Mobile Group (SMG) of the European Telecommunications Standards Institute (ETSI). This report has been elaborated by the Layer 1 expert group of SMG2 "Radio aspects", as a part of the work in defining and describing Layer 1 of the Universal Mobile Telecommunications System (UMTS) Terrestrial Radio Access (UTRA).

This report describes the radio transmission and reception parameters in UTRA/FDD.

1 Scope

This document establishes the minimum RF characteristics of the FDD mode of UTRA. The main objectives of the document are to be a part of the full description of the UTRA Layer 1, and to serve as a basis for the drafting of the technical specification (TS).

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] Reference 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 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>*

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
ACS	Adjacent Channel Selectivity
BER	Bit Error Rate
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

4 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 taken and the text contained in that section may have been update in line with that assumption
- This section is assumed to be finalised.

Reference should be made to the current XX18 (status and study document) for other open issues. Unless stated otherwise only the agreed working assumptions are indicated below.

Section number	**Section description**	**Status**
5.2	Frequency band	Working assumption
5.3	TX-RX frequency separation	Working assumption is based on fixed separation of 130 MHz between the specified RX and TX band A proposal exists to support a variable duplexer distance. The specific limits are yet to be determined.
5.4.2	Channel raster	Working assumption channel raster = 200 kHz
6.2.1	~~Mobile station~~UE output power	A working assumption is than one ~~MS~~ UE power class should be +21 dBm
7.2	Diversity characteristics	Working assumption is there are three forms of diversity; time, frequency and space

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. Appropriate adjustments should be made for higher chip rate options.

5.2 Frequency bands

UTRA/FDD is designed to operate in the following paired band;

a) 1920 – 1980 MHz: Mobile transmit, base receive
   2110 – 2170 MHz Base transmit, mobile receive

b) Deployment in other frequency bands is not precluded.

{From Vol. 5, Section 2.1}

The radio frequency band of IMT-2000 is recommended by ITU as shown in Fig. 2.1-1.

The range of IMT-2000 frequency band is 1885 ~ 2025MHz and 2110 ~ 2200MHz. Some part of this frequency range is designated for MSS (Region 1/3: 1980 ~ 2010MHz and 2170 ~ 2200MHz, Region 2: 1980 ~ 2025MHz and 2160 ~ 2200MHz).

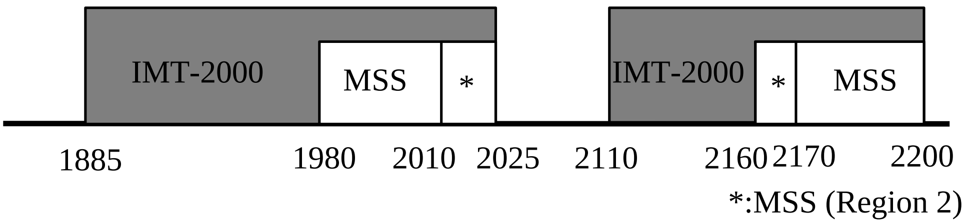

Fig. 2.1-1 Frequency band of IMT-2000

The range of ARIB-WCDMA frequency band is shown in Fig. 2.1-2. (FDD mode Reverse Link: 1920 ~ 1980MHz, FDD mode Forward Link: 2110 ~ 2170MHz, FDD mode Duplex distance: 190MHz, TDD mode: 2010 ~ 2025MHz.)

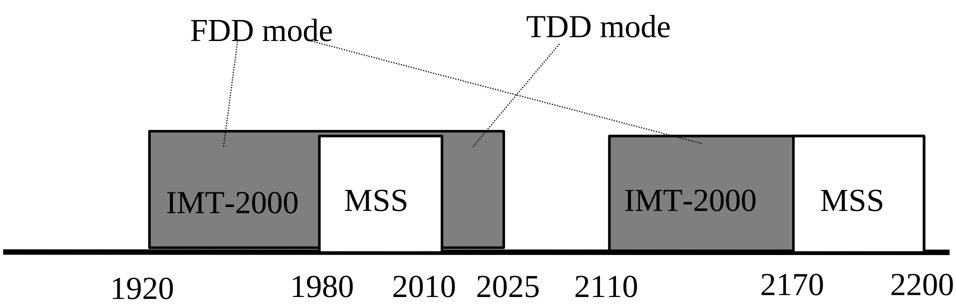

Fig. 2.1-2 Frequency band of ARIB-WCDMA System

5.3 TX–RX frequency separation

a) The minimum transmit to receive separation is 130 MHz when operating in the paired band defined in 5.2 a)

b) UTRA/FDD should support a variable duplex distance, i.e. $D_{duplexer} = F_{down} - F_{up}$ is not necessary a constant but is, in general, allowed to vary within certain limits. The specific limits for the duplex distance applicable for different frequency bands and terminal classes are yet to be determined.

{From Vol. 5, Section 2.1; also copied into 5.2}
FDD mode Duplex distance: 190MHz.

{From Vol. 5, Section 2.2}
The minimum carrier separation between the forward link and the reverse link for the FDD system shall be [MHz].

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).

{From Vol. 5, Section 2.2}
The minimum carrier spacing is shown in Table 2.2-1.

Chip Rate	Minimum Carrier spacing
1.024[Mcps]	[MHz]
4.096[Mcps]	[MHz]
8.192[Mcps]	[MHz]
16.384[Mcps]	[MHz]

Table 2.2-1 Minimum Carrier Spacing and Chip Rate

The base station transmit carrier frequency shall be maintained within [ ] of the frequency assignment discussed in Frequency Allocation.

{From Vol. 5, Section 2.2.1}
The base station shall support carrier raster of [kHz] and base station frequency in [MHz] is assigned according to Table 2.2-1for the FDD system.

This section identifies some of the network functions that are required to support 3GMS services. The functions are grouped according to their relation to overall network capabilities.

Chip Rate	Raster Number	Center Frequency
1.024[Mcps]	[]	[]
4.096[Mcps]	[]	[]
8.192[Mcps]	[]	[]
16.384[Mcps]	[]	[]

Table 2.2-1 Base Station Frequency Assignment and Raster Number for FDD System

N denotes a raster number in integer value.

The primary and secondary center frequency for the system with [MHz], [MHz], [MHz], and [MHz] shall be according to Table 2.2-2[1]

Carrier Spacing	Primary Frequency in N	Secondary Frequency in N
[MHz]		
[MHz]		
[MHz]		
[MHz]		

Table 2.2-2 Primary and Secondary Frequency Allocation for FDD System[2]

[1] Note that WCDMA carrier spacing around the primary and secondary center frequency should not be over- wrapped and therefore care must be taken in frequency assignment.

[2] The frequency assignment would have a regional variance according to respective radio environment.

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 User Equipment output power

The UE output power profile can be used to define a range of output powers for use in different system scenarios. For UE using directive antennas for transmission, a class dependent limit will be placed on the maximum EIRP (Equivalent Isotropic Radiated Power).
The following Power Classes define the capability of the UE in terms of the maximum output power;

Power Class	Maximum output power
1	[+33] dBm
2	[+27] dBm
3	[+24] dBm
4	+21 dBm
5	[+10] dBm
6	[0] dBm

Table 1; UE power classes.

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 mask for transmit power level versus time is an item for further study. <*Editor the transmit power mask versus time will need to be defined due to the use of slotted and DTX mode to minimise the effect of AM splatter* >

3. 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.
4. 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.
5. .Power classes 5 and 6 are envisaged for unlicensed operation.
6. 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

6.2.2 Base station output power

The base station output power profile can be used to cater for different system scenarios The following examples of base station classes can be considered for the various system scenarios.

Base station class	System scenarios
1	Macro
2	Micro
3	Pico

Table 2, BS power classes.

{From ARIB Vol. 5; Section 6.1.1.2.1}

6.1.1.2.1.1 Definition

Total power is the mean power delivered to a load with resistance equal to the nominal load impedance of the transmitter.

6.1.1.2.1.2 Test Conditions and measurement method

1. Connect the power measuring equipment to the base station RF output port.
2. Set the base station to transmit a signal modulated with a combination of Perch Channel, Common Physical Channel, and Dedicated Physical Channels as stated bellow.
3. Measure the mean power at the RF output port.

For those base station equipment tests that require multiple code channels be active simultaneously, the configuration shown in Table 6.1.1-1 should be used.
If a different number of Traffic Channels is used unless otherwise specified the partitioning of power shall be as shown in Table 6.1.1-2.
For Tables 6.1.1-1 and 6.1.1-2, the fraction of power noted for each traffic channel shall be inclusive of power control bits.

Table 6.1.1-1. Base Station Test Model, Nominal

Type	Number of Channels	Fraction of Power (Linear)	Fraction of Power (dB)	Comments
Perch	2	**TBD**	TBD	1st /2nd Perch Channel
Common Physical	**TBD**	**TBD**	**TBD**	
Dedicated Physical	**TBD**	**TBD**	**TBD**	

Table 6.1.1-2. Base Station Test Model, General

Type	Relative Power
Perch	**TBD** (linear)
Common Physical + Dedicated Physical	Remainder (**TBD**) of total power (linear)
Common Physical	**TBD** dB less than one Dedicated Physical Channel ; rate is **TBD**
Dedicated Physical	Equal Power in Each Traffic Channel ; full rate only

6.1.1.2.1.3 Minimum requirement

The total power shall remain within +**TBD** dB and **–TBD** dB of the manufacturer's rated power.

6.3 Frequency stability

Frequency stability is ability of the MS and BS to transmit at the assigned carrier frequency.

{From Vol. 5, Section 6.1.1.1}

6.1.1.1.1 Definition

Frequency stability is the ability of the transmitter to maintain an assigned carrier frequency.

6.1.1.1.2 Test conditions and measurement method

Frequency stability shall be measured by sampling the transmitter RF output .

6.1.1.1.3 Minimum requirement

For all operating temperatures specified by the manufacturer, the base station carrier frequency shall be maintained within ±**TBD** parts per million (ppm) of any assigned channel frequency.

6.3.1 UE frequency stability

The UE carrier frequency shall be accurate to within ±[0.1] PPM compared to signal 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 ±[0.1] PPM figure.

6.3.2 BS frequency stability

a) The frequency stability of the BS shall be accurate to within ± [0.05] PPM for RF frequency generation.

b) For some BS classes the frequency stability of the BS shall be accurate to within ± [ ] PPM for RF frequency generation.

6.4 Output power dynamics

Power control is used to limit the interference level. The transmitter uses a quality-based power control on both the uplink and downlink.

6.4.1 Open loop power control

Open loop power control is the ability of the UE transmitter to sets it's output power to a specified value. An example of open loop power control is when the received signal at the UE is used as an initial reference. If it's too low the UE is assumed to be far from the base station and transmits with a high power. If it's too high the UE it is assumed to be close in and transmits at low power. This procedure can be used during normal operation as well as for sending access requests.

{From ARIB Vol. 5; Section 6.1.1.2.3}

6.1.1.2.3.1 Definition

6.1.1.2.3.2 Test conditions and measurement method

6.1.1.2.3.3 Minimum requirement

6.4.2 Closed loop power control

Closed loop power control is the ability of the UE / BS transmitter to adjust its output power in response to the UL/DL received signal.

{From ARIB Vol. 5; Section 6.1.1.2.4}

6.1.1.2.4.1 Definition

For closed loop correction on the Forward Traffic Channel (with respect to the open loop estimate), the base station adjust its mean output power level in response to each valid power control bit received from MS on the Reverse Traffic Channel.

6.1.1.2.4.2 Test conditions and measurement method

(1) Configure both the base stations under test and a code domain analyzer as shown in the following figure.

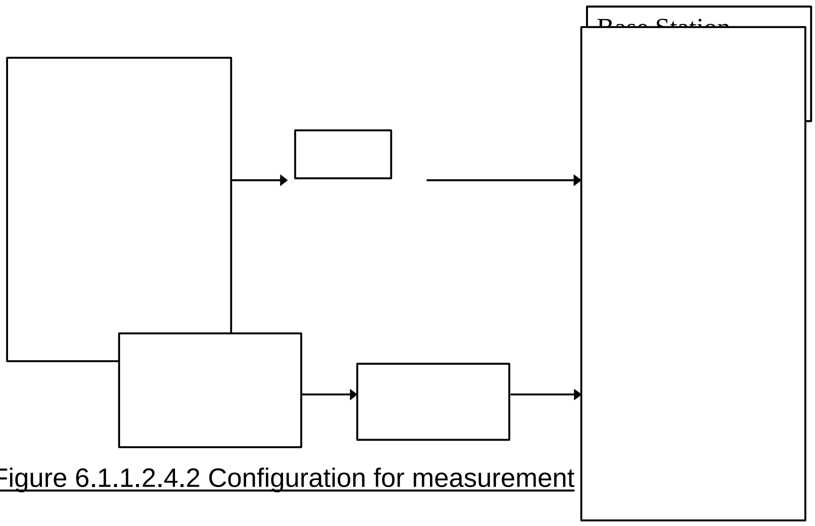

Figure 6.1.1.2.4.2 Configuration for measurement

(2) In the base station under test, set the frequency, disable closed loop power control in DTCH transmission test mode, and then set the transmission power.

(3) Measure the transmission power to confirm it within **TBD** of the set value.
(4) Start the TPC command transmission in the code dmain analyzer, and enable closed loop power control in the base station under test.
(5) Measure the absolute accuracy of transmission power in the base station under test each time TPC command is transmitted.
(6) Set the spectrum analyzer: center frequency is TRX transmission frequency, frequency span is zero-span, bandwidth of resolution is **TBD**, bandwidth of video is **TBD**, and range is **TBD**. Then measure the control step accuracy and control cycle of transmission power, and the transmission ramp up and ramp down time. Carry out the measurement in different symbol rates.

6.1.1.2.4.3 Minimum requirement

The minimum requirements are next:
Control range is **TBD**, control step is **TBD**, absolute control accuracy is less than **TBD**, relative control accuracy is less than **TBD** and within **TBD** at **TBD**th power control, control cycle is 0.625ms, and TPC command pattern is **TBD**.

6.4.3 Power control steps

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

a) Up link (UL) Variable 0.25- 1.5 dB
b) Down link (DL) Variable 0.25- 1.5 dB

{From ARIB Vol. 5; Section 6.1.1.2.4.3; Also copied into 6.4.2}
control step is **TBD**

6.4.4 Minimum transmit power

The minimum controlled output power of the UE/BS 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.

a) Up link (UL) -50 dBm
b) Down link (DL) -[ ] dBm

6.4.5 Dynamic range

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

a) Up link (UL) 80 dB
b) Down link (DL) 30 dB

{From ARIB Vol. 5; Section 6.1.1.2.4.3; Also copied into 6.4.2}
Control range is **TBD**

6.4.6 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

{From ARIB Vol. 5; Section 6.1.1.2.4.3; Also copied into 6.4.2}
control cycle is 0.625ms

{From ARIB Vol. 5; Section 6.1.1.2.2; No corresponding section in ETSI XX.06}

6.1.1.2.2 Perch channel power

6.1.1.2.2.1 Definition

The perch channel power, sum of the 1st and 2nd perch channel power, to total power ratio is the power attributed perch channel divided by the total power, and is expressed in dB. The 2nd perch channel power is the averaged power during one frame.

6.1.1.2.2.2 Test conditions and measurement method

1. Connect the RF output port of the BTS to the Code Domain Analyzer (the Code Domain Analyzer is the equipment that measure perch channel power) using an attenuator or directional coupler if necessary.
2. Configure the BTS to transmit the signal modurated with a combination of the 1st perch channel mapped BCCH (dummy), the 2nd perch channel and DPCH as described in 6.1.1.2.1.
3. Measure the perch channel power to total power ratio.

6.1.1.2.2.3 Minimum requirement

Each perch channel power to total power ratio is shall be within ±**TBD** dB of the configured value.

We feel it might not be necessary to define this section because of Forward Link.

6.5 Transmit ON/OFF ratio

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

{From ARIB Vol 5; Section 6.1.1.7}

6.1.1.7.1 Definition

Transmission on/off ratio is a ratio of the mean power when transmitting and the radiation power in no signal state in the transmission frequency band.

6.1.1.7.2 Test conditions and measurement method

Refer to Figure 6.1.1.7-1 for a functional block diagram of the test setup.

1. Connect the base station RF output port to the spectrum analyzer.
2. Set the spectrum analyzer condition as follows.

Median frequency	: carrier frequency
Sweep spectrum range	: [0]MHz
Resolution bandwidth	: [**]Hz
Video bandwidth	: Equivalent of resolution bandwidth
Y-axis scale	: 10dB/div
Input level	: Maximum amplitude is to be 70% to 90% of the full scale
Sweep mode	: Single mode
Sweep trigger	: Freerun or video trigger. Generally + voltage, but adjustment is necessary
Sweep time	: [**]m sec
Detection mode	: Sample mode

3. Set the base station to transmit a signal modulated with a combination of BCCH1, BCCH2, FACH, and Dedicated Traffic Channels as stated in Table 6.1.1.7-1.
   Total power at the RF output port shall be the nominal power as specified by the manufacturer.
4. Measure the transmission on power.
5. Stop the transmission of the base station.
6. Measure the transmission off power.
7. Calculate the on/off ratio

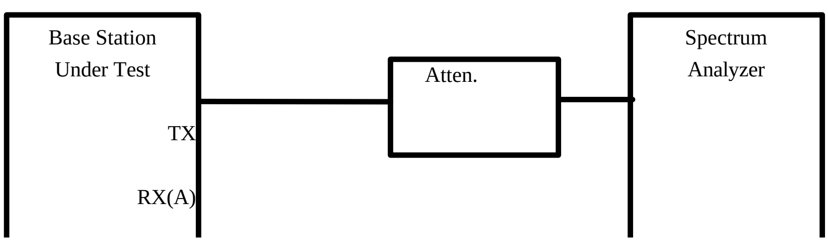

Figure 6.1.1.7-1 Functional Setup for Transmission on/off Ratio Test.

Table 6.1.1.7-1 Base Station Test Model. Nominal

Type	Number of Channels	Fraction of Power(linear)	Fraction of Power (dB)	Comments
BCCH1	1	*****	*****	
BCCH2	1	*****	*****	
FACH	1	*****	*****	
DTCH	***	*****	*****	

6.1.1.7.3 Minimum requirement

The transmission on/off ratio shall be more than [ ] dB.

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 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 BS(s) and may depend on the power class, single / multi-code allocation slotted mode, etc and is an item for further study.

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 UE ACPR

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

Table 3, UE ACPR

Note

1. In order to ensure that switching transients due to slotted or DTX mode do 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.

6.6.2.2.2 BS ACPR

BS channel	ACPR limit
± First adjacent channel	[ ] dB
± Second adjacent channel	[ ] dB

Table 4, BS ACPR

Note

In order to ensure that switching transients due to the slotted mode do not degrade the ACPR value the reference measurements conditions are an item for further study.

{From ARIB Vol. 5; Section 6.1.1.3}

6.1.1.3.1 Definition

The adjacent channel interference power shall be defined as the power that is radiated within a bandwidth of ±[***]Hz, of which center frequency is separated by Δf Hz from the subject carrier frequency, measured at the base station RF output port.

6.1.1.3.2 Test conditions and measurement method

1. Connect a spectrum analyzer (or other suitable test equipment) to the base station RF output port, using an attenuator or directional coupler if necessary.
2. The spectrum analyzer (Digital storage type) is set as shown below.
   - Median frequency : carrier frequency
   - Sweep spectrum range : [25]MHz
   - Resolution bandwidth : [**]Hz
   - Video bandwidth : Equivalent of resolution bandwidth
   - Y-axis scale : 10dB/div
   - Input level : Maxmum amplitude is to be 70% to 90% of the full scale
   - Sweep mode : Single mode
   - Sweep trigger : Freerun or video trigger. Generally + voltage, but adjustment is necessary
   - Sweep time : [**]msec
   - Detection mode : Sample mode
3. Set the base station to transmit a signal modulated with a combination of BCCH1, BCCH2, FACH, and Dedicated Traffic Channels as stated in Table 6.1.1.3-1.
   Total power at the RF output port shall be the nominal power as specified by the manufacturer.
4. Measure the power level at the carrier frequency.
5. Sweep the spectrum analyzer over an above sweep spectrum range at least.

Table 6.1.1.3-1 Base Station Test Model, Nominal

Type	Number of Channels	Fraction of Power(linear)	Fraction of Power (dB)	Comments
BCCH1	1	*****	*****	
BCCH2	1	*****	*****	
FACH	1	*****	*****	
DTCH	***	*****	*****	

6.1.1.3.3 Minimum requirement

The adjacent channel interference power against the mean output power of the base station in the transmission band shall not exceed the limits specified below.

Δf :[***]Hz off : [***] dB/[***]Hz or less

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

{From ARIB Vol. 5; Section 6.1.1.4; Note: This ARIB content partly maps also on XX.06 sections 6.6.1 and 6.6.2, because of somewhat different definitions of spurious emissions.}

6.1.1.4 Spurious Emissions

6.1.1.4.1 Definition

Spurious emissions are emissions at frequencies that are outside the assigned CDMA Channel, measured at the base station RF output port.

6.1.1.4.2 Test conditions and measurement method

1. Connect a spectrum analyzer to the base station RF output port, using an attenuator or directional coupler if necessary.
2. The spectrum analyzer (Digital storage type) is set as shown below.
   Median frequency : spurious frequency
   Sweep spectrum range : [**]Hz
   Resolution bandwidth : [**]Hz
   Video bandwidth : Equivalent of resolution bandwidth
   Y-axis scale : 10dB/div
   Input level : Maximum amplitude is to be 70% to 90% of the full scale
   Sweep mode : Single mode
   Sweep trigger : Freerun or video trigger. Generally + voltage, but adjustment is necessary.
   Sweep time : [**]msec
   Detection mode : Sample mode
3. Set the base station to transmit a signal modulated with a combination of BCCH1, BCCH2, FACH, and Dedicated Traffic Channels as stated in Table 6.1.1.4-1. Total power at the RF Output port shall be the nominal power as specified by the manufacturer.
4. Measure the power level at the carrier frequency.
5. Sweep the spectrum analyzer over a frequency range from a low radio frequency (about 25 MHz) to three times the carrier frequency at least.

Table 6.1.1.4-1. Base Station Test Model, Nominal

Type	Number of Channels	Fraction of Power(linear)	Fraction of Power(dB)	Comments
BCCH1	1	[**]	[**]	
BCCH2	1	[**]	[**]	
FACH	1	[**]	[**]	
DTCH	[**]	[**]	[**]	

6.1.1.4.3 Minimum requirement

The spurious emission level against the mean output power of the base station in the Transmission band shall not exceed the limits specified below.

In the (a) Concerned Operator's System Bands and the (b) Other Bands Within Cellular Band, the spurious emission level within a [**]kHz bandwidth shall not exceed a level Specified in the Table 6.1.1.4-2. In the (c) Other Bands, the spurious emission level within a 1MHz bandwidth shall not exceed a level specified in the Table 6.1.1.4-2. Each transmission band is defined as follows:

(a) Concerned Operator's System Bands: The bands of the concerned operator's system used for this CDMA system.
(b) Other Bands Within Cellular Band: The 2.0G-band including other operator's cellular system bands, but excluding the (a) Concerned Operator's System Bands.
(c) Other Bands: Other bands entirely consisting of all frequencies, but excluding the above bands (a) and (b).

Table 6.1.1.4-2. Spurious Emission Limits When Transmitting.

Measurement Band	Maximum Spurious Emission Level
Concerned Operator's System Bands	Shown the Adjacent channel leakage power in 6.1.1.3
Other Bands Within Cellular Band	-[**]dB/[**]kHz or [**] µW(-[**]dBm)/[**]kHz, whichever the level is smaller.
Other Bands	If the mean transmission power is no more than 25W: 25µW(-16dBm)/1MHz or less. If the mean transmission power is more than 25W: -60dBc/1MHz or less, and 20mW(+13dBm)/1MHz or less. [current rules in each country shall apply.]

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 UE intermodulation attenuation

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.

For a UE transmitter operating at the nominal power defined by its class, the intermodulation attenuation shall be at least [ ] dB for an intermodulation component when an interfering CW signal shall be applied at a frequency offset of [ ] MHz and with a power level of [ ]dB below the power level of the wanted signal.

6.7.2 BS intermodulation attenuation

In a BS intermodulation may be caused by combining several RF channels to feed a single antenna, or when BS(s) are operated in close vicinity of each other. In this case the BS(s) can produce intermodulation products, which can fall into the UE/BS receiver band.

The BS 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.

{From ARIB Vol. 5; Section 6.1.1.5}

6.1.1.5 Transmit intermodulation

6.1.1.5.1 Definition

The transmit intermodulation shall be defined by the ratio of the output power of subject transmitted signal to the output power of intermodulation product when an interference signal (that differs from frequency of subject signal) is added at a level [**]dB lower than that of the subject signal. The frequency of the interference signal shall be [**]MHz or more off the subject signal, however, as for interference signal whose frequency is in the range of 5MHz to 10MHz off the subject signal, adjacent channel leakage power is used instead of the output of intermodulation product.

6.1.1.5.2 Test conditions and measurement method

1. Configure the base station according to the test model described in Figure 6.1.1.5-1.
2. Conditions for measuring instrument is set as follows:
   (1) The transmitting wave must have enough directivity so that no leak nor measurement error occurs in the standard signal generator.
   (2) Setting of standard signal generator
   Median frequency: Transmission average frequency ?[**]MHz
   (3) The spectrum analyzer (Digital storage type) is set as shown below.

Median frequency	: Intermodulation spurious frequency
Sweep spectrum range	: [**]Hz
Resolution bandwidth	: [**]Hz
Video bandwidth	: Equivalent of resolution bandwidth
Y-axis scale	: 10dB/div
Input level	: Maximum amplitude is to be 70% to 90% of the full scale
Sweep mode	: Single mode
Sweep trigger	: Freerun or video trigger. Generally + voltage, but adjustment is necessary.
Sweep time	: [**]msec
Detection mode	: Sample mode

3. Set the base station to transmit a signal modulated with a combination of BCCH1, BCCH2, FACH, and Dedicated Traffic Channels as stated in Table 6.1.1.4-1.

   Total power at the RF Output port shall be the nominal power as specified by the manufacturer.

4. Set the median Frequency of the standard signal generator at the carrier +[**]MHz (or –[**]MHz) and set the output level of standard signal generator so that a maximum transmission output of –[**]dB is in terms of the unit under test antenna output end calculation.
5. Set the switching selector on the unit under test side and obtain power of transmission intermodulated wave by the spectrum analyzer.
6. The ratio of the maximum transmission output and the maximum value of power obtained in 2 corresponds to the transmission intermodulation.

Figure 6.1.1.5-1. Functional Setup for Base Station Intermodulation Spurious Response Testes

6.1.1.5.3 Minimum requirement

The Transmit intermodulation level against the mean output power of the base station shall not exceed the limits specified below.

If the mean transmission power is no more than 25W	: 25µW(-16dBm) / 1MHz or less.
If the mean transmission power is more than 25W	: -60dBc/1MHz or less, and 20mW (+13dBm) / 1MHz or less.

6.8 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.

{From ARIB Vol. 5; Section 6.1.1.6}

6.1.1.6.1 Definition

Modulation accuracy is the root-mean-square value of the error of the vector of the ideal signal point .

6.1.1.6.2 Test conditions and measurement method

Refer to Figure 6.1.1.6-1 for a functional block diagram of the test setup.

1. Connect the base station RF output port to the modulation analyzer with root-nyquist receive filter function.
2. Set the base station to transmit a signal modulated with BCCH.
   Total power at the RF output port shall be the nominal power as specified by the manufacturer.
3. Trigger the test equipment from the system time reference signal from the base station.
4. Measure the modulation accuracy factor.

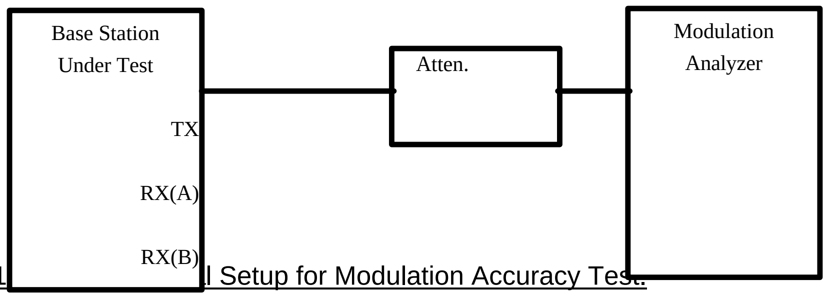

Figure 6.1 … l Setup for Modulation Accuracy Test.

6.1.1.6.3 Minimum requirement

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.

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:

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.
Space 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.

Table 6, Diversity characteristics for UTRA/FDD.

<Editor based on current discussions on diversity this section will need to be reviewed to reflect any changes>

7.3 Reference sensitivity level

The reference sensitivity is the minimum receiver input power measured at the antenna port at which the [FER/BER] does not exceed the specific value indicated in section 7.3.1 and 7.3.2

7.3.1 UE reference sensitivity level

For the different services with corresponding data rates, the reference sensitivity level of the UE shall be specified in table 7 below.

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

Table 7, UE reference sensitivity levels

Note

1. The performance will need to be specified for the different classes of User Equipment(s) identified in clause 6.2.1 and is an item for further study.

7.3.2 BS reference sensitivity level

For the different services with corresponding data rates, the reference sensitivity level of the BS shall be specified in table 8 below.

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

Table 8, BS reference sensitivity levels

Note

1. The performance will need to be specified for the different classes of base station(s) identified in clause 6.2.2 and is an item for further study.

{From ARIB Vol. 5; Section 6.1.2.1}

6.1.2.1 Reception Sensitivity

The contents of this section are for further study.

6.1.2.1.1 Definition

The reception sensitivity is the minimum static reception signal power per diversity branch, measured at the RF input port (antenna feeder connector), at which a minimum performance is obtained for one transport channel using DCH or RACH. The signal power is assumed to be equally applied to the two RF inputs for diversity. The reception sensitivity can be defined for each supported information rate and service. The dimension shall be power and the unit dBm.

6.1.2.1.2 Test conditions and measurement methods

This test is performed without interfering signal with equal power applied to each RF input branch according to Figure 6.1.2.1.2-1. In the case duplex operation is supported, the measurement configuration principle is indicated for one duplex branch in Figure 6.1.2.1.2-2. The reference point for signal power is at the input of each receiver (antenna connector).

MS Simulator

Figure 6.1.2.1.2-1

Figure 6.1.2.1.2-2

For each transport channel information rate and bearer service for which sensitivity is specified by the manufacturer, the applicable test in table 6.1.2.1.2-1 shall pass for an input signal equal to the specified sensitivity level.

[BER and UER measurement methods should be defined.]

Transport channel, information rate, service	Physical Channel, channel bit rate	Channel Frequency	Criteria (after channel decoding)	Remark
RACH, TBD kbps, packet	Common control, reverse link 16 ksps	Highest and lowest supported frequency	UER < 3%	
RACH, TBD kbps, packet	Common control, reverse link 64 ksps	Highest and lowest supported frequency	UER < 3%	
DCH, TBD kbps voice	DPDCH, TBD kbps	Highest and lowest supported frequency	BER < 10^-3	
DCH, TBD kbps low speed UDI	DPDCH, TBD kbps	Highest and lowest supported frequency	BER < 10^-6	
DCH, TBD kbps high speed UDI	DPDCH, TBD kbps	Highest and lowest supported frequency	BER < 10^-6	
DCH, TBD kbps, packet	DPDCH, TBD kbps	Highest and lowest supported frequency	UER < 3%	

Table 6.1.2.1.2-1

Note that in the table, services that are not supported by a certain product need not be tested. It might also be that other rates are supported. If sensitivity is specified for other rates, they shall be tested in a similar manner and the criteria shall be given in the specification.

6.1.2.1.3 Minimum Requirement

[There is no minimum required reception sensitivity.]

{From ARIB Vol. 5; Section 6.1.2.2; In ETSI XX.06, there is no section on Frequency Deviation performance}

6.1.2.2 Maximum Frequency Deviation for Receiver Performance

The contents of this section are for further study.

6.1.2.2.1 Definition

The long term frequency deviation from the channel centre that would increase required received signal power by 1 dB compared to specified sensitivity. The Maximum Frequency Deviation for Receiver Performance is defined for each supported information rate and bearer service.

6.1.2.2.2 Test conditions and measurement methods

This test is basically performed in the same way as the receiver sensitivity described in section 6.1.2.1.2 with the exception of the input frequency setting and input power.

For the lowest and highest supported frequencies Flo and Fhi, and for each supported information rate and bearer service with specified sensitivity and Maximum Frequency Deviation for Receiver Performance f, the following test shall pass

Channel frequency	Input power	Criteria (After channel decoding)
Flo+f	Specified sensitivity+1 dB	See Criteria in Table 6.1.2.1.2-1
Flo-f	Specified sensitivity +1 dB	See Criteria in Table 6.1.2.1.2-1
Fhi+f	Specified sensitivity +1 dB	See Criteria in Table 6.1.2.1.2-1
Fhi-f	Specified sensitivity +1 dB	See Criteria in Table 6.1.2.1.2-1

Table 6.1.2.2.2-1

6.1.2.2.3 Minimum Requirement

[There is no minimum required maximum frequency deviation for receiver performance.]

7.4 Dynamic range

The receiver dynamic range is the input power range at the [UE/BS] antenna port over which the [FER/BER} does not exceed a specific rate.

The static [BER/FER] reference performance as specified in clause 7.3.1 and 7.3.2 should be met over a receiver input range of [ ] dB above the specified reference sensitivity level.

{From ARIB Vol. 5; Section 6.1.2.3}

The contents of this section are for further study.

6.1.2.3.1 Definition

The dynamic range is the difference between the lowest signal power and the highest signal power that fulfills a certain receiver performance. Receiver dynamic range is specified for each supported information rate and bearer service.

6.1.2.3.2 Test conditions and measurement methods

This test is performed in the same way as the receiver sensitivity described in section 6.1.2.1.2 with the exception of the input power and criteria. The input power shall be as described in Table 6.1.2.3.2-1 and the criteria shall be as in Table 6.1.2.3.2-2.

For each supported information rate and bearer service with specified sensitivity and receiver dynamic range d, the following test shall pass.

Input power (d>=10 dB)	Criteria (After channel decoding)
Specified sensitivity+d dB	See Criteria in Table 6.1.2.3.2-2.

Table 6.1.2.3.2-1

Transport channel, information rate, service	Physical Channel, channel bit rate	Channel Frequency	Criteria (after channel decoding)	Remark
RACH, TBD kbps, packet	Common control, reverse link 16 ksps	Highest and lowest supported frequency	UER < 0.3%	
RACH, TBD kbps, packet	Common control, reverse link 64 ksps	Highest and lowest supported frequency	UER < 0.3%	
DCH, TBD kbps voice	DPDCH, TBD kbps	Highest and lowest supported frequency	BER < 10^-4	
DCH, TBD kbps low speed UDI	DPDCH, TBD kbps	Highest and lowest supported frequency	BER < 10^-7	
DCH, TBD kbps high speed UDI	DPDCH, TBD kbps	Highest and lowest supported frequency	BER < 10^-7	
DCH, TBD kbps, packet	DPDCH, TBD kbps	Highest and lowest supported frequency	UER < 0.3%	

Table 6.1.2.3.2-2

6.1.2.3.3 Minimum Requirement

The receiver dynamic range shall be at least 30 dB.

7.5 Adjacent channel selectivity

Adjacent channel selectivity (ACS) is a measure of the receiver ability to receive a wanted signal at is assigned channel frequency in the presence of a modulated signal in the adjacent channel

The static reference performance as specified in clause 7.3.1 and 7.3.2 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 modulated interfering adjacent channel signal with a level of [ ] dBm.

{From ARIB Vol. 5; Section 6.1.2.4}

6.1.2.4.1 Definitions

Adjacent channel selectivity shall be defined as the level ratio of the interference signal to the desired signal, specified by the following statement:

The level of desired signal shall be set to +3dB higher level of the specified reception sensitivity(refer to 6.1.2.2). The level of interfering signal shall be the one yielding a bit error rate of 1 x 10^{-3} on the desired (DTCH) channel.
The interference signal be detuned by Δf MHz and modulated by a pseudo random binary sequence with PN-15 stages.

6.1.2.4.2 Test conditions and measurement method

(a) Measuring system diagram

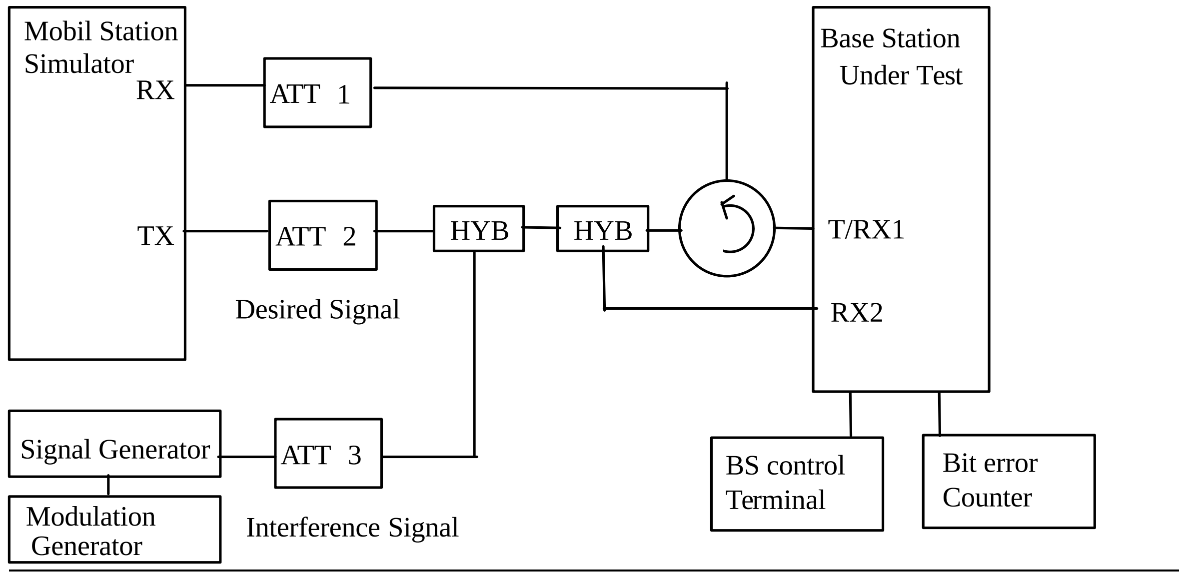

Figure 6.1.2.4.2 Measuring system Setup for Adjacent channel selectivity

(b) Measurement method

(1) To make the measurement, set up the equipment as shown in Figure 6.1.2.4.2. The Base station Under Test shall be connected through attenuator to Mobile Station simulator and measurement equipment.

(2) Transmit Perch Channel, Common Control Physical Channel and Dedicated Physical Channel to the mobile station simulator from the base station under test.

(3) Transmit Dedicated Traffic Channel(DTCH) to the base station under test from the mobile station simulator.

(4) Transmitter power control(TPC) is disable. *****

(5) Adjust ATT2 to set input level of Base Station Under Test to +3 dB higher level of the specified reception sensitivity.

(6) Set up the interference modulation signal to the adjacent channel frequency, then adjust ATT3 ,and obtain the level of interference signal such that BER=$1x10^{-3}$.

(7) Measure a difference between the level of an interference signal and the level of the specified reception sensitivity +3dB.

***** All power control mechanisms can be enabled. At that time, based on the measurement of the CDMA Cellular System (ARIB STD-T53), the following measurement method could be considered. The method is a little bit different comparing with above (5)~(7)

(5)* Measure the mobile station simulator output power.

(6)* Set up the interference modulation signal to the adjacent channel frequency.

(7)* Adjust the interference modulation signal to be X.X.dB above the mobile station simulator output power at the RF input ports as measured in step (5)*

(8)* The output power of the mobile station simulator shall increase by no more than 3 dB from Receiver Sensitivity is defined as the minimum received power and BER shall be less than $1x10^{-3}$

6.1.2.4.3 Minimum requirement

The Adjacent channel selectivity shall be [x. x. x. dB or higher]

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; 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.

The static reference performance as specified in clause 7.3.1 and 7.3.2 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 interfering signal at [frequency(s)] offset from the nominal assigned channel below a level of [ ] dBm.
- *< Editor The frequency range (in band/out of band) and level of the interfering signal is an item for further study>*

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.

The static reference performance as specified in clause 7.3.1 and 7.3.2 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.

{From ARIB Vol. 5; Section 6.1.2.6; Part of this content maps to XX.06 section 7.6, since the definition of Spurious Response is somewhat different.}

6.1.2.6 Spurious Response

6.1.2.6.1 Definitions

Spurious Response is a measure of the ability to receive a CDMA signal on the assigned channel frequency in the presence of one interference tone that is outside the assigned channel.
The level of desired signal shall be set +3 dB higher than the reference sensitivity level (refer to 6.1.2.2). The level of interference signal shall be as specified for the base station type, and the frequency within the specified band. This interfering signal shall not yield a bit error rate greater than $1x10^{-3}$ on the desired DTCH.

6.1.2.6.2 Test conditions and measurement method

(a) Measuring system diagram

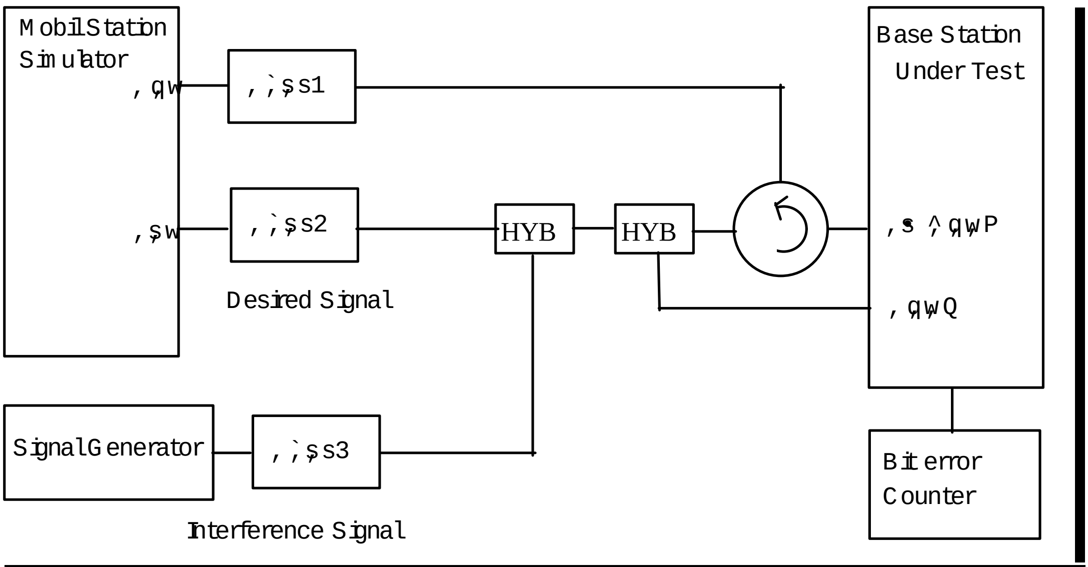

Figure 6.1.2.6.2 Measuring system Setup for Spurious Response

(b) Measurement method

(1) Connect the BTS to a mobile station simulator and a Signal generator.
(2) Transmitter power control (TPC) is disabled.*
(3) Adjust the mobile station simulator to a level 3dB above the minimum required reference sensitivity level.
(4) Adjust the Signal generator level to the appropriate level for the BTS type under test.
(5) The signal generator shall now be swept over the specified frequency band with a defined increment.
(6) The BTS shall satisfy the $1x10^{-3}$ BER requirement for all signal generator frequencies above.
(7) The requirement shall be met for all information rates and services specified for the BTS.

***Necessity and method of closed loop measurement is for future study.**

6.1.2.6.3 Minimum requirement

Applying the spurious level specified for the base station type, BER of the base station receiver shall be less than $1x10^{-3}$.

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.

The static reference performance as specified in clause 7.3.1 and 7.3.2 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.
- An interfering signal at frequency [f_1] and frequency [f_2] with a level of [ ] dBm.

{From ARIB Vol. 5; Section 6.1.2.5}

6.1.2.5 Reception intermodulation sensitivity

6.1.2.5.1 Definition

Reception intermodulation sensitivity is the capability of the base station to handle the intermodulation product generated by two CW signals.

6.1.2.5.2 Test conditions and measurement method

(a) Measuring system diagram

Figure 6.1.2.5.2 Measuring system Setup for Reception Intermodulation sensitivity

(b) Measurement method

(1) Connect the BTS to a mobile station simulator and a Signal generator.

? (2) Transmitter power control(TPC) is disabled.*

? (3) Transmit a PN signal from the MS simulator with a level 3dB higher than the minimum required sensitivity level. (refer to 6.1.2.2)

? (4) Adjust the Signal generators to frequency offsets of [+10**] MHz and [+20.1**] MHz from the assigned WCDMA channel.

? (5) Adjust the power of the Signal generators to the absolute value specified for the base station type.

? (6) Measure the BER of the base station.

? (7) Confirm that the BER of the base station receiver is less than 1×10^{-3}.

? (8) The requirement shall be met for all information rates and services specified for the BTS.

? (9) Repeat the measurement for frequency offsets [-10**] MHz and [-20.1**] MHz.

?

* Necessity and method of closed loop measurement is for future study.

** These values are working assumption for the 5MHz carrier spacing.

6.1.2.5.3 Minimum requirement

Applying the interference signal level specified for the base station type, BER of the base station receiver shall be less than 1×10^{-3}.

7.11 ~~7.11~~ Spurious emissions

{Other sections}
{From ARIB Vol. 5; Section 6.1.2.7; has no corresponding seciton in XX.06}

6.1.2.7 RSQI measurement (Received signal quality indicator)

6.1.2.7.1 Definition

Received signal quality indicator(RSQI) refers to a measurement of signal quality performed by base stations.

Signal quality is defined as the signal to noise ratio Eb/Io where Eb is the energy per bit and Io is the total received noise-plus-interference power in the CDMA bandwidth divided by X.X.MHz. Signal quality shall be computed by adding together the individual Eb/Io values from multipath components. RSQI shall be reported as a [6 bits] unsigned integer as follows;

Eb/Io = (Energy per Bit)/(Noise + Interference Power) x X.X.MHz

RSQI =

where the signal energy and noise power are measured within the CDMA bandwidth.

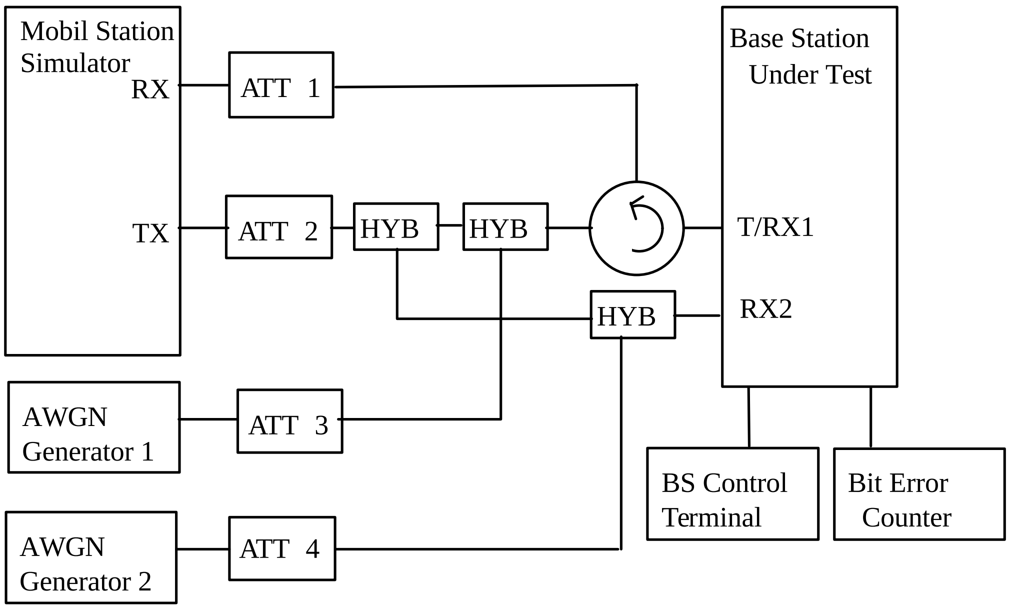

Fig. 6.1.2.7.2 Measuring system Setup for Base Station RSQI

(b) Measurement method

Configure the base station under test and a mobile station simulator as shown in Fig. 6.1.2.7.2.

(2) Disable reverse link closed loop power control in the mobile station simulator.

Adjust the AWGN generators for a noise power spectral density of [–84 dBm/X.X.MHz +/-5 dB]and adjust the equipment for an Eb/Io of 8 dB at each RF input terminal.

(4) Set up a call by the base station.

(5) Transmit random data to the mobile station simulator.

(6) Record the RSQI reported by the base station.

(7) Reduce the mobile station simulator output power by 4 dB.

(8) Record the RSQI reported by the base station.

(9) Increase the mobile station simulator output power by 1dB.

(10) Repeat steps (8) and (9) until the Eb/Io per antenna reaches 14 dB.

6.1.2.7.3 Minimum requirement

The report RSQI shall be within the bands shown in Table 6.1.2.7.3. For Eb/Io greater than 14 dB the RSQI reports should be monotonic non decreasing.

Table 6.1.2.7.3 Bounds on RSQI Reports

Eb/Io per input port (dB)	Minimum acceptable report value	Maximum acceptable report value
[4]	[10]	[18]
[5]	[12]	[20]

[6]	[14]	[22]
[7]	[16]	[24]
[8]	[18]	[26]
[9]	[20]	[28]
[10]	[22]	[30]
[11]	[24]	[32]
[12]	[26]	[34]
[13]	[28]	[36]
[14]	[30]	[38]

8 Performance requirement

8.1 General

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

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 UE sensitivity performance

8.2.2 ~~8.2.2~~ BS sensitivity performance

{From ARIB Vol. 5; Section 6.4}

6.4.1 Performance in AWGN channel

The performance requirement in AWGN channel is determined by the E_b/I_0 required for BER=10^{-3}, 10^{-6}. The BER is calculated for each of the possible data services.

6.4.1.1 Channel model

Refer to Figure XXX for a functional block diagram of the test setup.

6.4.1.2 Single link performance

The required E_b/I_0 is described in Table XXX.

Table XXX E_b/I_0 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.

[6.4.1.3 Uplink power control]

[The uplink power control test ensures that the power control bits have the correct sense, position, delay, and amplitude.]

[6.4.1.4 Softer handover performance]

[Further study]

[6.4.1.5 Soft handover performance]

[Further study]

6.4.2 Performance in multipath fading channels

The performance requirement of reverse link with/without TPC in multipath fading channels is determined by the E_b/I_0 required for BER=10^{-3}, 10^{-6}. The BER is calculated for each of the possible data services.

6.4.2.1 Channel models

Refer to Figure XXX for a functional block diagram of the test setup.

6.4.2.2 Single link performance

6.4.2.2.1 Performance without TPC

The required E_b/I_0 is described in Table XXX.

Table XXX E_b/I_0 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.

6.4.2.2.2 Performance with TPC

The required E_b/I_0 is described in Table XXX.

Table XXX E_b/I_0 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.

[6.4.2.3 Uplink power control]

[The uplink power control test ensures that the power control bits have the correct sense, position, delay, and amplitude.]

[6.4.2.4 Softer handover performance]

[Further study]

[6.4.2.5 Soft handover performance]

[Further study]

8.3 Rx synchronisation characterisitics

{From ARIB Vol. 5; Section 6.5.1}

6.5.1 Synchronization

6.5.1.1 Asynchronous operation

This chapter is for further study, until related specifications in Volume 3 are detailed.

ref: Vol. 3 chap. 3.2.6.1 ver. 0-4.0
Even in asynchronous operation, some tolerence requirement may be needed to be set on the alignment between neighboring sectors and neighboring base stations (BTS reference SFN).

6.5.1.2 Synchronous operation

This chapter is for further study, until related specifications in Volume 3 are detailed.

ref: Vol. 3 chap. 3.1 ver. 0-4.0
The text here will depend on the details of the synchronous operation, which has yet to be defined in Volume 3. A much tighter timing alignment requirement will need to be imposed than the asynchronous case.

- difference between synchronous and asynchronous operation
- requirements for synchronous operation

{From ARIB Vol. 5; Section 6.5.2; This section is related to higher layer protocols}

6.5.2 Channel timing dependencies

6.5.2.1 Physical channel timing

REF: VOL. 3 CHAP. 3.2.6.1 VER. 0-4.0

Relative timing between different code channels transmitted and received at the base station. This includes relative frame and slot timing requirements between the forward and reverse links, as well as among different channels. Refer to volume 3 whenever appropriate.
Possible items to be covered are:

- long code timing offsets for each downlink physical channel
- requirements for accuracy

6.5.2.2 L2/L3 procedures in radio interface

This chapter is for further study, until related specifications in Volume 3 and other relevant documents are detailed.

Protocol specifications should include all needed timing and delay requirements. There should be no additional requirements in this volume. This chapter should list appropriate test cases for type approval. Test cases should be such that they can be tested and verified from the radio interface.
Possible procedures to be covered are:

- handovers
- random access
- link setup

Other parts of ARIB Volume 5, Not merged into the baseline ETSI structure

{From Vol. 5, Section 2.4}

2.4 Environmental Requirements

2.4.1 Temperature and power supply voltage

2.4.1.1 Definition

The temperature and voltage ranges denote the range of ambient temperature and power supply input voltages over which the base station will operate and meet the requirements of this standard. The ambient temperature is the average temperature of the air surrounding the base station equipment. The power supply voltage is the voltage applied at the input terminals of the base station equipment. The manufacturer is to specify the temperature range and the power supply voltage over which the equipment is to operate.

2.4.1.2 Method of Measurement

The base station equipment shall be installed in its normal configuration (i.e., in its normal cabinet or rack mounting arrangement with all normally supplied cover installed) and placed in a temperature chamber. Optionally, the equipment containing the frequency determining element(s) may be placed in the temperature chamber if the frequency stability is to maintained over a different temperature from that specified for the rest of the base station equipment.

The temperature chamber shall be stabilized at the manufacturer’s highest specified operating temperature and then shall be operated in accordance with the standard duty cycle test conditions specified in section that describes standard test conditions, and over the power supply input voltage range specified by the manufacturer. With the base station equipment operating, the temperature is to be maintained at the specified test temperature without forced circulation of air from the temperature chamber being directly applied to the base station equipment.

During the entire duty cycle, the transmitter frequency accuracy, timing reference, output power, and waveform quality shall be measured as specified in section 6.1.1 Transmitter requirement.

Turn the base station equipment off, stabilize the equipment in the chamber at room temperature, and repeat the above measurements after a [minute] standby warm up period.

Turn the base station equipment off, stabilize the equipment in the chamber at the coldest operating temperature specified by the manufacturer, and repeat the above measurements above after a [minute] standby warm up period.

For transmitter frequency stability measurements, the above procedure shall be repeated every [C°] over the operating temperature range specified by the manufacturer. The equipment shall be allowed to stabilize at each step before a frequency measurement is made.

[2.4.1.3 Minimum Standard]

2.4.2 High Humidity

2.4.2.1 Definition

The term ‘high humidity’ denotes the relative humidity at which the base station will operate with no more than a specified amount of degradation in performance.

2.4.2.2 Method of Measurement

The base station equipment, after having been adjusted for normal operation under standard test conditions, shall be placed, inoperative, in a humidity chamber with the humidity maintained at [0.024] gm H_2O/gm Dry

Air at [C°] ([%] relative humidity) for a period of not less than eight hours. While in the chamber and at the end of this period, the base station transmitting equipment shall be tested for frequency accuracy, timing reference, output power, and waveform quality. No readjustment of the base station equipment shall be allowed during this test.

[2.4.2.3 Minimum Standard]

{From Vol. 5, Section 2.5}

2.5 Reliability

[Editor's Note: This section describes the requirement for reliability of the base station equipment. The elements should cover at least MTBF and system availability.   However the values of these elements may be determined by each country/operator basis.]

IMT-2000 system should be designed at least as good as the reliability of corresponding second generation systems. The mean time between failure (MTBF) is considered as the element of hardware reliability.

In addition, system availability is considered as the element of system reliability and may also be determined. The value of these element may be dependent on each vendor/operator.

{From Vol. 5, Section 2.6}

2.6 Interface Requirement

[Editor's Note: This section describes that the equipment of IMT-2000 base station should satisfy the Abis and Air interface specifications.
Question:
Interface name is A or Iu?
How do we treat BSC and OMC? Should we describe BSC and OMC in this document?
In case that BSC to be described in this document, should we describe Iur ?]

Base station has two interfaces :Abis and Air interface. Those interfaces are described in document No. X and X, respectively. The details of each interface specification is not described in this document.

{Vol. 5, Section 3 (EMC) is not merged into this document}

{From Vol. 5, Section 4}

[4 Safety]

4.1 Electrical safety

Purpose is to prevent injury or damage due to fire, electrical shock, energy hazard, heat and mechanical construction.

IEC60950, "Safety of information technology equipment", 1991-10 and IEC 60950-am4, "Amendment No. 4", 1996-07 shall be fulfilled.

4.2 Safety of radio equipment

The 3G BTS shall follow the essential requirements of IEC 215 and later versions of it.

TBD

4.3 SAR

Refer to ICNIRP Guidelines: "Guidelines for limiting Exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz)"; Health Physics, April 1998, Vol. 74, No. 4.

{From Vol. 5, Section 5}

[5 Operation and Maintenance]

[Editor's Note: This section describes the requirement related to operation and maintenance. Although these issues may depend on each operator ,minimum requirement is described in this section.]

Most functions of base station related to operation and maintenance depend on each vendor/operator. However, the following abilities should be at least included as the functions of base station;

- ability to report various status and parameters of base station required for operation and maintenance to the BSC.
- ability to be controlled from the BSC for operation and maintenance purpose.

Annex

Annex A (normative): Transmit power levels versus time

Annex B (normative): Propagation conditions

Annex C (normative): Environmental conditions

History

Document history		
~~V0.0.1~~	~~1998-08-28~~	~~Created document from UTRA/FDD L1 description, v0.4~~
~~V0.0.2~~	~~1998-09-15~~	~~This document is based on Tdoc s298x320/98, which was an agreed restructuring of document XX.06 V0.0.1. In addition changes discussed during the Helsinki L1 meeting (8th-11th Sept 98) have also been incorporated.~~
~~V0.1.0~~	~~1998-11-4~~	~~The main change to the previous document which was approved by the SM2 Marseilles September 98 meeting has been to add a status section.~~
~~V0.2.0~~	~~1998-11-13~~	~~The main changes are an update to the status table in section 4 and the inclusion of a table of MS Power Classes in section 6.~~
~~V0.3.0~~	~~1998-12-12~~	~~Changes introduced to harmonise with terms used in XX12v0.0.2 which include additional text changes~~
~~V0.3.1~~	~~1998-12-15~~	~~Changes introduced at the UMTS-LI meeting in Helsinki 14-18th December 1998~~
~~V0.4.0~~	~~1988-12-24~~	~~Document status upgrade to ver0.4.0 to reflect LI acceptance 18th Dec 1998~~
~~V0.4.1~~	~~1999-01-20~~	~~Document modified to correct editorial errors.~~

Editor

~~for UMTS XX.06 is:~~

~~Edgar Fernandes~~

~~Motorola Ltd.~~

~~Tel: +44 (0) 1256 790168~~
~~Fax: +44 (0) 1256 790190~~
~~Email: edgarf@euro.css.mot.com~~

This document is written in Microsoft Word ~~6~~7