ETSI TS 125 104 V4.9.0 (2007-03)

Universal Mobile Telecommunications System (UMTS);
Base Station (BS) radio transmission and reception (FDD)
(3GPP TS 25.104 version 4.9.0 Release 4)

Reference
RTS/TSGR-0425104v490

Keywords
UMTS

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00   Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

Individual copies of the present document can be downloaded from:
http://www.etsi.org

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at
http://portal.etsi.org/tb/status/status.asp

If you find errors in the present document, please send your comment to one of the following services:
http://portal.etsi.org/chaircor/ETSI_support.asp

Copyright Notification

ETSI

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 ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (http://webapp.etsi.org/IPR/home.asp).

Pursuant to the ETSI 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 ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

This Technical Specification (TS) has been produced by ETSI 3rd Generation Partnership Project (3GPP).

The present document may refer to technical specifications or reports using their 3GPP identities, UMTS identities or GSM identities. These should be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between GSM, UMTS, 3GPP and ETSI identities can be found under http://webapp.etsi.org/key/queryform.asp.

Contents

Foreword

This Technical Specification has been produced by the 3GPP.

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of this TS, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version 3.y.z

where:

> x   the first digit:
>
> > 1   presented to TSG for information;
> >
> > 2   presented to TSG for approval;
> >
> > 3   Indicates TSG approved document under change control.
>
> y   the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
>
> z   the third digit is incremented when editorial only changes have been incorporated in the specification.

1 Scope

This document establishes the Base Station 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, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] ITU-R Recommendation SM.329-8, "Spurious emissions".

[2] (void)

[3] ETSI ETR 273-1-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement of radiated methods of measurement (using test sites) and evaluation of the corresponding measurement uncertainties; Part 1: Uncertainties in the measurement of mobile radio equipment characteristics; Sub-part 2: Examples and annexes".

[4] 3GPP TR 25.942 "RF System Scenarios".

3 Definitions and abbreviations

3.1 Definitions

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

Mean power: When applied to a W-CDMA modulated signal this is the power (transmitted or received) in a bandwidth of at least $(1+ \alpha)$ times the chip rate of the radio access mode. The period of measurement shall be at least one timeslot unless otherwise stated.

RRC filtered mean power: The mean power as measured through a root raised cosine filter with roll-off factor α and a bandwidth equal to the chip rate of the radio access mode.

NOTE 1: The RRC filtered mean power of a perfectly modulated W-CDMA signal is 0.246 dB lower than the mean power of the same signal.

Code domain power: That part of the mean power which correlates with a particular (OVSF) code channel. The sum of all powers in the code domain equals the mean power in a bandwidth of $(1+ \alpha)$ times the chip rate of the radio access mode.

Output power: The mean power of one carrier of the base station, delivered to a load with resistance equal to the nominal load impedance of the transmitter.

Rated output power: Rated output power of the base station is the mean power level per carrier that the manufacturer has declared to be available at the antenna connector.

Maximum output Power: The mean power level per carrier of the base station measured at the antenna connector in a specified reference condition.

Power control dynamic range: The difference between the maximum and the minimum code domain power of a code channel for a specified reference condition.

Total power dynamic range: The difference between the maximum and the minimum output power for a specified reference condition.

NOTE 2: The roll-off factor α is defined in section 6.8.1.

3.2 Abbreviations

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

ACIR	Adjacent Channel Interference Ratio
ACLR	Adjacent Channel Leakage power Ratio
ACS	Adjacent Channel Selectivity
BS	Base Station
BER	Bit Error Ratio
BLER	Block Error Ratio
CW	Continuous Wave (unmodulated signal)
DL	Down Link (forward link)
FDD	Frequency Division Duplexing
GSM	Global System for Mobile Communications
P_{out}	Output Power
P_{RAT}	Rated Output Power
PHS	Personal Handyphone System
PPM	Parts Per Million
RSSI	Received Signal Strength Indicator
SIR	Signal to Interference ratio
TDD	Time Division Duplexing
TPC	Transmit Power Control
UARFCN	UTRA Absolute Radio Frequency Channel Number
UE	User Equipment
UL	Up Link (reverse link)
WCDMA	Wideband Code Division Multiple Access

4 General

4.1 Relationship between Minimum Requirements and Test Requirements

The Minimum Requirements given in this specification make no allowance for measurement uncertainty. The test specification 25.141 section 4 defines Test Tolerances. These Test Tolerances are individually calculated for each test. The Test Tolerances are used to relax the Minimum Requirements in this specification to create Test Requirements.

The measurement results returned by the Test System are compared - without any modification - against the Test Requirements as defined by the shared risk principle.

The Shared Risk principle is defined in ETR 273 Part 1 sub-part 2 section 6.5.

4.2 Base station classes

The requirements in this specification apply to base station intended for general-purpose applications.

In the future further classes of base stations may be defined; the requirements for these may be different than for general-purpose applications.

4.3 Regional requirements

Some requirements in TS 25.104 may only apply in certain regions. Table 4.1 lists all requirements that may be applied differently in different regions.

Table 4.1: List of regional requirements

Clause number	Requirement	Comments
5.2	Frequency bands	Some bands may be applied regionally.
5.3	Tx-Rx Frequency Separation	The requirement is applied according to what frequency bands in Clause 5.2 that are supported by the BS.
6.2.1	Base station maximum output power	In certain regions, the minimum requirement for normal conditions may apply also for some conditions outside the range of conditions defined as normal.
6.6.2.1	Spectrum emission mask	The mask specified may be mandatory in certain regions. In other regions this mask may not be applied.
6.6.3.1.1	Spurious emissions (Category A)	These requirements shall be met in cases where Category A limits for spurious emissions, as defined in ITU-R Recommendation SM.329-8 [1], are applied.
6.6.3.1.2	Spurious emissions (Category B)	These requirements shall be met in cases where Category B limits for spurious emissions, as defined in ITU-R Recommendation SM.329-8 [1], are applied.
6.6.3.3.1	Co-existence with GSM900 -Operation in the same geographic area	This requirement may be applied for the protection of GSM 900 MS and GSM 900 BTS in geographic areas in which both GSM 900 and UTRA are deployed.
6.6.3.3.2	Co-existence with GSM900 - Co-located base stations	This requirement may be applied for the protection of GSM 900 BTS receivers when GSM 900 BTS and UTRA BS are co-located.
6.6.3.4.1	Co-existence with DCS1800 -Operation in the same geographic area	This requirement may be applied for the protection of DCS 1800 MS and DCS 1800 BTS in geographic areas in which both DCS 1800 and UTRA are deployed.
6.6.3.4.2	Co-existence with DCS1800 - Co-located base stations	This requirement may be applied for the protection of DCS 1800 BTS receivers when DCS 1800 BTS and UTRA BS are co-located.
6.6.3.5	Co-existence with PHS	This requirement may be applied for the protection of PHS in geographic areas in which both PHS and UTRA are deployed.
6.6.3.6	Co-.existence with services in adjacent frequency bands	This requirement may be applied for the protection in bands adjacent to 2110-2170 MHz, as defined in sub-clause 5.2(a) and 1930-1990 MHz, as defined in sub-clause 5.2(b) in geographic areas in which both an adjacent band service and UTRA are deployed.
6.6.3.7.1	Co-existence with UTRA TDD - Operation in the same geographic area	This requirement may be applied to geographic areas in which both UTRA-TDD and UTRA-FDD are deployed.
6.6.3.7.2	Co-existence with UTRA TDD - Co-located base stations	This requirement may be applied for the protection of UTRA-TDD BS receivers when UTRA-TDD BS and UTRA FDD BS are co-located.
7.4.2	Adjacent Channel Selectivity Co-location with UTRA-TDD	This requirement may be applied for the protection of UTRA-FDD BS receivers when UTRA-FDD BS and UTRA-TDD BS are co-located.
7.5	Blocking characteristic	The requirement is applied according to what frequency bands in Clause 5.2 that are supported by the BS.
7.5.2	Blocking characteristics Co-location with GSM900 and/or DCS 1800	This requirement may be applied for the protection of UTRA FDD BS receivers when UTRA FDD BS and GSM 900/DCS1800 BS are co-located.
7.5.3	Blocking characteristics Co-location with UTRA TDD	This requirement may be applied for the protection of UTRA FDD BS receivers when UTRA FDD BS and UTRA TDD BS are co-located.

4.4   Environmental requirements for the BS equipment

The BS equipment shall fulfil all the requirements in the full range of environmental conditions for the relevant environmental class from the relevant IEC specifications listed below:

> 60 721-3-3   "Stationary use at weather protected locations"
>
> 60 721-3-4   "Stationary use at non weather protected locations"

Normally it should be sufficient for all tests to be conducted using normal test conditions except where otherwise stated. For guidance on the use of test conditions to be used in order to show compliance refer to TS 25.141.

5   Frequency bands and channel arrangement

5.1   General

The information presented in this section is based on a chip rate of 3.84 Mcps.

> NOTE 1: Other chip rates may be considered in future releases.

5.2   Frequency bands

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

> (a) 1920 - 1980MHz: Up-link (Mobile transmit, base receive)
>   2110 - 2170MHz: Down-link (Base transmit, mobile receive)
>
> (b) 1850 - 1910MHz: Up-link (Mobile transmit, base receive)
>   1930 - 1990MHz: Down-link (Base transmit, mobile receive)
>   (Note 1)

> NOTE 1: Used in Region 2. Additional allocations in ITU region 2 are FFS.

> NOTE 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 and all UE(s) shall support a TX -RX frequency separation of 190 MHz when operating in the paired band defined in sub-clause 5.2(a).
>
> b) UTRA/FDD can support both fixed and variable transmit to receive frequency separation.
>
> c) When operating in the paired band defined in sub-clause 5.2(b), all UE(s) shall support a TX - RX frequency separation of 80 MHz.
>
> d) The use of other transmit to receive frequency separations in existing or 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 optimise performance in a particular deployment scenario.

5.4.2   Channel raster

The channel raster is 200 kHz, which means that the center frequency must be an integer multiple of 200 kHz.

5.4.3   Channel number

The carrier frequency is designated by the UTRA Absolute Radio Frequency Channel Number (UARFCN). The value of the UARFCN in the IMT2000 band is defined as follows:

Table 5.1: UTRA Absolute Radio Frequency Channel Number

Uplink	$N_u = 5 * F_{uplink}$	$0.0 \text{ MHz} \leq F_{uplink} \leq 3276.6 \text{ MHz}$ where F_{uplink} is the uplink frequency in MHz
Downlink	$N_d = 5 * F_{downlink}$	$0.0 \text{ MHz} \leq F_{downlink} \leq 3276.6 \text{ MHz}$ where $F_{downlink}$ is the downlink frequency in MHz

Table 5.1A: UARFCN definition (Band b, region 2, Additional Channels)

Uplink	$N_u = 5 * ((F_{uplink} - 100khz) - 1850)$	1852.5, 1857.5, 1862.5, 1867.5, 1872.5, 1877.5, 1882.5, 1887.5, 1892.5, 1897.5, 1902.5, 1907.5
Downlink	$N_d = 5 * ((F_{downlink} - 100khz) - 1850)$	1932.5, 1937.5, 1942.5, 1947.5, 1952.5, 1957.5, 1962.5, 1967.5, 1972.5, 1977.5, 1982.5, 1987.5

6   Transmitter characteristics

6.1   General

Unless otherwise stated, the transmitter characteristics are specified at the BS antenna connector (test port A) with a full complement of transceivers for the configuration in normal operating conditions. If any external apparatus such as a TX amplifier, a filter or the combination of such devices is used, requirements apply at the far end antenna connector (port B).
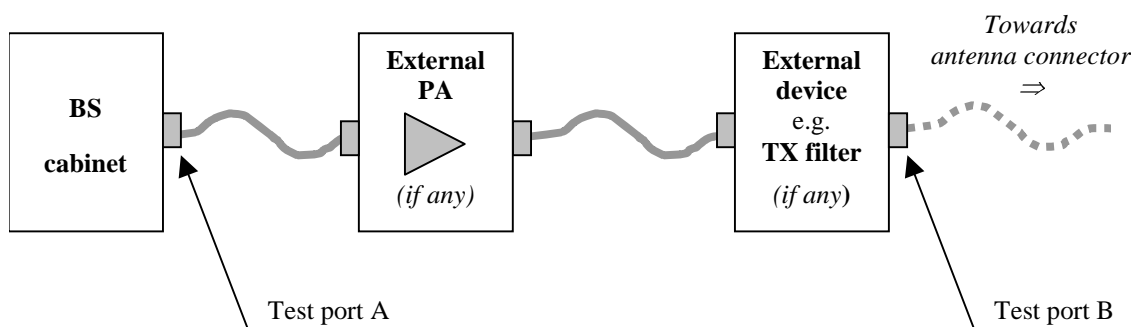
Figure 6.1: Transmitter test ports

6.2   Base station output power

Output power, Pout, of the base station is the mean power of one carrier delivered to a load with resistance equal to the nominal load impedance of the transmitter.

Rated output power, PRAT, of the base station is the mean power level per carrier that the manufacturer has declared to be available at the antenna connector.

6.2.1   Base station maximum output power

Maximum output power, Pmax, of the base station is the mean power level per carrier measured at the antenna connector in specified reference condition.

6.2.1.1   Minimum requirement

In normal conditions, the Base station maximum output power shall remain within +2 dB and -2dB of the manufacturer's rated output power.

In extreme conditions, the Base station maximum output power shall remain within +2.5 dB and -2.5 dB of the manufacturer's rated output power.

In certain regions, the minimum requirement for normal conditions may apply also for some conditions outside the range of conditions defined as normal.

6.3   Frequency error

The same source shall be used for RF frequency and data clock generation.

6.3.1   Minimum requirement

The modulated carrier frequency of the BS shall be accurate to within $\pm$ 0.05 ppm observed over a period of one timeslot.

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   Inner loop power control in the downlink

Inner loop power control in the downlink is the ability of the BS transmitter to adjust the transmitter output power of a code channel in accordance with the corresponding TPC symbols received in the uplink.

6.4.1.1   Power control steps

The power control step is the required step change in the code domain power of a code channel in response to the corresponding power control command. The aggregated output power change is the required total change in the code domain power of a code channel in response to multiple consecutive power control commands corresponding to that code channel.

6.4.1.1.1   Minimum requirement

The BS transmitter shall have the capability of setting the inner loop code domain power with a step sizes of 1dB mandatory and 0.5 dB optional

   a) The power control step due to inner loop power control shall be within the range shown in Table 6.1.

   b) The aggregated output power change due to inner loop power control shall be within the range shown in Table 6.2.

Table 6.1: Transmitter power control step tolerance

Power control commands in the down link	Transmitter power control step tolerance			
	1 dB step size		0.5 dB step size	
	Lower	Upper	Lower	Upper
Up (TPC command "1")	+0.5 dB	+1.5 dB	+0.25 dB	+0.75 dB
Down (TPC command "0")	-0.5 dB	-1.5 dB	-0.25 dB	-0.75 dB

Table 6.2: Transmitter aggregated power control step range

Power control commands in the down link	Transmitter aggregated power control step after 10 consecutive equal commands (up or down)			
	1 dB step size		0.5dB step size	
	Lower	Upper	Lower	Upper
Up (TPC command "1")	+8 dB	+12 dB	+4 dB	+6 dB
Down (TPC command "0")	-8 dB	-12 dB	-4 dB	-6 dB

6.4.2 Power control dynamic range

The power control dynamic range is the difference between the maximum and the minimum code domain power of a code channel for a specified reference condition.

6.4.2.1 Minimum requirements

Down link (DL) power control dynamic range:

Maximum code domain power: BS maximum output power - 3 dB or greater

Minimum code domain power: BS maximum output power - 28 dB or less

6.4.3 Total power dynamic range

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

NOTE: The upper limit of the dynamic range is the BS maximum output power. The lower limit of the dynamic range is the lowest minimum power from the BS when no traffic channels are activated.

6.4.3.1 Minimum requirement

The downlink (DL) total power dynamic range shall be 18 dB or greater.

6.4.4 Primary CPICH power

Primary CPICH power is the code domain power of the Common Pilot Channel averaged over one frame. Primary CPICH power is indicated on the BCH.

6.4.4.1 Requirement

Primary CPICH code domain power shall be within ± 2.1dB of the Primary CPICH code domain power indicated on the BCH.

6.4.5 IPDL time mask

To support IPDL location method, the Node B shall interrupt all transmitted signals in the downlink (i.e. common and dedicated channels).

The IPDL time mask specifies the limits of the BS output power during these idle periods.

The requirement in this section shall apply to BS supporting IPDL.

6.4.5.1 Minimum Requirement

The mean power measured over a period starting 27 chips after the beginning of the IPDL period and ending 27 chips before the expiration of the IPDL period shall be equal to or less than

<div align="center">

BS maximum output power – 35 dB;

</div>

see also Figure 6.1A.
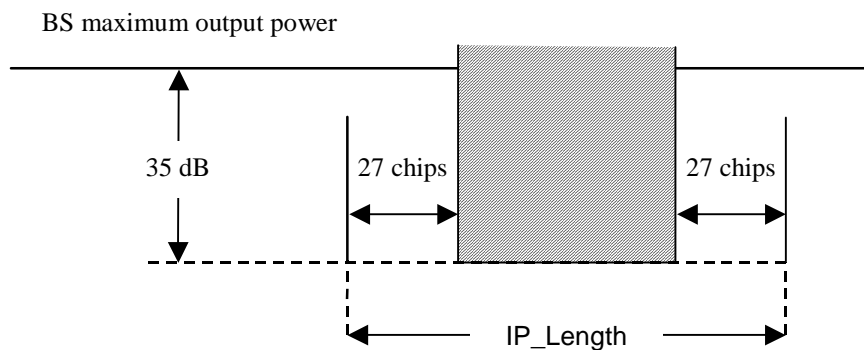
Figure 6.1A: IPDL Time Mask

The requirement applies to all output powers within the total power dynamic range as specified in subclause 6.4.3.

6.5 (void)

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 shall be less than 5 MHz based on a chip rate of 3.84 Mcps.

6.6.2 Out of band emission

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

6.6.2.1 Spectrum emission mask

The mask defined in Tables 6.3 to 6.6 below may be mandatory in certain regions. In other regions this mask may not be applied.

For regions where this clause applies, the requirement shall be met by a base station transmitting on a single RF carrier configured in accordance with the manufacturer's specification. Emissions shall not exceed the maximum level specified in tables 6.3 to 6.6 for the appropriate BS maximum output power, in the frequency range from Δf = 2.5 MHz to Δf_{max} from the carrier frequency, where:

- Δf is the separation between the carrier frequency and the nominal -3dB point of the measuring filter closest to the carrier frequency.

- F_offset is the separation between the carrier frequency and the centre of the measuring filter.

- f_offset_{max} is either 12.5 MHz or the offset to the UMTS Tx band edge as defined in section 5.2, whichever is the greater.

- Δf_{max} is equal to f_offset_{max} minus half of the bandwidth of the measuring filter.
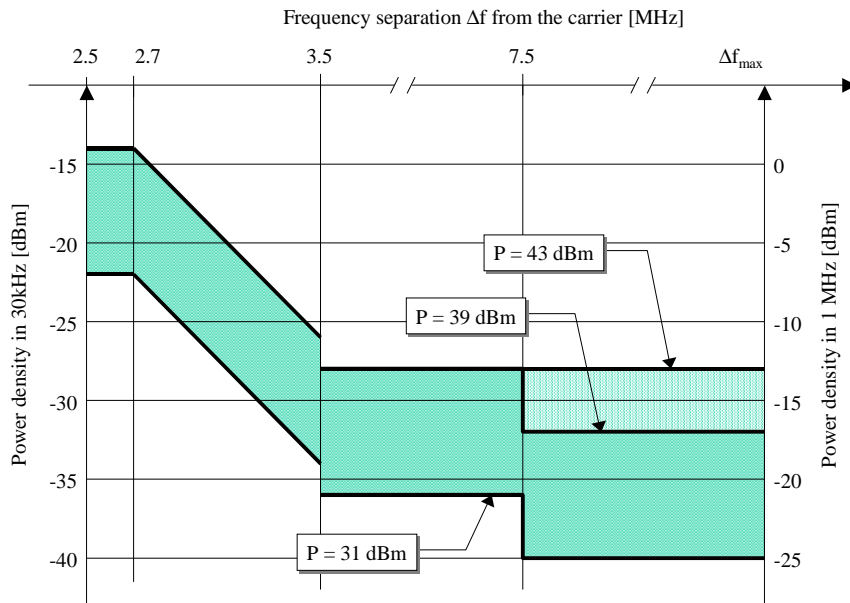
Illustrative diagram of spectrum emission mask

Figure 6.2: Spectrum emission mask

Table 6.3: Spectrum emission mask values, BS maximum output power P ≥ 43 dBm

Frequency offset of measurement filter -3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Minimum requirement	Additional Minimum Requirement for Band b	Measurement bandwidth
2.5 ≤ Δf < 2.7 MHz	2.515MHz ≤ f_offset < 2.715MHz	-14 dBm	-15 dBm	30 kHz
2.7 ≤ Δf < 3.5 MHz	2.715MHz ≤ f_offset < 3.515MHz	- 14 dBm- 15·(f_offset-2.715) dB	-15 dBm	30 kHz
(see note)	3.515MHz ≤ f_offset < 4.0MHz	-26 dBm	NA	30 kHz
3.5 ≤ Δf MHz	4.0MHz ≤ f_offset < f_offset_max	-13 dBm	NA	1 MHz

Table 6.4: Spectrum emission mask values, BS maximum output power 39 ≤ P < 43 dBm

Frequency offset of measurement filter -3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Minimum requirement	Additional Minimum Requirement for Band b	Measurement bandwidth
2.5 ≤ Δf < 2.7 MHz	2.515MHz ≤ f_offset < 2.715MHz	-14 dBm	-15 dBm	30 kHz
2.7 ≤ Δf < 3.5 MHz	2.715MHz ≤ f_offset < 3.515MHz	-14 dBm - 15·(f_offset - 2.715) dB	-15 dBm	30 kHz
(see note)	3.515MHz ≤ f_offset < 4.0MHz	-26 dBm	NA	30 kHz
3.5 ≤ Δf < 7.5 MHz	4.0MHz ≤ f_offset < 8.0MHz	-13 dBm	NA	1 MHz
7.5 ≤ Δf MHz	8.0MHz ≤ f_offset < f_offset$_{max}$	P - 56 dB	NA	1 MHz

Table 6.5: Spectrum emission mask values, BS maximum output power 31 ≤ P < 39 dBm

Frequency offset of measurement filter -3dB point,Δf	Frequency offset of measurement filter centre frequency, f_offset	Minimum requirement	Additional Minimum Requirement for Band b	Measurement bandwidth
2.5 ≤ Δf < 2.7 MHz	2.515MHz ≤ f_offset < 2.715MHz	P - 53 dB	-15 dBm	30 kHz
2.7 ≤ Δf < 3.5 MHz	2.715MHz ≤ f_offset < 3.515MHz	P - 53 dB - 15·(f_offset - 2.715) dB	-15 dBm	30 kHz
(see note)	3.515MHz ≤ f_offset < 4.0MHz	P - 65 dB	NA	30 kHz
3.5 ≤ Δf < 7.5 MHz	4.0MHz ≤ f_offset < 8.0MHz	P - 52 dB	NA	1 MHz
7.5 ≤ Δf MHz	8.0MHz ≤ f_offset < f_offset$_{max}$	P - 56 dB	NA	1 MHz

Table 6.6: Spectrum emission mask values, BS maximum output power P < 31 dBm

Frequency offset of measurement filter -3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Minimum requirement	Measurement bandwidth
2.5 ≤ Δf < 2.7 MHz	2.515MHz ≤ f_offset < 2.715MHz	-22 dBm	30 kHz
2.7 ≤ Δf < 3.5 MHz	2.715MHz ≤ f_offset < 3.515MHz	-22 dBm - 15·(f_offset - 2.715) dB	30 kHz
(see note)	3.515MHz ≤ f_offset < 4.0MHz	-34 dBm	30 kHz
3.5 ≤ Δf < 7.5 MHz	4.0MHz ≤ f_offset < 8.0MHz	-21 dBm	1 MHz
7.5 ≤ Δf MHz	8.0MHz ≤ f_offset < f_offset$_{max}$	-25 dBm	1 MHz

NOTE: This frequency range ensures that the range of values of f_offset is continuous.

6.6.2.2   Adjacent Channel Leakage power Ratio (ACLR)

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the RRC filtered mean power centered on the assigned channel frequency to the RRC filtered mean power centered on an adjacent channel frequency.

6.6.2.2.1   Minimum requirement

The ACLR shall be higher than the value specified in Table 6.7.

Table 6.7: BS ACLR

BS adjacent channel offset below the first or above the last carrier frequency used	ACLR limit
5 MHz	45 dB
10 MHz	50 dB

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. This is measured at the base station RF output port.

The requirements shall apply whatever the type of transmitter considered (single carrier or multiple-carrier). It applies for all transmission modes foreseen by the manufacturer's specification.

The requirements (except 6.6.3.5) apply at frequencies within the specified frequency ranges that are more than 12.5MHz below the first carrier frequency used or more than 12.5MHz above the last carrier frequency used.

Unless otherwise stated, all requirements are measured as mean power.

6.6.3.1   Mandatory Requirements

The requirements of either subclause 6.6.3.1.1 or subclause 6.6.3.1.2 shall apply.

6.6.3.1.1   Spurious emissions (Category A)

The following requirements shall be met in cases where Category A limits for spurious emissions, as defined in ITU-R Recommendation SM.329-8 [1], are applied.

6.6.3.1.1.1   Minimum Requirement

The power of any spurious emission shall not exceed:

Table 6.8: BS Mandatory spurious emissions limits, Category A

Band	Maximum level	Measurement Bandwidth	Note
9kHz - 150kHz		1 kHz	Bandwidth as in ITU-R SM.329-8, s4.1
150kHz - 30MHz		10 kHz	Bandwidth as in ITU-R SM.329-8, s4.1
30MHz - 1GHz	-13 dBm	100 kHz	Bandwidth as in ITU-R SM.329-8, s4.1
1GHz - 12.75 GHz		1 MHz	Upper frequency as in ITU-R SM.329-8, s2.5 table 1

6.6.3.1.2   Spurious emissions (Category B)

The following requirements shall be met in cases where Category B limits for spurious emissions, as defined in ITU-R Recommendation SM.329 [1], are applied.

6.6.3.1.2.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 6.9: BS Mandatory spurious emissions limits, Category B

Band	Maximum Level	Measurement Bandwidth	Note
9 kHz ↔ 150 kHz	-36 dBm	1 kHz	Note 1
150 kHz ↔ 30 MHz	-36 dBm	10 kHz	Note 1
30 MHz ↔ 1 GHz	-36 dBm	100 kHz	Note 1
1 GHz ↔ 2100 MHz	-30 dBm	1 MHz	Note 1
2100 MHz ↔ 2180 MHz	-15 dBm	1 MHz	Note 2
2180 MHz ↔ 12.75 GHz	-30 dBm	1 MHz	Note 3
NOTE 1: Bandwidth as in ITU-R Recommendation SM.329 [1], s4.1 NOTE 2: Limit based on ITU-R Recommendation SM.329 [1], s4.3 and Annex 7 NOTE 3: Bandwidth as in ITU-R Recommendation SM.329 [1], s4.1. Upper frequency as in ITU-R SM.329 [1], s2.5 table 1			

6.6.3.2 Protection of the BS receiver of own or different BS

This requirement shall be applied in order to prevent the receivers of the BSs being desensitised by emissions from a BS transmitter.

6.6.3.2.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 6.10: BS Spurious emissions limits for protection of the BS receiver

Band	Maximum Level	Measurement Bandwidth	Note
1920 - 1980MHz For operation in Frequency Bands defined in sub-clause 5.2(a)	-96 dBm	100 kHz	
1850-1910 MHz For operation in Frequency Bands defined in sub-clause 5.2(b)	-96 dBm	100 kHz	

6.6.3.3 Co-existence with GSM 900

6.6.3.3.1 Operation in the same geographic area

This requirement may be applied for the protection of GSM 900 MS and GSM 900 BTS receivers in geographic areas in which both GSM 900 and UTRA are deployed.

6.6.3.3.1.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 6.11: BS Spurious emissions limits for BS in geographic coverage area of GSM 900 MS and GSM 900 BTS receivers

Band	Maximum Level	Measurement Bandwidth	Note
876 – 915 MHz	-61 dBm	100 kHz	
921 - 960 MHz	-57 dBm	100 kHz	

6.6.3.3.2 Co-located base stations

This requirement may be applied for the protection of GSM 900 BTS receivers when GSM 900 BTS and UTRA BS are co-located.

6.6.3.3.2.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 6.12: BS Spurious emissions limits for protection of the GSM 900 BTS receiver

Band	Maximum Level	Measurement Bandwidth	Note
876-915 MHz	-98 dBm	100 kHz	

6.6.3.4 Co-existence with DCS 1800

6.6.3.4.1 Operation in the same geographic area

This requirement may be applied for the protection of DCS 1800 MS and DCS 1800 BTS receivers in geographic areas in which both DCS 1800 and UTRA are deployed.

6.6.3.4.1.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 6.13: BS Spurious emissions limits for BS in geographic coverage area of DCS 1800 MS and DCS 1800 BTS receivers

Band	Maximum Level	Measurement Bandwidth	Note
1710 – 1785 MHz	-61 dBm	100 kHz	
1805 - 1880 MHz	-47 dBm	100 kHz	

6.6.3.4.2 Co-located base stations

This requirement may be applied for the protection of DCS 1800 BTS receivers when DCS 1800 BTS and UTRA BS are co-located.

6.6.3.4.2.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 6.14: BS Spurious emissions limits for BS co-located with DCS 1800 BTS

Band	Maximum Level	Measurement Bandwidth	Note
1710 - 1785 MHz	-98 dBm	100 kHz	

6.6.3.5 Co-existence with PHS

This requirement may be applied for the protection of PHS in geographic areas in which both PHS and UTRA are deployed. This requirement is also applicable at specified frequencies falling between 12.5MHz below the first carrier frequency used and 12.5MHz above the last carrier frequency used.

6.6.3.5.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 6.15: BS Spurious emissions limits for BS in geographic coverage area of PHS

Band	Maximum Level	Measurement Bandwidth	Note
1884.5 - 1919.6 MHz	-41 dBm	300 kHz	

6.6.3.6 Co-existence with services in adjacent frequency bands

This requirement may be applied for the protection in bands adjacent to 2110-2170 MHz, as defined in sub-clause 5.2(a) and 1930-1990 MHz, as defined in sub-clause 5.2(b) in geographic areas in which both an adjacent band service and UTRA are deployed.

6.6.3.6.1 Minimum requirement

The power of any spurious emission shall not exceed:

Table 6.16: BS spurious emissions limits for protection of adjacent band services

Band (f)	Maximum Level	Measurement Bandwidth	Note
2100-2105 MHz For operation in frequency bands as defined in sub-clause 5.2(a)	$-30 + 3.4 \cdot (f - 2100 \text{ MHz})$ dBm	1 MHz	
2175-2180 MHz For operation in frequency bands as defined in sub-clause 5.2(a)	$-30 + 3.4 \cdot (2180 \text{ MHz} - f)$ dBm	1 MHz	
1920-1925 MHz For operation in frequency bands as defined in sub-clause 5.2(b)	$-30 + 3.4 \cdot (f - 1920 \text{ MHz})$ dBm	1 MHz	
1995-2000 MHz For operation in frequency bands as defined in sub-clause 5.2(b)	$-30 + 3.4 \cdot (2000 \text{ MHz} - f)$ dBm	1 MHz	

6.6.3.7 Co-existence with UTRA-TDD

6.6.3.7.1 Operation in the same geographic area

This requirement may be applied to geographic areas in which both UTRA-TDD and UTRA-FDD are deployed.

6.6.3.7.1.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 6.17: BS Spurious emissions limits for BS in geographic coverage area of UTRA-TDD

Band	Maximum Level	Measurement Bandwidth	Note
1900 - 1920 MHz	-52 dBm	1 MHz	
2010 - 2025 MHz	-52 dBm	1 MHz	

6.6.3.7.2 Co-located base stations

This requirement may be applied for the protection of UTRA-TDD BS receivers when UTRA-TDD BS and UTRA FDD BS are co-located.

6.6.3.7.2.1   Minimum Requirement

The power of any spurious emission shall not exceed:

Table 6.18: BS Spurious emissions limits for BS co-located with UTRA-TDD

Band	Maximum Level	Measurement Bandwidth	Note
1900 - 1920 MHz	-86 dBm	1 MHz	
2010 - 2025 MHz	-86 dBm	1 MHz	

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.

The transmit intermodulation level is the power of the intermodulation products when a WCDMA modulated interference signal is injected into the antenna connector at a mean power level of 30 dB lower than that of the mean power of the wanted signal. The frequency of the interference signal shall be ±5 MHz, ±10 MHz and ±15 MHz offset from the subject signal.

6.7.1   Minimum requirement

The transmit intermodulation level shall not exceed the out of band emission or the spurious emission requirements of section 6.6.2 and 6.6.3.

6.8   Transmit modulation

Transmit modulation is specified in three parts, Frequency Error, Error Vector Magnitude and Peak Code Domain Error. These specifications are made with reference to a theoretical modulated waveform.

The theoretical modulated waveform is created by modulating a carrier at the assigned carrier frequency using the same data as was used to generate the measured waveform. The chip modulation rate for the theoretical waveform shall be exactly 3.84 Mcps. The code powers of the theoretical waveform shall be the same as the measured waveform, rather than the nominal code powers used to generate the test signal.

6.8.1   Transmit pulse shape filter

The transmit pulse-shaping filter is a root-raised cosine (RRC) with roll-off α =0.22 in the frequency domain. The impulse response of the chip impulse filter $RC_0(t)$ is

$$RC_0(t) = \frac{\sin\left(\pi\frac{t}{T_C}(1-\alpha)\right) + 4\alpha\frac{t}{T_C}\cos\left(\pi\frac{t}{T_C}(1+\alpha)\right)}{\pi\frac{t}{T_C}\left(1-\left(4\alpha\frac{t}{T_C}\right)^2\right)}$$

Where the roll-off factor $\alpha = 0.22$ and the chip duration:

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

6.8.2   Error Vector Magnitude

The Error Vector Magnitude is a measure of the difference between the reference waveform and the measured waveform. This difference is called the error vector. Both waveforms pass through a matched Root Raised Cosine filter

with bandwidth 3.84 MHz and roll-off α =0.22. Both waveforms are then further modified by selecting the frequency, absolute phase, absolute amplitude and chip clock timing so as to minimise the error vector. The EVM result is defined as the square root of the ratio of the mean error vector power to the mean reference power expressed as a %. The measurement interval is one timeslot as defined by the C-PICH (when present) otherwise the measurement interval is one timeslot starting with the beginning of the SCH. The requirement is valid over the total power dynamic range as specified in subclause 6.4.3.

6.8.2.1 Minimum requirement

The Error Vector Magnitude shall not be worse than 17.5 %.

6.8.3 Peak code Domain error

The Peak Code Domain Error is computed by projecting the power of the error vector (as defined in 6.8.2) onto the code domain at a specified spreading factor. The Code Domain Error for every code in the domain is defined as the ratio of the mean power of the projection onto that code, to the mean power of the composite reference waveform. This ratio is expressed in dB. The Peak Code Domain Error is defined as the maximum value for the Code Domain Error for all codes. The measurement interval is one timeslot as defined by the C-PICH (when present) otherwise the measurement interval is one timeslot starting with the beginning of the SCH.

6.8.3.1 Minimum requirement

The peak code domain error shall not exceed -33 dB at spreading factor 256.

7 Receiver characteristics

7.1 General

The requirements in Section 7 assume that the receiver is not equipped with diversity. For receivers with diversity, the requirements apply to each antenna connector separately, with the other one(s) terminated or disabled .The requirements are otherwise unchanged.

Unless otherwise stated, the receiver characteristics are specified at the BS antenna connector (test port A) with a full complement of transceivers for the configuration in normal operating conditions. If any external apparatus such as a RX amplifier, a filter or the combination of such devices is used, requirements apply at the far end antenna connector (port B).
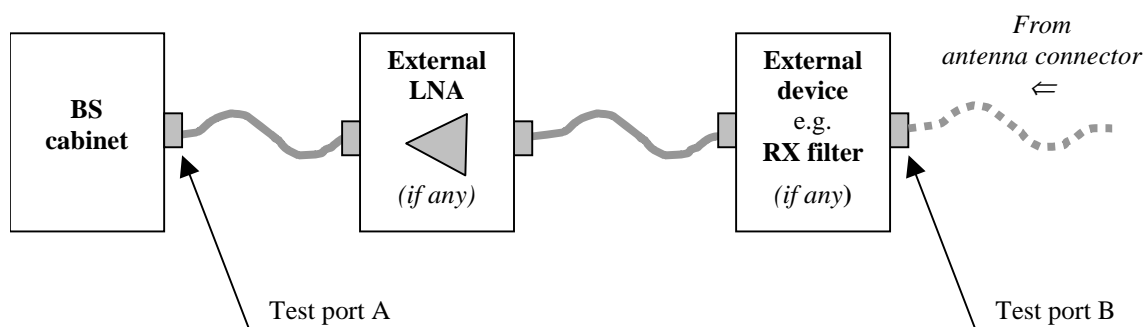
Figure 7.1: Receiver test ports

7.2 Reference sensitivity level

The reference sensitivity level is the minimum mean power received at the antenna connector at which the Bit Error Ratio (BER) shall not exceed the specific value indicated in section 7.2.1.

7.2.1   Minimum requirement

Using the reference measurement channel specifications in Annex A, the reference sensitivity level and performance of the BS shall be as specified in Table 7.1.

Table 7.1: BS reference sensitivity levels

Reference measurement channel data rate	BS reference sensitivity level (dBm)	BER
12.2 kbps	-121	BER shall not exceed 0.001

7.2.2   Maximum Frequency Deviation for Receiver Performance

The need for such a requirement is for further study.

7.3   Dynamic range

Receiver dynamic range is the receiver ability to handle a rise of interference in the reception frequency channel. The receiver shall fulfil a specified BER requirement for a specified sensitivity degradation of the wanted signal in the presence of an interfering AWGN signal in the same reception frequency channel.

7.3.1   Minimum requirement

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

Table 7.2: Dynamic range

Parameter	Level	Unit
Reference measurement channel data rate	12.2	kbps
Wanted signal mean power	-91	dBm
Interfering AWGN signal	-73	dBm/3.84 MHz

7.4   Adjacent Channel Selectivity (ACS)

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 single code W-CDMA modulated adjacent channel signal at a given frequency offset from the center frequency of the assigned channel. ACS is the ratio of the receiver filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

7.4.1   Minimum requirement

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

Table 7.3: Adjacent channel selectivity

Parameter	Level	Unit
Data rate	12.2	kbps
Wanted signal mean power	-115	dBm
Interfering signal mean power	-52	dBm
Fuw offset (Modulated)	5	MHz

7.4.2   Minimum requirement – Co-location with UTRA-TDD

The current state-of-the-art technology does not allow a single generic solution for co-location with UTRA-TDD on adjacent frequencies for 30dB BS-BS minimum coupling loss.

Further information and analysis for this scenario can be found in TR 25.942 [4].

7.5   Blocking characteristics

The blocking characteristics is a measure of the receiver ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the adjacent channels. The blocking performance requirement applies as specified in the tables 7.4 to 7.5B below, using a 1 MHz step size.

7.5.1   Minimum requirement

The static reference performance as specified in clause 7.2.1 shall be met with a wanted and an interfering signal coupled to BS antenna input using the following parameters.

Table 7.4: Blocking performance requirement for operation in frequency bands in sub-clause 5.2(a)

Center Frequency of Interfering Signal	Interfering Signal mean power	Wanted Signal mean power	Minimum Offset of Interfering Signal	Type of Interfering Signal
1920 - 1980 MHz	-40 dBm	-115 dBm	10 MHz	WCDMA signal with one code
1900 - 1920 MHz 1980 - 2000 MHz	-40 dBm	-115 dBm	10 MHz	WCDMA signal with one code
1 MHz -1900 MHz, and 2000 MHz - 12750 MHz	-15 dBm	-115 dBm	—	CW carrier

Table 7.5: Blocking performance requirement for operation in frequency bands in sub-clause 5.2(b)

Center Frequency of Interfering Signal	Interfering Signal mean power	Wanted Signal mean power	Minimum Offset of Interfering Signal	Type of Interfering Signal
1850 - 1910 MHz	- 40 dBm	-115 dBm	10 MHz	WCDMA signal with one code
1830 - 1850 MHz 1910 - 1930 MHz	-40 dBm	-115 dBm	10 MHz	WCDMA signal with one code
1 MHz - 1830 MHz 1930 MHz - 12750 MHz	-15 dBm	-115 dBm	—	CW carrier

7.5.2   Minimum Requirement – Co-location with GSM900 and/or DCS 1800

This additional blocking requirement may be applied for the protection of FDD BS receivers when GSM900 and/or DCS1800 BTS are co-located with UTRA BS.

The static reference performance as specified in clause 7.2.1 shall be met with a wanted and an interfering signal coupled to BS antenna input using the following parameters.

Table 7.5A : Blocking performance requirement for operation in frequency bands in sub-clause 5.2(a) when co-located with GSM900

Center Frequency of Interfering Signal	Interfering Signal mean power	Wanted Signal mean power	Minimum Offset of Interfering Signal	Type of Interfering Signal
921 -960 MHz	+16 dBm	-115 dBm	—	CW carrier

Table 7.5B : Blocking performance requirement for operation in frequency bands in sub-clause 5.2(a) when co-located with DCS1800

Center Frequency of Interfering Signal	Interfering Signal mean power	Wanted Signal mean power	Minimum Offset of Interfering Signal	Type of Interfering Signal
1805 – 1880 MHz	+16 dBm	-115 dBm	—	CW carrier

7.5.3 Minimum Requirement - Co-location with UTRA-TDD

The current state-of-the-art technology does not allow a single generic solution for co-location with UTRA-TDD on adjacent frequencies for 30dB BS-BS minimum coupling loss.

However, there are certain site-engineering solutions that can be used. These techniques are addressed in TR 25.942 [4].

7.6 Intermodulation characteristics

Third and higher order mixing of the two interfering RF signals can produce an interfering signal in the band of the desired channel. Intermodulation response rejection is a measure of the capability of the receiver to receive a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.

7.6.1 Minimum requirement

The static reference performance as specified in clause 7.2.1 should be met when the following signals are coupled to BS antenna input:

- A wanted signal at the assigned channel frequency with a mean power of -115 dBm.

- Two interfering signals with the following parameters.

Table 7.6: Intermodulation performance requirement

Interfering Signal mean power	Offset	Type of Interfering Signal
- 48 dBm	10 MHz	CW signal
- 48 dBm	20 MHz	WCDMA signal with one code

7.7 Spurious emissions

The spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the BS receiver antenna connector. The requirements apply to all BS with separate RX and TX antenna port. The test shall be performed when both TX and RX are on with the TX port terminated.

For all BS with common RX and TX antenna port the transmitter spurious emission as specified in section 6.6.3 is valid.

7.7.1 Minimum requirement

The power of any spurious emission shall not exceed:

Table 7.7: Spurious emission minimum requirement

Band	Maximum level	Measurement Bandwidth	Note
1900 - 1980 MHz and 2010 - 2025 MHz	-78 dBm	3.84 MHz	
30 MHz - 1 GHz	-57 dBm	100 kHz	
1 GHz - 12.75 GHz	-47 dBm	1 MHz	With the exception of frequencies between 12.5 MHz below the first carrier frequency and 12.5 MHz above the last carrier frequency used by the BS.

In addition to the requirements in table 7.7, the co-existence requirements for co-located base stations specified in subclause 6.6.3.3.2, 6.6.3.4.2 and 6.6.3.7.2 may also be applied.

8 Performance requirement

8.1 General

Performance requirements for the BS are specified for the measurement channels defined in Annex A and the propagation conditions in Annex B. The requirements only apply to those measurement channels that are supported by the base station.

The requirements only apply to a base station with dual receiver antenna diversity. The required E_b/N_0 shall be applied separately at each antenna port.

The Eb/No used in this section is defined as:

$$E_b / N_o = \frac{E_c}{N_o} \cdot \frac{L_{chip}}{L_{inf}}$$

Where:

E_c is the received total energy of DPDCH and DPCCH per PN chip per antenna from all paths.

N_o is the total one-sided noise power spectral density due to all noise sources

L_{chip} is the number of chips per frame

L_{inf} is the number of information bits in DTCH excluding CRC bits per frame

Table 8.1: Summary of Base Station performance targets

Physical channel	Measurement channel	Static	Multi-path Case 1	Multi-path Case 2	Multi-path Case 3	Moving	Birth / Death
		Performance metric					
DCH	12.2 kbps	$BLER<10^{-2}$	$BLER<10^{-2}$	$BLER<10^{-2}$	$BLER<10^{-2}$	BLER<	BLER<
	64 kbps	$BLER< 10^{-1},10^{-2}$	$BLER< 10^{-1}, 10^{-2}$	$BLER< 10^{-1},10^{-2}$	$BLER< 10^{-1}, 10^{-2},10^{-3}$	BLER<	BLER<
	144 kbps	$BLER< 10^{-1},10^{-2}$	$BLER< 10^{-1},10^{-2}$	$BLER< 10^{-1},10^{-2}$	$BLER< 10^{-1}, 10^{-2},10^{-3}$	-	-
	384 kbps	$BLER< 10^{-1},10^{-2}$	$BLER< 10^{-1},10^{-2}$	$BLER< 10^{-1},10^{-2}$	$BLER< 10^{-1}, 10^{-2},10^{-3}$	-	-

8.2 Demodulation in static propagation conditions

8.2.1 Demodulation of DCH

The performance requirement of DCH in static propagation conditions is determined by the maximum Block Error Ratio (BLER) allowed when the receiver input signal is at a specified E_b/N_0 limit. The BLER is calculated for each of the measurement channels supported by the base station.

8.2.1.1 Minimum requirement

The BLER should not exceed the limit for the E_b/N_0 specified in Table 8.2.

Table 8.2: Performance requirements in AWGN channel

Measurement channel	Received E_b/N_0	Required BLER
12.2 kbps	n.a.	$< 10^{-1}$
	5.1 dB	$< 10^{-2}$
64 kbps	1.5 dB	$< 10^{-1}$
	1.7 dB	$< 10^{-2}$
144 kbps	0.8 dB	$< 10^{-1}$
	0.9 dB	$< 10^{-2}$
384 kbps	0.9 dB	$< 10^{-1}$
	1.0 dB	$< 10^{-2}$

8.3 Demodulation of DCH in multipath fading conditions

8.3.1 Multipath fading Case 1

The performance requirement of DCH in multipath fading Case 1 is determined by the maximum Block Error Ratio (BLER) allowed when the receiver input signal is at a specified E_b/N_0 limit. The BLER is calculated for each of the measurement channels supported by the base station.

8.3.1.1 Minimum requirement

The BLER should not exceed the limit for the E_b/N_0 specified in Table 8.3.

Table 8.3: Performance requirements in multipath Case 1 channel

Measurement channel	Received E_b/N_0	Required BLER
12.2 kbps	n.a.	$< 10^{-1}$
	11.9 dB	$< 10^{-2}$
64 kbps	6.2 dB	$< 10^{-1}$
	9.2 dB	$< 10^{-2}$
144 kbps	5.4 dB	$< 10^{-1}$
	8.4 dB	$< 10^{-2}$
384 kbps	5.8 dB	$< 10^{-1}$
	8.8 dB	$< 10^{-2}$

8.3.2 Multipath fading Case 2

The performance requirement of DCH in multipath fading Case 2 is determined by the maximum Block Error Ratio (BLER) allowed when the receiver input signal is at a specified E_b/N_0 limit. The BLER is calculated for each of the measurement channels supported by the base station.

8.3.2.1 Minimum requirement

The BLER should not exceed the limit for the E_b/N_0 specified in Table 8.4.

Table 8.4: Performance requirements in multipath Case 2 channel

Measurement channel	Received E_b/N_0	Required BLER
12.2 kbps	n.a.	$< 10^{-1}$
	9.0 dB	$< 10^{-2}$
64 kbps	4.3 dB	$< 10^{-1}$
	6.4 dB	$< 10^{-2}$
144 kbps	3.7 dB	$< 10^{-1}$
	5.6 dB	$< 10^{-2}$
384 kbps	4.1 dB	$< 10^{-1}$
	6.1 dB	$< 10^{-2}$

8.3.3 Multipath fading Case 3

The performance requirement of DCH in multipath fading Case 3 is determined by the maximum Block Error Ratio (BLER) allowed when the receiver input signal is at a specified E_b/N_0 limit. The BLER is calculated for each of the measurement channels supported by the base station.

8.3.3.1 Minimum requirement

The BLER should not exceed the limit for the E_b/N_0 specified in Table 8.5.

Table 8.5: Performance requirements in multipath Case 3 channel

Measurement channel	Received E_b/N_0	Required BLER
12.2 kbps	n.a.	$< 10^{-1}$
	7.2 dB	$< 10^{-2}$
	8.0 dB	$< 10^{-3}$
64 kbps	3.4 dB	$< 10^{-1}$
	3.8 dB	$< 10^{-2}$
	4.1 dB	$< 10^{-3}$
144 kbps	2.8 dB	$< 10^{-1}$
	3.2 dB	$< 10^{-2}$
	3.6 dB	$< 10^{-3}$
384 kbps	3.2 dB	$< 10^{-1}$
	3.6 dB	$< 10^{-2}$
	4.2 dB	$< 10^{-3}$

8.3.4 Multipath fading Case 4

The performance requirement of DCH in multipath fading Case 4 is determined by the maximum Block Error Ratio (BLER) allowed when the receiver input signal is at a specified E_b/N_0 limit. The BLER is calculated for each of the measurement channels supported by the base station.

8.3.4.1 Minimum requirement

The BLER should not exceed the limit for the E_b/N_0 specified in Table 8.5A.

Table 8.5A: Performance requirements in multipath Case 4 channel

Measurement channel	Received E_b/N_0	Required BLER
12.2 kbps	n.a.	$< 10^{-1}$
	10.2 dB	$< 10-2$
	11.0 dB	$< 10-3$
64 kbps	6.4 dB	$< 10-1$
	6.8 dB	$< 10-2$
	7.1 dB	$< 10-3$
144 kbps	5.8 dB	$< 10-1$
	6.2 dB	$< 10-2$
	6.6 dB	$< 10-3$
384 kbps	6.2 dB	$< 10-1$
	6.6 dB	$< 10-2$
	7.2 dB	$< 10-3$

8.4 Demodulation of DCH in moving propagation conditions

The performance requirement of DCH in moving propagation conditions is determined by the maximum Block Error Ratio (BLER) allowed when the receiver input signal is at a specified Eb/N0 limit. The BLER is calculated for each of the measurement channels supported by the base station.

8.4.1 Minimum requirement

The BLER should not exceed the limit for the E_b/N_0 specified in Table 8.6.

Table 8.6: Performance requirements in moving channel

Measurement channel	Received E_b/N_0	Required BLER
12.2 kbps	n.a.	$< 10^{-1}$
	5.7 dB	$< 10^{-2}$
64 kbps	2.1 dB	$< 10^{-1}$
	2.2 dB	$< 10^{-2}$

8.5 Demodulation of DCH in birth/death propagation conditions

The performance requirement of DCH in birth/death propagation conditions is determined by the maximum Block Error Ratio (BLER) allowed when the receiver input signal is at a specified E_b/N_0 limit. The BLER is calculated for each of the measurement channels supported by the base station.

8.5.1 Minimum requirement

The BLER should not exceed the limit for the E_b/N_0 specified in Table 8.7.

Table 8.7: Performance requirements in birth/death channel

Measurement channel	Received E_b/N_0	Required BLER
12.2 kbps	n.a.	$< 10^{-1}$
	7.7 dB	$< 10^{-2}$
64 kbps	4.1 dB	$< 10^{-1}$
	4.2 dB	$< 10^{-2}$

8.6 void

8.7 Performance requirement for RACH

Performance requirements for RACH consists of two parts: preamble detection and message demodulation. Requirements for these are in sections 8.7.1 and 8.7.2, respectively. Requirements are defined for two propagation conditions: static and fading case 3. The propagation conditions are defined in annexes B.1 and B.2.

8.7.1 Performance requirement for RACH preamble detection

Probability of false alarm, Pfa (=false detection of the preamble) when the preamble was not sent, shall be 10^{-3} or less. The performance measure Required Ec/N0 at probability of detection, Pd of 0.99 and 0.999. Only 1 signature is used and it is known by the receiver. The requirement for preamble detection, when the preamble was sent is in table 8.9 and 8.10 for static and case 3 fading.

Table 8.9: Requirements for Ec/N0 of Pd in static propagation condition

E_c/N_0 for required Pd $\geq$ 0.99	E_c/N_0 for required Pd $\geq$ 0.999
-20.5 dB	-20.1 dB

Table 8.10: Requirements of Ec/N0 of Pd in case 3 fading

E_c/N_0 for required Pd $\geq$ 0.99	E_c/N_0 for required Pd $\geq$ 0.999
-15.5 dB	-13.4 dB

8.7.2 Demodulation of RACH message

The performance measure is required Eb/N0 for block error rate (BLER) of 10^{-1} and 10^{-2}. Both measurement channels have TTI=20 ms. Payloads are 168 and 360 bits. Channel coding is rate ½ convolutional coding.

8.7.2.1 Minimum requirements for Static Propagation Condition

Table 8.11: Required Eb/N0 for static propagation

Transport Block size TB and TTI in frames	E_b/N_0 for required BLER < 10^{-1}	E_b/N_0 for required BLER < 10^{-2}
168 bits, TTI = 20 ms	4.1 dB	5.0 dB
360 bits, TTI = 20 ms	3.9 dB	4.8 dB

8.7.2.2 Minimum requirements for Multipath Fading Case 3

Table 8.12: Required Eb/N0 for case 3 fading

Transport Block size TB and TTI in frames	E_b/N_0 for required BLER < 10^{-1}	E_b/N_0 for required BLER < 10^{-2}
168 bits, TTI = 20 ms	7.4 dB	8.5 dB
360 bits, TTI = 20 ms	7.3 dB	8.3 dB

Annex A (normative):
Measurement channels

A.1 Summary of UL reference measurement channels

The parameters for the UL reference measurement channels are specified in Table A.1 and the channel coding is detailed in figure A.2 through A.6 respectively. Note that for all cases, one DPCCH shall be attached to DPDCH(s).

Table A.1: Reference measurement channels for UL DCH

Parameter		DCH for DTCH / DCH for DCCH					Unit
DPDCH	Information bit rate	12.2/2.4	64/2.4	144/2.4	384/2.4	2048/2.4	kbps
	Physical channel	60/15	240/15	480/15	960/15	960/15	kbps
	Spreading factor	64	16	8	4	4	
	Repetition rate	22/22	19/19	8/9	-18/-18	-1/-1	%
	Interleaving	20	40	40	40	80	ms
	Number of DPDCHs	1	1	1	1	6	
DPCCH	Dedicated pilot	6					bit/slot
	Power control	2					bit/slot
	TFCI	2					bit/slot
	Spreading factor	256					
Power ratio of DPCCH/DPDCH		-2.69	-5.46	-9.54	-9.54	-9.54	dB
Amplitude ratio of DPCCH/DPDCH		0.7333	0.5333	0.3333	0.3333	0.3333	

A.2 UL reference measurement channel for 12.2 kbps

The parameters for the UL reference measurement channel for 12.2 kbps are specified in Table A.2 and the channel coding is detailed in Figure A.2.

Figure A.2: Channel coding for the UL reference measurement channel (12.2 kbps)

Table A.2: UL reference measurement channel (12.2 kbps)

Parameter	Level	Unit
Information bit rate	12.2	kbps
DPCH	60	kbps
Power control	Off	
TFCI	On	
Repetition	22	%

A.3 UL reference measurement channel for 64 kbps

The parameters for the UL reference measurement channel for 64 kbps are specified in Table A.3 and the channel coding is detailed in Figure A.3.

Uplink

DTCH   DCCH

Figure A.3: Channel coding for the UL reference measurement channel (64 kbps)

Table A.3: UL reference measurement channel (64kbps)

Parameter	Level	Unit
Information bit rate	64	kbps
DPCH	240	kbps
Power control	Off	
TFCI	On	
Repetition	19	%

A.4 UL reference measurement channel for 144 kbps

The parameters for the UL reference measurement channel for 144 kbps are specified in Table A.4 and the channel coding is detailed in Figure A.4.
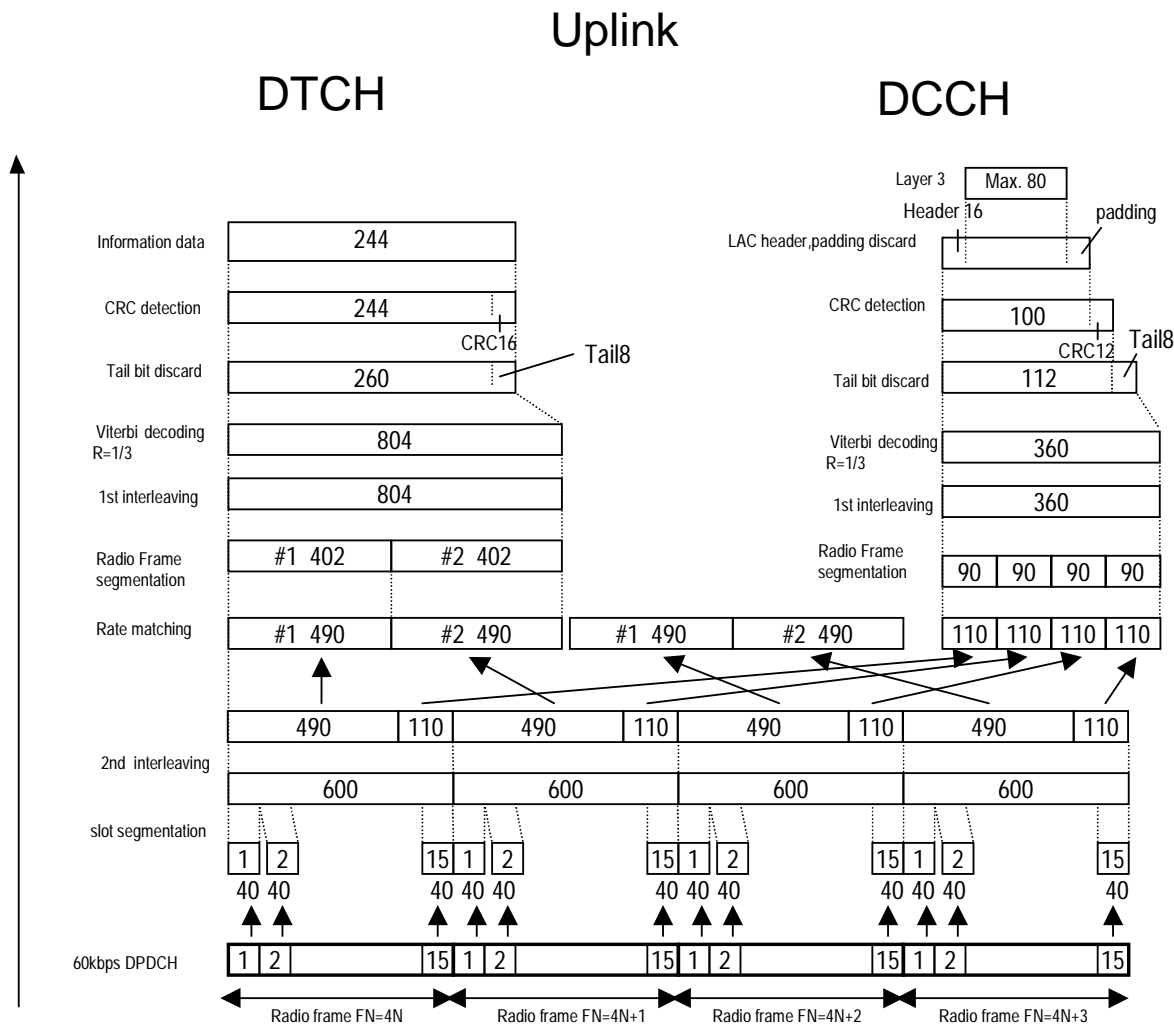

Figure A.4: Channel coding for the UL reference measurement channel (144 kbps)

Table A.4: UL reference measurement channel (144kbps)

Parameter	Level	Unit
Information bit rate	144	Kbps
DPCH	480	Kbps
Power control	Off	
TFCI	On	
Repetition	8	%

A.5 UL reference measurement channel for 384 kbps

The parameters for the UL reference measurement channel for 384 kbps are specified in Table A.5 and the channel coding is detailed in Figure A.5.
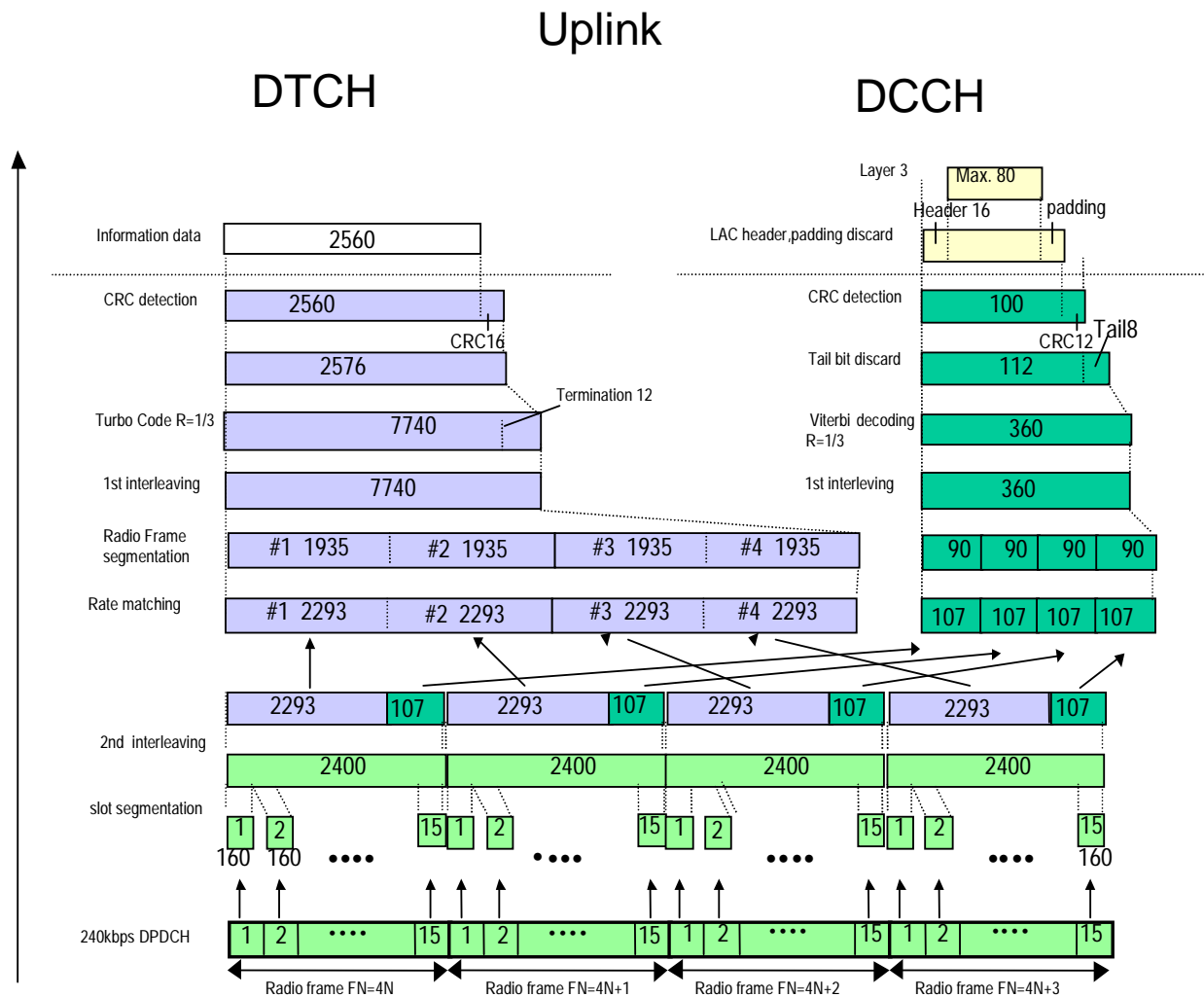

Figure A.5: Channel coding for the UL reference measurement channel (384 kbps)

Table A.5: UL reference measurement channel (384kbps)

Parameter	Level	Unit
Information bit rate	384	Kbps
DPCH	960	Kbps
Power control	Off	
TFCI	On	
Puncturing	18	%

A.6 UL reference measurement channel for 2048 kbps

The parameters for the UL reference measurement channel for 2048 kbps are specified in Table A.6 and the channel coding is detailed in Figure A.6.
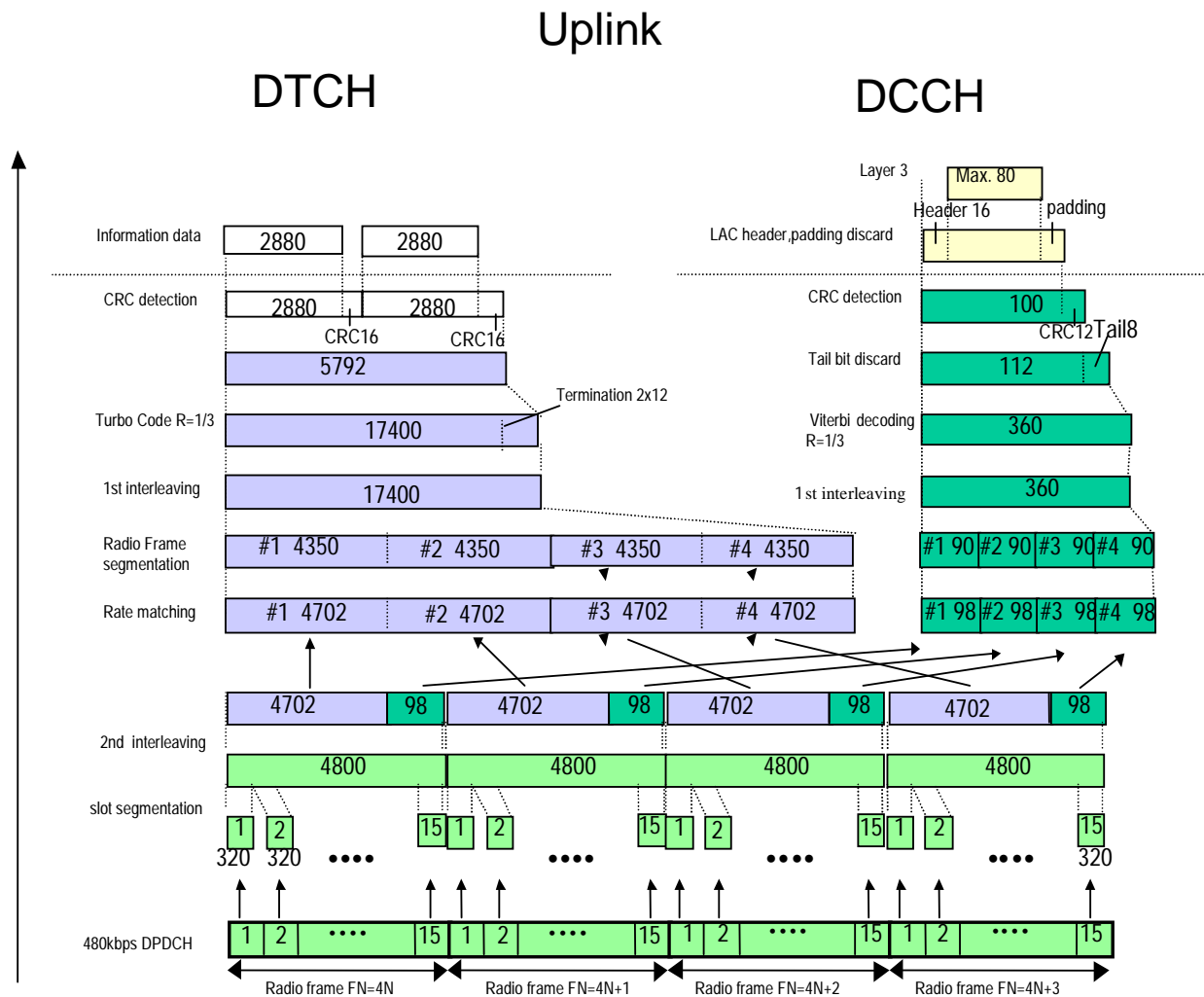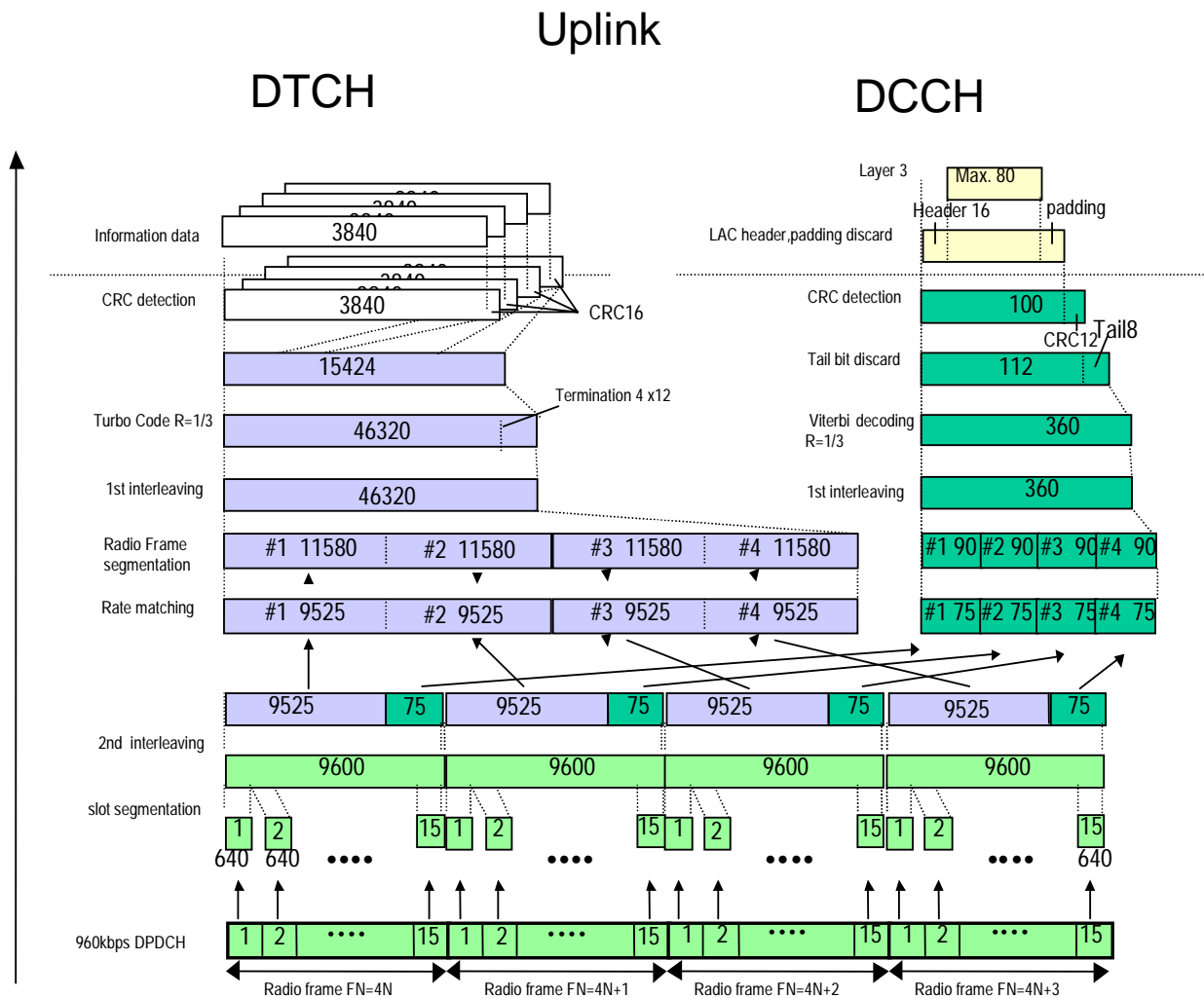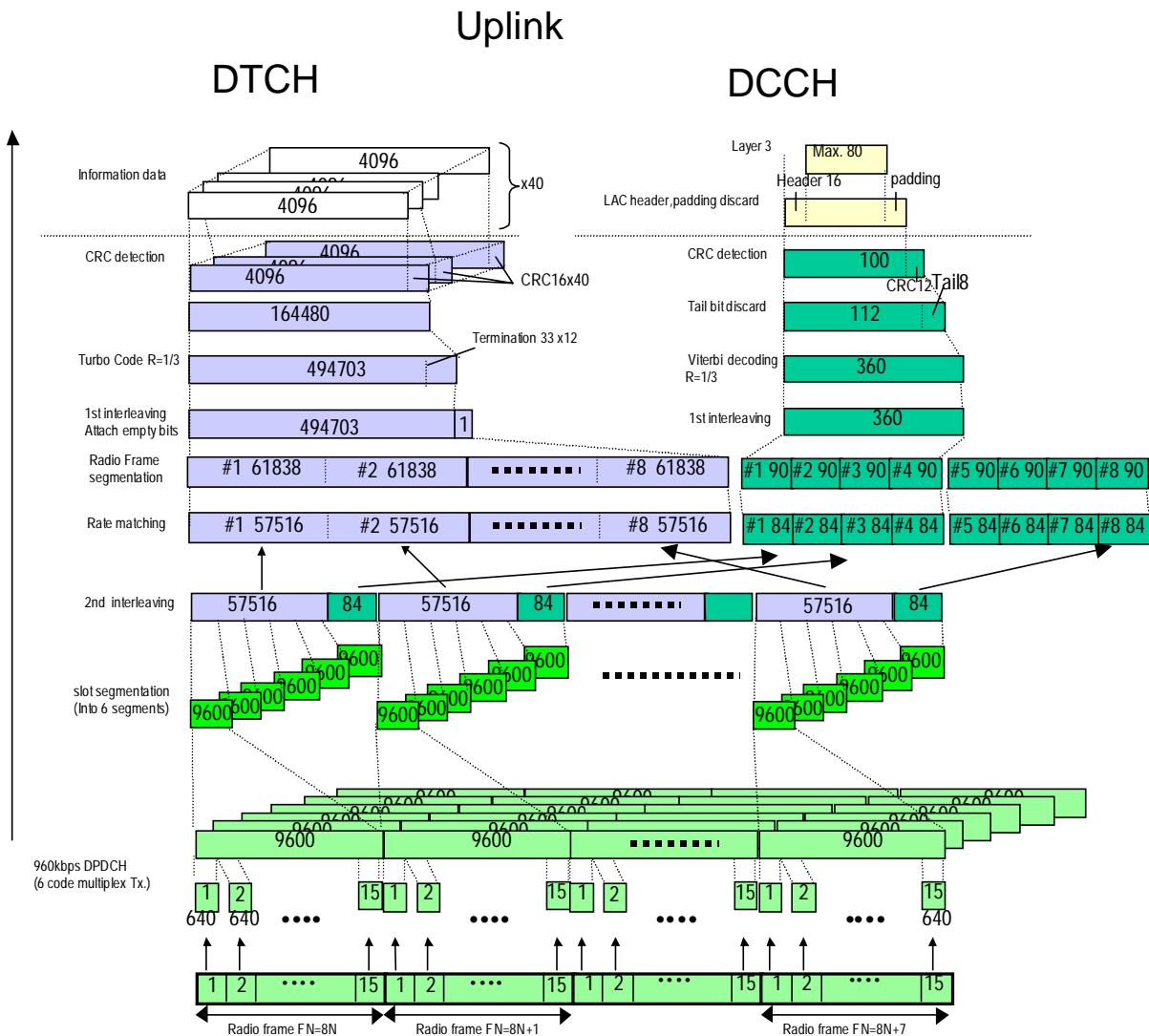
Uplink

Figure A.6: Channel coding for the UL reference measurement channel (2048 kbps)

Table A.6: UL reference measurement channel (2048kbps)

Parameter	Level	Unit
Information bit rate	2048	Kbps
DPCH	960	Kbps
Power control	Off	
TFCI	On	
Puncturing	1	%

A.7 Reference measurement channels for UL RACH

The parameters for the UL RACH reference measurement channels are specified in Table A.7.

Table A.7: Reference measurement channels for UL RACH

Parameter			Unit
RACH	CRC	16	bits
	Channel Coding	Rate ½ conv. coding	
	TTI	20	ms
	TB size	168, 360	bits
	Rate Matching	Repetition	
	Number of diversity antennas	2	
	Preamble detection window size	256	chips
	Ratio of preamble power and total message power	0	dB
Power ratio of RACH Control/Data TB = 168		-2.69	dB
Power ratio of Control/Data TB = 360		-3.52	dB

Annex B (normative):
Propagation conditions

B.1   Static propagation condition

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

B.2   Multi-path fading propagation conditions

Table B.1 shows propagation conditions that are used for the performance measurements in multi-path fading environment. All taps have classical Doppler spectrum, defined as:

(CLASS)
$$S(f) \propto 1/(1-(f/f_D)^2)^{0.5}$$
for f ∈ -f_d, f_d.

Table B.1: Propagation Conditions for Multi path Fading Environments

Case 1, speed 3km/h		Case 2, speed 3 km/h		Case 3, 120 km/h		Case 4, 250 km/h	
Relative Delay [ns]	Average Power [dB]	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
976	-10	976	0	260	-3	260	-3
		20000	0	521	-6	521	-6
				781	-9	781	-9

B.3   Moving propagation conditions

The dynamic propagation conditions for the test of the base band performance are non-fading channel models with two taps. The moving propagation condition has two tap, one static, Path0, and one moving, Path1. The time difference between the two paths is according Equation (B.1). The parameters for the equation are shown in Table B.2. The taps have equal strengths and equal phases.
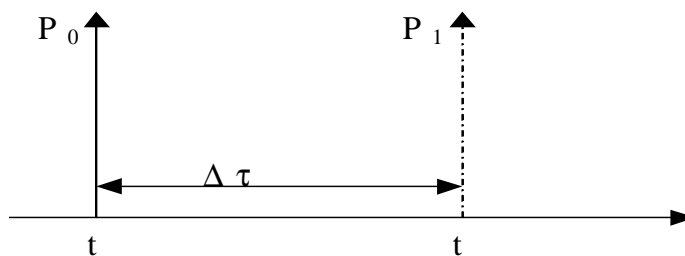

Figure B.1: The moving propagation conditions

$$\Delta\tau = B + \frac{A}{2}\left(1 + \sin(\Delta\omega \cdot t)\right)$$
(B.1)

Table B.2: Parameters for moving propagation

Parameter	Value
A	5 µs
B	1 µs
$\Delta\omega$	$40 \cdot 10^{-3}$ s^{-1}

B.4 Birth-Death propagation conditions

The dynamic propagation conditions for the test of the baseband performance is a non-fading propagation channel with two taps. The moving propagation conditions has two taps, Path1 and Path2 which alternate between 'birth' and 'death'. The positions the paths appear are randomly selected with an equal probability rate and are shown in Figure B.2.
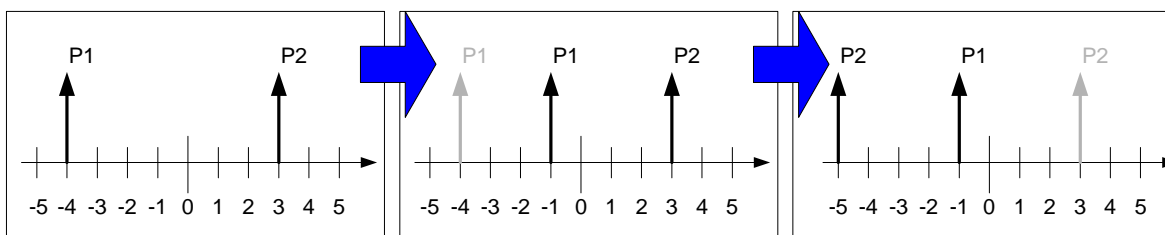

Figure B.2: Birth death propagation sequence

1. Two paths, Path1 and Path2 are randomly selected from the group [-5, -4, -3, -2, -1, 0 ,1, 2, 3, 4, 5] µs. The paths have equal magnitudes and equal phases.

2. After 191 ms, Path1 vanishes and reappears immediately at a new location randomly selected from the group [-5, -4, -3, -2, -1, 0 ,1, 2, 3, 4, 5] µs but excludes the point Path2. The magnitudes and the phases of the tap coefficients of Path 1 and Path 2 shall remain unaltered.

3. After an additional 191 ms, Path2 vanishes and reappears immediately at a new location randomly selected from the group [-5, -4, -3, -2, -1, 0 ,1, 2, 3, 4, 5] µs but excludes the point Path1. The magnitudes and the phases of the tap coefficients of Path 1 and Path 2 shall remain unaltered.

4. The sequence in 2) and 3) is repeated.

Annex C (informative): Change history

Table C.1: Change History

Meeting /Date	RAN Doc	CR	R	Subject	Cat	Curr	New	WI
RP-11				Generation of version 4 based on 3.6.0			4.0.0	
RP-11	RP-010100	0063		RACH implementation requirements	B	3.6.0	4.0.0	
RP-12	RP-010349	0065		Receiver Blocking characteristics	A	4.0.0	4.1.0	
RP-12	RP-010349	0067		Receiver spurious emission for co-located base stations	A	4.0.0	4.1.0	
RP-12	RP-010349	0069		Definition of Eb/No used for uplink receiver performance requirements in TS 25.104	A	4.0.0	4.1.0	
RP-12	RP-010349	0071		ACLR definition	A	4.0.0	4.1.0	
RP-12	RP-010467	0072		Requirements for demodulation of RACH message	F	4.0.0	4.1.0	
RP-12	RP-010467	0075		RACH preamble requirements	F	4.0.0	4.1.0	
RP-13	RP-010616	0077		Correction to PCDE requirement.	A	4.1.0	4.2.0	
RP-13	RP-010616	0079		Correction of frequency range for receiver spurious emission requirements	A	4.1.0	4.2.0	
RP-13	RP-010616	0081		Clarification in Spectrum emission mask section	A	4.1.0	4.2.0	
RP-13	RP-010616	0083		Blocking requirement for co-location of FDD and TDD base stations	A	4.1.0	4.2.0	
RP-13	RP-010616	0085		Definition of "classical Doppler spectrum"	A	4.1.0	4.2.0	
RP-13	RP-010626	0086		RACH measurement channel definition	F	4.1.0	4.2.0	
RP-14	RP-010779	0089		Multi and single carrier for spurious emissions	A	4.2.0	4.3.0	
RP-14	RP-010779	0092		Correction to units in Spectrum emission mask	A	4.2.0	4.3.0	
RP-14	RP-010779	0096		Co location with UTRA TDD	A	4.2.0	4.3.0	
RP-14	RP-010779	0098		Correction for FCC emission mask and frequency raster for Band B (UMTS1900)	A	4.2.0	4.3.0	
RP-15	RP-020016	0101	1	Removal of BS performance requirements in SSDT mode	A	4.3.0	4.4.0	
RP-15	RP-020016	0116		Correction of power terms and definitions	A	4.3.0	4.4.0	
RP-16	RP-020290	0125		Reference measurement channels for UL RACH Ratio of preamble power and total message power	F	4.4.0	4.5.0	
RP-16	RP-020290	0127		Correction of RACH preamble detection requirement	F	4.4.0	4.5.0	
RP-18	RP-020781	0149	1	FDD GSM co-existence in the Same Geographic Area	A	4.5.0	4.6.0	
RP-18	RP-020791	0159	1	BS IPDL requirement	F	4.5.0	4.6.0	
RP-18	RP-020783	0161		Correction to table of regional requirements	F	4.5.0	4.6.0	
RP-19	RP-030029	0170	1	Protection of the FDD BS receiver	A	4.6.0	4.7.0	
RP-19	RP-030035	0180		Correction to external equipment definition	F	4.6.0	4.7.0	
RP-29	RP-050489	0242	1	Clarification of '12.5MHz rule' and modification of the protection band for PHS	A	4.7.0	4.8.0	
RP-35	RP-070080	0285		Category B spurious emission limits for UTRA BS	A	4.8.0	4.9.0	TEI

History

Document history		
V4.0.0	March 2001	Publication
V4.1.0	June 2001	Publication
V4.2.0	September 2001	Publication
V4.3.0	December 2001	Publication
V4.4.0	March 2002	Publication
V4.5.0	June 2002	Publication
V4.6.0	December 2002	Publication
V4.7.0	March 2003	Publication
V4.8.0	September 2005	Publication
V4.9.0	March 2007	Publication