Technical Specification Group, Radio Access Network
Meeting #5, Korea, 6 - 8 October 1999

TSGR#5(99)435

TS 25.105 V~~1.3.0~~2.0.0 (<1999-~~08~~09>)

Technical Specification

3rd Generation Partnership Project (3GPP); Technical Specification Group (TSG) RAN WG4; UTRA (BS) TDD; Radio transmission and Reception

Reference
<Workitem> (<Shortfilename>.PDF)

Keywords
<keyword[, keyword]>

3GPP

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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 minimum RF characteristics of the TDD 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.
- 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] ITU-R Recommendation SM.329-7 “Spurious emissions”

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the 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>*

Zero distance - Connected to the antenna connector of the BS using an interconnection of negligible delay

3.2 Symbols

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

<symbol> <Explanation>

3.3 Abbreviations

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

ACIR	Adjacent Channel Interference Ratio
ACLR	Adjacent Channel Leakage power Ratio
ACS	Adjacent Channel Selectivity
BER	Bit Error Rate
BS	Base Station
CW	Continuous wave (unmodulated signal)
DL	Down link (forward link)
EIRP	Effective Isotropic Radiated Power
FDD	Frequency Division Duplexing
FER	Frame Error Rate
PPM	Parts Per Million
RSSI	Received Signal Strength Indicator
SIR	Signal to Interference ratio
TDD	Time Division Duplexing
TPC	Transmit Power Control
UE	User Equipment
UL	Up link (reverse link)
UTRA	UMTS Terrestrial Radio Access

4 General

4.1 Measurement uncertainty

The requirements given in this specification are absolute. Compliance with the requirements is determined by comparing the measured value with the specified limit, without making allowance for measurment uncertainty.

4.2 Base station classes

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

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

5 Frequency bands and channel arrangement

This section is identical to section 5 of TS 25.102 on “Frequency bands and Channel arrangement”.

6 Transmitter characteristics

6.1 General

Unless detailed the transmitter characteristic are specified at the antenna connector.

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 during one slot.

6.2.1 Base station maximum output power

Maximum output power, Pmax, of the base station is the mean power level per carrier that the manufacturers has declared to be available at the antenna connector.

6.2.1.1 Minimum Requirement

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

6.3 Frequency stability

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

6.3.1 Minimum Requirement

The modulated carrier frequency of the BS shall be accurate to within ± 0.05 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 the downlink.

6.4.1 Closed loop power control

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

For closed loop correction on the Downlink 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 the UE on the Uplink Traffic Channel.

6.4.2 Power control steps

The power control step is the step change in the DL transmitter output power in response to a TPC message from the UE.

6.4.2.1 Minimum Requirement

Down link (DL) 1, 2, 3 dB

The tolerance of the transmitter output power and the greatest average rate of change in mean power due to the power control step shall be within the range shown in Table 1.

Table 1: power control step size tolerance

Step size	tolerance	Range of average rate of change in mean power per 10 steps	
		minimum	maximum
1dB	+/-0.5dB	+/-8dB	+/-12dB
2dB	~~[~~+/-0.75dB~~]~~	~~[~~+/-16dB~~]~~	~~[~~+/-24dB~~]~~
3dB	~~[~~+/-1dB~~]~~	~~[~~+/-24dB~~]~~	~~[~~+/-36dB~~]~~

~~<Need to define the transmitter power as "code domain power". This is ffs.>~~

6.4.3 Power control dynamic range

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

6.4.3.1 Minimum Requirement

Down link (DL) power control dynamic range 30 dB

~~<Definition needs clarification.>~~

6.4.4 Minimum transmit power

The minimum controlled output power of the BS is when the power control setting is set to a minimum value. This is when the power control indicates a minimum transmit output power is required.

6.4.4.1 Minimum Requirement

Down link (DL) minimum transmit power is set to: Maximum output power – 30dB

~~<The maximum output power definition is ffs.>~~

6.4.5 Total power dynamic range

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

6.4.5.1 Minimum Requirement

Down link (DL) total dynamic range 30 dB

<This requirement is redundant, since 6.4.4 defines the same dynamic range by a minimum transmit power.>

6.4.6 Power control cycles per second

The rate of change for DL transmitter power control step.

6.4.6.1 Minimum Requirement

The rate of change for the DL transmitter power control step is a s follows: 100 – 800 Hz.

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

6.4.7 Perch channel power

<The name and the use of the common control channel may need to be adapted , subject to WG1 definition.>

6.5 Transmit ~~ON/~~OFF ~~ratio~~ power

The ~~T~~transmit ~~ON/~~OFF ~~ratio~~ power state is when the BS does not transmit. This parameter is defined as ~~the ratio of the~~ maximum output transmit power within the channel bandwidth ~~with~~ when the transmitter is ~~ON and~~ OFF.

6.5.1 Minimum Requirement

The ~~minimum~~ requirement of transmit~~ting ON/~~OFF ~~ratio is [x dBm /4.096MHz],~~ power shall be better than –33dBm measured with a filter that has a Root Raised Cosine (RRC) filter responcse with a roll off α=0.22 and a bandwidth equal to the chip rate.

6.6 Output RF spectrum emissions

6.6.1 Occupied bandwidth

Occupied bandwidth is a measure of the bandwidth containing 99% of the total integrated power for transmitted spectrum and is centered on the assigned channel frequency. The occupied channel bandwidth is 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 limit is specified in terms of a spectrum emission mask and adjacent channel power ratio for the transmitter.

6.6.2.1 Spectrum emission mask

6.6.2.2 Adjacent Channel Leakage power Ratio (ACLR)

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the transmitted power to the power measured after a receive filter in the adjacent channel(s). Both the transmitted and the received power are measured through a matched filter (Root Raised Cosine and roll-off 0.22) with a noise power bandwidth equal to the chip rate.

6.6.2.2.1 Minimum Requirement

Table 2: BS ACLR

BS adjacent channel offset	ACLR limit
± 5 MHz	[45] dB
± 10 MHz	[55] dB

6.6.2.3 Protection outside a licensee's frequency block

This requirement is applicable if protection is required outside a licensee's defined frequency block.

6.6.2.3.1 Minimum requirement

This requirement applies for frequencies outside the licensee's frequency block, up to an offset of 12.5MHz from a carrier frequency.

The power of any emission shall be attenuated below the transmit power (P) by at least 43 + 10 log (P)dB.

Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1MHz or greater. However, in the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier centre frequency and one above the carrier centre frequency, outside of which all emissions are attenuated at least 26dB below the transmitter power.

When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee's frequency block edges, both upper and lower, as the design permits.

The measurements of emission power shall be mean power.

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.

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 whatever the type of transmitter considered (single carrier or multi-carrier). It applies for all transmission modes foreseen by the manufacturer's.

Either requirement applies at frequencies within the specified frequency ranges which are more than 12.5MHz under the first carrier frequency used or more than 12.5 MHz above the last carrier frequency used. ~~from a [carrier frequency].~~

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.329-7 [1], are applied.

6.6.3.1.1.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 3: BS Mandatory spurious emissions limits, Category A

Band	Minimum requirement	Measurement Bandwidth	Note
9kHz – 150kHz	~~43 + 10logP (dBc)~~ -13 dBm	1 kHz	Bandwidth as in ITU SM.329-7, s4.1
150kHz – 30MHz		10 kHz	Bandwidth as in ITU SM.329-7, s4.1
30MHz – 1GHz		100 kHz	Bandwidth as in ITU SM.329-7, s4.1
1GHz – 12.75 GHz		1 MHz	Upper frequency as in ITU SM.329-7, s2.6

P = Mean power (W) where P < 500W

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.329-7 [1], are applied.

6.6.3.1.2.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 4: BS Mandatory spurious emissions limits, Category B

Band	Maximum Level	Measurement Bandwidth	Note
9kHz – 150kHz	-36dBm	1 kHz	Bandwidth as in ITU SM.329-7, s4.1
150kHz – 30MHz	- 36 dBm	10 kHz	Bandwidth as in ITU SM.329-7, s4.1
30MHz – 1GHz	-36 dBm	100 kHz	Bandwidth as in ITU SM.329-7, s4.1
1GHz – 12.75 GHz	-30 dBm	1 MHz	Upper frequency as in ITU SM.329-7, s2.6

6.6.3.2 Co-existence with GSM 900

6.6.3.2.1 Operation in the same geographic area

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

[This requirement assumes the scenario described in 25.942.] For different scenarios, the manufacturer may declare a different requirement.

6.6.3.2.1.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 5: BS Spurious emissions limits for BS in geographic coverage area of GSM 900

Band	Maximum Level	Measurement Bandwidth	Note
921 – 960MHz	-47 dBm	100 kHz	

6.6.3.2.2 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.

[This requirement assumes the scenario described in 25.942.] For different scenarios, the manufacturer may declare a different requirement.

6.6.3.2.2.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 6: BS Spurious emissions limits for protection of the BS receiver

Band	Maximum Level	Measurement Bandwidth	Note
921 – 960MHz	–[98]dBm	100 kHz	

6.6.3.3 Co-existence with DCS 1800

6.6.3.3.1 Operation in the same geographic area

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

[This requirement assumes the scenario described in 25.942.] For different scenarios, the manufacturer may declare a different requirement.

6.6.3.3.1.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 7: BS Spurious emissions limits for BS in geographic coverage area of DCS 1800

Band	Maximum Level	Measurement Bandwidth	Note
1805 – 1880MHz	-57 dBm	100 kHz	

6.6.3.3.2 Co-located basestations

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

[This requirement assumes the scenario described in 25.942.] For different scenarios, the manufacturer may declare a different requirement.

6.6.3.3.2.1 Minimum Requirement

The power of any spurious emission shall not exceed:

Table 8: 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	

6.7 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 CDMA modulated interference signal is injected into the antenna connector at a level of 30 dB lower than that of the subject signal. The frequency of the interference signal shall be ±5 MHz, ±10 MHz and ±15 MHz offset from the subject signal.

~~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.~~

6.7.1. Minimum Requirement

The Transmit intermodulation level shall not exceed the out of band or the spurious emission requirements of section 6.6.2 and 6.6.3.~~against the mean output power per carrier 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.]~~

~~<This is based on ARIB input. Further input for co-located cellular systems is needed.>~~

6.8 Transmit modulation

6.8.1 Transmit pulse shape filter

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

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

Where the roll-off factor α =0.22 and the chip duration: $T_C = \frac{1}{chiprate} \approx 0.26042ms$

6.8.2 Modulation Accuracy

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

6.8.2.1 Minimum Requirement

The Modulation accuracy shall not be worse than 12.5 %.

6.8.3 Peak Code Domain Error

The code domain error is computed by projecting the error vector power onto the code domain at the maximum spreading factor. The error power for each code is defined as the ratio to the mean power of the reference waveform expressed in dB. And the Peak Code Domain Error is defined as the maximum value for Code Domain Error. The measurement interval is one timeslot.

6.8.3.1 Minimum Requirement

The peak code domain error shall not exceed -28 dB.

7 Receiver characteristics

7.1 General

Unless detailed the receiver characteristic are specified at each antenna connector of the BS.

7.2 Reference sensitivity level

The reference sensitivity is the minimum receiver input power measured at the antenna connector at which the FER/BER does not exceed the specific value indicated in section 7.2.1. The signal power is equally applied to each antenna connector for diversity.

7.2.1 Minimum Requirement

For the different services with corresponding data rates, the reference sensitivity level of the BS shall be specified in table 9 below.

Table 9: BS reference sensitivity levels

Data rate	BS reference sensitivity level (dBm)	~~[~~FER/BER~~]~~
12.2 kbps	-110 dBm	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

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

The static [BER/FER] reference performance as specified in clause 7.3.1 should be met over a receiver input range of [30] dB above the specified reference sensitivity level for [channel type ffs].

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 an 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 10.

Table 10 : Adjacent channel selectivity

Parameter	**Level**	**Unit**
Data rate	12.2	kbps
Wanted signal	[ ]	dBm
Interfering signal	[ ]	dBm

Fuw (Modulated)	5	MHz

7.5 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 as specified in the table below.~~except those at which a spurious response occur.~~

The static reference performance as specified in clause 7.2.1 should be met ~~when the following signals are applied to the receiver;~~ with a wanted and an interfering signal coupled to BS antenna input using the following parameters.

Table 11 : Blocking requirements

Center Frequency of Interfering Signal	Interfering Signal Level	Wanted Signal Level	Minimum Offset of Interfering Signal	Type of Interfering Signal
1900 – 1920 MHz, 2010 – 2025 MHz	-40 dBm	<REFSENS> + 6 dB	10 MHz	WCDMA signal with one code
1880 – 1900 MHz, 1990 – 2010 MHz, 2025 – 2045 MHz	-40 dBm	<REFSENS> + 6 dB	10 MHz	WCDMA signal with one code
1920 – 1980 MHz	-40 dBm	<REFSENS> + 6 dB	10 MHz	WCDMA signal with one code
<1880, 1980 – 1990 MHz, > 2045 MHz	-15 dBm	<REFSENS> + 6 dB	—	CW carrier

~~- A wanted signal at the assigned channel frequency, 3 dB above the static reference level.~~

~~- An 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>*~~

~~*<The definition of the exemptions needs to be reconsidered, since it is unclear.>*~~

~~7.6 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 should be met when the following signals are applied to the receiver;~~

~~- A wanted signal at the assigned channel frequency, 3 dB above the static reference level.~~

~~- A CW interfering signal below a level of [ ] dBm.~~

~~- The number of allowed spurious responses is an item for further study.~~

7.6 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 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 7.2.1 should be met when the following signals are ~~applied to the receiver;~~ coupled to BS antenna input.

- A wanted signal at the assigned channel frequency, ~~3~~ 6 dB above the static reference level.

~~A CW interfering signal at frequency [10 MHz] and a [CW] signal at frequency [20.1 MHz] with a level of [ ] dBm.~~

- Two interfering signals with the following parameters.

Table 12 : Intermodulation requirement

Interfering Signal Level	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.

7.7.1 Minimum Requirement

The spurious emission shall be:

(a) Less than [-78] dBm/3.84 MHz at the BS receiver antenna connector, for frequencies within the BS receive band.

(b) Less than [-57] dBm/100 kHz at the BS receiver antenna connector, for frequencies bands from 9kHz to 1GHz.

(c) Less than [-47] dBm/100 kHz at the BS receiver antenna connector, for frequencies bands from 1GHz to 12.75GHz.

7.8 Timing Advance (TA) Requirements

The conditions under the requirements which must be met shall be 3dB below reference sensitivity level in section 7.2.

- On request the BS shall measure the delay of the received signal relative to the expected signal from an UE at zero distance under static channel conditions (see Annex B). This delay, called the timing advance, shall be rounded to the nearest value corresponding to 4 chips period. The delay shall be assessed in such a way that the measurement error (due to noise and interference) is less than 2 chips periods for stationary UE.

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 Performance in AWGN channel

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

8.2.1.1 Single link performance

The required Eb/I0 is described in Table 13.

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

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

8.2.1.2 Multi link performance

The required Eb/I0 is described in Table 14.

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

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

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

8.2.2 Performance in multipath fading channels

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

8.2.2.1 Single link performance

8.2.2.1.1 Performance without TPC

The required Eb/I0 is described in Table 15.

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

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

8.2.2.1.2 Performance with TPC

The required Eb/I0 is described in Table 16.

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

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

8.2.2.2 Multi link performance

The required Eb/I0 is described in Table 17.

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

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

	links		
Speech (10^{-3})	N	8	T.B.D.

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

8.3 BS synchronisation performance

8.3.1 Minimum Requirement

The timing error of BSs synchronised to each other shall be less than [5μs].

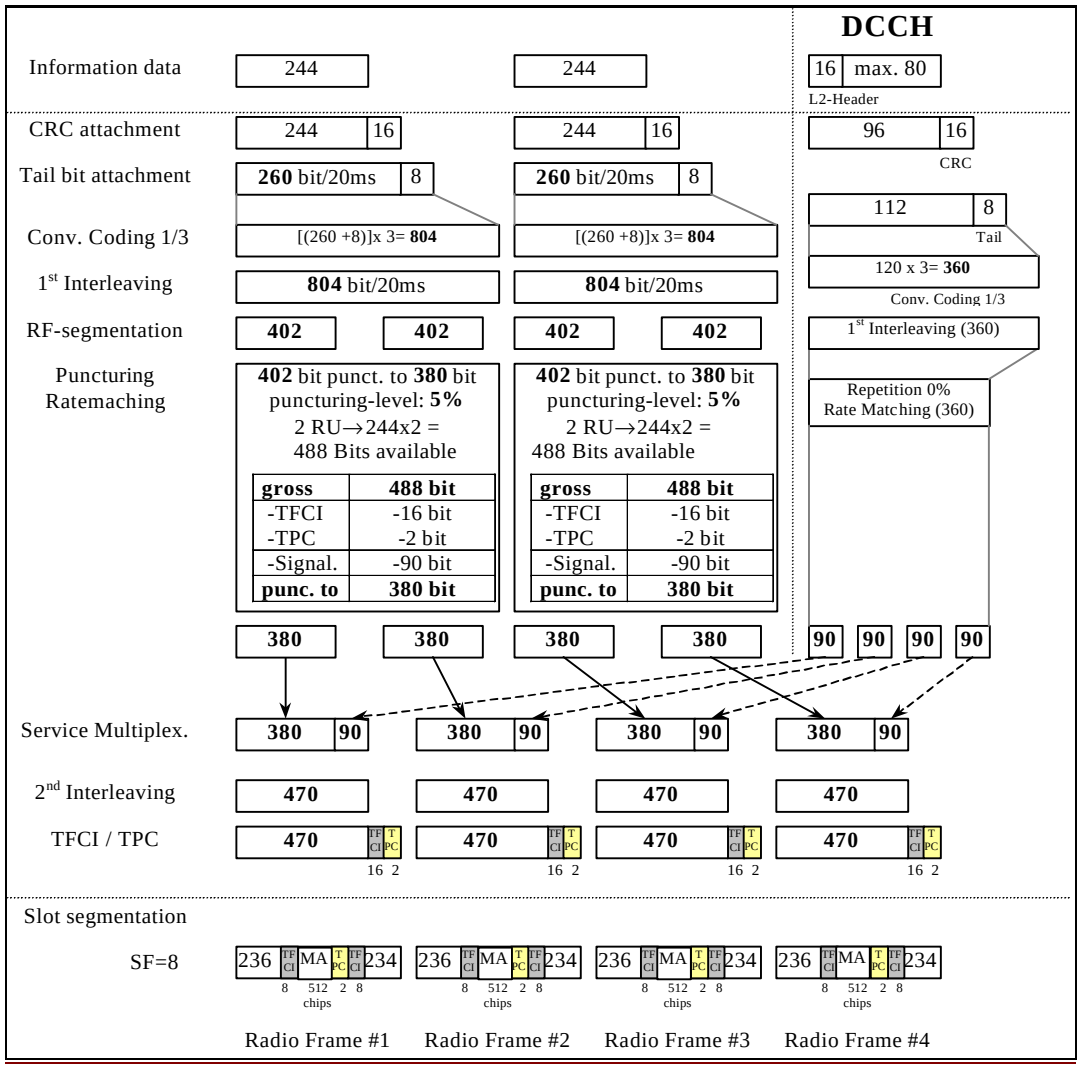
Annex A (normative): ~~Transmit power levels versus time~~Measurement Channels

A.1 General

A.2 Reference measurement channel

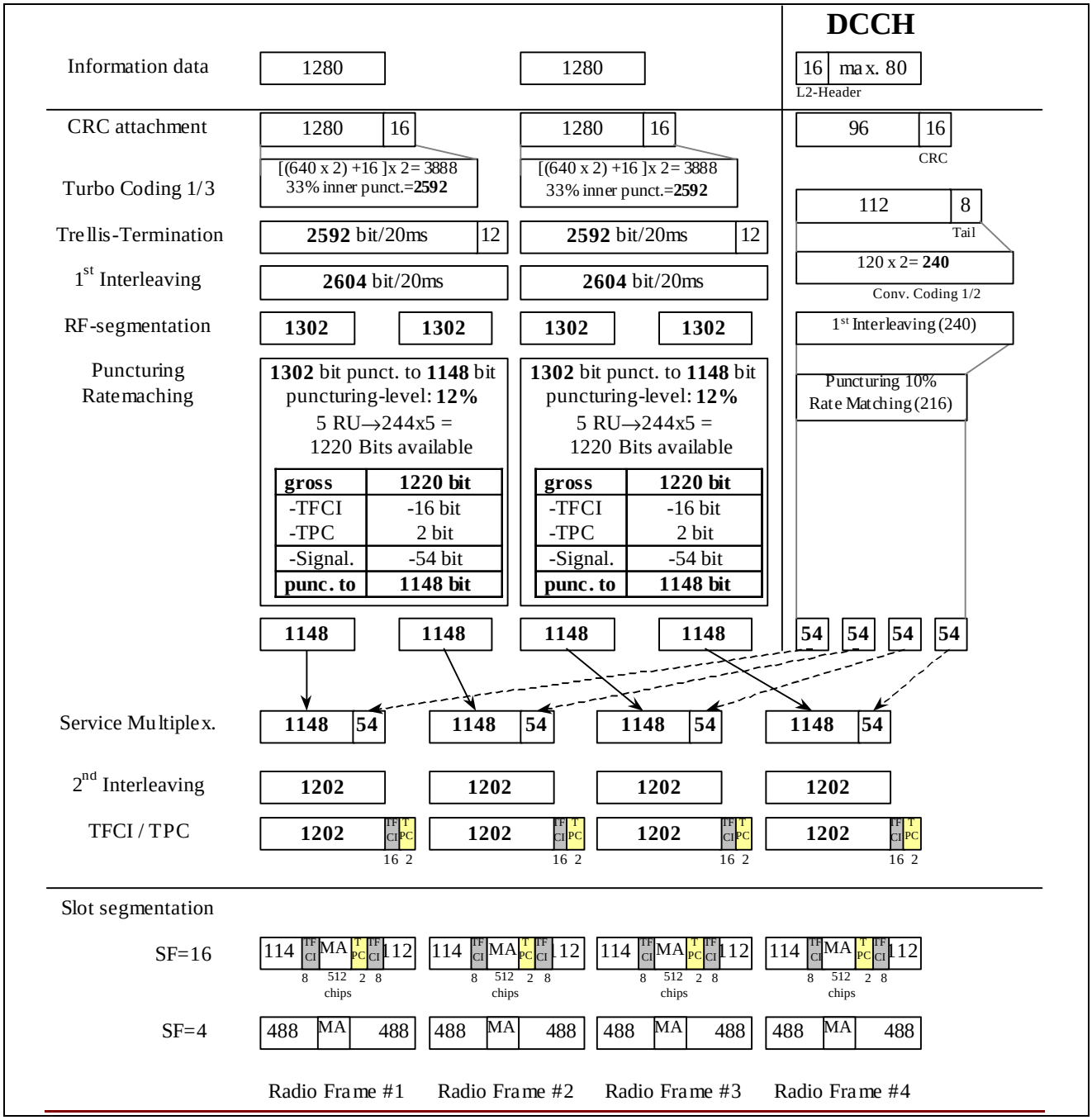
A.2.1 UL reference measurement channel (12.2 kbps)

Parameter	
Information data rate	12.2 kbps
RU´s allocated	2 RU
Midamble	**512** chips
Interleaving	20 ms
Power control	2 Bit/user
TFCI	16 Bit/user
Inband signalling DCCH	2 kbps
Puncturing level at Code rate 1/3 : DCH / DCCH	5% / 0%



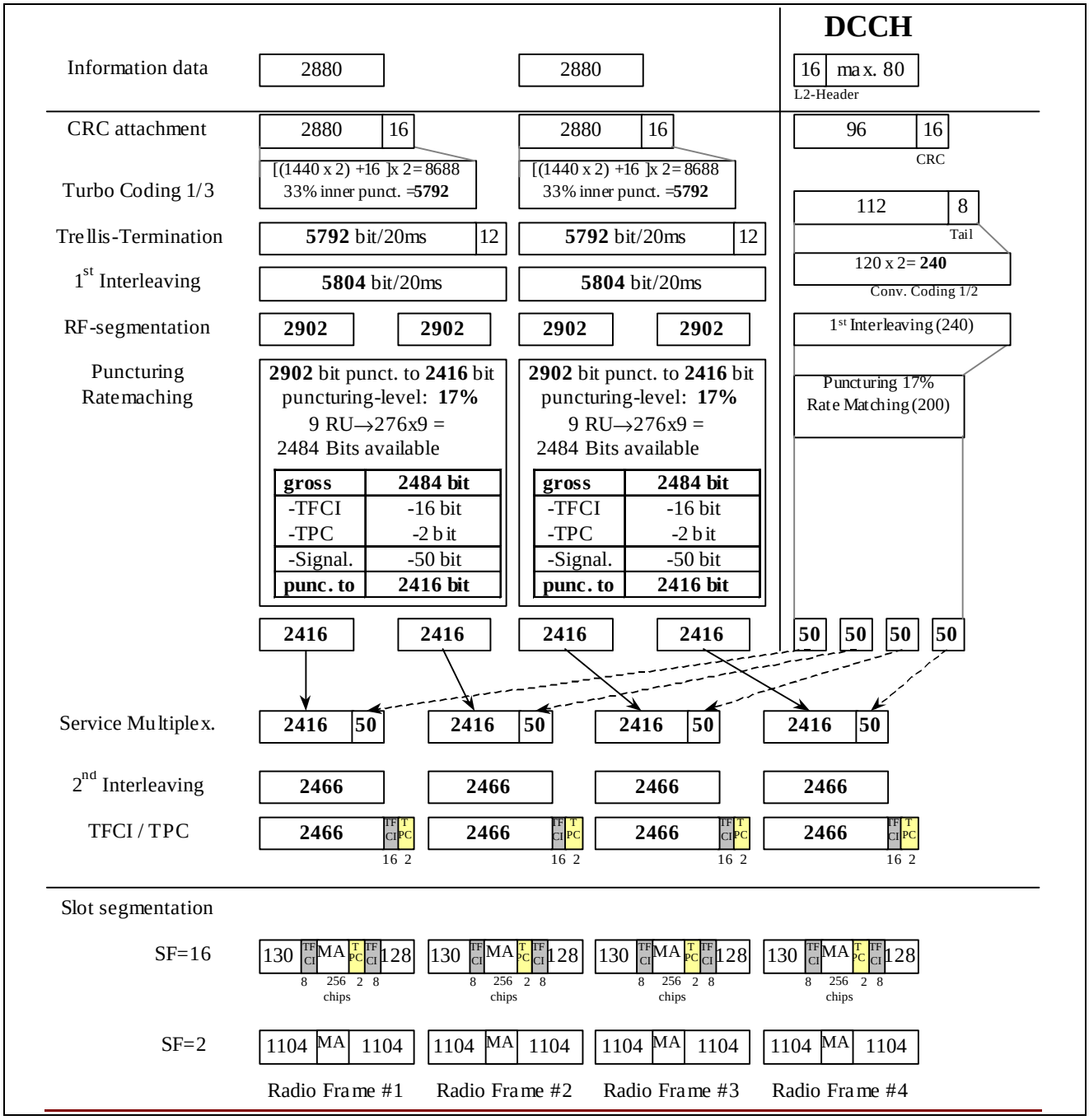
A.2.2 UL reference measurement channel (64 kbps)

Parameter	
Information data rate	64 kbps
RU´s allocated	1 SF4 + 1 SF16 = 5RU
Midamble	512 chips
Interleaving	20 ms
Power control	2 Bit/user
TFCI	16 Bit/user
Inband signalling DCCH	2 kbps
Puncturing level at Code rate : 1/3 DCH / ½ DCCH	41.2% / 10%



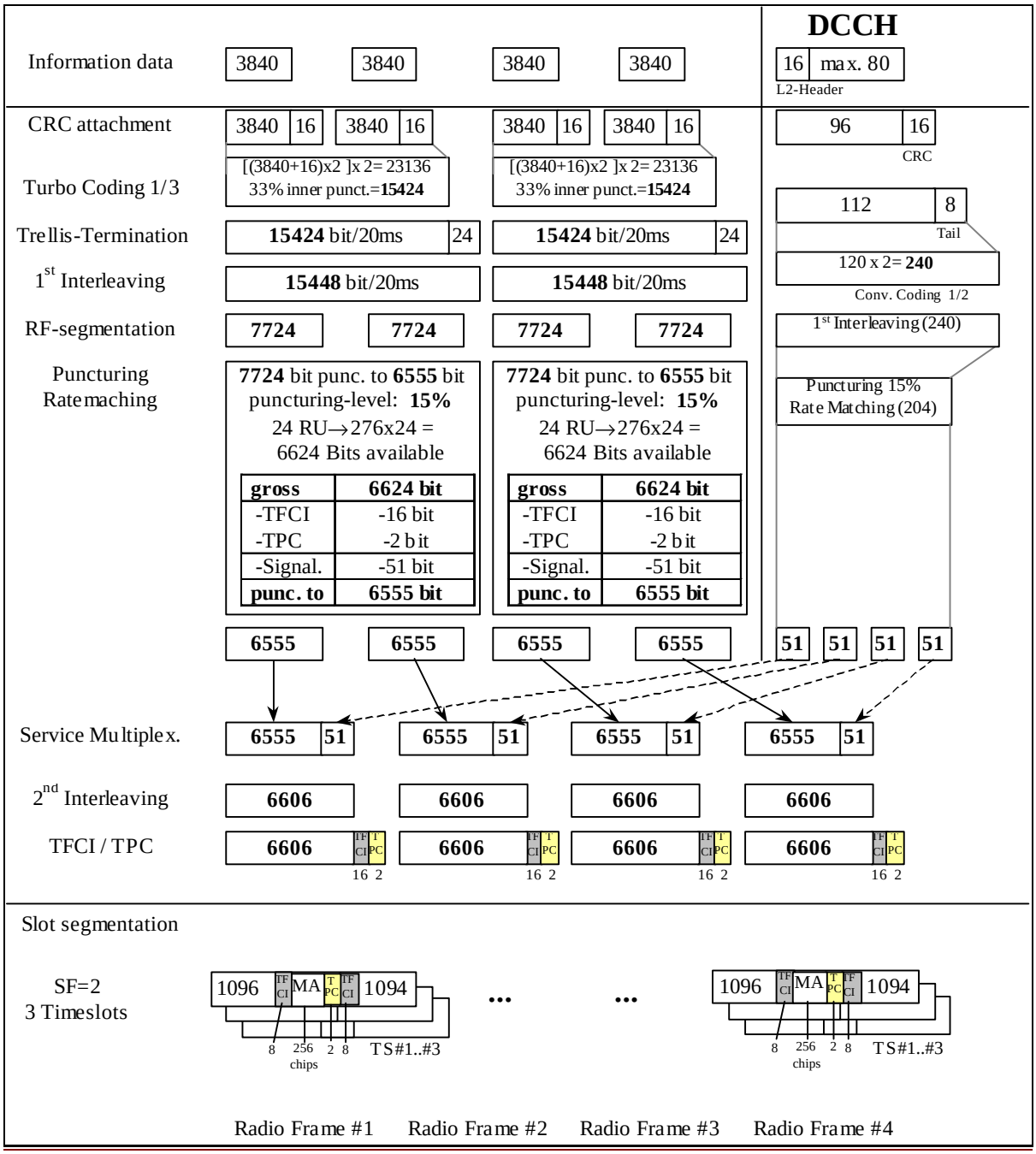
A.2.3 UL reference measurement channel (144 kbps)

Parameter	
Information data rate	144 kbps
RU´s allocated	1 SF2 + 1 SF16 = 9RU
Midamble	256 chips
Interleaving	20 ms
Power control	2 Bit/user
TFCI	16 Bit/user
Inband signalling DCCH	2 kbps
Puncturing level at Code rate : 1/3 DCH / ½ DCCH	44.4% / 16.6%



A.2.4 UL reference measurement channel (384 kbps)

Parameter	
Information data rate	384 kbps
RU´s allocated	8*3TS = 24RU
Midamble	256 chips
Interleaving	20 ms
Power control	2 Bit/user
TFCI	16 Bit/user
Inband signalling DCCH	2 kbps
Puncturing level at Code rate : 1/3 DCH / ½ DCCH	43.4% / 15.3%



Annex B (normative): Propagation conditions

B.1 Test Environments

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

Table B1: Test Environments for UE Performance Specifications

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

B.2 Propagation Conditions

B.2.1 Static propagation condition

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

B.2.2 Multi-path fading propagation conditions

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

Table B2: Propagation Conditions for Multi path Fading Environments

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

B.1 Test Environments

Each of these environments static, indoor, out-door to indoor and pedestrian, and vehicular environments is modeled by typical propagation condition that are defined in this section. These channels may have different bit rates and different BER/FER requirements. Table B1 describes these requirements

Table B1: Test Environments for UE Performance Specifications

Test Services	Static	Indoor Office 3 km/h	Outdoor to Indoor and Pedestrian 3 km/h	Vehicular 120 km/h
	Information Data Rate, Performance metric	Information Data Rate, Performance metric	Information Data Rate, Performance metric	Information Data Rate, Performance metric
Paging Message		-	-	-
FACH Message		-	-	-
Speech	12.2 kbps BER <10^{-3}	12.2 kbps BER <10^{-3}	12.2 kbps BER <10^{-3}	12.2 kbps BER <10^{-3}
Circuit Switched Data	64, 384, 2048 kbps, BER < 10^{-6}	64, 144, 384 kbps BER < 10^{-6}	64, 144, 384 kbps BER < 10^{-6}	64, 144 kbps BER < 10^{-6}
Packet Switched Data	TBD	TBD	TBD	TBD

B.2 Propagation Conditions

B.2.1 Static propagation condition

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

B.2.2 Multi-path fading propagation conditions

Modified ITU propagation models are used for the performance measurements in multi-path fading channels. The propagation condition models for indoor, indoor to outdoor and pedestrian, and for vehicular environments are depicted in Table B2

Table B2: Propagation condition for multi-path fading environments

Case 1 (3 km/h)		Case 2 (3 km/h)		Case 3 (120 km/h)	
Relative Delay [ns]	Average Power [dB]	Relative Delay [ns]	Average Power [dB]	Relative Delay [ns]	Average Power [dB]
0	0.0	0	0.0	0	0.0
244	-9.6	244	-12.5	244	-2.4
488	-33.5	488	-24.7	488	-6.5
				732	-9.4
				976	-12.7
				1220	-13.3
				1708	-15.4
				1952	-25.4

Annex C (normative): Environmental conditions

Annex D (informative): Open items

Section number	Section description	Status
3	Definitions, symbols and abbreviations	Update needed
6.3	Frequency stability	Should there also be an accuracy requirement on the clock rate ? Alternatives are to either tie the clock rate to the frequency accuracy or to have a separate clock rate requirement.
6.4.3	Power control dynamic range	Redundant requirement included. The need for this parameter to be specified should be confirmed.
6.4.6	Power control cycles per second	Adaptation to 15 slots per frame needed, depending on WG1 specification, requirement needed ?
6.4.7	Perch channel power	Requirement for reference power in the cell is TBD.
6.6.2.1	Spectrum mask	Not included
6.6.2.2	ACLR	Values in square brackets
6.6.3.2.2	Co-existence with GSM 900; co-located base stations	Scenario calculations should be performed to confirm the requirement, currently [-98] dB.
6.6.3.3.2	Co-existence with GSM 1800; co-located base stations	Scenario calculations should be performed to confirm the requirement, currently [-98] dB.
~~6.7~~	~~Transmit Intermodulation~~	~~Values in square brackets~~
~~7.2~~	~~Reference sensitivity~~	~~No value~~
7.3	Dynamic Range	Value in square brackets
7.4	ACS	Requirement is TBD. ~~Value in square brackets~~
~~7.5~~	~~Blocking Requirements~~	~~No value~~
~~7.6~~	~~Spurious Response~~	~~No value~~
~~7.7~~	~~Intermodulation Characterisitics~~	~~No value~~
7.8	Spurious Emissions	Values in square brackets
8	Performance Requirement	No values, complete update of structure needed.
~~Annex A~~	~~Transmit Power Levels Versus Time~~	~~Empty~~
~~Annex B~~	~~Propagation Conditions~~	~~Update of Multi-path fading propagation conditions~~
Annex C	Environmental Conditions	~~Empty~~TBD

History

Document history		
V0.0.1	1999-02-19	Document created based on S4.01B v0.0.2 “UTRA (BS) FDD, radio transmission and reception”
V0.0.2	1999-02-25	Editorial update after WG4#2 for distribution on the e-mail reflector.
V1.0.0	1999-03-02	Version presented to TSG RAN for information (identical to version 0.0.2)
V1.0.1	1999-04-13	Update according to decisions in TSG RAN WG4#3 in Tokyo, Japan, sent to WG4 e-mail reflector for comments
TS 25.105 V1.0.0	1999-04-22	Noted by TSG-RAN as TS 25.105 V1.0.0
V1.1.0	1999-06-11	Incorporation of agreed changes from WG4#4 Meeting in Kista.
V1.2.0	1999-07-07	Incorporation of agreed changes from WG4#5 Meeting in Miami.
V1.3.0	1999-08-06	Incorporation of agreed changes from WG4#6 Meeting in Edinburgh.
V2.0.0	1999-09-24	Incorporation of agreed changes from WG4#7 Meeting in Makuhari – Tokyo.

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