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Characteristics of terrestrial IMT-2000 systems for frequency sharing/interference analyses

Foreword

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REPORT ITU-R M.2039-4

Characteristics of terrestrial IMT-2000 systems for frequency sharing/interference analyses

(2004-2009-2010-2014-2025)

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1 Introduction

International Mobile Telecommunications 2000 (IMT-2000) third generation mobile systems started service around the year 2000, and provide access by means of one or more radio links to a wide range of telecommunications services supported by the fixed telecommunication networks (e.g. PSTN/ISDN/ Internet protocol (IP)) and to other services specific to mobile users. Since then, IMT-2000 has been continually enhanced.

The Radiocommunication Assembly 2007 adopted Resolution ITU-R 56 that resolves that the term “IMT” be the root name that encompasses both IMT-2000 and IMT-Advanced collectively.

Certain bands are identified for IMT in the Radio Regulations (RR) and the frequency arrangements used in those bands can be found in Recommendation ITU-R M.1036.

Frequency sharing studies and interference analyses involving IMT systems and other systems and services operating in bands identified for IMT may need to be undertaken within ITU R.

To perform the necessary sharing studies between IMT systems and systems in other services, characteristics of the terrestrial component of IMT systems are needed.

This Report provides the baseline characteristics of terrestrial IMT-2000 systems only for use in frequency sharing and interference analysis studies involving IMT-2000 systems and between IMT-2000 systems and other systems.

Recommendations ITU-R M.1457, ITU-R M.1580 and ITU-R M.1581 provide standardization information relating to IMT-2000 interfaces.

Parameters for IMT-Advanced interfaces are not addressed in this Report. They are addressed in Report ITU-R M.2292.

The characteristics of the IMT-2000 interfaces have been grouped by frequency ranges:

– below 1 GHz,

– between 1 and 3 GHz,

– between 3 and 6 GHz.

Band specific variations, if any, are reflected in the Tables.

2 Acronyms

3GPP	3rd Generation Partnership Project
3GPP2	3rd Generation Partnership Project 2
ACLR	Adjacent channel leakage ratio
ACR	Adjacent channel rejection
ACS	Adjacent channel selectivity
BS	Base station
BW	Bandwidth
CDMA	Code-division multiple access
DECT	Digital enhanced cordless telecommunications
DL	Downlink
EDGE	Enhanced data rates for GSM evolution
e.i.r.p.	Equivalent isotropic radiated power
e.r.p.	Effective radiated power
E-UTRA	Evolved UTRA
EV-DO	Evolution-Data Optimized
EV-DV	Evolution-Data/Voice
FDD	Frequency division duplex
FDMA	Frequency-division multiple access
GMSK	Gaussian minimum shift keying
HPSK	Hybrid phase shift keying
HRPD	High rate packet data
HSPA	High speed packet access
HSPA+	Evolved high speed packet access
IMT	International Mobile Telecommunications – root name that encompasses both IMT-2000 and IMT-Advanced collectively
IMT-2000	International Mobile Telecommunications 2000
IMT-Advanced	International Mobile Telecommunications-Advanced – previously known as systems beyond IMT 2000
I/*N*	Interference to noise ratio
LTE	Long term evolution
MC	Multi-carrier
MS	Mobile station
N/A	Not applicable
OFDMA	Orthogonal frequency-division multiple access
PUSC	Partially used sub-channel

QAM	Quadrature amplitude modulation
QPSK	Quadrature phase shift keying
RF	Radio frequency
SC-FDMA	Single carrier frequency division multiple access
SDO	Standards development organization
TDD	Time division duplex
TDMA	Time-division multiple access
TD-SCDMA	Time division synchronous code-division multiple access
TR	Technical report of 3GPP
TS	Technical specification of 3GPP
TX	Transmitter
UE	User equipment
UL	Uplink
UMB	Ultra mobile broadband
UMTS	Universal mobile telecommunication system
UT	User terminal
UTRA	Universal terrestrial radio access
UWC	Universal wireless communications
WCDMA	Wideband code-division multiple access
WiMAX	Worldwide interoperability for microwave access

3 IMT-2000 interfaces

Table 1 provides an explanation of the terminology used for the IMT-2000 terrestrial radio interfaces as given in Recommendation ITU-R M.1457. For IMT-Advanced terrestrial radio interfaces see Recommendation ITU-R M.2012.

TABLE 1

IMT-2000 terrestrial radio interfaces

Full name	Common names	Duplex mode
IMT-2000 CDMA Direct Spread (interface No. 1)	UTRA FDD WCDMA UMTS HSPA, HSPA+ E-UTRA FDD (LTE FDD)	FDD
IMT-2000 CDMA Multi-Carrier (interface No. 2)	CDMA2000 CDMA2000 1X and 3X CDMA2000 HRPD CDMA2000 1xEV-DV CDMA2000 1xEV-DO EVDOHRPD UMB	FDD and TDD
IMT-2000 CDMA TDD (time-code) (interface No. 3)	UTRA TDD 7.68 Mchip/s UTRA TDD 3.84 Mchip/s UTRA TDD 1.28 Mchip/s (TD-SCDMA) UMTS HSPA, HSPA+ E-UTRA TDD (LTE TDD)	TDD
IMT-2000 TDMA Single-Carrier (interface No. 4)	UWC-136 EDGE	FDD
IMT-2000 FDMA/TDMA (frequency-time) (interface No. 5)	DECT	TDD
IMT-2000 OFDMA TDD WMAN (interface No. 6)	Mobile WiMAX	FDD and TDD

4 Non-deployment related parameters

Specification requirements indicate the minimum acceptable performance. Equipment performance often exceeds this performance significantly. Implementation aspects may also mandate improved performance, e.g. when duplex filters reduce the interference generated in adjacent spectrum.

When equipment performance measurements, band specific parameters or detailed models are available, these factors may be taken into account in sharing analysis.

4.1 Non-deployment related parameters for IMT-2000 CDMA DS (interface No. 1)

TABLE 2

Non-deployment related parameters for IMT-2000 CDMA DS (interface No. 1)

	IMT-2000 RADIO INTERFACE	**IMT-2000 CDMA Direct Spread [1], [2], [3], [4], [5]**			
		UTRA		**E-UTRA**	
No.	**Parameter**	**Base station**	**Mobile station**	**Base station**	**Mobile station**
1.	Access technique	CDMA	CDMA	OFDM	SC-FDMA
2.	Modulation parameters	QPSK 16-QAM 64-QAM	<1 GHz: QPSK 16-QAM 1-3 GHz: HPSK(10) 16-QAM	QPSK 16-QAM 64-QAM	QPSK 16-QAM 64-QAM
3.	Duplex mode	FDD		FDD	
4.	Carrier spacing	5 MHz ± n × 0.2 MHz		Nominal Channel spacing = $(BW_{Channel(1)} + BW_{Channel(2)})/2$[(1)]	
5.	Channel bandwidth (MHz)[(2)]	5	5	1.4, 3, 5, 10, 15, 20	1.4, 3, 5, 10, 15, 20
6.	Effective transmitter/receiver bandwidth (MHz)	3.84	3.84	1.08, 2.7, 4.5, 9, 13.5 and 18	1.08, 2.7, 4.5, 9, 13.5 and 18

TABLE 2 (*continued*)

	IMT-2000 RADIO INTERFACE	**IMT-2000 CDMA Direct Spread [1], [2], [3], [4], [5]**			
		UTRA		**E-UTRA**	
No.	**Parameter**	**Base station**	**Mobile station**	**Base station**	**Mobile station**
7.	Transmitter characteristics				
7.1	Total power dynamic range for BS (dB) and minimum power (dBm) for MS (Power control)	Total power dynamic range > 18 dB(3)	Minimum power < −50 dBm(4)	Total power dynamic range > 7.7/11.7/13.9/16.9/ 18.7 dB for 1.4/3/5/10/15/20 MHz Channel BW(5)	Minimum power ≤ −40 dBm(6)
7.2	Spectral emission mask or Operating band unwanted emissions	(7)	(8)	(9)	(10)
7.3	ACLR(11)				
7.3a.	ACLR1	Macro, Micro, Pico, Femto: 45 dB (12)	33 dB (13)	Macro, Micro, Pico, Femto: 45 dB at ±BW MHz (14)(15)	30 dB (interference to E-UTRA) 33 dB (interference to UTRA) (16)

TABLE 2 (*continued*)

	IMT-2000 RADIO INTERFACE	IMT-2000 CDMA Direct Spread [1], [2], [3], [4], [5]			
		UTRA		E-UTRA	
No.	**Parameter**	**Base station**	**Mobile station**	**Base station**	**Mobile station**
7.3b.	ACLR2	Macro, Micro, Pico, Femto: 50 dB[12]	43 dB[13]	Macro, Micro, Pico, Femto: 45 dB at ±2*BW MHz[14][15]	N/A for second adjacent E-UTRA channel 36 dB for second adjacent UTRA channel)[16]
7.4	Transmitter power[17]	(dBm/antenna) Macro: No limit Micro: 35 Pico: 24 Femto: < +20 dBm (1 transmit antenna) [18]	(dBm) 24 (power class 3) / 21 (power class 4)[19]	(dBm/antenna) Macro: No limit Micro: 38 Pico: 24 [20]	(dBm) 23 [21]
7.5	Transmitter Spurious emissions [1], [2], [3], [5][22]	−36 dBm/100 kHz for 30 MHz – 1 GHz −30 dBm/1 MHz for 1 GHz – 12.75 GHz −30 dBm/1 MHz for 12.75 GHz – 5th harmonic of the upper frequency edge of the UL operating band in GHz (applicable to 3GPP E-UTRA Band 22 or UTRA Band XXII)			

TABLE 2 (*continued*)

	IMT-2000 RADIO INTERFACE	IMT-2000 CDMA Direct Spread [1], [2], [3], [4], [5]			
		UTRA		E-UTRA	
No.	**Parameter**	**Base station**	**Mobile station**	**Base station**	**Mobile station**
8.	Receiver characteristics				
8.1	Receiver Noise Figure (NF) (dB)	Macro: 5 Micro: 15 Pico: 19 Femto: 19	9	Macro: 5 Micro: 10 Pico: 13 Femto: 13	9
8.2	Receiver thermal noise level	RTN = 10 $\log_{10}$(kTB)+NF k : Boltzmann's constant = 1.38 × 10^{-23}; T : 290 K; B : effective rx bandwidth (Hz).			
8.3	Receiver blocking (in-band, out-of-band, narrow-band)	(23)	(24)	(25)	(26)
8.4	ACS(27) (relative ACS)	Macro: −52 dBm (46 dB) Micro: −42 dBm (46 dB) Pico / Femto: −38 dBm (46 dB) (28)	33 dB (29)	(30)	(31)(33 dB) (up to 10 MHz channel bandwidth) (30 dB) (BW = 15 MHz) (27 dB) (BW = 20 MHz)
9.	Interference criterion, *I*/*N* (dB)	*I*/*N* = −6 dB, −10 dB or −20 dB depending on scenario(32)			

Notes relative to Table 2:

(1) $BW_{Channel(1)}$ and $BW_{Channel(2)}$ are the channel bandwidths of the two respective E-UTRA carriers. Supported channel bandwidths: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz and 20 MHz.

(2) This value refers to the transmission bandwidth.

(3) See 3GPP Document: TS 25 104, § 6.4

(4) See 3GPP Document: TS 25 101, § 6.4

(5) See 3GPP Document: TS 36 104, § 6.3

(6) See 3GPP Document: TS 36 101, § 6.3

(7) See 3GPP Documents: TS 25 104, § 6.6.2.1 or TS 37 104, § 6.6.2

(8) See 3GPP Documents: TS 25 101, § 6.6.2.1

(9) See 3GPP Documents: TS 36 104, § 6.6.3 or TS 37 104 § 6.6.2

(10) See 3GPP Documents: TS 36 101, § 6.6.2

(11) These unwanted emission limits are the upper limits from SDO specifications for laboratory testing with maximum transmitting power. It is assumed that when the in-band transmitting power is reduced by x dB through power control, the unwanted emission levels would be reduced by x dB in consequence in the coexistence simulations.

(12) See 3GPP Documents: TS 25 104, § 6.6.2.2 or TS 37 104, § 6.6.4

(13) See 3GPP Documents: TS 25 101, § 6.6.2.2

(14) ACLR applies up to 10 MHz outside the operating band. Stricter limits may apply beyond 10 MHz outside the operating band, see 3GPP Documents TS 36 104 § 6.6.2 or TS 37 104 § 6.6.4

(15) BW represents the channel bandwidth. Supported channel bandwidths: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz and 20 MHz.

(16) See 3GPP Document TS 36.101, § 6.6.2.3. The ACLR value provided in the table applies to a single-UE occupying the whole channel bandwidth.

(17) Transmit power values refer to maximum values defined in the specifications. For actual powers to be used in sharing studies see the deployment specific parameters.

(18) See 3GPP Documents: TS 25 104, § 6.2 or TS 37 104, § 6.2.

(19) See 3GPP Document TS 25.101, § 6.2.

(20) See 3GPP Documents: TS 36 104, § 6.2 or TS 37 104, § 6.2.

(21) See 3GPP Document TS 36.101, § 6.2.

(22) 3GPP specifies additional spurious emissions for co-existence/co-location between 3GPP technologies.

Notes relative to Table 2 (end):

(23) See 3GPP Document TS 25.104, § 7.5 or TS 37 104 § 7.4, § 7.5

(24) See 3GPP Document TS 25.101, § 7.6

(25) See 3GPP Document TS 36.104, §§ 7.5, 7.6 or TS 37 104 §§ 7.4, 7.5

(26) See 3GPP Document TS 36.101, § 7.6

(27) The absolute ACS values are the test values as specified in 3GPP TS 25.104 § 7.4. The following conversion formula: ACS_relative = ACS_test – Noise_floor – 10 $\log_{10}$ (10M/10 – 1) can be used to derive relative ACS values, where M is the margin (dB) used in the ACS test, which is the useful signal level above the reference sensitivity level. For both IMT 2000 CDMA direct spread and IMT 2000 CDMA TDD (time code), E.g. M = 6 dB for Macro BS. ACS relative values are often used in sharing studies. For values of M see 3GPP Documents: TS 25.104 § 7.4, TS 36.104 § 7.5 or TS 37.104 § 7.4.

(28) See 3GPP Document TS 25.104, § 7.4

(29) See 3GPP Document TS 25.101, § 7.5

(30) E-UTRA BS receiver ACS and blocking test conditions are specified in 3GPP 36.104 § 7.5, those test conditions should be used to derive E-UTRA BS receiver mask with the conversion formula in note (27), special care is needed when deriving the E-UTRA BS receiver mask for channel bandwidth larger than 5 MHz since a 5 MHz interfering signal is specified in the ACS and Blocking test conditions.

(31) E-UTRA UE ACS values are to be used if the E-UTRA victim channel bandwidth is the same as interferer transmitting channel bandwidth. In case that the E-UTRA victim channel bandwidth is different from the interferer transmitting channel bandwidth, the E-UTRA receiver mask needs to be derived with the formula in Note (27) using the E-UTRA UE ACS and Blocking test conditions defined in 3GPP TS 36.101 § 7.5, special care is needed when deriving the E-UTRA UE receiver mask for UE channel bandwidth larger than 5 MHz since a 5 MHz interfering signal is specified in the ACS and Blocking test conditions.

(32) Different protection criteria correspond to different interference situations: $I/N = -6$ dB (corresponding to 1 dB reduction of the receiver sensitivity) is applicable to cases where interference affects one or a few cells, or when the IMT-2000 system is interference limited. In other cases $I/N = -10$ dB (corresponding to 0.4 dB reduction of the receiver sensitivity) is applicable. In case of interference from systems which are allowed to be operated on lower priority basis, including in particular license exempt systems, a requirement of $I/N = -20$ dB applies. In case of multiple interfering services, the allowed interference should be partitioned among the interferers. These criteria may be modified in case of cross-border negotiations.

4.2 Non-deployment related parameters for IMT-2000 CDMA MC (CDMA 2000, HRPD and UMB) (interface No. 2)

TABLE 3[(1)]

Non-deployment related parameters for IMT-2000 CDMA MC (CDMA 2000, HRPD and UMB) (interface No. 2)

	IMT-2000 RADIO INTERFACE		**IMT-2000 CDMA MC**					
			cdma2000		**HRPD**		**UMB**	
No.	**Parameter**		**Base station**	**Mobile station**	**Base station**	**Mobile station**	**Base station**	**Mobile station**
1.	Access technique		CDMA	CDMA	TDMA	CDMA	OFDMA	CDMA/OFDMA
2.	Modulation parameters	Forward link or downlink	Data modulation: BPSK; QPSK, 8-PSK, 16-QAM Spreading modulation: QPSK		Data modulation: QPSK, 8-PSK, 16-QAM, and 64-QAM Spreading modulation: QPSK		Data modulation: QPSK, 8-PSK, 16-QAM, and 64-QAM	
		Reverse link or uplink	Data modulation: 64-ary Orthogonal Modulation, BPSK; QPSK, 8-PSK Spreading modulation: HPSK		Data modulation: BPSK; QPSK, 8-PSK Spreading modulation: HPSK		Data modulation: QPSK, 8-PSK, 16-QAM, and 64-QAM Spreading modulation: QPSK (CDMA control segment)	
3.	Duplex mode		FDD		FDD		FDD/TDD	
4.	Carrier spacing		Nominal carrier spacing is 1.23 MHz or 1.25 MHz		Nominal carrier spacing is 1.23 MHz or 1.25 MHz		Nominal Channel spacing = $(BW_{Channel(1)} + BW_{Channel(2)})/2$[(2)]	
5.	Channel bandwidth (MHz) Channel bandwidth(s), some systems being capable of multiple bandwidths		It has a chip rate of N = 1.2288 Mchip/s (currently, N = 1 and 3 are specified) Carrier spacing is 1.23 MHz for Band Class 0; 1.25 MHz for all other Band Classes		M carriers of 1.2288 Mchip/s can be aggregated in a single or multi-carrier operation, where M = 1, 2, 3, 4, …, 15. Carriers in a multi- carrier operation do not have to be contiguous and their spacing is multiple of 30, 50, 25 or 12.5 kHz depending on the Band Class		Native bandwidth can fit deployment of 1.25 to 20 MHz (0.768 + N × 0.1536 MHz, N × 0, …, 123). Also, multi-carrier configurations can be used to aggregate two or more carriers of possibly different native bandwidths and operating in non-contiguous spectral allocation	

TABLE 3[(1)] (*continued*)

	IMT-2000 RADIO INTERFACE	IMT-2000 CDMA MC					
		cdma2000		HRPD		UMB	
No.	**Parameter**	**Base station**	**Mobile station**	**Base station**	**Mobile station**	**Base station**	**Mobile station**
6.	Effective transmitter/receiver bandwidth (MHz)	1.2288 per carrier. One or three carriers can be used together, with carriers separated by 1.23 MHz for Band Class 0 and 1.25 MHz in other cases	1.2288 (1x) and 3.6864 (3x)	1.2288 per carrier. One to fifteen carriers can be used together, with carriers separated by 1.23 MHz for Band Class 0 and 1.25 MHz in other cases	1.2288 per carrier. One to fifteen carriers can be used together, separated by 1.23 MHz for Band Class 0 and 1.25 MHz in other cases	0.768-19.6608 with step size of 0.1536	0.768-19.6608 with step size of 0.1536
7.	Transmitter characteristics						
7.1	Output power dynamic (Power control) (dB)	Open loop and Closed loop (800, 400, 200, 50, 25, 12.5 Hz update rate) with power control steps: 0.25 × N, N = 1, 2, 4 dB		Open loop and Closed loop (600 and 150 Hz update rate) with power control steps: 0.5 × N, N = 1, 2, 3, 4 dB		Open loop and Closed loop (Once every N data frames (0.911 ms), N = 4, 8, 16, 32) with power control steps: 0.25 × N, N = 1, 2, 3, ..., 8 dB	
7.2	Spectral emission mask or Operating band unwanted emissions	See Rec. ITU-R M.1580 for CDMA-MC Base Stations	See Rec. ITU-R M.1581 for CDMA-MC Mobile Stations	See Rec. ITU-R M.1580 for CDMA-MC Base Stations	See Rec. ITU-R M.1581 for CDMA-MC Mobile Stations	See Rec. ITU-R M.1580 for CDMA-MC Base Stations	See Rec. ITU-R M.1581 for CDMA-MC Mobile Stations
7.3	ACLR	[19]	[20]	[21]	[22]	[31]	[32]

TABLE 3[(1)] (*continued*)

	IMT-2000 RADIO INTERFACE	IMT-2000 CDMA MC					
		cdma2000		HRPD		UMB	
No.	**Parameter**	**Base station**	**Mobile station**	**Base station**	**Mobile station**	**Base station**	**Mobile station**
7.3a	ACLR1	See Rec. ITU-R M.1580 for CDMA-MC Base Stations	See Rec. ITU-R M.1581 for CDMA-MC Mobile Stations	See Rec. ITU-R M.1580 for CDMA-MC Base Stations	See Rec. ITU-R M.1581 for CDMA-MC Mobile Stations	See Rec. ITU-R M.1580 for CDMA-MC Base Stations	See Rec. ITU-R M.1581 for CDMA-MC Mobile Stations
7.3b	ACLR2	See Rec. ITU-R M.1580 for CDMA-MC Base Stations	See Rec. ITU-R M.1581 for CDMA-MC Mobile Stations	See Rec. ITU-R M.1580 for CDMA-MC Base Stations	See Rec. ITU-R M.1581 for CDMA-MC Mobile Stations	See Rec. ITU-R M.1580 for CDMA-MC Base Stations	See Rec. ITU-R M.1581 for CDMA-MC Mobile Stations
7.4	Transmitter power (dBm/antenna)	Macro: Nominal 43 dBm (vendor dependent subject to regulation) Pico: ≤ 24 dBm Femto: ≤ 20 dBm	23 dBm (single transmit antenna)	Macro: Nominal 43 dBm (vendor dependent subject to regulation) Pico: ≤ 24 dBm Femto: ≤ 20 dBm	23 dBm (single transmit antenna)	Macro: Nominal 43 dBm (vendor dependent subject to regulation) Pico: ≤ 24 dBm Femto: ≤ 20 dBm	23 dBm (single transmit antenna)
7.5	Transmitter Spurious emissions	[6]	[7]	[8]	[9]	[10]	[11]
8.	Receiver characteristics						
8.1	Receiver noise figure (NF) (dB)	5 dB nominal	10 dB nominal	5 dB nominal	10 dB nominal	5 dB nominal	10 dB nominal

TABLE 3[1] (*end*)

	IMT-2000 RADIO INTERFACE	IMT-2000 CDMA MC					
		cdma2000		HRPD		UMB	
No.	**Parameter**	**Base station**	**Mobile station**	**Base station**	**Mobile station**	**Base station**	**Mobile station**
8.2.	Receiver thermal noise level	RTN = 10 $\log_{10}$(kTB)+NF k: Boltzmann's constant = 1.38×10^{-23}, T: 290 K, B: effective rx bandwidth (Hz).					
8.3.	Receiver blocking (in-band, out-of-band, narrow-band)	[6]	[7]	[8]	[9]	[10]	[11]
8.4.	ACS (relative ACS)	[6]	[7]	[8]	[9]	[10]	[11]
9.	Interference criterion, *I*/*N* (dB)	*I*/*N* = −6 dB, −10 dB or −20 dB depending on scenario[3]					

Notes relative to Table 3:

[1] Note that some of the parameters in this table are typically not included in the cdma2000 specifications. These include: maximum spectral power density, transmitting antenna type, antenna gain, antenna height, antenna pattern, antenna downtilt, feeder loss, and polarization. Some information in these categories found in this Table is listed in 3GPP2 Report C.R1002 (cdma2000 Evaluation Methodology) and may be considered typical in some deployments.

[2] $BW_{Channel(1)}$ and $BW_{Channel(2)}$ are the channel bandwidths of the two respective UMB carriers. Supported channel bandwidths: 0.768 + N × 0.1536 MHz, N = 0, …, 123.

[3] Different protection criteria correspond to different interference situations: *I*/*N* = −6 dB (corresponding to 1 dB reduction of the receiver sensitivity) is applicable to cases where interference affects one or a few cells, or when the IMT-2000 system is interference limited. In other cases *I*/*N* = −10 dB (corresponding to 0.4 dB reduction of the receiver sensitivity) is applicable. In case of interference from systems which are allowed to be operated on lower priority basis, including in particular license exempt systems, a requirement of *I*/*N* = −20 dB applies. In case of multiple interfering services, the allowed interference should be partitioned among the interferers. These criteria may be modified in case of cross-border negotiations.

4.3 Non-deployment related parameters for IMT-2000 CDMA TDD (interface No. 3)

TABLE 4

Non-deployment related parameters for IMT-2000 CDMA TDD (interface No. 3)

	IMT-2000 RADIO INTERFACE	**IMT 2000 CDMA TDD (time-code) [2], [5], [12], [13]**			
		UTRA		**E-UTRA**	
No.	**Parameter**	**Base station**	**Mobile station**	**Base station**	**Mobile station**
1.	Access technique	TDMA/CDMA	TDMA/CDMA	OFDM in DL SC-FDMA in UL	OFDM in DL SC-FDMA in UL
2.	Modulation parameters	1.28 Mchip/s: QPSK/ 8-PSK/16-QAM 3.84 Mchip/s: QPSK/16-QAM 7.68 Mchip/s: QPSK/16-QAM		QPSK/ 16-QAM/64-QAM	
3.	Duplex mode	TDD		TDD	
4.	Carrier spacing	1.28 Mchip/s: 1.6 MHz 3.84 Mchip/s: 5 MHz 7.68 Mchip/s: 10 MHz		Nominal Channel spacing = $(BW_{Channel(1)} + BW_{Channel(2)})/2$[(1)]	
5.	Channel bandwidth (MHz)[(2)]	1.6, 5, 10	1.6, 5, 10	1.4, 3, 5, 10, 15, 20	1.4, 3, 5, 10, 15, 20
6.	Effective transmitter/receiver bandwidth (MHz)	1.28 Mchip/s: < 1.6 MHz [13] 3.84 Mchip/s: < 5 MHz [13] 7.68 Mchip/s: < 10 MHz [13]	1.28 Mchip/s: < 1.6 MHz [12] 3.84 Mchip/s: < 5 MHz [12] 7.68 Mchip/s: < 10 MHz [12]	1.08, 2.7, 4.5, 9, 13.5 and 18	1.08, 2.7, 4.5, 9, 13.5 and 18

TABLE 4 (*continued*)

	IMT-2000 RADIO INTERFACE	**IMT 2000 CDMA TDD (time-code) [2], [5], [12], [13]**			
		UTRA		**E-UTRA**	
No.	**Parameter**	**Base station**	**Mobile station**	**Base station**	**Mobile station**
7.	Transmitter characteristics				
7.1	Total power dynamic range (dB) for BS and minimum power (dBm) for MS (Power control)	Total power dynamic range ≥ 30 (3)	Minimum power < −49/44/41 dBm for 1.28/3.84/7.68 Mcps(4)	Total power dynamic range > 7.7/11.7/13.9/16.9/18.7 dB for 1.4/3/5/10/15/20 MHz Channel BW (5)	Minimum power ≤ −40 dBm (6)
7.2	Spectral emission mask or Operating band unwanted emissions	(7)	(8)	(9)	(10)
7.3	ACLR(11)				
7.3a.	ACLR1	1.28 Mchip/s: 40 dB at ±1.6 MHz 3.84 Mchip/s: 45 dB at ±5 MHz 7.68 Mchip/s: 45 dB at ±10 MHz (12)	33 dB (for 1.28, 3.84 and 7.68 Mchip/s) (13)	45 dB at ± BW MHz (14) (15)	30 dB at ± BW MHz (interference to E-UTRA) 33 dB (interference to UTRA) (16)

TABLE 4 (*continued*)

	IMT-2000 RADIO INTERFACE	**IMT 2000 CDMA TDD (time-code) [2], [5], [12], [13]**			
		UTRA		**E-UTRA**	
No.	**Parameter**	**Base station**	**Mobile station**	**Base station**	**Mobile station**
7.3b.	ACLR2	1.28 Mchip/s: 45 dB at ±3.2 MHz 3.84 Mchip/s: 55 dB at ±10 MHz 7.68 Mchip/s: 55 dB at ±20 MHz (12)	43 dB (for 1.28, 3.84 and 7.68 Mchip/s) (13)	45 dB at ± 2 × BW MHz (14) (15)	N/A for second adjacent E-UTRA channel 36 dB for second adjacent UTRA channel) (16)
7.4	Transmitter power(17)	(dBm/antenna) 25(18) for 1.28 Mchip/s, 43 for 3.84 Mchip/s (19) [13]	24 dBm for class 3 / 21 dBm for class 4 (20) [12]	(dBm/antenna) Macro: No limit Micro: 38 Pico: 24 Femto: 20 (1 transmit antenna)(21)	23 dBm (22)
7.5	Transmitter Spurious emissions(23) [1], [2], [3], [5]	−36 dBm/100 kHz for 30 MHz – 1 GHz −30 dBm/1 MHz for 1 GHz – 12.75 GHz −30 dBm/1 MHz for 12.75 GHz– 5th harmonic of the upper frequency edge of the UL operating band in GHz (applicable to 3GPP E-UTRA Band 42 and E-UTRA Band 43)			

TABLE 4 (*continued*)

	IMT-2000 RADIO INTERFACE	**IMT 2000 CDMA TDD (time-code) [2], [5], [12], [13]**			
		UTRA		**E-UTRA**	
No.	**Parameter**	**Base station**	**Mobile station**	**Base station**	**Mobile station**
8.	Receiver characteristics				
8.1	Receiver Noise Figure (NF) (dB)	1.28 Mchip/s: – Macro: 7 dB – Pico: 21 dB – Femto: 16 dB 3.84 Mchip/s: – Macro: 5 dB – Pico: 19 dB 7.68 Mchip/s: – Macro: 5 dB – Pico: 19 dB	9 dB	Macro: 5 dB Micro: 10 dB Pico: 13 dB Femto: 13 dB	9 dB
8.2	Receiver thermal noise level	RTN = (log(kTB)+N) k: Boltzmann's constant = 1.38×10^{-23}; T: 290 K; B: effective rx bandwidth (Hz)= 1.08, 2.7, 4.5, 9, 13.5 and 18			
8.3	Receiver blocking (in-band, out-of-band, narrow-band)	(24)	(25)	(26)	(27)

TABLE 4 (*end*)

	IMT-2000 RADIO INTERFACE	**IMT 2000 CDMA TDD (time-code) [2], [5], [12], [13]**			
		UTRA		**E-UTRA**	
No.	**Parameter**	**Base station**	**Mobile station**	**Base station**	**Mobile station**
8.4	ACS[28] (relative ACS)	Macro: 1.28 Mchip/s: −55 dBm (46 dB) 3.84 Mchip/s: −52 dBm (46 dB) 7.68 Mchip/s: −49 dBm (46 dB) [29]	33 dB [30]	[31]	[32] (33 dB) (up to 10 MHz channel bandwidth) (30 dB) (BW = 15 MHz) (27 dB) (BW = 20 MHz)
9.	Interference criterion, *I*/*N* (dB)	*I*/*N* = −6 dB, −10 dB or −20 dB depending on scenario[33]			

Notes relative to Table 4:

(1) $BW_{Channel(1)}$ and $BW_{Channel(2)}$ are the channel bandwidths of the two respective E-UTRA carriers. Supported channel bandwidths: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz and 20 MHz.

(2) This value refers to the transmission bandwidth.

(3) See 3GPP Documents: TS 25 105, § 6.4.

(4) See 3GPP Documents: TS 25 102, § 6.4.

(5) See 3GPP Document TS 36 104, § 6.3.

(6) See 3GPP Documents: TS 36 101, § 6.3.2.

(7) See 3GPP Documents: TS 25 105, §§ 6.6.2.1, 6.6.2.1A.

(8) See 3GPP Documents: TS 25 102, §§ 6.6.2.1, 6.6.2.1A.

(9) See 3GPP Documents: TS 36 104, § 6.6.3 or TS 37 104 § 6.6.2.

(10) See 3GPP Documents: TS 36 101, Table 6.6.2.

(11) These unwanted emission limits are the upper limits from SDO specifications for laboratory testing with maximum transmitting power. It is assumed that when the in-band transmitting power is reduced by x dB through power control, the unwanted emission levels would be reduced by x dB in consequence in the coexistence simulations.

(12) See 3GPP Documents: TS 25 105, § 6.6.2.2.

(13) See 3GPP Documents: TS 25 102, § 6.6.2.2.

(14) ACLR applies up to 10 MHz outside the operating band. Stricter limits may apply beyond 10 MHz outside the operating band, see 3GPP Documents TS 36 104 § 6.6.2 or TS 37 104 § 6.6.2.

(15) BW represents the channel bandwidth. Supported channel bandwidths: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz and 20 MHz.

(16) See 3GPP Documents: TS 36 101, § 6.6.2.3.

(17) Transmit power values refer to maximum values defined in the specifications. For actual powers used in sharing studies see the deployment specific parameters.

(18) 8-element smart antenna system is employed for UTRA TDD 1.28 Mchip/s.

(19) See 3GPP Documents: TS 25 105, § 6.2.

Notes relative to Table 4 (end):

(20) See 3GPP Document TS 25.102, § 6.2.

(21) See 3GPP Documents: TS 36 104, § 6.2 or TS 37 104, § 6.2.

(22) See 3GPP Document TS 36.101, § 6.2.

(23) 3GPP specifies additional spurious emissions for co-existence/co-location between 3GPP technologies.

(24) See 3GPP Documents: TS 25 105, § 7.6.

(25) See 3GPP Documents: TS 25 102, § 7.6.

(26) See 3GPP Documents: TS 36 104, § 7.6. or TS 37 104, §§ 7.4, 7.5.

(27) See 3GPP Documents: TS 36 101, § 7.6.

(28) The absolute ACS values are the test values as specified in 3GPP TS 25 105. The following conversion formula: ACS_relative = ACS_test – Noise_floor – 10 $\log_{10}$ ($10^{M/10}$ – 1) can be used to derive relative ACS values, where M is the margin (dB) used in the ACS test, which is the useful signal level above the reference sensitivity level. For both IMT-2000 CDMA direct spread and IMT-2000 CDMA TDD (time code), e.g. M = 6 dB for macro BS. ACS relative values are often used in sharing studies. For values of M see 3GPP Documents: TS 25.105 § 7.4, TS 36.104 § 7.5 or TS 37.104 § 7.4.

(29) See 3GPP Documents: TS 25 105, see § 7.4.

(30) See 3GPP Documents: TS 25 102, § 7.5.

(31) E-UTRA BS receiver ACS and blocking test conditions are specified in 3GPP 36.104 §§ 7.5 and 7.6, those test conditions should be used to derive EUTRA BS receiver mask with the conversion formula in note (28), special care is needed when deriving the E-UTRA BS receiver mask for channel bandwidth larger than 5 MHz since a 5 MHz interfering signal is specified in the ACS and Blocking test conditions.

(32) E-UTRA UE ACS values are to be used if the E-UTRA victim channel bandwidth is the same as interferer transmitting channel bandwidth. In case that the E-UTRA victim channel bandwidth is different from the interferer transmitting channel bandwidth, the E-UTRA receiver mask needs to be derived with the formula in Note (28) using the E-UTRA UE ACS and Blocking test conditions defined in 3GPP TS 36.101 §§ 7.5 and 7.6, special care is needed when deriving the E-UTRA UE receiver mask for UE channel bandwidth larger than 5 MHz since a 5 MHz interfering signal is specified in the ACS and Blocking test conditions.

(33) Different protection criteria correspond to different interference situations: $I/N = -6$ dB (corresponding to 1 dB reduction of the receiver sensitivity) is applicable to cases where interference affects one or a few cells, or when the IMT-2000 system is interference limited. In other cases $I/N = -10$ dB (corresponding to 0.4 dB reduction of the receiver sensitivity) is applicable. In case of interference from systems which are allowed to be operated on lower priority basis, including in particular license exempt systems, a requirement of $I/N = -20$ dB applies. In case of multiple interfering services, the allowed interference should be partitioned among the interferers. These criteria may be modified in case of cross-border negotiations.

4.4 Non-deployment related parameters for IMT-2000 TDMA SC (interface No. 4)

TABLE 5

Non-deployment related parameters for IMT-2000 TDMA SC (interface No. 4)

	IMT-2000 RADIO INTERFACE	**IMT 2000 TDMA Single-Carrier**			
No.	**Parameter**	**Base station**		**Mobile station**	
1.	Access Technique	TDMA	TDMA	TDMA [14]	TDMA(1)
2.	Modulation parameters	π/4-DQPSK 8-PSK	GMSK 8-PSK	π/4-DQPSK 8-PSK	GMSK 8-PSK
3.	Duplex mode	FDD	FDD	FDD	FDD
4.	Carrier spacing	30 kHz	200 kHz	30 kHz [15]	200 kHz [16]
5.	Channel bandwidth (MHz)	24.3 kHz at −3 dB points	130 kHz at −3 dB points	24.3 kHz at −3 dB point	130 kHz at −3 dB points
6.	Effective transmitter/receiver bandwidth (MHz)	N/A	N/A	[17], [18]	[19]
7.	Transmitter characteristics				
7.1	Output power dynamic (Power control) (dB)			Class IV MS is nominally 32 dB	50 dB
7.2	ACLR				
7.2a.	ACLR1	26 dB	30 dB	26 dB	30 dB
7.2b.	ACLR2	45 dB	60 dB 56 dB (8 PSK)	45 dB	60 dB 54 dB (8 PSK)

TABLE 5 (*end*)

	IMT-2000 RADIO INTERFACE	IMT 2000 TDMA Single-Carrier			
No.	**Parameter**	**Base station**		**Mobile station**	
7.3	Transmitter power (dBm/antenna) (maximum)	≥ 43	≥ 43	30 [14]	30 [20]
7.3a.	Transmitter power (dBm/antenna) (typical)(2)	Macro: 40	Macro: 40	20	20
7.4	Spurious emissions	−30 dBm (1 GHz – 2.1 GHz)	[10]	−30 dBm (1 GHz – 2.1 GHz)	[10]
8.	Receiver characteristics				
8.1	Receiver noise figure (NF)	5 dB	5 dB	9 dB	9 dB
8.2	Receiver thermal noise level	−125 dBm(3)	−117 dBm(4)	−119 dBm	−112 dBm
8.3	ACS (relative ACS)	N/A	N/A	N/A	N/A
9.	Interference criterion, *I*/*N* (dB)	*I*/*N* = −6 dB, −10 dB or −20 dB depending on scenario(5)			

Notes relative to Table 5:

(1) TDMA, comprising 8 timeslots (577 μs) per single TDMA frame (4.615 ms). For user packet data service, 1-4 timeslots per frame may be used by mobile stations having multi-slot classes that do not require simultaneous transmission and reception, i.e. classes for which a duplexer is not required.

(2) May not be appropriate for all scenarios, for example when calculating aggregate interference from all users in a cell.

(3) In bandwidth equal to data rate: for IMT-2000 CDMA multicarrier, values are given for 9 600 bit/s speech services and nominal supported rate for data services.

(4) In bandwidth equal to data rate: for IMT-2000 CDMA multicarrier, values are given for 9 600 bit/s speech services and nominal supported rate for data services.

(5) Different protection criteria correspond to different interference situations: $I/N = -6$ dB (corresponding to 1 dB reduction of the receiver sensitivity) is applicable to cases where interference affects one or a few cells, or when the IMT-2000 system is interference limited. In other cases $I/N = -10$ dB (corresponding to 0.4 dB reduction of the receiver sensitivity) is applicable. In case of interference from systems which are allowed to be operated on lower priority basis, including in particular license exempt systems, a requirement of $I/N = -20$ dB applies. In case of multiple interfering services, the allowed interference should be partitioned among the interferers. These criteria may be modified in case of cross-border negotiations.

4.5 Non-deployment related parameters for IMT-2000 FDMA/TDMA (interface No. 5)

TABLE 6

Non-deployment related parameters for IMT-2000 FDMA/TDMA (interface No. 5)

	IMT-2000 RADIO INTERFACE	IMT 2000 FDMA/TDMA (frequency-time) [21]	
No.	**Parameter**	**Base station**	**Mobile station**
1.	Access Technique	MC/ TDMA	MC/TDMA(1) [(1)]
2.	Modulation parameters	GMSK (BT = 0.5) (+ multi-level modulation options)	GMSK (BT = 0.5) (+ multi-level modulation options)
3.	Duplex mode	TDD	TDD
4.	Carrier spacing	1.728 MHz	1.728 MHz
5.	Effective transmitter/receiver bandwidth (MHz)	[21]	[21]
6.	ACLR		[21]
7.	Transmitter power (dBm/antenna) (maximum)		24
8.	Transmitter power (dBm/antenna) (typical)[(2)]	24	10
9.	Receiver noise figure (NF)	10 dB	10 dB
10.	Receiver thermal noise level	−103 dBm in 1.152 MHz	−102 dBm in 1.728 MHz
11.	Receiver blocking response/levels		[21]
12.	Interference criterion	−105 dBm typical (−97 dBm for speech specification)	

Notes relative to Table 6:

(1) Ten frequency channels with 24 time slots (32 kbit/s) per frame. The frame length is 10 ms.

(2) May not be appropriate for all scenarios, for example when calculating aggregate interference from all users in a cell.

4.6 Non-deployment related parameters for IMT-2000 OFDMA TDD WMAN (interface No. 6)

TABLE 7

Non-deployment related parameters for IMT-2000 OFDM TDD WMAN (interface No. 6)

	IMT-2000 RADIO INTERFACE	**IMT 2000 OFDMA TDD WMAN**					
		Mobile WiMAX (OFDMA)					
No.	**Parameter**	**Base station**			**Mobile station**		
1.	Access Technique	TDMA/ OFDMA	TDMA/ OFDMA	TDMA/ OFDMA	TDMA/ OFDMA	TDMA/ OFDMA	TDMA/ OFDMA
2.	Modulation parameters	QPSK 16-QAM 64-QAM, Repetition factor (R) 2, 4, 6	QPSK 16-QAM 64-QAM, Repetition factor (R) 2, 4, 6	QPSK 16-QAM 64-QAM, Repetition factor (R) 2, 4, 6	QPSK 16-QAM 64-QAM (64-QAM optional), Repetition factor (*R*) 2, 4, 6	QPSK 16-QAM 64-QAM (64-QAM optional), Repetition factor (*R*) 2, 4, 6	QPSK 16-QAM 64-QAM, (64-QAM optional), Repetition factor (*R*) 2, 4, 6
3.	Duplex mode	TDD	TDD	TDD	TDD	TDD	TDD
4.	Carrier spacing	5 MHz	8.75 MHz	10 MHz	5 MHz	8.75 MHz(1)	10 MHz
5.	Channel bandwidth (MHz)	4.60 MHz(2)	6.57 MHz(2)	9.20 MHz(2)	4.60 MHz(2)	6.57 MHz(2)	9.20 MHz(2)
6.	Effective transmitter/receiver bandwidth (MHz)	4.75 MHz as defined by –1 dB bandwidth (3), (4)	8.447 MHz as defined by –1 dB bandwidth	9.5 MHz as defined by –1 dB bandwidth (3), (5)	4.75 MHz as defined by –1 dB bandwidth(6)	8.447 MHz	9.5 MHz as defined by –1 dB bandwidth(6)
7.	Transmitter characteristics						
7.1	Spectral emission mask or Operating band unwanted emissions	An example of regulatory requirements for unwanted emission can be found in the FCC regulations(7) §§ 27.53 and 90.543 for the 700 MHz band (698-806 MHz). These are representative of the levels for mobile WiMAX emission masks.					

TABLE 7 (*continued*)

	IMT-2000 RADIO INTERFACE	**IMT 2000 OFDMA TDD WMAN**					
		Mobile WiMAX (OFDMA)					
No.	**Parameter**	**Base station**			**Mobile station**		
7.2	ACLR	(8)		(8)	(9)	(9)	(9)
7.2a	ACLR1	For Macro/Micro/ Pico BS: 45 53.5 dB (3.84 MHz Rx) at ±5 MHz inter-system case(10) 45 dB (4.75 MHz Rx) at ±5 MHz Intra-system case		For Macro/Micro/ Pico BS: 45 53.5 dB (7.68 MHz Rx) at ±10 MHz inter-system case(10) 45 dB (9.5 MHz Rx) at ±10 MHz Intra-system case	33 dB (3.84 MHz Rx) 30 dB (4.75 MHz Rx) at ±5 MHz	30 dB (8.447 MHz Rx) at ±8.75 MHz	33 dB (7.68 MHz Rx) 30 dB (9.5 MHz Rx) at ±10 MHz
7.2b	ACLR2	For Macro/Micro/ Pico BS: 50(11) 66 dB (3.84 MHz Rx) at ±10 MHz Inter-system case(10) 55 dB (4.75 MHz Rx) at ±10 MHz Intra-system case(10)		For Macro/Micro/ Pico BS: 50(11) 66 dB (7.68 MHz Rx) at ±20 MHz inter-system case(10) 55 dB (9.5 MHz Rx) at ±20 MHz Intra-system case(10)	43 dB (3.84 MHz Rx) 44 dB (4.75 MHz Rx) at ±10 MHz	44 dB (8.447 MHz Rx) at ±17.5 MHz	43 dB (7.68 MHz Rx) 44 dB (9.5 MHz Rx) at ±20 MHz

TABLE 7 (*continued*)

	IMT-2000 RADIO INTERFACE	**IMT 2000 OFDMA TDD WMAN**					
		Mobile WiMAX (OFDMA)					
No.	**Parameter**	**Base station**			**Mobile station**		
7.3	Transmitter power (dBm) (maximum)	55[12]	55[12]	55[12]	23[13]	23[13]	23[13]
7.3a	Transmitter power (dBm) (typical)[14]	36[15]	36[15]	36[15]	20[16]	20[16]	20[16]
8.	Receiver characteristics						
8.1	Receiver noise figure (NF)	3 dB with tower top LNA, 5 dB otherwise	3 dB with tower top LNA, 5 dB otherwise	3 dB with tower top LNA, 5 dB otherwise	5 dB for single band and 8 dB for multi-band designs	5 dBm	5 dB for single band and 8 dB for multi-band designs
8.2	Receiver thermal noise level[17]	−104 dBm for tower top LNA case and −102 dBm for other cases in 4.75 MHz	−101.51 dBm for tower top LNA case and −99.51 dBm for other cases in 8.447 MHz	−101 dBm for tower top LNA case and −99 dBm for other cases in 9.5 MHz	−102 dBm in 4.75 MHz for 5 dB NF and −99 for 8 dB NF	−99.51 dBm In 8.447 MHz	−99 dBm in 9.5 MHz for 5 dB NF and −96 for 8 dB NF
8.3	ACS (relative ACS)	46 dB[18]		46 dB[18]	33 dB[19]		33 dB
9.	Interference threshold[20]				−108 dBm or in 4.75 MHz for single band and −105 dBm for multi-band devices	−105.51 dBm in 8.447 MHz for single band and −102.51 dBm for multi-band devices	−105 dBm in 9.5 MHz for single band and −102 dBm for multi-band devices

Notes relative to Table 7:

(1) Only applicable to the band 2 300-2 400 MHz band.

(2) These values are corresponding to the utilized spectrum within 5, 7 and 10 MHz channel bandwidths in Up Link when PUSC is used.

(3) Receiver thermal noise level as defined by thermal noise in specified bandwidth + receiver NF.

(4) Please refer to Recommendation ITU-R M.1580, Annex 6 for more information.

(5) For a 10^{-3} raw bit error rate, theoretical E_b/N_0.

(6) Please refer to Recommendation ITU-R M.1581, Annex 6 for more information.

(7) US Code of Federal Regulations, Title 47, FCC Rules Parts 27 and 90.

(8) ACLR values are specified in Recommendation ITU-R M.1580, Annex 6.

(9) ACLR values are specified in Recommendation ITU-R M.1581, Annex 6.

(10) For the 2.5 GHz band only.

(11) Applicable to the 1 800 MHz and 2.3 GHz bands.

(12) This value does not take account of the effect of multiple transmit antennas.

(13) WiMAX numbers for MS related to Item 7 are preliminary numbers. WiMAX Forum profiles 7.A and 7.E of Table 15, in general, cover a range of power classes.

(14) May not be appropriate for all scenarios, for example when calculating aggregate interference from all users in a cell.

(15) TX power reported is typical and higher values may be available based on region. TX power is the RF power averaged during the transmit burst, without considering traffic statistics or lowered-power operation or UL/DL ratio.

(16) TX power reported is typical and higher values may be available based on region. TX power is the RF power averaged during the transmit burst, without considering traffic statistics or lowered-power operation or UL/DL ratio.

(17) Receiver thermal noise level as defined by thermal noise in specified bandwidth + receiver NF.

(18) ACS = SNR_{min} + implementation loss + M –10 $\log_{10}$ ($10^{M/10}$ – 1) + ACR, where the test margin, M, and the ACR are contained in the global core specification (WiMAX Forum Mobile Radio Specification version 0.3.1).

(19) ACS = SNR_{min} + implementation loss + pilot boosting offset + M –10 $\log_{10}$($10^{M/10}$ – 1) + ACR, where the test margin, M , is given in IEEE802.16 as 3 dB, and the ACR values are contained in the global core specification (WiMAX Forum Mobile Radio Specification version 0.3.1).

(20) Different protection criteria correspond to different interference situations: $I/N = -6$ dB (corresponding to 1 dB reduction of the receiver sensitivity) is applicable to cases where interference affects one or a few cells, or when the IMT-2000 system is interference limited. In other cases $I/N = -10$ dB (corresponding to 0.4 dB reduction of the receiver sensitivity) is applicable. In case of interference from systems which are allowed to be operated on lower priority basis, including in particular license exempt systems, a requirement of $I/N = -20$ dB applies. In case of multiple interfering services, the allowed interference should be partitioned among the interferers. These criteria may be modified in case of cross-border negotiations.

5 Deployment-related parameters in the bands below 1 GHz

5.1 Deployment-related parameters for IMT-2000 CDMA DS (interface No. 1)

TABLE 8

Deployment-related parameters for IMT-2000 CDMA DS (interface No. 1) below 1 GHz

	IMT-2000 RADIO INTERFACES	**IMT-2000 CDMA Direct Spread**	
No.	**Parameter**	**UTRA**	**E-UTRA**
	Base station parameters		
1.	Coverage radius	> 5 km (typical 8 km) for macro rural scenario 0.5-5 km (typical 2 km) for macro urban/suburban scenario	> 5 km (typical 8 km) for macro rural scenario 0.5-5 km (typical 2 km) for macro urban/suburban scenario
2.	Typical height of the transmitting BS antenna (m)	30	30
3.	Antenna type (sectorized/omnidirectional)	3 sectors	3 sectors
4.	Antenna downtilt for macro base stations (degree)	3	3
5.	Frequency reuse factor	1	1

TABLE 8 (*continued*)

	IMT-2000 RADIO INTERFACES	IMT-2000 CDMA Direct Spread	
No.	**Parameter**	**UTRA**	**E-UTRA**
	Base station parameters		
6.	Antenna pattern	Sector Antenna: Rec. ITU-R F.1336 (*recommends* 3.1) • ka = 0.7 • kp = 0.7 • kh = 0.7 • kv = 0.3 Horizontal 3 dB beamwidth: 65 degrees Vertical 3 dB beamwidth: determined from the horizontal beamwidth by equations in Rec. ITU-R F.1336 (*recommends* 3.3). Vertical beamwidths of actual antennas may also be used when available.	Sector Antenna: Rec. ITU-R F.1336 (*recommends* 3.1) • ka = 0.7 • kp = 0.7 • kh = 0.7 • kv = 0.3 Horizontal 3 dB beamwidth: 65 degrees Vertical 3 dB beamwidth: determined from the horizontal beamwidth by equations in Rec. ITU-R F.1336 (*recommends* 3.3). Vertical beamwidths of actual antennas may also be used when available.
7.	Polarization	linear / ±45 degrees	linear / ±45 degrees
8.	Feeder loss (dB)	3	3
9.	Maximum BS transmitter power per sector (dBm)	43	43 for BW ≤ 5 MHz 46 for BW ≥ 10 MHz
10.	Maximum BS transmitter e.i.r.p. per sector (dBm/channel bandwidth)	55	55 for BW ≤ 5 MHz 58 for BW ≥ 10 MHz
11.	Transmitting BS antenna gain (dBi)	15	15
12.	Average base station activity factor (%)	50	50
13.	Average base station e.i.r.p. per sector taking into account the base station activity factor (dBm/channel bandwidth)	52	52 for BW ≤ 5 MHz 55 for BW ≥ 10 MHz
	TDD activity factor (%)	N/A	

TABLE 8 (*end*)

	IMT-2000 RADIO INTERFACES	IMT-2000 CDMA Direct Spread	
No.	**Parameter**	**UTRA**	**E-UTRA**
14.	**User terminal parameters**		
15.	Indoor usage	50% for macro rural scenario 70% for macro urban/suburban scenario	50% for macro rural scenario 70% for macro urban/suburban scenario
16.	Average indoor user terminal penetration loss	15 dB for macro rural scenario 20 dB for macro urban/suburban scenario	15 dB for macro rural scenario 20 dB for macro urban/suburban scenario
17.	Density of the user equipment in active mode(1) (number/km^2)	0.17 / 5 MHz/km^2 for macro rural scenario 2.16 / 5 MHz/km^2 for urban/suburban scenario	0.17 / 5 MHz/km^2 for macro rural scenario 2.16 / 5 MHz/km^2 for urban/suburban scenario
17.1	User terminal transmitter output power (dBm)		
17.2	Maximum user terminal transmitter output power (dBm/5 MHz)	24	23
18.	Average user terminal transmitter output power in active mode(1) (dBm/5 MHz)	2 dBm for macro rural scenario −9 dBm for macro urban/suburban scenario	2 dBm for macro rural scenario −9 dBm for macro urban/suburban scenario
19.	Transmitting user terminal antenna gain (dBi)	−3	−3
20.	Body loss (dB)	4	4

Note relative to Table 8:

(1) By “active mode” it should be understood that these are terminals with an active communication session but which are not necessarily transmitting. If only transmitting terminals are used in a study, the average power levels for user equipment in active mode cannot be used. In that case power levels need to be computed differently, e.g. by simulations (including power control).

5.2 Deployment-related parameters for IMT-2000 CDMA MC (CDMA 2000, HRPD and UMB) (interface No. 2)

TABLE 9[(1)]

Deployment-related parameters for IMT-2000 CDMA MC (CDMA 2000, HRPD and UMB) (interface No. 2) below 1 GHz

	IMT-2000 RADIO INTERFACES	**IMT-2000 CDMA MC**		
No.	**Parameter**	**cdma2000**	**HRPD**	**UMB**
	Base station parameters			
1.	Coverage radius	> 5 km (typical 8 km) for macro rural scenario 0.5-5 km (typical 2 km) for macro urban/suburban scenario	> 5 km (typical 8 km) for macro rural scenario 0.5-5 km (typical 2 km) for macro urban/suburban scenario	> 5 km (typical 8 km) for macro rural scenario 0.5-5 km (typical 2 km) for macro urban/suburban scenario
2.	Typical height of the transmitting BS antenna (m)	30	30	30
3.	Antenna type (sectorized/omnidirectional)	3 sectors	3 sectors	3 sectors
4.	Antenna downtilt for macro base stations (degree)	3	3	3
5.	Frequency reuse factor	1	1	1

TABLE 9[1] (*continued*)

	IMT-2000 RADIO INTERFACES	**IMT-2000 CDMA MC**		
No.	**Parameter**	**cdma2000**	**HRPD**	**UMB**
	Base station parameters			
6.	Antenna pattern	Sector Antenna: Rec. ITU-R F.1336 (*recommends* 3.1) • ka = 0.7 • kp = 0.7 • kh = 0.7 • kv = 0.3 Horizontal 3 dB beamwidth: 65 degrees Vertical 3 dB beamwidth: determined from the horizontal beamwidth by equations in Rec. ITU-R F.1336 (*recommends* 3.3). Vertical beamwidths of actual antennas may also be used when available.	Sector Antenna: Rec. ITU-R F.1336 (*recommends* 3.1) • ka = 0.7 • kp = 0.7 • kh = 0.7 • kv = 0.3 Horizontal 3 dB beamwidth: 65 degrees Vertical 3 dB beamwidth: determined from the horizontal beamwidth by equations in Rec. ITU-R F.1336 (*recommends* 3.3). Vertical beamwidths of actual antennas may also be used when available.	Sector Antenna: Rec. ITU-R F.1336 (*recommends* 3.1) • ka = 0.7 • kp = 0.7 • kh = 0.7 • kv = 0.3 Horizontal 3 dB beamwidth: 65 degrees Vertical 3 dB beamwidth: determined from the horizontal beamwidth by equations in Rec. ITU-R F.1336 (*recommends* 3.3). Vertical beamwidths of actual antennas may also be used when available.
7.	Polarization	linear / ± 45 degrees	linear / ± 45 degrees	linear / ± 45 degrees
8.	Feeder loss (dB)	2	2	2
9.	Maximum BS transmitter e.i.r.p. (dBm/5 MHz) per sector	61[4]	61[4]	N/A
10.	Transmitting BS antenna gain (dBi)	15	15	15
11.	Average base station activity factor	0.58[5]	1[7]	N/A
12.	Average base station e.i.r.p. per sector taking into account the base station activity factor (dBm)	58.6[6]	61	N/A
13.	TDD activity factor (dB)	N/A	N/A	N/A

TABLE 9[(1)] (*end*)

	IMT-2000 RADIO INTERFACES	IMT-2000 CDMA MC		
No.	**Parameter**	**cdma2000**	**HRPD**	**UMB**
	User terminal parameters			
14.	Average indoor user terminal penetration loss	15 dB for macro rural scenario 20 dB for macro urban/suburban scenario	15 dB for macro rural scenario 20 dB for macro urban/suburban scenario	15 dB for macro rural scenario 20 dB for macro urban/suburban scenario
15.	Density of the user equipment in active mode[(2)] (number/km^2)	[(3)]	[(3)]	[(3)]
16.	User terminal transmitter output power (dBm)	23 dBm is the minimum when commanded to transmit as maximum power. Typical maximum transmit power is no more than a few dB higher	23 dBm is the minimum when commanded to transmit as maximum power. Typical maximum transmit power is no more than a few dB higher	22.5 ± 2 dBm
16.1	Maximum user terminal transmitter output power (dBm/5 MHz)	23 dBm is the minimum when commanded to transmit as maximum power. Typical maximum transmit power is no more than a few dB higher	23 dBm is the minimum when commanded to transmit as maximum power. Typical maximum transmit power is no more than a few dB higher	N/A
17.	Transmitting user terminal antenna gain (dBi)	0 (omnidirectional)	0 (omnidirectional)	0 (omnidirectional)
18.	Body loss (dB)	4	4	4

Notes relative to Table 9:

(1) Note that some of the parameters in this table are typically not included in the cdma2000 specifications. These include: maximum spectral power density, transmitting antenna type, antenna gain, antenna height, antenna pattern, antenna downtilt, feeder loss, and polarization. Some information in these categories found in this table is listed in 3GPP2 Report C.R1002 (cdma2000 Evaluation Methodology) and may be considered typical in some deployments.

(2) By "active mode" it should be understood that these are terminals with an active communication session but are not necessarily transmitting. If only transmitting terminals are used in a study, the average power levels for user equipment in active mode cannot be used. In that case power levels need to be computed differently, e.g. by simulations (including power control).

(3) This is a function of frequency, coverage desired, propagation, data rates desired, etc.

(4) Assuming 43 dBm per carrier transmit power, 15 dBi antenna gain, 2 dB feeder loss, and 3 carriers within 5 MHz.

(5) Assuming 30% overhead power, fully loaded sector, and 40% voice activity factor.

(6) Time averaged e.i.r.p.

(7) Assuming the base station is fully loaded.

TABLE 10

Maximum power for IMT-2000 CDMA MC mobile stations and HRPD access terminals for band classes in the 698-862 MHz range

Band class	Mobile station class/access terminal class	Radiating measurement	Lower limit	Upper limit
0 and 3	Class I	e.r.p.	1 dBW (1.25 W)	8 dBW (6.3 W)
	Class II	e.r.p.	−3 dBW (0.5 W)	4 dBW (2.5 W)
	Class III	e.r.p.	−7 dBW (0.2 W)	0 dBW (1.0 W)
7 and 10	Class I	e.r.p.	−3 dBW (0.5 W)	4 dBW (2.5 W)
	Class II	e.r.p.	−7 dBW (0.2 W)	0 dBW (1.0 W)

Table 11 maps the band classes defined in Table 10 to the actual frequencies.

TABLE 11

Band class designations in the 698-862 MHz range

Band class	Transmit frequency band (MHz)	
	Mobile station	Base station
0	815-849	860-894
3	887-889 893-901 915-925	832-834 838-846 860-870
7	776-788	746-758
10	806-824 896-901	851-869 935-940
18	787-799	757-769
19	698-716	728-746

With regard to the band class 5 (450-470 MHz band), the following parameters have to be adjusted:

– BS antenna gain, which would be 14 dBi.

– The MS power levels are given in Table 12. A typical MS uses class III.

TABLE 12

Maximum power for IMT-2000 CDMA MC terminals for band classes in the 450-470 MHz range

Band class	Mobile station class/ access terminal class	Radiating measurement	Lower limit	Upper limit
5	Class I	e.r.p.	3 dBW (2 W)	10 dBW (10 W)
	Class II	e.r.p.	−2 dBW (0.63 W)	5 dBW (3.2 W)
	Class III	e.r.p.	−7 dBW (0.2 W)	0 dBW (1.0 W)
	Class IV	e.r.p.	−12 dBW (0.063 W)	−5 dBW (0.32 W)

5.3 Deployment-related parameters for IMT-2000 CDMA TDD (interface No. 3)

TABLE 13

Deployment-related parameters for IMT-2000 CDMA TDD (interface No. 3) below 1 GHz

	IMT-2000 RADIO INTERFACES	IMT-2000 CDMA TDD
No.	**Parameter**	**E-UTRA**
	Base station parameters	
1.	Coverage radius	> 5 km (typical 8 km) for macro rural scenario 0.5-5 km (typical 2 km) for macro urban/suburban scenario
2.	Typical height of the transmitting BS antenna (m)	30
3.	Antenna type (sectorized/omnidirectional)	3 sectors
4.	Antenna downtilt for macro base stations	3°
5.	Frequency reuse factor	1
6.	Antenna pattern	Sector Antenna: Rec. ITU-R F.1336 (*recommends* 3.1) • ka = 0.7 • kp = 0.7 • kh = 0.7 • kv = 0.3 Horizontal 3 dB beamwidth: 65 degrees Vertical 3 dB beamwidth: determined from the horizontal beamwidth by equations in Rec. ITU-R F.1336 (*recommends* 3.3). Vertical beamwidths of actual antennas may also be used when available.
7.	Polarization	linear / ± 45 degrees
8.	Feeder loss (dB)	3
9.	Maxim BS transmitter power per sector (dBm)	43 for BW ≤ 5 MHz 46 for BW ≥ 10 MHz

TABLE 13 (*end*)

	IMT-2000 RADIO INTERFACES	IMT-2000 CDMA TDD
No.	**Parameter**	**E-UTRA**
	Base station parameters	
10.	Maximum BS transmitter e.i.r.p. per sector (dBm/channel bandwidth)	55 for BW ≤ 5 MHz 58 for BW ≥ 10 MHz
11.	Transmitting BS antenna gain (dBi)	15
12.	Average base station activity factor (%)	50
13.	Average base station e.i.r.p. per sector taking into account the base station activity factor (dBm/channel bandwidth)	52 for BW ≤ 5 MHz 55 for BW ≥ 10 MHz
14.	TDD activity factor (%)(1)	subject to specific DL/UL ratio
	User terminal parameters	
15.	Indoor usage	50% for macro rural scenario 70% for macro urban/suburban scenario
16.	Average indoor user terminal penetration loss	15 dB for macro rural scenario 20 dB for macro urban/suburban scenario
17.	Density of the user equipment in active mode(2) (number/km^2)	0.17 / 5 MHz/km^2 for macro rural scenario 2.16 / 5 MHz/km^2 for urban/suburban scenario
18.	User terminal transmitter output power (dBm)	
18.1	Maximum user terminal transmitter output power (dBm/5 MHz)	23
18.2	Average user terminal transmitter output power in active mode(2)(dBm/5 MHz)	2 dBm for macro rural scenario –9 dBm for macro urban/suburban scenario
19.	Transmitting user terminal antenna gain (dBi)	–3 (omnidirectional)
20.	Body loss (dB)	4

Notes relative to Table 13:

(1) In case TDD is used, base station downlink transmission occurs only part of the time, which will further reduce average base station power.

(2) By “active mode” it should be understood that these are terminals with an active communication session but which are not necessarily transmitting. If only transmitting terminals are used in a study, the average power levels for user equipment in active mode cannot be used. In that case power levels need to be computed differently, e.g. by simulations (including power control).

5.4 Deployment-related parameters for IMT-2000 OFDMA TDD WMAN (interface No. 6)

TABLE 14

Deployment-related parameters for IMT-2000 OFDMA TDD WMAN (interface No. 6) below 1 GHz

	IMT-2000 RADIO INTERFACES	IMT 2000 OFDMA TDD WMAN
No.	**Parameter**	
	Base station parameters	
1.	Coverage radius	Rural: 3.46 km Urban: 2.698 km
2.	Typical height of the transmitting BS antenna (m)	25 (Urban macro) 35 (Suburban/Rural Macro) Per ITU-R M.2135-1
3.	Antenna type (sectorized/omnidirectional)	3 sectors
4.	Antenna downtilt for macro base stations (degree)	3
5.	Frequency reuse factor	1
6.	Antenna pattern	Sector Antenna: Rec. ITU-R F.1336 (*recommends* 3.1) • ka = 0.7 • kp = 0.7 • kh = 0.7 • kv = 0.3 Horizontal 3 dB beamwidth: 65 degrees Vertical 3 dB beamwidth: determined from the horizontal beamwidth by equations in Rec. ITU-R F.1336 (*recommends* 3.3). Vertical beamwidths of actual antennas may also be used when available.
7.	Feeder loss (dB)	3
8.	Maximum BS transmitter e.i.r.p. (dBm/5 MHz) per sector	55(1)
9.	Transmitting BS antenna gain (dBi)	15
	User terminal parameters	
10.	Density of the user equipment in active mode(2) (number/km^2)	Deployment dependent
11.	Maximum user terminal transmitter e.i.r.p. (dBm/5 MHz)	23(3)
12.	Average user terminal transmitter e.i.r.p. in active mode(2) (dBm/5 MHz)	3 (rural) −8 (urban)

Notes relative to Table 14:

(1) This value does not take account of the effect of multiple transmit antennas.

(2) By “active mode” it should be understood that these are terminals with an active communication session but are not necessarily transmitting. If only transmitting terminals are used in a study, the average power levels for user equipment in active mode cannot be used. In that case power levels need to be computed differently, e.g. by simulations (including power control).

(3) WiMAX numbers for MS related to Item 4 are preliminary numbers. WiMAX Forum profiles 7.A and 7.E of Table 15, in general, cover a range of power classes.

TABLE 15

Complementary information about IMT-2000 OFDMA TDD WMAN (Mobile WiMAX)

Band Class Group (BCG)	Frequency range UL (MHz)	Frequency range DL (MHz)	Channel bandwidth (MHz)	Duplex mode	Comments
7.A	698-862	698-862	5, 7 and 10	TDD	The bandwidths are applicable to both the MS and BS
7.B	776-787	746-757	2 × 5 and 2 × 10	FDD	
7.C	788-793, 793-798	758-763, 763-768	2 × 5	FDD	
7.D	788-798	758-768	2 × 10	FDD	
7.E	698-862	698-862	5, 7 and 10 (TDD) 2 × 5, 2 × 7 and 2 × 10 (FDD)	TDD/FDD	
7.G	880-915	925-960	2 × 5 and 2 × 10	FDD	

6 Deployment-related parameters in the 1-3 GHz range

6.1 Deployment-related parameters for IMT-2000 CDMA DS (interface No. 1)

TABLE 16

Deployment-related parameters for IMT-2000 CDMA DS (interface No. 1) between 1 and 3 GHz

	IMT-2000 RADIO INTERFACES	IMT-2000 CDMA Direct Spread	
No.	**Parameter**	**UTRA**	**E-UTRA**
	Base station parameters		
1.	Coverage radius / Deployment density (for bands between 1 and 2 GHz)	Macro rural: > 3 km (typical figure to be used in sharing studies 5 km) Macro suburban: 0.5-3 km (typical figure to be used in sharing studies 1 km) Macro urban: 0.25-1 km (typical figure to be used in sharing studies 0.5 km) Small cell outdoor / Micro urban: 1-3 per urban macro cell(1) < per suburban macro site Small cell indoor / Indoor urban: depending on indoor coverage/ capacity demand	

TABLE 16 (*continued*)

	IMT-2000 RADIO INTERFACES	**IMT-2000 CDMA Direct Spread**	
No.	**Parameter**	**UTRA**	**E-UTRA**
1a.	Coverage radius / Deployment density (for bands between 2 and 3 GHz)	Macro rural: > 2 km (typical figure to be used in sharing studies 4 km) Macro suburban: 0.4-2.5 km (typical figure to be used in sharing studies 0.8 km) Macro urban: 0.2-0.8 km (typical figure to be used in sharing studies 0.4 km) Small cell outdoor / Micro urban: 1-3 per urban macro cell(1) < 1 per suburban macro site Small cell indoor / Indoor urban: depending on indoor coverage/ capacity demand	
2.	Typical height of the transmitting BS antenna (m)	Macro rural: 30 Macro suburban: 30 (1-2 GHz), 25 (2-3 GHz) Macro urban: 25 (1-2 GHz), 20 (2-3 GHz) Micro: 6 Pico: 3 Femto: 2	Macro rural: 30 Macro suburban: 30 (1-2 GHz), 25 (2-3 GHz) Macro urban: 25 (1-2 GHz), 20 (2-3 GHz) Micro: 6 Pico: 3 Femto: 2
3.	Antenna type (sectorized/omnidirectional)	3 sectors for Macro 1 sector for Micro, Pico, Femto	3 sectors for Macro 1 sector for Micro, Pico, Femto
4.	Antenna downtilt for macro base stations	Rural: 3° Suburban: 6° Urban: 10°	Rural: 3° Suburban: 6° Urban: 10°
5.	Frequency reuse factor	1	1
6.	Antenna pattern	Sector Antenna: Rec. ITU-R F.1336 (*recommends* 3.1) • ka = 0.7 • kp = 0.7 • kh = 0.7 • kv = 0.3 Horizontal 3 dB beamwidth: 65 degrees Vertical 3 dB beamwidth: determined from the horizontal beamwidth by equations in Rec. ITU-R F.1336 (*recommends* 3.3). Vertical beamwidths of actual antennas may also be used when available. Omni antenna: F.1336 (*recommends* 2)	Sector Antenna: Rec. ITU-R F.1336 (*recommends* 3.1) • ka = 0.7 • kp = 0.7 • kh = 0.7 • kv = 0.3 Horizontal 3 dB beamwidth: 65 degrees Vertical 3 dB beamwidth: determined from the horizontal beamwidth by equations in Rec. ITU-R F.1336 (*recommends* 3.3). Vertical beamwidths of actual antennas may also be used when available. Omni antenna: F.1336 (*recommends* 2)

TABLE 16 (*continued*)

	IMT-2000 RADIO INTERFACES	IMT-2000 CDMA Direct Spread	
No.	**Parameter**	**UTRA**	**E-UTRA**
7.	Polarization	linear / ± 45 degrees	linear / ± 45 degrees
8.	Feeder loss (dB)	Macro 3 Micro, Pico, Femto: 0	Macro: 3 Micro, Pico, Femto: 0
9.	Maximum BS transmitter power per sector (dBm)	Macro Rural: 43 Macro Suburban: 43 Macro Urban: 43 Micro: 35 Pico: 24 Femto: 17	BW ≤ 5 MHz / BW ≥ 10 MHz Macro Rural: 43/46 Macro Suburban: 43/46 Macro Urban: 43/46 Micro: 35/35 Pico: 24/24 Femto: 17/17
10.	Maximum BS transmitter e.i.r.p. per sector (dBm/channel bandwidth)	Macro Rural: 58 Macro Suburban: 56 Macro Urban: 56 Micro: 40 Pico: 24 Femto: 17	BW ≤ 5 MHz / BW ≥ 10 MHz Macro Rural: 58/61 Macro Suburban: 56/59 Macro Urban: 56/59 Micro: 40/40 Pico: 24/24 Femto: 17/17
11.	Transmitting BS antenna gain (dBi)	Macro Rural: 18 Macro Suburban: 16 Macro Urban: 16 Micro: 5 Pico: 0 Femto: 0	Macro Rural: 18 Macro Suburban: 16 Macro Urban: 16 Micro: 5 Pico: 0 Femto: 0
12.	Average base station activity factor (%)	50	50
13.	Average base station e.i.r.p. per sector taking into account the base station activity factor (dBm/channel bandwidth)	Macro Rural: 55 Macro Suburban: 53 Macro Urban: 53 Micro: 37 Pico: 21 Femto: 14	BW ≤ 5 MHZ / BW ≥ 10 MHz Macro Rural: 55/58 Macro Suburban: 53/56 Macro Urban: 53/56 Micro: 37/37 Pico: 21/21 Femto: 14/14
14.	TDD activity factor (dB)	N/A	
	User terminal parameters		
15.	Indoor usage (%)	Macro Rural: 50 Macro Suburban: 70 Macro Urban: 70 Micro: 70 Pico: 100 Femto: 100	Macro Rural: 50 Macro Suburban: 70 Macro Urban: 70 Micro: 70 Pico: 100 Femto: 100

TABLE 16 (*end*)

	IMT-2000 RADIO INTERFACES	**IMT-2000 CDMA Direct Spread**	
No.	**Parameter**	**UTRA**	**E-UTRA**
16.	Average indoor user terminal penetration loss (dB)	Macro Rural: 15 Macro Suburban: 20 Macro Urban: 20 Micro: 20 Pico: 20 Femto: 20	Macro Rural: 15 Macro Suburban: 20 Macro Urban: 20 Micro: 20 Pico: 20 Femto: 20
17.	Density of the user equipment in active mode(2) (number/km^2)	Macro rural: 0.17 / 5 MHz/km^2 Macro suburban: 2.16 / 5 MHz/km^2 Macro urban: 3 / 5 MHz/km^2 Small cell outdoor / Micro urban: 3 / 5 MHz/km^2 Small cell indoor / Indoor urban: depending on indoor coverage/ capacity demand	
18.	User terminal transmitter output power (dBm)		
18.1	Maximum user terminal transmitter output power (dBm/5 MHz)	24	23
18.2	Average user terminal transmitter output power in active mode(2) (dBm/5 MHz)	Macro Rural: 2 dBm Macro Suburban: –9 dBm Macro Urban: –9 dBm Micro: –9 dBm Pico: –9 dBm Femto: –9 dBm	Macro Rural: 2 dBm Macro Suburban: –9 dBm Macro Urban: –9 dBm Micro: –9 dBm Pico: –9 dBm Femto: –9 dBm
19.	Transmitting user terminal antenna gain (dBi)	–3	–3
20.	Body loss (dB)	4	4

Notes relative to Table 16:

(1) Outdoor small cells would typically be deployed in very limited areas in order to provide local capacity enhancement. Within these areas, the outdoor small cells would not need to provide contiguous coverage since there would typically be an overlaying macro network present.

(2) By “active mode” it should be understood that these are terminals with an active communication session, but which are not necessarily transmitting. If only transmitting terminals are used in a study, the average power levels for user equipment in active mode cannot be used. In that case power levels need to be computed differently, e.g. by simulations (including power control).

6.2 Deployment-related parameters for IMT-2000 CDMA MC (CDMA 2000, HRPD and UMB) (interface No. 2)

TABLE 17

Deployment-related parameters for IMT-2000 CDMA MC (CDMA 2000, HRPD and UMB) (interface No. 2) between 1 and 3 GHz

	IMT-2000 RADIO INTERFACES	IMT-2000 CDMA MC
No.	**Parameter**	
	Base station parameters	
1.	Typical height of the transmitting BS antenna (m)	30 for Macro, 5 for Micro, 1.5 for Pico
2.	Transmitting BS antenna gain (dBi)	17 (1)
3.	TDD activity factor (dB)(2)	subject to specific DL/UL ratio

Notes relative to Table 17:

(1) Antenna gain is for 2 GHz.

(2) In case TDD is used, base station downlink transmission occurs only part of the time, which will further reduce average base station power.

6.3 Deployment-related parameters for IMT-2000 CDMA TDD (interface No. 3)

TABLE 18

Deployment-related parameters for IMT-2000 CDMA TDD (interface No. 3) between 1 and 3 GHz

	IMT-2000 RADIO INTERFACES	IMT 2000 CDMA TDD	
No.	**Parameter**	**UTRA**	**E-UTRA**
	Base station parameters		
1.	Coverage radius / Deployment density (for bands between 1 and 2 GHz)	Macro rural: > 3 km (typical figure to be used in sharing studies 5 km) Macro suburban: 0.5-3 km (typical figure to be used in sharing studies 1 km) Macro urban: 0.25-1 km (typical figure to be used in sharing studies 0.5 km) Small cell outdoor / Micro urban: 1-3 per urban macro cell(1) < 1 per suburban macro site Small cell indoor / Indoor urban: depending on indoor coverage/ capacity demand	

TABLE 18 (*continued*)

	IMT-2000 RADIO INTERFACES	**IMT 2000 CDMA TDD**	
No.	**Parameter**	**UTRA**	**E-UTRA**
	Base station parameters		
1a.	Coverage radius / Deployment density (for bands between 2 and 3 GHz)	Macro rural: > 2 km (typical figure to be used in sharing studies 4 km) Macro suburban: 0.4-2.5 km (typical figure to be used in sharing studies 0.8 km) Macro urban: 0.2-0.8 km (typical figure to be used in sharing studies 0.4 km) Small cell outdoor / Micro urban: 1-3 per urban macro cell(1) < 1 per suburban macro site Small cell indoor / Indoor urban: depending on indoor coverage/ capacity demand	
2.	Typical height of the transmitting BS antenna (m)	Macro rural: 30 Macro suburban: 30 (1-2 GHz), 25 (2-3 GHz) Macro urban: 25 (1-2 GHz), 20 (2-3 GHz) Micro: 6 Pico: 3 Femto: 2	Macro rural: 30 Macro suburban: 30 (1-2 GHz), 25 (2-3 GHz) Macro urban: 25 (1-2 GHz), 20 (2-3 GHz) Micro: 6 Pico: 3 Femto: 2
3.	Antenna type (sectorized/omnidirectional)	3 sectors for Macro, 1 sector for Micro, Pico and Femto.	3 sectors for Macro, 1 sector for Micro, Pico and Femto.
4.	Antenna downtilt for macro base stations	Rural: 3° Suburban: 6° Urban: 10°	Rural: 3° Suburban: 6° Urban: 10°
5.	Frequency reuse factor	1	1

TABLE 18 (*continued*)

	IMT-2000 RADIO INTERFACES	IMT 2000 CDMA TDD	
No.	**Parameter**	**UTRA**	**E-UTRA**
6.	Antenna pattern	For Dedicated Channels: Smart Antenna in 3GPP TR 36.942 Annex <B> For Common Channels: Sector Antenna: Rec. ITU-R F.1336 (*recommends* 3.1) • ka = 0.7 • kp = 0.7 • kh = 0.7 • kv = 0.3 Horizontal 3 dB beamwidth: 65 degrees Vertical 3 dB beamwidth: determined from the horizontal beamwidth by equations in Rec. ITU-R F.1336 (*recommends* 3.3). Vertical beamwidths of actual antennas may also be used when available. (2) Omni antenna: F.1336 (*recommends* 2)	Sector Antenna: Rec. ITU-R F.1336 (*recommends* 3.1) • ka = 0.7 • kp = 0.7 • kh = 0.7 • kv = 0.3 Horizontal 3 dB beamwidth: 65 degrees Vertical 3 dB beamwidth: determined from the horizontal beamwidth by equations in Rec. ITU-R F.1336 (*recommends* 3.3). Vertical beamwidths of actual antennas may also be used when available. Omni antenna: F.1336 (*recommends* 2)
7.	Polarization	linear / ± 45 degrees	linear / ± 45 degrees
8.	Feeder loss (dB)	Macro: 3 Micro, Pico, Femto: 0	Macro: 3 Micro, Pico, Femto: 0
9.	Maximum BS transmitter power per sector (dBm)	Macro: 43	BW ≤5 MHz / BW ≥ 10 MHz Macro Rural: 43/46 Macro Suburban: 43/46 Macro Urban: 43/46 Micro: 35/35 Pico: 24/24 Femto: 17/17
10.	Maximum BS transmitter e.i.r.p. per sector (dBm/channel bandwidth)	Macro Rural: 49 Macro Suburban: 47 Macro Urban: 47 Micro: 40 Pico: 24 Femto: 17	BW ≤ 5 MHz / BW ≥ 10 MHz Macro Rural: 58/61 Macro Suburban: 56/59 Macro Urban: 56/59 Micro: 40/40 Pico: 24/24 Femto: 17/17

TABLE 18 (*continued*)

	IMT-2000 RADIO INTERFACES	IMT 2000 CDMA TDD	
No.	**Parameter**	**UTRA**	**E-UTRA**
11.	Transmitting BS antenna gain (dBi)	Macro Rural: 18 Macro Suburban: 16 Macro Urban: 16 Micro: 5 Pico: 0 Femto: 0	Macro Rural: 18 Macro Suburban: 16 Macro Urban: 16 Micro: 5 Pico: 0 Femto: 0
12.	Average base station activity factor (%)	50	50
13.	Average base station e.i.r.p. per sector taking into account activity factor (dBm/channel bandwidth)	Macro Rural: 46 Macro Suburban: 44 Macro Urban: 44 Micro: 37 Pico: 21 Femto: 14	BW ≤ 5 MHz / BW ≥ 10 MHz Macro Rural: 55/58 Macro Suburban: 53/56 Macro Urban: 53/56 Micro: 37/37 Pico: 21/21 Femto: 14/14
14.	TDD activity factor (%)(3)	subject to specific DL/UL ratio	subject to specific DL/UL ratio
	User terminal parameters		
15.	Indoor usage (%)	Macro Rural: 50 Macro Suburban: 70 Macro Urban: 70 Micro: 70 Pico: 100 Femto: 100	Macro Rural: 50 Macro Suburban: 70 Macro Urban: 70 Micro: 70 Pico: 100 Femto: 100
16.	Average indoor user terminal penetration loss (dB)	Macro Rural: 15 Macro Suburban: 20 Macro Urban: 20 Micro: 20 Pico: 20 Femto: 20	Macro Rural: 15 Macro Suburban: 20 Macro Urban: 20 Micro: 20 Pico: 20 Femto: 20
17.	Density of the user equipment in active mode(4) (number/km^2)	Macro rural: 0.17 / 5 MHz/km^2 Macro suburban: 2.16 / 5 MHz/km^2 Macro urban: 3 / 5 MHz/km^2 Small cell outdoor / Micro urban: 3 / 5 MHz/km^2 Small cell indoor / Indoor urban: depending on indoor coverage/ capacity demand	
17.1	User terminal transmitter output power (dBm)		

TABLE 18 (*end*)

	IMT-2000 RADIO INTERFACES	IMT 2000 CDMA TDD	
No.	**Parameter**	**UTRA**	**E-UTRA**
17.2	Maximum user terminal transmitter output power (dBm/5 MHz)	24	23
18.	Average user terminal transmitter output power in active mode[4] (dBm/5 MHz)	Macro Rural: 2 dBm Macro Suburban: –9 dBm Macro Urban: –9 dBm Micro: –9 dBm Pico: –9 dBm Femto: –9 dBm	Macro Rural: 2 dBm Macro Suburban: –9 dBm Macro Urban: –9 dBm Micro: –9 dBm Pico: –9 dBm Femto: –9 dBm
19.	Transmitting user terminal antenna gain (dBi)	–3	–3
20.	Body loss (dB)	4	4

Notes relative to Table 18:

(1) Outdoor small cells would typically be deployed in very limited areas in order to provide local capacity enhancement. Within these areas, the outdoor small cells would not need to provide contiguous coverage since there would typically be an overlaying macro network present.

(2) 8-element smart antenna system is employed for UTRA TDD 1.28 Mchip/s.

(3) In case TDD is used, base station downlink transmission occurs only part of the time, which will further reduce average base station power.

(4) By “active mode” it should be understood that these are terminals with an active communication session, but which are not necessarily transmitting. If only transmitting terminals are used in a study, the average power levels for user equipment in active mode cannot be used. In that case power levels need to be computed differently, e.g. by simulations (including power control).

6.4 Deployment-related parameters for IMT-2000 TDMA SC (interface No. 4)

TABLE 19

Deployment-related parameters for IMT-2000 TDMA SC (interface No. 4) between 1 and 3 GHz

	IMT-2000 RADIO INTERFACES	IMT-2000 TDMA SC[1]	
No.	**Parameter**		
1.	Typical height of the transmitting BS Macro antenna (m)	30[2]	30[2]
2.	Antenna downtilt for macro base stations	2.5[2]	2.5[2]

Notes relative to Table 19:

(1) IMT 2000 TDMA single carrier consists of three components: enhancements to the 30 kHz channels (designated as 136+) for advanced voice and data capabilities, a 200 kHz carrier component for high-speed data (384 kbit/s) accommodating high mobility (designated as 136HS outdoor), and a 1.6 MHz carrier component for very high speed data (2 Mbit/s) in low mobility applications (designated as 136HS indoor). The combined result constitutes the IMT 2000 radio interface referred to as IMT 2000 TDMA single carrier.

(2) May not be appropriate for all scenarios.

6.5 Deployment-related parameters for IMT-2000 FDMA/TDMA (interface No. 5)

TABLE 20

Deployment-related parameters for IMT-2000 FDMA/TDMA (interface No. 5) between 1 and 3 GHz

	IMT-2000 RADIO INTERFACES	IMT-2000 FDMA/TDMA
No.	**Parameter**	
	Base station parameters	
1.	Typical height of the transmitting BS Macro antenna (m)	1.5-10 (typical 2.5)(1)
2.	Transmitting antenna type (sectorized/omnidirectional)	Omnidirectional
3.	Maximum BS transmitter e.i.r.p. (dBm)	24
4.	Transmitting BS antenna gain (dBi)	Maximum 12 Normal 0

Note relative to Table 20:

(1) May not be appropriate for all scenarios.

6.6 Deployment-related parameters for IMT-2000 OFDMA TDD WMAN (interface No. 6)

TABLE 21

Deployment-related parameters for IMT-2000 OFDMA TDD WMAN (interface No. 6) between 1 and 3 GHz

	IMT-2000 RADIO INTERFACES	IMT-2000 OFDMA TDD WMAN		
No.	**Parameter**	**5 MHz**	**8.75 MHz**	**10 MHz**
	Base station parameters			
1.	Typical height of the transmitting BS Macro antenna (m)	15-30(1)	15-30(1)	15-30(1)
2.	Antenna downtilt for macro base stations	2.5(1)	2.5(1)	2.5(1)
3.	Reuse factor	1:1; 1:3	1:1; 1:3	1:1; 1:3
4.	Maximum BS transmitter e.i.r.p. (dBm) per sector	36(2)	36(2)	36(2)
5.	Transmitting BS antenna gain (dBi)	18(3),(4),(5),(6)	18(3),(4),(5),(6)	18(3),(4),(5),(6)
6.	TDD activity factor (dB)	3 dB(1)	3 dB(1)	3 dB(1)

Notes relative to Table 21:

(1) May not be appropriate for all scenarios.

(2) TX power reported is typical and higher values may be available based on region. TX power is the RF power averaged during the transmit burst, without considering traffic statistics or lowered-power operation or UL/DL ratio.

(3) Feeder losses are not included in the values and should be considered in the sharing/compatibility issues. In the case of using a tower top LNA, this loss is negligible and does not need to be included in the sharing/compatibility studies.

(4) The reference pattern is specified in Rec. ITU-R F.1336.

(5) See 3GPP TR 25.892 v2.0.0 2004-06.

(6) See Rec. ITU-R M.1646/ Rec. ITU-R F.1336.

7 Deployment-related parameters in the 3-6 GHz range

7.1 Deployment-related parameters for IMT-2000 CDMA DS (interface No. 1) and IMT CDMA TDD (interface No. 3)

TABLE 22

Deployment-related parameters for IMT-2000 CDMA DS (interface No. 1) and IMT-2000 CDMA TDD (interface No. 3) between 3 and 6 GHz

	IMT-2000 RADIO INTERFACES	**IMT-2000 CDMA Direct Spread / IMT-2000 CDMA TDD**
No.	**Parameter**	**E-UTRA**
	Base station parameters	
1.	Coverage radius / Deployment density	Macro suburban: 0.3-2 km (typical figure to be used in sharing studies 0.6 km) Macro urban: 0.15-0.6 km (typical figure to be used in sharing studies 0.3 km) Small cell outdoor / Micro urban: 1-3 per urban macro cell(1) < 1 per suburban macro site Small cell indoor / Indoor urban: depending on indoor coverage/ capacity demand
2.	Typical height of the transmitting BS antenna (m)	Macro suburban: 25 Macro urban: 20 Micro: 6 Pico: 3 Femto: 2
3.	Antenna type (sectorized/omnidirectional)	3 sectors for Macro, 1 sector for Micro, Pico and Femto
4.	Antenna downtilt for macro base stations	Suburban: 6° Urban: 10°
5.	Frequency reuse factor	1
6.	Antenna pattern	Sector Antenna: Rec ITU-R F.1336 (*recommends* 3.1) • ka = 0.7 • kp = 0.7 • kh = 0.7 • kv = 0.3 Horizontal 3 dB beamwidth: 65 degrees Vertical 3 dB beamwidth: determined from the horizontal beamwidth by equations in Rec. ITU-R F.1336 (*recommends* 3.3). Vertical beamwidths of actual antennas may also be used when available. Omni antenna: F.1336 (*recommends* 2)
7.	Polarization	linear / ± 45 degrees
8.	Feeder loss (dB)	Macro: 3 Micro, pico, femto: 0

TABLE 22 (*continued*)

	IMT-2000 RADIO INTERFACES	**IMT-2000 CDMA Direct Spread / IMT-2000 CDMA TDD**
No.	**Parameter**	**E-UTRA**
9	Maximum BS transmitter power per sector (dBm)	BW ≤ 5 MHz / BW ≥ 10 MHz Macro Suburban: 43/46 Macro Urban: 43/46 Micro: 24/24 Pico: 24/24 Femto: 17/17
10.	Maximum BS transmitter e.i.r.p. per sector (dBm/channel bandwidth)	BW ≤ 5 MHz / BW ≥ 10 MHz Macro Suburban: 58/61 Macro Urban: 58/61 Micro: 29/29 Pico: 24/24 Femto: 17/17
11.	Transmitting BS antenna gain (dBi)	Macro Suburban: 18 Macro Urban: 18 Micro: 5 Pico: 0 Femto: 0
12.	Average base station activity factor (%)	50
13.	Average base station e.i.r.p. per sector taking into account the base station activity factor (dBm/channel bandwidth)	BW ≤ 5 MHz / BW ≥ 10 MHz Macro Suburban: 55/58 Macro Urban: 55/58 Micro: 26/26 Pico: 21/21 Femto: 14/14
14.	TDD activity factor (%)[3][4]	subject to specific DL/UL ratio
	User terminal parameters	
15.	Indoor usage (%)	Macro Suburban: 70 Macro Urban: 70 Micro: 70 Pico: 100 Femto: 100
16.	Average indoor user terminal penetration loss (dB)	Macro Suburban: 20 Macro Urban: 20 Micro: 20 Pico, Femto: 20 dB (3-5 GHz), 25 dB (5-6 GHz) (horizontal direction) Rec. ITU-R P.1238, Table 3 (vertical direction)

TABLE 22 (*end*)

	IMT-2000 RADIO INTERFACES	**IMT-2000 CDMA Direct Spread / IMT-2000 CDMA TDD**
No.	**Parameter**	**E-UTRA**
17.	Density of the user equipment in active mode(5) (number/km^2)	Macro suburban: 2.16 / 5 MHz/km^2 Macro urban: 3 / 5 MHz/km^2 Small cell outdoor / Micro urban: 3 / 5 MHz/km^2 Small cell indoor / Indoor urban: depending on indoor coverage/ capacity demand
18.	User terminal transmitter output power (dBm)	
18.1	Maximum user terminal transmitter output power (dBm/5 MHz)	23
18.2	Average user terminal transmitter output power in active mode(5) (dBm/5 MHz)	Macro Suburban: –9 dBm Macro Urban: –9 dBm Micro: –9 dBm Pico: –9 dBm Femto: –9 dBm
19.	Transmitting user terminal antenna gain (dBi)	–3
20.	Body loss (dB)	4

Notes relative to Table 22:

(1) Outdoor small cells would typically be deployed in very limited areas in order to provide local capacity enhancement. Within these areas, the outdoor small cells would not need to provide contiguous coverage since there would typically be an overlaying macro network present.

(2) In case TDD is used, base station downlink transmission occurs only part of the time, which will further reduce average base station power.

(3) Only applicable to IMT-2000 CDMA TDD (interface No. 3).

(4) In case TDD is used, base station downlink transmission occurs only part of the time, which will further reduce average base station power.

(5) By “active mode” it should be understood that these are terminals with an active communication session, but which are not necessarily transmitting. If only transmitting terminals are used in a study, the average power levels for user equipment in active mode cannot be used. In that case power levels need to be computed differently, e.g. by simulations (including power control).

7.2 Parameters for IMT-2000 OFDMA TDD WMAN (interface No. 6)

TABLE 23

Technical and operational characteristics of base stations for use in sharing studies in the 3.4-3.6 GHz band

	IMT-2000 OFDMA TDD WMAN		
Parameter			
Deployment scenario	**Specific cellular deployment rural with expected nomadic BWA use**	**Typical cellular deployment rural**	**Typical cellular deployment urban**
Channel bandwidth (MHz)	7 (5, 7 and 10)[1]	7 (5, 7 and 10)[1]	7 (5, 7 and 10)[1]
Carrier frequency	3.5 GHz	3.5 GHz	3.5 GHz
Modulation type	QPSK, 16-QAM, 64-QAM	QPSK, 16-QAM, 64-QAM	QPSK, 16-QAM, 64-QAM
Duplex method	TDD/FDD	TDD/FDD	TDD/FDD
Access technique	TDMA/OFDMA	TDMA/OFDMA	TDMA/OFDMA
No. of sectors	3	3	3
Reuse factor	1:3 (1:1)[2]	1:3 (1:1)[2]	1:3 (1:1)[2]
Antennas per sector	Depending on deployment	Depending on deployment	Depending on deployment
Co-located antenna minimum coupling loss (dB)	50	50	50
Peak antenna gain (dBi)	17	17	9
Antenna 3 dB beamwidth (degrees)	60 and 90 (sectorized)	60 and 90 (sectorized)	Omnidirectional
Antenna downtilt (degrees)[3]	0-8 (1º)	0-8 (2º)	0-8 (4º)
Antenna height a.g.l. (m)	50	30	15
Antenna gain pattern	Rec. ITU-R F.1336	Rec. ITU-R F.1336	Rec. ITU-R F.1336
Transmitter			
TX peak output power (dBm)	43	35	32
Feeder loss (dB)	3	3	3
Power control (dB)	> 10	> 10	> 10
e.i.r.p. (dBm)	57	49	38
Unwanted emissions	ECC Recommendation (04)05[4]		
Adjacent channel leakage ratio (ACLR) (dB)			
ACLR_1 (dB)	37 (51)[5]	37 (51)[5]	37 (51)[5]
ACLR_2 (dB)	48 (87)[5]	48 (87)[5]	48 (87)[5]

TABLE 23 (*end*)

	IMT-2000 OFDMA TDD WMAN		
Parameter		**Parameter**	
Deployment scenario	**Specific cellular deployment rural with expected nomadic BWA use**	**Typical cellular deployment rural**	**Typical cellular deployment urban**
Receiver			
Noise figure (dB)	5	5	5
Thermal noise density (dBm/Hz)	–174	–174	–174
Adjacent Channel Selectivity (ACS) (dB)			
ACS_1 (dB)	20(6)	20(6)	20(6)
ACS_2 (dB)	39(6)	39(6)	39(6)
Required SINR (dB)	2.9 (for CTC QPSK ½)	2.9 (for CTC QPSK ½)	2.9 (for CTC QPSK ½)
Max. tolerable interference power (dBm)	–45	–45	–45

Notes relative to Table 23:

(1) Other values of 5 and 10 MHz channel bandwidth in parenthesis are also supported.

(2) Other values or reuse 3 (1:3) in parenthesis are also supported.

(3) A range of values is indicated, recognizing that the value for each situation depends on the actual deployment scenario taking into account the topology of the terrain. In parentheses, a typical value is given for use in the compatibility studies.

(4) WiMAX base stations may comply with a specific regional regulatory requirement to the lowermost and uppermost edges of an operator's block assignment. The regulatory requirement is detailed as a Block Edge Mask. The Block Edge Mask regulatory requirement imposes a more stringent out of block emission performance on the operator and therefore implies a correspondingly more stringent unwanted emission performance across the edges of the system operating block which can be deduced from analysis of the defined Block Edge Mask. The block edge mask is as specified in § 2 Annex 2 of ECC Recommendation (04)05.

(5) Additional ACLR values for the base station are provided in parentheses. These additional ACLR values result from the application of a specific regional regulatory requirement to the lowermost and uppermost edges of an operator's block assignment. The regulatory requirement is detailed as a Block Edge Mask. The Block Edge Mask regulatory requirement imposes a more stringent out of block emission performance on the operator and therefore implies a correspondingly more stringent ACLR performance across the edges of the system operating block which can be deduced from analysis of the defined Block Edge Mask.

(6) The numbers provided are for receiver adjacent channel rejection that is a measure of the capability of the receiver to receive a wanted signal without exceeding a given degradation due to the presence of an unwanted signal (interferer) either in the first or second adjacent channel. Receiver adjacent channel rejection is expressed as the ratio, in dB, of the level of the unwanted signal to the level of the wanted signal, at the receiver input. The minimum receiver adjacent channel rejection for a bit error rate (BER) $\leq 10^{-6}$.

TABLE 24

Technical and operational characteristics of terminal/mobile stations for use in sharing studies in the 3.4-3.6 GHz band

	IMT-2000 OFDMA TDD WMAN			
	Fixed-outdoor	**Fixed-indoor**	**Nomadic**	**Mobile**
Parameters				
Channel bandwidth (MHz)	7 (5, 10)[1]	7 (5, 10)[1]	7 (5, 10)[1]	7 (5, 10)[1]
Carrier frequency	3.5 GHz	3.5 GHz	3.5 GHz	3.5 GHz
Modulation type	QPSK, 16-QAM, 64-QAM	QPSK, 16-QAM, 64-QAM	QPSK, 16-QAM, 64-QAM	QPSK, 16-QAM, 64-QAM
Duplex method	TDD/FDD	TDD/FDD	TDD/FDD	TDD/FDD
Access technique	TDMA/OFDMA	TDMA/OFDMA	TDMA/OFDMA	TDMA/OFDMA
No. of sectors	Not applicable	Not applicable	Not applicable	Not applicable
Reuse factor	1:3 (1:1)[2]	1:3 (1:1)[2]	1:3 (1:1)[2]	1:3 (1:1)[2]
Co-located antenna minimum coupling loss (dB)	N/A	N/A	N/A	N/A
Peak antenna gain (dBi)	17	5	5	0
Antenna gain pattern	Rec. ITU-R F.1245	Omnidirectional	Omnidirectional	Omnidirectional
Antenna 3 dB beamwidth (degrees)	24°	N/A	N/A	N/A
Antenna height a.g.l. (m)	10	1.5	1.5	1.5
Number of co-channel TSs per BS	10 users for uplink activity factor[3] of 38% in a 5 ms frame	10 users for uplink activity factor[3] of 38% in a 5 ms frame	10 users for uplink activity factor[3] of 38% in a 5 ms frame	10 users for uplink activity factor[3] of 38% in a 5 ms frame
Transmitter				
TX peak output power (dBm)	26[4]	26	22	20
Feeder loss (dB)	1	1	1	1
Power control (dB)[5]	> 45	> 45	> 45	> 45
e.i.r.p. (dBm)	42	30	26	19
Unwanted emissions	See Note 1			
Adjacent channel leakage ratio (ACLR) (dB)				
ACLR_1 (dB)	33	33	33	33
ACLR_2 (dB)	43	43	43	43

TABLE 24 (*end*)

	IMT-2000 OFDMA TDD WMAN			
	Fixed-outdoor	**Fixed-indoor**	**Nomadic**	**Mobile**
Parameters				
Receiver				
Noise figure (dB)	8	8	8	8
Thermal noise density (dBm/Hz)	–174	–174	–174	–174
Feeder loss (dB)	1	1	1	1
Adjacent channel selectivity (ACS) (dB)				
ACS_1 (dB)	28	28	28	28
ACS_2 (dB)	47	47	47	47
Required SINR (dB)	2.9 (for CTC QPSK ½)	2.9 (for CTC QPSK ½)	2.9 (for CTC QPSK ½)	2.9 (for CTC QPSK ½)
Max. tolerable interference power (dBm)	–30	–30	–30	–30
Nominal reference sensitivity (dBm)(6)	–98 dBm/MHz	–98 dBm/MHz	–98 dBm/MHz	–98 dBm/MHz

Notes relative to Table 24:

(1) Other values of 5 and 10 MHz channel bandwidth in parenthesis are also supported.

(2) Other values of Reuse 1 (1:1) in parenthesis are also supported.

(3) Uplink activity factor for TDD mode is defined by the ratio of uplink subframe over the entire frame, that is uplink plus downlink subframes.

(4) WiMAX numbers for Tx peak output power are preliminary numbers. Mobile WiMAX Band Class Groups 5L.A, 5.L.B and 5L.C, in general, cover a range of power classes. (See Recs ITU-R M.1580 and ITU-R 1581 for a description of band class groups.)

(5) The 45 dB is based on the minimum dynamic range requirements.

(6) An example value for the cases of no repetition (QPSK ½), SISO AWGN. The value is dependent on many parameters including the channel bandwidth, downlink allocated bandwidth, channel model and repetition factor. For the 7 MHz channel bandwidth, the above sensitivity levels (per MHz) need to be increased by 10 log (7) = 8.45 dB.

NOTE 1 – The following information on the spectrum emission mask is an extract from the WiMAX Forum mobile radio specification [22].

7.3 Spectrum emission mask for terminal/mobile station equipment operating in the band 3 400-3 600 MHz

Emission mask for 5 MHz channel bandwidth

The spectrum emission mask of the MS applies to frequency offsets between 2.5 MHz and 12.5 MHz on both sides of the MS centre carrier frequency. The out-of-channel emission is specified as power level measured over the specified measurement bandwidth relative to the total mean power of the MS carrier measured in the 5 MHz channel.

The MS emission shall not exceed the levels specified in Table 25. Assuming specific power classes, the relative requirements of Table 25 can be converted to absolute values for testing purposes.

TABLE 25

Spectrum emission mask requirement for 5 MHz channel bandwidth

Frequency offset Δf	Minimum requirement	Measurement bandwidth
2.5 MHz to 3.5 MHz	$\left\{-33.5-15\times\left(\frac{\Delta f}{\text{MHz}}-2.5\right)\right\}$ dBc	30 kHz
3.5 to 7.5 MHz	$\left\{-33.5-1\times\left(\frac{\Delta f}{\text{MHz}}-3.5\right)\right\}$ dBc	1 MHz
7.5 to 8.5 MHz	$\left\{-37.5-10\times\left(\frac{\Delta f}{\text{MHz}}-7.5\right)\right\}$ dBc	1 MHz
8.5 to 12.5 MHz	−47.5 dBc	1 MHz

Notes relative to Table 25:

NOTE 1 − Δf is the separation between the carrier frequency and the centre of the measuring filter.

NOTE 2 − The first measurement position with a 30 kHz filter is at Δf equals 2.515 MHz; the last is at Δf equals 3.485 MHz.

NOTE 3 − The first measurement position with a 1 MHz filter is at Δf equals 4 MHz; the last is at Δf equals 12 MHz. As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be different from the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 4 − Note that equivalent PSD type mask can be derived by applying 10*log ((5 MHz)/(30 kHz)) = 22.2 dB and 10*log((5 MHz)/(1 MHz)) = 7 dB scaling factor for 30 kHz and 1 MHz measurement bandwidth respectively.

Emission mask for 7 MHz channel bandwidth

The spectrum emission mask of the MS applies to frequency offsets between 3.5 MHz and 17.5 MHz on both sides of the MS centre carrier frequency. The out-of-channel emission is specified as power level measured over the specified measurement bandwidth relative to the total mean power of the MS carrier measured in the 7 MHz channel.

The MS emission shall not exceed the levels specified in Table 26. Assuming specific power classes, the relative requirements of Table 26 can be converted to absolute values for testing purposes.

TABLE 26

Spectrum emission mask requirement for 7 MHz channel bandwidth

Frequency offset Δf	Minimum requirement	Measurement bandwidth
3.5 MHz to 4.75 MHz	$\left\{-33.5-13.5\times\left(\frac{\Delta f}{\text{MHz}}-3.5\right)\right\}$ dBc	30 kHz
4.75 to 10.5 MHz	$\left\{-35-0.7\times\left(\frac{\Delta f}{\text{MHz}}-4.75\right)\right\}$ dBc	1 MHz
10.5 to 11.9 MHz	$\left\{-39.0-7\times\left(\frac{\Delta f}{\text{MHz}}-10.5\right)\right\}$ dBc	1 MHz
11.9 to 17.5 MHz	−49.0 dBc	1 MHz

Notes relative to Table 26:

NOTE 1 − Δf is the separation between the carrier frequency and the centre of the measuring filter.

NOTE 2 −The first measurement position with a 30 kHz filter is at Δf equals 3.515 MHz; the last is at Δf equals 4.735 MHz.

NOTE 3 − The first measurement position with a 1 MHz filter is at Δf equals 5.25 MHz; the last is at Δf equals 17 MHz. As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be different from the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 4 − Note that equivalent PSD type mask can be derived by applying 10*log ((7 MHz)/(30 kHz)) = 23.7 dB and 10*log((7 MHz)/(1 MHz)) = 8.5 dB scaling factor for 30 kHz and 1 MHz measurement bandwidth respectively.

Emission mask for 10 MHz channel bandwidth

The spectrum emission mask of the MS applies to frequency offsets between 5.0 MHz and 25.0 MHz on both sides of the MS centre carrier frequency.

The out-of-channel emission is specified as power level measured over the specified measurement bandwidth relative to the total mean power of the MS carrier measured in the 10 MHz channel.

The MS emission shall not exceed the levels specified in Table 27. Assuming specific power classes, the relative requirements of Table 27 can be converted to absolute values for testing purposes.

TABLE 27

Spectrum emission mask requirement for 10 MHz channel bandwidth

Frequency offset Δf	Minimum requirement	Measurement bandwidth
5.0 MHz to 7.0 MHz	$\left\{-33.5-9\times\left(\frac{\Delta f}{\text{MHz}}-5.0\right)\right\}$ dBc	30 kHz
7.0 to 15.0 MHz	$\left\{-36.5-0.5\times\left(\frac{\Delta f}{\text{MHz}}-7.0\right)\right\}$ dBc	1 MHz
15.0 to 17.0 MHz	$\left\{-40.5-5\times\left(\frac{\Delta f}{\text{MHz}}-15.0\right)\right\}$ dBc	1 MHz
17.0 to 25.0 MHz	−50.5 dBc	1 MHz

Notes relative to Table 27:

NOTE 1 − Δf is the separation between the carrier frequency and the centre of the measuring filter.

NOTE 2 − The first measurement position with a 30 kHz filter is at Δf equals 510.015 MHz; the last is at Δf equals 6.985 MHz.

NOTE 3 − The first measurement position with a 1 MHz filter is at Δf equals 7.5 MHz; the last is at Δf equals 24.5 MHz. As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be different from the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 4 − Equivalent PSD type mask can be derived by applying 10*log ((10 MHz)/(30 kHz)) = 25.2 dB and 10*log((10 MHz)/(1 MHz)) = 10 dB scaling factor for 30 kHz and 1 MHz measurement bandwidth respectively.

References

[1] 3GPP TS 25.101: 3rd Generation Partnership Project; Technical Specification Group Radio Access Networks; UE Radio Transmission and Reception (FDD) (Release 9).

[2] 3GPP TS 36.101: 3rd Generation Partnership Project; Technical Specification Group Radio Access Networks; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception (Release 9).

[3] 3GPP TS 25.104: 3rd Generation Partnership Project; Technical Specification Group Radio Access Networks; BS Radio Transmission and Reception (FDD) (Release 9).

[4] 3GPP TR 25.951: 3rd Generation Partnership Project; Technical Specification Group Radio Access Networks, FDD Base Station Classification (Release 9).

[5] 3GPP TS 36.104: 3rd Generation Partnership Project; Technical Specification Group Radio Access Networks; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception (Release 9).

[6] TIA-97-H; Recommended minimum performance Standards for cdma2000® spread spectrum base stations, Feb 2012.

[7] TIA-98-H; Recommended minimum performance Standards for cdma2000® spread spectrum mobile stations, April 2012.

[8] TIA-864-D; Recommended minimum performance Standards for cdma2000® High Rate Packet Data Access Network, May 2012.

[9] TIA-866-D; Recommended minimum performance Standards for cdma2000® High Rate Packet Data Access Terminal, May 2012.

[10] TIA-1170: Recommended Minimum Performance Standards for cdma2000 Ultra Mobile Broadband (UMB) Access Network, February 2010.

[11] TIA-1171: Recommended Minimum Performance Standards for cdma2000 Ultra Mobile Broadband Access Terminal, February 2010.

[12] 3GPP TS 25.102: 3rd Generation Partnership Project; Technical Specification Group Radio Access Networks; UE Radio Transmission and Reception (TDD) (Release 9).

[13] 3GPP TS 25.105: 3rd Generation Partnership Project; Technical Specification Group Radio Access Networks; BS Radio Transmission and Reception (TDD) (Release 9).

[14] TR45 technical specification, SP-4027-270b); Mobile Station Minimum Performance, clause 1.4 and clause 3.2.2. Refers To Power Class Ii Mobile Station.

[15] TR45 technical specification, SP-4027-270b); Mobile Station Minimum Performance, clause 2.3.1.3.1.

[16] TR45 technical specification, TIA/EIA-136-290); RF Minimum performance requirements 136HS Outdoor and 136HS Indoor Bearers, clause 2.

[17] TR45 technical specification, SP-4027-270b); Mobile Station Minimum Performance, clause 3.4.1.1.3.

[18] TR45 technical specification, SP-4027-270b); Mobile Station Minimum Performance, clause 2.3.2.4.3:

TABLE 28

Blocking and spurious response rejection

Frequency band	Desired signal (frequency, F_c)	Blocking signal (frequency, F_0)	Spurious response limit (frequency, F_0)	Error rate (%)
$\|fc - f_0\| > 3$ MHz (π/4 DQPSK)	–102	–30	–45	3
3 MHz > $\|fc - f_0\|$ > 90 kHz (π/4 DQPSK)	–102	–45	–45	3
$\|f_c - f_0\| > 3$ MHz (8-PSK)	–99	–30	–45	3
3 MHz > $\|f_c - f_0\|$ > 90 kHz (8-PSK)	–99	–45	–45	3

[19] TR45 technical specification, TIA/EIA-136-290; RF Minimum performance requirements 136HS Outdoor and 136HS Indoor Bearers, clause 5.1:

The mobile station shall meet the requirements set forth in clause 6.2 in the presence of an unmodulated carrier at the following frequencies and amplitudes:

TABLE 29

Requirements of clause 6.2

Frequency of blocking signal	Amplitude of blocking signal (dBm)
600 kHz < $\|f - f_0\|$ < 800 kHz	–43
800 kHz < $\|f - f_0\|$ < 1.6 MHz	–43
1.6 MHz < = < $\|f - f_0\|$ < 3 MHz	–33
3 MHz = $\|f - f_0\|$	–26

[20] TR45 technical specification, TIA/EIA-136-290; RF Minimum performance requirements 136HS Outdoor and 136HS Indoor Bearers, clause 4.1.1.2 refers to Power Class II mobile station.

[21] Final Draft ETSI EN 300 175-2: Digital Enhanced Telecommunications (DECT) Common Interface (CI) part 2: Physical Layer.

[22] WiMAX Forum® Mobile Radio Specification, WMF-T23-005-R015v04.