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| **Radiocommunication Study Groups** |  |
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| **17 October 2012** |
| **English only** |
| Working Party 5D | |
| Liaison statement to 3GPP and IEEE | |
| Parameters for LTE-Advanced and WirelessMAN  Advanced for use in sharing studies | |

Working Party 5D (WP 5D) would like to thank 3GPP and IEEE for providing information regarding IMT-Advanced parameters for use in sharing studies in particular related to WRC-15 Agenda items 1.1 and 1.2. As described in our liaison statement from the last WP 5D meeting, the sharing parameters for IMT systems in the frequency range 694-790 MHz (designated as “Part 1” in our previous liaison statement) have been finalised during the 14th meeting of WP 5D and submitted to JTG4-5-6-7. The submitted material is reproduced below for your information.

As also indicated in our previous liaison statement, WP 5D is still in the process of compiling the relevant sharing parameters for IMT systems for the studies related to WRC-15 Agenda item 1.1 (designated as “Part 2” in our previous liaison statement) and will provide the final submission of these parameters to JTG 4-5-6-7 before the 31 July 2013 deadline.

In the context of WRC-15 Agenda item 1.1, WP 5D would like to draw the attention of 3GPP and IEEE to footnote 18 of Table A. WP 5D would appreciate feedback on the validity of this footnote, for base stations and terminals.

Therefore WP 5D looks forward to further contributions from 3GPP and IEEE to the 15th and 16th meetings of WP 5D regarding “Part 2” as indicated in your submissions to this WP 5D meeting in order to be able to complete this critical deliverable for the work of JTG 4-5-6-7 within the defined timeframe.

Specification-related parameters

The following parameters in Table A are relevant for the studies in response to WRC-15 Agenda item 1.2 and the band 694-790 MHz.

Table A

Specification-related parameters for the band 694-790 MHz

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Base station(1) | | Mobile station |
| Class of emission | For 1.4 MHz, 1M40V7WEW For 3 MHz, 3M00V7WEW For 5 MHz, 5M00V7WEW For 10 MHz, 10M0V7WEW For 15 MHz, 15M0V7WEW For 20 MHz, 20M0V7WEW | | For 1.4 MHz, 1M40V7WEW For 3 MHz, 3M00V7WEW For 5 MHz, 5M00V7WEW For 10 MHz, 10M0V7WEW For 15 MHz, 15M0V7WEW For 20 MHz, 20M0V7WEW |
| Modulation parameters | QPSK 16-QAM 64-QAM | | QPSK 16-QAM 64-QAM |
| Duplex mode | FDD and TDD | | |
| Spectral mask of signals, including | **(2)** | **(3)** | |
| Maximum spectral power density, dB(mW/Hz) | −23.5 | −43.5**(4)** | |
| Signal bandwidth (MHz) | 1.08, 2.7, 4.5, 9, 13.5 and 18 | 1.08, 2.7, 4.5, 9, 13.5 and 18 | |
| Channel bandwidth (MHz)**(7**) | 1.4, 3, 5, 10, 15, 20 | 1.4, 3, 5, 10, 15, 20 | |
| Power control range (dB) | **(8)** | 63 | |
| Polarization discrimination (dB) | 3**(9)** | 0 | |
| Capacity criteria, including capacity per cell | Capacity in a cellular system can be measured in terms of simultaneous voice users per cell, data throughput per cell, etc. The actual capacity is dependent on the assumptions made about system configuration, loading, quality, and fairness, among other things. | | |
| Frequency reuse factor | 1 | 1 | |
| Receiver thermal noise | NF = 5 dB | NF = 9 dB | |
| Reference sensitivity | **(10)** | **(11)** | |
| Receiver blocking response | **(12)** | **(13)** | |
| ACLR | **(14)** | **(15)** | |
| ACS | **(16)** | **(17)** | |
| Unwanted emissions**(18)** | 3GPP TS 36.104 (V11.2.0) Table 6.6.3.2.1-3 &  Table 6.6.4.1.2.1-1 | 3GPP TS 36.101  (V11.2.0) Table 6.6.2.1.1-1 & Table 6.6.3.1-2 | |

Notes:

(1) See 3GPP Document: TS 36 104 v 11.1.0, Section 4.2 for the definition of base station classes which are designated as Wide Area Base Stations, Local Area Base Stations and Home Area Base Stations. The information provided here corresponds to the Wide Area Base station class.

(2) See 3GPP Documents: TS 36 104 v 11.1.0, see § 6.6.3 and TS 36 141 v 11.1.0, see § 6.6.

(3) See 3GPP Documents: TS 36 101 v 11.1.0, see Table 6.6.2.1.1-1 (General E-UTRA spectrum emission mask) and TS 36 521-1 v 10.2.0, see § 6.6.

(4) This value corresponds to a 4.5 MHz bandwidth, noting that other measurement bandwidth is possible: 1.08 MHz, 2.7 MHz, 9.0 MHz, 13.5 MHz and 18 MHz.

(5) [Not used]

(6) [Not used]

(7) This value refers to the block size.

(8) See 3GPP Document TS 36.104 v.11.1.0, Table 6.3.2.1-1 (E-UTRA BS total power dynamic range).

(9) Typically base stations today use cross-polarized antennas (two sets of dipoles slanted at ±45° against the horizontal plane), usually transmitting on one of the two polarisation paths (either +45° or −45° for a given frequency) whilst receiving on both paths (to achieve polarisation diversity). Such signals provide an isolation of 3 dB against both horizontally and vertically polarized signals (e.g. DVB-T signals) due to cross-polarisation discrimination.

(10) See 3GPP Document TS 36.104 v.11.1.0, § 7.2.

(11) See 3GPP Document TS 36.101 v.11.1.0, § 7.3.

(12) See 3GPP Document TS 36.104 v.11.1.0, § 7.6.

(13) See 3GPP Document TS 36.101 v.11.1.0, § 7.6.

(14) See 3GPP Document TS 36.104 v.11.1.0, § 6.6.2.

(15) See 3GPP Document TS 36.101 v.11.1.0, § 6.6.2.3.

(16) See 3GPP Document TS 36.104 v.11.1.0, § 7.5.

(17) See 3GPP Document TS 36.101 v.11.1.0, § 7.5.

(18) These unwanted emission limits are the upper limits from SDO specifications for laboratory testingwith 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.

REFERENCES

(Documents publically available at <http://www.3gpp.org/specification-numbering>)

[1] TS 36.101 v.11.1.0, 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 11)

[2] TS 36.104 v.11.1.0, 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 11)

Deployment-related parameters

This section describes typical parameters used in the different scenarios. In many cases the values of these parameters vary within a range, but to facilitate the planned sharing studies wherever possible a single value has been chosen that represents a typical value.

These typical parameter values are appropriate for studies concerning the impact of a single IMT cell operating in the presence of another system/service. For some parameters such as transmitted power levels and cell sizes, however, studies to assess the impact of an entire IMT network will need to take account of the dynamic nature of an IMT network, within which inter-cell interference must be minimised and parameters such as power levels and cell radii adjusted in order to optimize the operational performance and capacity of the network.

Base station characteristics and cell structure

Deployment-dependent parameters describing the cell structure and other base station related parameters needed to conduct sharing studies are summarized below.

Cell size and base station density

Cell sizes in IMT networks can vary considerably depending on the environment the network is deployed in. Table B indicates typical cell sizes for 4 different types of networks. The base station density could be calculated from the cell sizes indicated. However in a typical IMT network all frequency bands are not deployed everywhere and hence the base station density for a specific frequency band may be lower than the result obtained from such a calculation. Indoor urban cell sizes will also vary depending on frequency band and the configuration of the building interior.

Antenna height

Typical antenna heights when deploying IMT networks are indicated in Table B for each type of network. Antennas deployed in indoor urban environments may vary in height depending on the building configuration.

Sectorization

The numbers of sectors used per site is an important factor to take into account when undertaking sharing studies for compatibility between IMT and other services. The most common way to deploy an IMT network is to use 3 sectors with an azimuthal spacing of 120 degrees at each site. However, exceptions may occur and single sector sites may be used, especially for the urban micro and urban indoor scenarios.

Downtilt

Typical downtilt used in IMT networks are indicated in Table B.

Frequency reuse

Typical frequency reuse figures that might be used for IMT networks are 1 or 3 but a frequency re-use of 1 is the most common one and it is proposed to be used for all scenarios. Fractional frequency reuse (FFR) may also be used in some IMT network deployments but this option is not included in the table.

Antenna pattern

Recommendation ITU-R [F.1336](http://www.itu.int/rec/R-REC-F.1336/en) has been used in the past when conducting sharing studies. It should be noted that the Recommendation states that “it is essential that every effort be made to utilize the actual antenna pattern in coordination studies and interference assessment” (Note 1 to *recommends* 1). It should also be noted that there is an ongoing discussion (e.g. in WP 5C) about the accuracy of this Recommendation when modelling IMT base station antenna patterns (esp. for the frequency range below 1 GHz which is not covered by the current Recommendation) and the resulting impact on sharing studies needs to be considered.

Indoor base station deployment

Many IMT systems are used indoors. Table B indicates the typical percentage of base stations deployed indoors for all types of networks.

Antennas deployed below rooftop level

When conducting sharing studies it is also important to account for how the antennas are deployed in relation to the surrounding environment, including the clutter. If the antennas are deployed below the rooftop level a different propagation model should be used compared to the scenario when the antennas are installed above the roof top level. Table B indicates the typical percentage of base station antennas installed below the rooftop level. An alternative approach could be to add clutter loss to propagation loss calculations.

Maximum and average base station output power

Maximum output powers from base stations are indicated in Table B for each environment. Additionally, typical average activity of a base station and corresponding average output powers are indicated in the table. For further details see Report ITU-R [M.2241](http://www.itu.int/pub/R-REP-M.2241) section 2.2.3.2.

User terminal parameters

Indoor user terminal usage and indoor penetration loss

A large proportion of the user terminals are used indoors. Table B indicates suitable figures for the percentage of terminals that are expected to be used indoors. Additionally, suitable figures for the indoor penetration attenuation to be used in sharing studies are indicated. This penetration loss may be frequency dependent.

User terminal density in active mode

In Report ITU-R [M.2039](http://www.itu.int/pub/R-REP-M/publications.aspx?lang=en&parent=R-REP-M.2039) and document [JTG 5-6/180 Annex 2](http://www.itu.int/md/dologin_md.asp?lang=en&id=R07-JTG5.6-C-0180!N02!MSW-E) the density of terminals in “active mode” is indicated. By “active mode” it should be understood that these are terminals with an active communication session but are not necessarily transmitting.

Average transmit power of user terminals transmitting

The average transmit power of terminals are indicated in Report ITU-R M.2039 and JTG [5-6/180 Annex 2](http://www.itu.int/md/dologin_md.asp?lang=en&id=R07-JTG5.6-C-0180!N02!MSW-E) and should be understood as the average transmit power of the terminals in active mode (i.e. when they have an active communication session). See also section 2.2.3 of Report ITU‑R M.2241.

Antenna gain

Typical values for the antenna gain of a user terminal are indicated in Table B. The antenna gain is dependent on operating frequency and type of terminal.

Body loss

Proposed values for body loss are indicated in Table B. Body loss may in reality be frequency dependent.

Table B

Deployment-related parameters

|  |  |
| --- | --- |
| Base station characteristics / Cell structure | |
| Cell radius | > 5 km (typical 8 km[[1]](#footnote-1)) for macro rural scenario  0.5-5 km (typical 2 km1) for macro urban/suburban scenario |
| Antenna height | 30 m |
| Sectorization | 3 sectors |
| Downtilt | 3 degrees |
| Frequency reuse | 1 |
| Antenna pattern | Recommendation ITU-R F.1336 Annex 8  k = 0.7 for both peak and average side lobes  Horizontal 3 dB beamwidth 65 degrees  Vertical 3 dB beamwidth[[2]](#footnote-2) |
| Antenna polarization | linear / +- 45 degrees |
| Feeder loss | 3 dB |
| Maximum base station output power | 46 dBm in 10 MHz |
| Typical base station antenna gain | 15 dBi |
| Typical base station output power (EIRP) | 58 dBm in 10 MHz |
| Average base station activity | 50 % |
| Average base station power/sector (to be used in sharing studies) | 55 dBm in 10 MHz |

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| User terminal characteristics | |
| Indoor user terminal usage | 50% for macro rural scenario  70% for macro urban/suburban scenario |
| Average Indoor user terminal penetration loss | 15 dB for macro rural scenario  20 dB for macro urban/suburban scenario |
| User terminal density in active mode to be used in sharing studies1 | 0.17 / 5MHz/km2 |
| Maximum user terminal transmitter output power | 23 dBm |
| Average user terminal transmitter output power1 | 2 dBm for macro rural scenario  -9 dBm for macro urban/suburban scenario |
| Typical antenna gain for user terminals | -3 dBi |
| Typical body loss | 4 dB |

WP 5D would like to point out that the deadline for document submissions to the 15th and 16th meetings of WP 5D is 23 January 2013 and 3 July 2013 at 16:00 hours UTC respectively.

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1. According to [JTG5-6/180 Annex 2](http://www.itu.int/md/dologin_md.asp?lang=en&id=R07-JTG5.6-C-0180!N02!MSW-E). [↑](#footnote-ref-1)
2. The vertical 3 dB beamwidth is determined from the horizontal beamwidth by equations in Recommendation ITU-R F.1336. Annex 8 of this Recommendation and a k-value of 0.7 is proposed based on comparisons between the antenna models in Rec. ITU-R F.1336 and extensive measurements of antennas for frequencies below 1 GHz. [↑](#footnote-ref-2)