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| **Radiocommunication Study Groups** |  |
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|  | **Document 5D/1120-E** |
| **20 December 2018** |
| **English only** |
|  | **SPECTRUM ASPECTS** |
| Director, Radiocommunication Bureau[[1]](#footnote-1) | |
| Liaison statement on characteristics of IMT-Advanced, IMT-2020 and advanced antenna systems for ITU-R sharing and compatibility studies in the frequency band 3 300-3 400 MHz | |
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**Response to:** LS (RP-182225, 5D/1110, Att. 7.4) on Characteristics of IMT-Advanced, IMT‑2020 and Advanced Antenna Systems for ITU-r sharing and compatibility studies in the frequency band 3 300-3 400 MHz

**Attachments:** None.

# 1 Overall description

RAN WG4 reviewed the incoming LS from ITU-R Working Party 5D LS on Characteristics of IMT-Advanced, IMT-2020 and Advanced Antenna Systems for ITU-r sharing and compatibility studies in the frequency band 3 300-3 400 MHz. The following text provides RAN4 view.

The 5G RF parameters for BS and UE for sub-6 GHz are still under development in RAN4. However, as an initial estimation, a majority of the RF parameters for IMT-Advanced will be reused for the same channel bandwidth for sub-6 GHz.

It would be feasible to reuse the IMT-Advanced parameters for 3 300-3 400 MHz from sharing study point of view. Further, the beamforming antenna characteristics in Table A2-1 can also be used for sub-6 GHz sharing studies with some modifications, although Table A2-1 was originally created (and submitted) for the 24.25-33.4 GHz frequency range.

The recommended parameters are given in Annex 1 and Annex 2 of this LS. Note that these parameters align with those attached to the LS received from WP 5D Document [5D/1110](http://www.itu.int/md/R15-WP5D-C-1110/en), except for the ones marked yellow. In addition, the titles of Annex 1 and 2 of Document 5D/1110 have been modified. Note also that beam forming is not assumed for the UE in the sub-6 GHz range and Table A2-1 is only applicable for Base Stations.

One thing to be pointed out is that the combination of maximum output power in Table A1-1 and the beamforming antenna characteristic in Table A2-1 should be well considered from a link budget point of view. E.g., it may not need as much power as for the cases where beamforming is considered, since beamforming can improve the coverage.

# 2 Actions

**To ITU-R WP 5D**

**Action:** 3GPP TSG RAN asks ITU-R WP 5D to take into account the above information.

# 3 Dates of next 3GPP TSG RAN Meetings:

3GPP TSG RAN #83 – 18-21 March 2019 Shenzhen, China

3GPP TSG RAN #84 – 03-06 June 2019 Newport Beach, USA

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ANNEX 1

IMT-Advanced and IMT-2020 technology-related and deployment-related parameters for bands between 3 and 6 GHz

TABLE A1-1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | IMT-Advanced | | | |
|  | Duplex mode | FDD | | TDD | |
| No. | Parameter | Base station | Mobile station | Base station | Mobile station |
| 1 | Access technique | OFDM | SC-FDMA | OFDM | SC-FDMA |
| 2 | Modulation parameters | QPSK  16-QAM  64-QAM | | | |
| 3 | Channel spacing | Nominal channel spacing = (BW*Channel*(1) + BW*Channel*((2))/2 | | | |
| **4** | **Channel bandwidth (MHz)** | (1) | (1), (19) | (1) | (1), (19) |
| **5** | **Signal bandwidth (MHZ)** | (1) | (1), (19) | (1) | (1), (19) |
| **6** | **Transmitter characteristics** |  |  |  |  |
| 6.1 | Power dynamic range (dB) | (2) | 63(18) | (2) | 63(18) |
| 6.2 | Spectral mask | (3), (17) | (4), (17) | (3), (17) | (4), (17) |
| 6.3 | ACLR | (5), (17) | (6), (17) | (5), (17) | (6), (17) |
| 6.4 | Maximum output power | (7) | (8) | (7) | (8) |
| 6.5 | Spurious emissions | (15), (17) | (16), (17) | (15), (17) | (16), (17) |
| **7** | **Receiver characteristics** |  |  |  |  |
| 7.1 | Noise figure | 5 dB (macro)  10 dB (micro)  13 dB (pico/femto) | 9 dB | 5 dB (macro)  10 dB (micro)  13 dB (pico/femto) | 9 dB |
| 7.2 | Sensitivity | (9) | (10) | (9) | (10) |
| 7.3 | Blocking response | (11) | (12) | (11) | (12) |
| 7.4 | ACS | (13) | (14) | (13) | (14) |
| Notes to the Table:  (1) See 3GPP Document TS 36.101 v.11.2.0, § 5.6. Signal bandwidth in MHz corresponds to “Transmission bandwidth configuration\*0.180”.  (2) See 3GPP Document TS 36.104 v.11.2.0, § 6.3.2.1.  (3) See 3GPP Document TS 36 104 v.11.2.0, § 6.6.3.  (4) See 3GPP Document TS 36 101 v.11.2.0, §§ 6.6.2.1, 6.6.2.1A, 6.6.2.2 and 6.6.2.2A describe UE spectrum emissions masks for different channel bandwidths. In case multiple UEs are transmitting simultaneously on the same channel they will share the available radio resource blocks. As the actual transmission bandwidth is thus decreased the unwanted emissions performance might be improved. This may be taken into account during sharing analysis when measurements or detailed models are available.  (5) See 3GPP Document TS 36.104 v.11.2.0, § 6.6.2.  (6) See 3GPP Document TS 36.101 v.11.2.0, § 6.6.2.3.  (7) See 3GPP Document TS 36.104 v.11.2.0, § 6.2.  (8) See 3GPP Document TS 36.101 v.11.2.0, § 6.2.  (9) See 3GPP Document TS 36.104 v.11.2.0, § 7.2.  (10) See 3GPP Document TS 36.101 v.11.2.0, § 7.3.  (11) See 3GPP Document TS 36.104 v.11.2.0, § 7.6.  (12) See 3GPP Document TS 36.101 v.11.2.0, § 7.6 and § 7.7.  (13) See 3GPP Document TS 36.104 v.11.2.0, § 7.5.  (14) See 3GPP Document TS 36.101 v.11.2.0, § 7.5.  (15) See 3GPP Document TS 36.104 v.11.2.0, § 6.6.4.  (16) See 3GPP Document TS 36.101 v.11.2.0, § 6.6.3.  (17) 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.  (18) See 3GPP Document TS 36.101 v.11.2.0, § 6.3.  (19) In case multiple UEs are transmitting simultaneously on the same channel they will share the available radio resource blocks. As the actual transmission bandwidth is thus decreased the unwanted emissions performance might be improved. This may be taken into account during sharing analysis when measurements or detailed models are available. | | | | | |

TABLE A1-2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Macro suburban | Macro urban | | Small cell outdoor/ Micro urban | | Small cell indoor/ Indoor urban |
| Base station characteristics/Cell structure | | | | | | |
| Cell radius/Deployment density | 0.3-2 km (typical figure to be used in sharing studies 0.6 km) | 0.15-0.6 km (typical figure to be used in sharing studies 0.3 km) | | 1-3 per urban macro cell <1 per suburban macro site | | Depending on indoor coverage/capacity demand |
| Antenna height | 25 m | 20 m | | 6 m | | 3 m |
| Sectorization | 3 sectors | 3 sectors | | Single sector | | Single sector |
| Downtilt (1) | 6 degrees | 10 degrees | | n.a. | | n.a. |
| Frequency reuse | 1 | 1 | | 1 | | 1 |
| Antenna pattern (2) | Recommendation 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 Recommendation ITU-R F.1336. Vertical beamwidths of actual antennas may also be used when available. | | | Recommendation ITU-R F.1336 omni | | |
| Antenna polarization | Linear/±45 degrees | | Linear/±45 degrees | Linear | Linear | | |
| Indoor base station deployment | n.a. | | n.a. | n.a. | 100% | | |
| Indoor base station penetration loss | n.a. | | n.a. | n.a. | 20 dB (3-5 GHz) 25 dB (5-6 GHz) (horizontal direction) Rec. ITU-R P.1238, Table 3 (vertical direction) | | |
| Below rooftop base station antenna deployment | 0% | | 50% | 100% | n.a. | | |
| Feeder loss(2) | 3 dB | | 3 dB | n.a. | n.a. | | |
| Maximum base station output power  (5/10/20 MHz)(2) | 43/46/46 dBm | | 43/46/46 dBm | 24 dBm | 24 dBm | | |
| Maximum base station antenna gain(2) | 18 dBi | | 18 dBi | 5 dBi | 0 dBi | | |
| Maximum base station output power/sector (e.i.r.p.)(2) | 58/61/61 dBm | | 58/61/61 dBm | 29 dBm | 24 dBm | | |
| Average base station activity | 50% | | 50% | 50% | 50% | | |
| Average base station power/ sector taking into account activity factor(2) | 55/58/58 dBm | | 55/58/58 dBm | 26 dBm | 21 dBm | | |
| User terminal characteristics | | | | | | | |
| Indoor user terminal usage | 70% | | 70% | 70% | 100% | | |
| Indoor user terminal penetration loss | 20 dB | | 20 dB | 20 dB | 20 dB (3-5 GHz) 25 dB (5-6 GHz) (horizontal direction)  Rec. ITU-R P.1238, Table 3 (vertical direction) | | |
| User terminal density in active mode to be used in sharing studies | 2.16/5 MHz/km2 | | 3/5 MHz/km2 | 3/5 MHz/km2 | Depending on indoor coverage/capacity demand | | |
| User terminal characteristics | | | | | | | |
| Maximum user terminal output power | 23 dBm | | 23 dBm | 23 dBm | 23 dBm | | |
| Average user terminal output power | –9 dBm | | –9 dBm | –9 dBm | –9 dBm | | |
| Typical antenna gain for user terminals | –4 dBi | | –4 dBi | –4 dBi | –4 dBi | | |
| Body loss | 4 dB | | 4 dB | 4 dB | 4 dB | | |
| Notes to the Table:  (1) For AAS Base Stations, the value relates to mechanical downtilt only.  (2) The parameter is only applicable to non-AAS Base Stations. Antenna characteristics for AAS Base Stations are in Table A2-1. | | | | | | | |

ANNEX 2

Antenna characteristics for IMT-Advanced and IMT-2020 AAS base stations   
for bands between 3 and 6 GHz

TABLE A2-1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | **Outdoor Suburban hotspot** | | **Outdoor Urban hotspot** | **Indoor** |
| **1** | **Base station Antenna Characteristics** | | | | |
| 1.1 | Antenna pattern | Refer to Recommendation ITU-R M.2101 | | | |
| 1.2 | Element gain (dBi) | 8 | 8 | | 8 |
| 1.3 | Horizontal/vertical 3 dB beamwidth of single element (degree) | 80º for H 65 for V | 80º for H 65 for V | | 80º for H 65 for V |
| 1.4 | Horizontal/vertical front-to-back ratio (dB) | 30 for both H/V | 30 for both H/V | | 25 for both H/V |
| 1.5 | Antenna polarization | Linear ±45º | Linear ±45º | | Linear ±45º |
| 1.6 | Antenna array configuration (Row × Column)  NOTE 2 | 8 × 8 elements | 8 × 8 elements | | 8 × 8 elements |
| 1.7 | Horizontal/Vertical radiating element spacing | 0.6 of wavelength for H, 0.9 of wavelength for V | 0.6 of wavelength for H, 0.9 of wavelength for V | | 0.6 of wavelength for H, 0.9 of wavelength for V |
| 1.8 | Array Ohmic loss (dB) | 2 | 2 | | 2 |
| 1.9 | Conducted power (before Ohmic loss) per antenna element (dBm/200 MHz) | 25/28/31 | 25/28/31 | | 6/9/12 |
| 1.10 | Base station maximum coverage angle in the horizontal plane (degrees) | 120 | 120 | | 120 |

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1. Submitted on behalf of 3GPP RAN. [↑](#footnote-ref-1)