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| **Radiocommunication Study Groups** |  |
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| Source: Document 5A/TEMP/110(Rev.1) | **Annex 18 to Document 5A/359-E** |
| **11 May 2021** |
| **English only** |
| Annex 18 to Working Party 5A Chairman’s Report | |
| technical characteristics and operational PARAMETERS OF the land MOBILE Service for sharing and compatibility studies under WRC-23 agenda item 1.3 | |
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[SWG chair note: This document has captured the status of the discussion in SWG5A-4 on AI 1.3 on the parameters for mobile systems at the closure of the SWG sessions on Wednesday 5th May. This document has NOT been agreed by the SWG]

[Editor’s note: The tables in this working document are based on input contribution 5A/298 (Sweden, Finland) and amended by content of contributions [5A/322](https://www.itu.int/md/R19-WP5A-C-0322/en) (Germany) and [5A/333](https://www.itu.int/md/R19-WP5A-C-0333/en) (Egypt, United Arab Emirates).]

[Editor’s note: The used terminology of some input contributions has been aligned according to RR No. **1.24** to correspond with the discussion on land mobile and mobile systems in WG5A-4.]

The following tables provide technical characteristics of the land mobile service\* along with operational parameters [taking into account the parameters and characteristics of IMT systems/technologies] including beamforming antenna characteristics, as basis for sharing and compatibility studies under WRC-23 AI 1.3.

[Editor’s note: Further consideration may be required on some of the characteristics/parameters below, such as base station output power, channel bandwidth and EIRP. There were views that the rural deployment scenario may needs to be considered as well however other views were presented that this rural scenario is not needed]

*[Editor’s note: Information on unwanted emissions of land stations and mobile stations is needed to conduct compatibility studies with services in adjacent bands, as appropriate]*

*[\*During the consideration of this document some members proposed that technical characteristics of IMT be also added to this element however this view was not shared by others]*

Table 1[[1]](#footnote-1)

land station characteristics/deployment parameters [[2]](#footnote-2)

{*Editor’s note: The used terminology of some input contributions has been aligned with RR No.* ***1.24****.*}

| Contribution | 5A/298+333 | 5A/298+333 | 5A/298+333 | 5A/322 |
| --- | --- | --- | --- | --- |
|  | Urban/suburban macro | Urban small cell (outdoor)/ Micro cell | Indoor  (small cell) | Private networks |
| Cell radius / Deployment density (non-AAS) | Typical cell radius 0.3 km urban / 0.6 km suburban | 1-3 per urban macro cell <1 per suburban macro site | Depending on indoor coverage/ capacity demand | Area limited to an industry premise, depending on indoor QoS requirements |
| Cell radius / Deployment density (AAS) | Typical cell radius 0.4 km urban / 0.8 km suburban (10 BSs/km2 urban / 2.4 BSs/km2 suburban) | 1-3 per urban macro cell <1 per suburban macro site | Depending on indoor coverage/ capacity demand |
| Antenna height | 20 m urban / 25 m suburban | 6 m | 3 m | 3 – 20 m. High deployments only indoor on premise |
| Sectorization | 3 sectors | Single sector | Single sector | single sector (depending on premise, see antenna gain) |
| Downtilt | 10 degrees urban / 6 degrees suburban | n.a. | n.a. | n.a. |
| Frequency reuse | 1 | 1 | 1 | 1 |
| Non-AAS land station antenna pattern | 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: *recommends* 2) | | Recommendation ITU-R F.1336  omni |
| Antenna polarization | Linear/±45 degrees | Linear | Linear | linear |
| Indoor land station deployment | n.a. | n.a. | 100% | Depends on application and can be considered by coordination. Example:  Discrete manufacturing: 100% |
| Indoor land station penetration loss | n.a. | n.a. | Rec. ITU-R P.2109 | 20 dB (3-5 GHz)  (horizontal direction)  P.1238, Table 3 (vertical direction) |
| Below rooftop land station antenna deployment | Urban: 50% Suburban: 0% | 100% | n.a. | 100% (outdoor) or n.a. (indoor) |
| Feeder loss | 3 dB | 3 dB | 3 dB | n.a. |
| Typical channel bandwidth | 40/80 MHz | 40/80 MHz | 40/80 MHz | N/A |
| Maximum land station output power (40/80 MHz) | 49/52 dBm | 24 dBm | 24 dBm | 24 dBm (5/10/20 MHz) |
| Maximum land station non-AAS antenna gain | 18 dBi | 5 dBi | 0 dBi | 0 dBi (sectorized depending on premise) |
| Maximum land station output power/sector (e.i.r.p.) (non-AAS BS) | 64/67 dBm | 29 dBm | 24 dBm | 24 dBm |
| Network loading factor (Average land station activity) | 20%, 50% | 20%, 50% | 20%, 50% | typical setting is up to 70% Uplink/Downlink |
| Average land station power/sector (e.i.r.p.) (non-AAS BS) taking into account activity factor | Use Rec. ITU-R M.2101 | Use Rec. ITU-R M.2101 | Use Rec. ITU-R M.2101 | 21 dBm - 22.4 dBm, depends on deployment |
| TDD / FDD | TDD | TDD | TDD | N/A |
| land station TDD activity factor | 75% | 75% | 75% | N/A |

Table 2[[3]](#footnote-3)

mobile station characteristics and parameters

{*Editor’s note: The used terminology of some input contributions has been aligned with RR 1.24.*}

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Contribution | 5A/298+333 | 5A/298+333 | 5A/298+333 | 5A/322 |
|  | Urban/suburban macro | Urban small cell (outdoor)/ Micro cell | Indoor  (small cell) | Private Networks |
| Indoor mobile station usage | 70% | 70% | 100% | Discrete manufacturing: 100%  Process industry: 10% |
| Indoor mobile station penetration loss | Rec. ITU-R P.2109 | Rec. ITU-R P.2109 | Rec. ITU-R P.2109 | 20 dB (3-5 GHz)  (horizontal direction)  P.1238, Table 3 (vertical direction) |
| mobile station density [for terminals] that are transmitting simultaneously | 3 mobile stations per land station | 3 mobile stations per land station | 3 mobile stations per land station | Limited to industry premise, depending on coverage/ capacity demand |
| mobile station height | Outdoor:1.5 m | Outdoor:1.5 m | 1.5 m | n.a. |
| Maximum mobile station output power | - | - | - | 23 dBm |
| Average mobile station output power | Use transmit power control | Use transmit power control | Use transmit power control | –9 dBm |
| Typical antenna gain for mobile station | −4 dBi | −4 dBi | −4 dBi | –4 dBi |
| Body loss | 4 dB | 4 dB | 4 dB | n/a, mostly machines equipped with transceiver |
| mobile station TDD activity factor | 25% | 25% | 25% | N/A |
| Transmit Power Control |  | | | |
| Power control model | Refer to Recommendation ITU-R M.2101 | | | N/A |
| Maximum mobile station output power, PCMAX | 23 dBm | 23 dBm | 23 dBm | N/A |
| Transmit power (dBm) target value per RB, P0\_PUSCH | −92.2 | −87.2 | −87.2 | N/A |
| Path loss compensation factor, | 0.8 | 0.8 | 0.8 | N/A |

Table 3

Beamforming Antenna Characteristics

{*Editor’s note: The used terminology of some input contributions has been aligned with RR 1.26.*}

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Contribution | | 5A/298+333 | 5A/298+333 | 5A/298+333 |
|  |  | Suburban Macro | Urban Macro | Urban small cell (outdoor)/Micro cell |
| 1 |  |
| 1.1 | Antenna pattern | Refer to Recommendation ITU-R M.2101 | | |
| 1.2 | Element gain (dBi)(Note 1) | 7.1 | 6.4 | 6.4 |
| 1.3 | Horizontal/vertical 3 dB beam width of single element (degree) | 90º for H 54º for V | 90º for H 65º for V | 90º for H 65º for V |
| 1.4 | Horizontal/vertical front‑to‑back ratio (dB) | 30 for both H/V | 30 for both H/V | 30 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 | 0.5 of wavelength for H, 0.9 of wavelength for V | 0.5 of wavelength for H, 0.7 of wavelength for V | 0.5 of wavelength for H, 0.7 of wavelength for V |
| 1.8 | Array Ohmic loss (dB) (Note 1) | 2 | 2 | 2 |
| 1.9 | Conducted power (before Ohmic loss) per antenna element (dBm)(Note 3,4) | 25 | 25 | 16 |
|  |  |  |  |  |
| 1.10 | land station horizontal coverage range (degrees) |  |  |  |
| 1.11 | land station vertical coverage range (degrees)  (Note 5) | 90-100 | 90-120 | 90-120 |
| 1.12 | Mechanical downtilt (degrees) | 6 | 10 | 10 |
| 1.13 | Maximum base station output power/sector (e.i.r.p.) | TBD | TBD | TBD |

Note 1: The element gain in row 1.2 includes the loss given in row 1.8. This means that this parameter is not needed for the calculation of the land station composite antenna gain and e.i.r.p.

Note 2: 8 × 8 means there are 8 vertical and 8 horizontal radiating elements. In the sub-array case, one implementation is 2 vertical radiating elements combined in a 2 × 1 sub-array.

Note 3: The conducted power per element assumes 8 × 8 × 2 elements (i.e. power per H/V polarized element).

Note 4: In sharing studies, the transmit power should be considered for the typical bandwidths in

Note 5: The vertical coverage range is given in global coordinate system, i.e. 90° being at the horizon.

1. The table refers in the first three columns to Report ITU-R M.2292. [↑](#footnote-ref-1)
2. These characteristics and parameters are for land mobile systems including those based on IMT technologies, bearing in mind the scope of the AI in accordance with Resolution 246 (WRC-19). [↑](#footnote-ref-2)
3. The table refers in the first three columns to ITU-R Report M.2292. [↑](#footnote-ref-3)