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| U.S. Radiocommunications SectorFact Sheet |
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| **Document Title:** WORKING DOCUMENT TO SHARING STUDIES UNDER WRC-27 AGENDA ITEM 1.10 |
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| **Purpose/Objective:** To provide additional technical information for modeling FS deployments in the 70/80 GHz bands. |
| **Abstract:** At the last meeting of WP 5C, the meeting progressed its studies towards developing pfd and e.i.r.p. limits for inclusion in Article 21 for the FSS, MSS and BSS to protect terrestrial services in the 70/80 GHz frequency bands. As noted in the “Meeting Report of Working Group 5C-2,” there was a call for input on the working document on sharing studies for AI 1.10 including: (1) the number of satellites visible/for sims and (2) data on elevation angles and real antenna patterns for fixed links. This contribution is limited to providing the information for modeling current and planned fixed service operations in the 70 and 80 GHz bands. |

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| **Radiocommunication Study Groups** |  |
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| WORKING DOCUMENT on sharing studies under wrc-27 agenda item 1.10 |
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# Summary

At the last meeting of Working Party (WP) 5C, the meeting progressed its studies towards developing pfd and e.i.r.p. limits for inclusion in Article **21** for the FSS, MSS and BSS to protect terrestrial services in the 70/80 GHz frequency bands. As noted in the “[Meeting Report of Working Group 5C-2](https://www.itu.int/dms_ties/itu-r/md/23/wp5c/c/R23-WP5C-C-0206%21N02-R1%21MSW-E.docx),” there was a call for input on the working document on sharing studies for AI 1.10 including: (1) the number of satellites visible/for sims and (2) data on elevation angles and real antenna patterns for fixed links. This contribution is limited to providing the information for modeling current and planned fixed service operations in the 70 and 80 GHz bands.

# Elevation Angles

Based on input contributions and discussions to develop representative parameters for FS point-to-point systems at the last meeting of WP 5C, the meeting decided to solicit additional information on the elevation angles to be assumed in the studies. The current options are presented in Table 4 of the working document, illustrated below.

Table 4

**Typical values for FS point-point system parameters in the frequency band 71-76 and 81-86 GHz**

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| **System parameters** | **Typical Value** |
| Channel spacing and receiver noise bandwidth (MHz) | 500 |
| Modulation | 64 to128-QAM |
| Feeder/multiplexer loss (dB) | 0 |
| Antenna gain (dBi)  | 41.5, 45 or 51 |
| Antenna size (m) | 0.2, 0.3 or 0.6 |
| Receiver noise figure (dB) | 8 |
| Antenna height(m)  | 30 |
| Antenna RPE | F.699-8 and F.1245-3 |
| Link length (km)  | 0.4-3 |
| Elevation angle (degree) | [−10 to 10], [−5 to −5], [−4 to 4] |
| Nominal long-term interference power density (dBW/MHz)  | –136 + *I*/*N* |

It is important to note that WP 5C recently compatibility studies in nearby frequencies to evaluate the potential impact of unwanted emissions into EESS (passive) operating in adjacent bands, agreeing to send this draft new Report ITU-R F.[[EESS-PROTECTION](https://www.itu.int/md/R23-SG05-C-0071/en)] to Study Group 5 for approval in its upcoming meeting. In that Report, for studies modelling the elevation angle of fixed service transmissions, the Working Party agreed to the following distributions of FS antenna elevation angles as appropriates cases (baseline) to consider a reasonable representation of practical deployments:

– Case 1: Random uniform distribution between −10° and 10°.

– Case 2: Random gaussian distribution with a mean of 0° and standard deviation of 4.92°, with 0.39% of FS sites having a random uniform distribution of antenna elevation angles between 20° to 30°.

Further, based on the link database in the United States, we find the the elevation angles used by Fixed Service antennas in the E-band are highly concentrated near horizontal (0 deg elevation). 81% of antennas use elevation angles below 1 degree, and 91% are below 3 degrees. The registration data shows 1,855 of 31,772 antennas (5.8%) use an elevation angle above 5 degrees. Between 5-10 degrees includes 1162 antennas (3.7%). In the United States, the Federal Communication Commission (FCC) has agreed to changes to the fixed service rules to allow deployment for smaller, lighter backhaul antennas to facilitate 5G deployments, reducing site costs. The new backhaul links intended for urban deployment are expected to have shorter link lengths, in line with their urban use cases, and require higher elevation angles compared to those currently in operation.

It is important that these service operations be fully protected when establishing new Article **21** provisions in the Radio Regulations. Thus, the same elevation angles used in the DNR F.[EESS-PROTECTION] should equally apply when modelling the protection of fixed service reception as these cases model existing deployment considerations in the United States.

Finally, it is important to note that the antenna height should be taken as “antenna height above ground” noting many deployments cover cities at higher ground elevations (for example, Denver in the United States). The table should be amended accordingly.

**Antenna Patterns**

At the last meeting of WP 5C, a proposal ([5C/170](https://www.itu.int/md/R23-WP5C-C-0170/en)) was received that suggested WP 5C should consider both the antenna patterns provided by Recommendations ITU-R F.699 and ITU-R F.1245, as well as the pattern provided by the Class 3 mask of ETSI EN 302 217-4 in the sharing studies under WRC-27 agenda item 1.10. The main point of contention in the discussion was the difference in the side lobe radiation patterns compared to the existing Recommendations.

As noted in the scope of these recommendations (Recommendations [ITU-R F.1245](https://www.itu.int/rec/R-REC-F.1245/en) and [ITU-R F.699](https://www.itu.int/rec/R-REC-F.699/en) ), they “may be used in interference assessments when particular information concerning the FWS antenna is not available”. Further, as instructed by the Text from the WRC-23 Plenary for the attention of the CPM ([CPM27-1/03](https://www.itu.int/md/R23-CPM27.1-C-0003/en)), “to ensure that the ITU‑R studies relevant to WRC agenda items are based on ITU‑R Recommendations in force, input contributions, real-world measurements where feasible, evaluate realistic sharing scenarios and use real system values and refer to best practices.”

Based on both the recent domestic fixed service regulation[[1]](#footnote-2) changes and real world deployments in the United States, we support the inclusion of the Class 3 mask of ETSI EN 302 217-4 as a baseline antenna pattern in the sharing studies under WRC-27 agenda item 1.10.

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1. FCC Updates Rules in 70/80/90 GHz bands, rel. 1/26/24, available at [link](https://www.fcc.gov/document/fcc-updates-rules-708090-ghz-bands-0). [↑](#footnote-ref-2)