



Antenna and Propagation Measurement for 6G Standardization

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In 6G, the next generation mobile communication system, radio and photonics systems will be converging to enable ultra-high speed communications up to 100 Gbit/sec, where the new THz spectrum should be developed. In World Radiocommunication Conference 2019 (WRC-19), four new frequency bands at 275-296 GHz, 306-313 GHz, 318-333 GHz, and 356-450 GHz are identified as footnote 5.564A for the use of land mobile service applications (LMS) and fixed service applications (FS) [1]. On the other hand, resolution 731 [2] resolved to taking the necessary actions for sharing with other services or protect Earth exploration satellite service (EESS), space research service (SRS), and radio astronomy service (RAS) applications already identified at THz spectrum. After these actions, the frequency bands will be allocated to LMS and FS in the future WRC.

Table 1 listed ITU-R recommendations used in coordination studies and interference assessment together with their applicable frequency ranges. Most of the recommendations are required to be expand their applicable frequency range over 450 GHz. We measured typical antenna patterns from 75 GHz to 500GHz to expand F.699 [3]. Recently indoor propagation studies are undergoing to enhance the propagation data included in P.1238 [4]. In the conference, preliminary coexistence studies between LMS and FS will also be introduced.

Table 1. ITU-R recommendations used for coordination studies and interference assessment.

ITU-R Rec.	Published	Contents	Upper Freq. Limit [GHz]
F.699-8	01/2018	reference radiation patterns for FS antennas	86
F.1245-3	01/2019	mathematical model of average and related radiation patters	86
F.1336-5	01/2019	reference radiation patterns of omnidirectional, sectoral antennas	70
P.620-7	06/2017	propagation data for the evaluation of coordination distances	105
P.1238-10	08/2019	propagation data and prediction method, indoor radiocom. systems	450
P.1410-5	02/2012	prop. data and predict. method, terrestrial broadband radio access	60
P.1411-11	09/2021	prop. data and predict. method, short-range outdoor radiocom.	100
P.2001-4	09/2021	general purpose wide-range terrestrial propagation model	50
P.527-6	09/2021	Electrical characteristics of the surface of the Earth	1000
P.2040-2	09/2021	Effects of building materials and structures on radiowave prop.	100

1. ITU-R, Radio Regulation, Article 5, Edition of 2020, 2020.
2. ITU-R, Resolution 731, Rev.WRC-19, 2019.
3. Recommendation ITU-R F.699-8, “Reference Radiation Patterns for Fixed Wireless System Antennas for Use in Coordination Studies and Interference Assessment in the Frequency Range from 100 MHz to 86 GHz,” 2018.
4. Recommendation ITU-R P.1238-10, “Propagation Data and Prediction Methods for the Planning of Indoor Radiocommunication Systems and Radio Local Area Networks in the Frequency Range 300 MHz to 450 GHz,” 2019.