QUESTION ITU-R 235-1/3

Impact of engineered electromagnetic surfaces on radiowave propagation

(2019-2023)

The ITU Radiocommunication Assembly,

considering

*a)* that engineered electromagnetic surfaces (EEMSs) have the ability to enhance or attenuate the transmission and reception of electromagnetic signals;

*b)* that EEMSs are being developed to extend the communications range, shape the coverage area, and mitigate the risk of interference;

*c)* that EEMSs are expected to be of great importance for future wireless systems and networks particularly international mobile telecommunications (IMT) and wireless local area networks (WLANs);

*d)* that EEMSs can be more cost and energy efficient than the deployment of additional access points or base stations;

*e)* that advances in EEMSs could reduce the demand for additional spectrum for future wireless systems and networks;

*f)* that EEMSs could be deployed predominantly as part of building materials and/or furnishing materials;

*g)* that the presence of EEMSs could modify, to a large extent, the propagation characteristics along the communications path;

*h)* that the electrical properties of surface materials as well as the orientation, design, and structure of the EEMS impact signal reflections and frequency selectivity;

*i)* that the modelling of signal reflections from EEMSs is of great significance for service coexistence and spectrum sharing between radiocommunication services and between service providers;

*j)* that the availability of EEMS databases will facilitate the development of appropriate site-specific propagation models,

noting

*a)* that Recommendation ITU-R P.526 provides guidance on calculation methods for obstacle diffraction effects, including those due to building materials and structures;

*b)* that Recommendation ITU-R P.530 provides propagation data and prediction methods required for the design of terrestrial line-of-sight systems;

*c)* that Recommendation ITU-R P.1238 provides 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;

*d)* that Recommendation ITU-R P.1407 provides information on various aspects of multi-path propagation;

*e)* that Recommendation ITU-R P.1411 provides propagation data and prediction methods for the planning of short-range outdoor radiocommunication systems and radio local area networks in the frequency range 300 MHz to 100 GHz;

*f)* that Recommendation ITU-R P.1812 provides a propagation prediction method for terrestrial point-to-area services in the frequency range 30 MHz to 6 GHz;

*g)* that Recommendation ITU-R P.2040 provides guidance on the effects of building materials and structures on radiowave propagation above about 100 MHz;

*h)* that Recommendation ITU-R P.2109 provides statistical models for building entry loss,

decides that the following Questions should be studied

1 What are suitable methods to describe the detailed characteristics of the EEMSs particularly reflectors and frequency selective structures?

2 Which deterministic and statistically-based methods can be used to model reflection of electromagnetic signals from EEMSs?

3 Which deterministic and statistically-based methods can be used to model propagation of electromagnetic signals through frequency selective EEMSs acting as band-stop or band-pass filters?

4 How do frequency selective EEMSs in buildings impact indoor-to-outdoor and outdoor-to-indoor transmissions and what is the effect on building entry/exit loss?

5 What is the influence of EEMSs such as reflectors and frequency selective surfaces on the transmission loss, diffraction loss, clutter loss, shadowing and polarization, including polarization mismatch loss, delay spread, and angular spread?

6 How can EEMS databases, together with other detailed information of the propagation path be applied to predict signal attenuation, time delay, scatter, diffraction, and other propagation characteristics?

7 In which way does the use of higher frequencies, particularly in the millimetre wave spectrum, impact the modelling of EEMSs (for key parameters such as surface roughness and conductivity)?

further decides

that the results of the above studies should be included in ITU-R Recommendations and/or Reports and that the above studies should be completed by 2027.

Category: S3