FREQUENCY SHARING PROBLEMS AND EMC BETWEEN FWA TERMINALS AND GEOSTATIONARY FSS SATELLITE RECEIVERS IN THE BAND 5725-5825 MHZ

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Abstract:

At present fixed wireless access (FWA) networks are rapidly deploying in Russia and other countries. These systems use the following frequency bands: 2.4-2.5 GHz; 2.5-2.8 GHz, 3.5-3.8 GHz, 5-6 GHz etc. The forecast tells that a number of FWA terminals operating in the 5-6 GHz will be about 40% of all FWA devices. In compliance with the National table of frequency allocations to the radio services in the Russian Federation the band 5725-5825 MHz is shared by Fixed-Satellite Service (FSS) (Earth-to-space) and Fixed service. According to the Frequency allocations table for Region 1 the band of 5725-5825 MHz is shared by Radiolocation, Amateur, Fixed-Satellite and Fixed services. Therefore much attention should be payed to the problem of electromagnetic compatibility between FSS systems and FWA networks. The methodology of the EMC analysis for assessment of interference from FWA transmitters to receivers of geostationary space stations has been developed to solve this problem. This methodology is based on dT/T criterion described in Appendix 8 of the Radio Regulations determining the impact of interference from a large number of FWA devices on receivers of FSS space stations. In this methodology the interference from the FWA terminals into the satellite receivers is treated as an increase in thermal noise in the wanted FSS network and hence is converted to a noise temperature and compared with a threshold defined as a tolerable percentage increases in noise temperature. In Recommendation ITU-R S.1432 for FSS systems below 15 GHz this tolerable threshold is defined as a 6% of the interference allowance for systems operating on a primary basis and 1% in the case of interference from the systems having co-primary status. 3 types of FWA systems (Point-to-Point, Point-to-Multipoint and Multipoint-to-Multipoint) and 2 scenarios (the satellite in question subtends a high elevation angle and low elevation satellites) were considered in this methodology. The reason is that the systems with the directional and undirectional antennas have different interference impacts on FSS systems. The major parameter is a terminal penetration ratio determining a number of FWA devices per million people. Using this parameter it is possible to estimate a maximum number of FWA devices, which can be deployed in the case of ensuring EMC between FSS and FWA networks. According to developed methodology and algorithm, the software for determining

dependence of tolereble FWA terminal penetration ratio on device power, penetration ratio on number of channels and penetration ratio on satellite receiver figure-of-merit has been created. The maximum terminal penetration ratio is strongly depends on geostationary orbit position of space station due to irregular distribution of population on the planet. Therefore on the base of this methodology the software for determining dependence of maximum terminal penetration ratio on satellite orbit position has been developed. The performed analysis has shown that not for all satellite points the situation be good. Therefore, for ensuring EMC it's necessary to make some restrictions on FWA devices. On the base of obtained results the proposals for normative documents concerning EMC and sharing conditions for FWA and FSS systems in the 6 GHz range can be developed.