PART 5C – EFFICIENT USE OF THE RADIO SPECTRUM CHARACTERISTICS AND SHARING OF FREQUENCY RESOURCES

RECOMMENDATION ITU-R M.1183*

PERMISSIBLE LEVELS OF INTERFERENCE IN A DIGITAL CHANNEL OF A GEOSTATIONARY NETWORK IN MOBILE-SATELLITE SERVICE IN 1-3 GHz CAUSED BY OTHER NETWORKS OF THIS SERVICE AND FIXED-SATELLITE SERVICE

(Question ITU-R 83/8)

(1995)

Summary

This Recommendation indicates the permissible levels of interference to a mobile-satellite service (MSS) network from other MSS and fixed-satellite service (FSS) networks. The recommended single entry and aggregate interference levels are expressed by the ratios of interference power level to total noise power level.

The ITU Radiocommunication Assembly,

considering

a) that interference between networks of the MSS and between those of the MSS and FSS degrades the bit-error ratio (BER) performance relative to its value in the absence of such interference;

b) that it is desirable that the allowable degradation in the BER in networks in the MSS caused by transmitters of different networks of MSS and FSS, should be such as to give a reasonable orbit utilization efficiency;

c) that the overall performance of a mobile-satellite network should essentially be under the control of the system operator;

d) that criteria for permissible levels of interference are needed to guide designers and operators of mobile-satellite systems as to the amount of degradation in performance to be accepted as a result of interference from other systems;

e) that a mobile-satellite system can utilize a wide variety of channels to fulfil various communication needs of aircraft, ship or land mobile earth station users, and that the performance characteristics associated with these channels may differ;

f) that it is desirable that the increase in BER due to interference from other satellite networks should be a controlled fraction of the total BER as set out in relevant ITU-R Recommendations on performance objectives of different types of mobile-satellite networks;

g) that because of the small mobile earth station antennas used in the MSS the angle dependent reduction of interference entries may not be significant;

h) that any significant discrimination between mobile-satellite systems would come from the use of satellite spot beam antennas;

j) that mobile-satellite systems are designed to take into account various propagation environments such as multipath fading, shadowing and blocking;

k) that the level of worst case interference from other mobile-satellite systems would correspond to the unfaded condition of the interfering carrier;

l) that the MSS, usually, utilizes the bands allocated to the FSS for its feeder links,

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* This Recommendation should be brought to the attention of Radiocommunication Study Group 4.

recommends

1 that the networks in the MSS operating in the frequency bands between 1-3 GHz, and using geostationary satellites, be designed and operated in such a manner that the total interference power level in a digital channel, caused by the earth station and space station transmitters of all other MSS and FSS geostationary-satellite networks should conform to the following limits:

1.1 in frequency bands in which the MSS network does not practise frequency re-use, the interference power level should not exceed, for more than $(100 - X)$% of any month, 24% of the total noise power at the input to the demodulator which would give rise to the desired performance (see Note 1);

1.2 in frequency bands in which the MSS network practises frequency re-use, the interference power level should not exceed, for more than $(100 - X)$% of any month, 20% of the total noise power at the input to the demodulator that would give rise to the desired performance (see Note 1):

2 that the maximum level of interference power in any such digital channel caused by the transmitters of another mobile-satellite network or fixed-satellite network, should not exceed for more than $(100 - X)$% of any month, 6% of the total noise power at the input to the demodulator which would give rise to the desired performance objectives (see Note 1);

3 that the following Notes should be regarded as part of this Recommendation:

NOTE 1 – X is the percentage time availability, for different types of MSS services, as defined under the relevant ITU-R Recommendation on performance objectives;

NOTE 2 – The values specified in § 1 and 2 apply to simple frequency changing transponders. Further study is needed for the case of regenerative transponders. For the calculation of the interference levels for comparison with those in § 1 it should be assumed that the total noise power at the input to the demodulator is of thermal nature.

NOTE 3 – It is assumed in this Recommendation that interference from other networks is of a continuous nature. Further study is required with respect to cases where interference is not of a continuous nature.

NOTE 4 – In some cases it may be necessary to adopt a different single entry interference value, either higher or lower than the one indicated in § 2 above, but any interference noise power in excess of the value recommended in § 2 should be disregarded in calculating whether the total value recommended in § 1 is exceeded.

NOTE 5 – Taking account of possible increase in the re-uses of the limited service-link spectrum and a consequent increase in the number of interference entries there is a need for an urgent further study on the relationship between the total and single entry interference values quoted in § 1 and 2 above.

NOTE 6 – In cases where interference is caused by transmitters using code division multiple access techniques the interference, referred to in § 2 above, is the composite interference from all transmissions having overlapping spectra in that network.

NOTE 7 – If found feasible and, in the interest of overall spectrum utilization efficiency, the administrations may adopt values higher than those quoted in § 1 for the total interference level.

NOTE 8 – The maximum level of interference noise power should be calculated on the basis of the reference antenna radiation pattern for the applicable type of receiving mobile earth station (if available), except when the actual antenna radiation pattern is known and gives lower interference noise power value, in which case the actual antenna radiation pattern should be used. However, this requires further study.