

RECOMMENDATION ITU-R S.1324

**ANALYTICAL METHOD FOR ESTIMATING INTERFERENCE BETWEEN
NON-GEOSTATIONARY MOBILE-SATELLITE FEEDER LINKS
AND GEOSTATIONARY FIXED-SATELLITE NETWORKS
OPERATING CO-FREQUENCY AND CODIRECTIONALLY**

(Question ITU-R 206/4)

(1997)

The ITU Radiocommunication Assembly,

considering

- a) that the World Radiocommunication Conference (Geneva, 1995) (WRC-95) identified the need to develop, as a matter of urgency, criteria for determining the necessity to coordinate and calculation methods for determining levels of interference, as well as the required protection ratios between networks in the mobile-satellite service (MSS);
- b) that the WRC-95 allocated the frequency bands 19.3-19.6 GHz and 29.1-29.4 GHz for feeder links of non-geostationary-satellite orbit (GSO) networks in MSS in co-direction with GSO fixed-satellite service (FSS) systems;
- c) that WRC-95 Resolution 121 identified the need to undertake, as a matter of urgency, studies to develop coordination methodologies for GSO FSS networks and non-GSO MSS feeder links operating in the bands 19.3-19.6 GHz and 29.1-29.4 GHz on an equal basis;
- d) that there may be a need in general to develop a methodology that could be used to estimate interference between satellite networks;
- e) that the estimation of interference between non-GSO MSS feeder links and GSO FSS systems should be based on the interference power levels not to be exceeded for a specified percentage of time, the frequency of occurrence and the duration of single events,

recognizing

- a) that estimating interference between non-GSO MSS feeder links and GSO FSS systems based on computer methods of simulation features high accuracy of the obtained results but they may require considerable runtime and may not be commonly available;
- b) that interference between non-GSO MSS feeder links and GSO FSS systems may be estimated using time percentage for non-GSO satellites staying within an area into certain discrimination angles from a direction to a GSO satellite in relation to the earth station concerned;
- c) that the time percentage for a specified value of an angle between a GSO satellite and a non-GSO satellite in relation to the earth station concerned may be defined using either simulations or by the analytical method described in Recommendation ITU-R S.1257 or by using other methods,

recommends

- 1 that the method given in Annex 1 may be used for estimating interference between non-GSO MSS feeder links and GSO FSS systems co-frequency operating in the same direction.

ANNEX 1

**Description of analytical method for estimating interference
between non-GSO MSS feeder links and GSO FSS networks
operating co-frequency and codirectionally**

For estimating interference from non-GSO MSS feeder links and GSO FSS systems a criterion is specified according to which:

- interference power spectral density, I_0 , from feeder links of an non-GSO MSS network (in uplink from earth station and in downlink from satellite being a result of feeder link transmissions to and from all the satellites in a constellation) at the input of receiver of a GSO FSS earth station shall not exceed a certain fraction, x , of receiver thermal noise power spectral density, N_0 , within a specified time percentage, $\%t$.

An example of criteria for interference from non-GSO MSS feeder links to GSO FSS receivers given in Table 1 are used in the example in Appendix 1.

TABLE 1

11-14 GHz		
	I_0	t (%)
1	$0.06 N_0$	0.87
2	$0.26 N_0$	0.119
3	N_0	0.029
4	$2.16 N_0$	0.0004

The present method provides an estimation of the time percentage, $\%t$, based on acceptable interference power spectral density, I_0 , without using simulation methods.

For estimating interference between feeder links of non-GSO MSS networks and GSO FSS systems four cases of possible interference effects between earth and space stations of the networks discussed are analysed. They are:

Case 1: emissions from non-GSO MSS feeder-link earth stations interfering into GSO FSS receiving space stations (see Fig. 1).

Case 2: emissions from non-GSO MSS feeder-link space stations interfering into GSO FSS receiving earth stations (see Fig. 2).

Case 3: emissions from GSO FSS earth stations interfering into non-GSO MSS feeder-link receiving space stations (see Fig. 3).

Case 4: emissions from GSO FSS space stations interfering into non-GSO MSS feeder-link receiving earth stations (see Fig. 4).