

QUESTION ITU-R 208/4

Use of statistical and stochastic methods in evaluation of interference between satellite networks in the fixed-satellite service

(1993)

The ITU Radiocommunication Assembly,

considering

- a) that the density of satellites in the geostationary-satellite orbit (GSO) is governed by the interference deemed to be acceptable to each network;
- b) that the computation of interference is currently performed by deterministic methods which, in general, assume worst-case conditions in order to avoid unacceptable levels in all cases;
- c) that this approach sometimes leads to unduly conservative estimates, resulting in inefficient use of orbit capacity;
- d) that many of the technical characteristics of satellite networks which affect performance and orbit spectrum/utilization have random effects which are either stochastic (time varying) or statistical (time invariant);
- e) that there are stochastic/statistical elements in the interference environment, including *inter alia* satellite and earth-station antenna side-lobe gains, earth-station locations, satellite station-keeping tolerances, satellite network parameters, transponder frequency plans, aggregate-to-single entry interference ratios;
- f) that such stochastic/statistical elements may be represented by random parameters which vary with time, with space or with operational circumstances, and are in most cases variables which are independent of each other;
- g) that mathematical techniques exist by which the joint probability density function for interference may be computed in any given case;
- h) that the use of such mathematical techniques would often lead to a less conservative estimate of interference but nevertheless ensure the required degree of protection to coordinating parties;
- j) that increased use of statistical and stochastic properties of GSO satellite network characteristics may facilitate coordination;
- k) that, whilst stochastic/statistical techniques would be useful in coordination exercises, there may be risks in embodying them in the determination of the need to coordinate;
- l) that non-GSO satellites (particularly Low Earth Orbit) can also operate in the fixed-satellite service;
- m) that interference between non-GSO satellite networks and between non-GSO and GSO networks may have pseudo-random characteristics,

decides that the following Question should be studied

- 1 What elements in the calculation of inter-network interference are of a stochastic or statistical nature?

- 2 What is the independent parameter for each of the random elements, and what is the mathematical nature of the statistical variability?
- 3 How should these random variables be combined to yield overall probability density functions for the interference?
- 4 What confidence limits or similar criteria should be used to quantify acceptable interference in terms of the overall probability density functions?
- 5 To what extent would the usable capacity of the GSO be increased by the application of the stochastic and statistical approaches relative to the deterministic approach?

further decides

- 1 that the results of these studies should lead to an appropriate Recommendation by 2006.
