QUESTION ITU-R 208/4[[1]](#footnote-1)\*

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 initial computation of interference is currently performed using 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 for affected parties;

*i)* that increased use of statistical and stochastic properties of GSO satellite network characteristics may facilitate coordination;

*j)* 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;

*k)* that non-GSO satellites (particularly Low Earth Orbit) can also operate in the fixed-satellite service;

*l)* that interference between non-GSO satellite systems and between non-GSO systems and GSO networks may have pseudo-random characteristics,

decides that the following Questions 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 the above studies should be included in appropriate Recommendations and/or Reports;

2 that the above studies should be completed by 2027.

Category: S3

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1. \* Radiocommunication Study Group 4 made editorial amendments to this Question in the year 2023 in accordance with Resolution ITU-R 1. [↑](#footnote-ref-1)