

RECOMMENDATION ITU-R S.1524

**Coordination identification between geostationary-satellite orbit
fixed-satellite service networks**

(2001)

The ITU Radiocommunication Assembly,

considering

- a) that the Plenipotentiary Conference (Minneapolis, 1998) agreed, through Resolution 86, on the need for improved coordination and notification of satellite networks;
- b) that there is a need to accelerate the identification of geostationary-satellite orbit fixed-satellite service (GSO FSS) networks with which coordination is required;
- c) that simple methods are needed for identifying the necessary co-frequency GSO FSS networks with which coordination must take place and which can be used in fulfilment of the objectives of Resolution 86;
- d) that typical network characteristics of 6/4 GHz, 13-14/11-12 GHz and 30/20 GHz GSO FSS networks are well known;
- e) that in many parts of the GSO co-frequency FSS networks in bands identified in *considering* d) above are closely spaced with overlapping beams;
- f) that the operators of such networks have extensive experience in coordinating satellite systems with other co-frequency satellite systems;
- g) that where applicable, the off-axis equivalent isotropically radiated power (e.i.r.p.) density recommended maximum levels on GSO FSS earth stations toward an adjacent GSO FSS network and power flux-density limits on GSO FSS space stations at the surface of the Earth are among the most important technical parameters used in defining orbital separation;
- h) that a coordination arc can be defined around a given network such that interference between that network and networks outside that arc may typically be considered negligible compared to the interference from networks within that arc;
- j) that network parameters developed to accommodate networks within the coordination arc would likely help to accommodate networks at greater orbital spacing;
- k) that the coordination arc, by itself, may not be sufficient in some cases to identify all networks which might cause interference to or receive interference from a new network;
- l) that the World Radiocommunication Conference (Istanbul, 2000) adopted Resolution 55 (WRC-2000) to bring into effect temporary procedures for improving satellite network coordination, including modifications to Articles 9, 11 and Table 5-1 of Appendix 5 of the Radio Regulations (RR),

recommends

1 that determination of the need for coordination between GSO FSS networks should be based on coordination arcs of $\pm 10^\circ$, in the bands 3 400-4 200 MHz, 5 725-5 850 MHz (Region 1) and 5 850-6 725 MHz, $\pm 9^\circ$ in the bands 10.95-11.2 GHz, 11.45-11.7 GHz, 11.7-12.2 GHz (Region 2), 12.2-12.5 GHz (Region 3), 12.5-12.75 GHz (Regions 1 and 3), 12.7-12.75 GHz (Region 2), and 13.75-14.5 GHz, and $\pm 8^\circ$ in the bands 17.7-20.2 GHz and 27.5-30 GHz about the nominal orbital positions of those networks;

2 that, although the full RR Appendix 4 data must still be provided, the information in Annex 1 is sufficient, and should be used, for determining whether the threshold coordination arc conditions defined in *recommends* 1 are exceeded for a co-frequency GSO FSS network;

3 that an administration, on its own initiative or with the assistance of the Radiocommunication Bureau (BR) in application of No. 9.41 and other relevant provisions of the RR (e.q. No. 13.1), may request that a co-frequency GSO FSS satellite network outside the coordination arc be included in coordination when the administration can demonstrate by analysis that the increase in the system noise due to the proposed network exceeds 6%;

4 that the administration filing the request for coordination, on its own initiative or with the assistance of the BR in application of No. 9.41 and other relevant provisions of the RR (e.q. No. 13.1), may request that a co-frequency GSO FSS satellite network within the coordination arc be excluded from the coordination when the filing administration can demonstrate by analysis that the increase in system noise to the network, within the coordination arc due to the proposed network, is less than 6%. This is to be confirmed by the BR which will inform the concerned administrations.

NOTE 1 – In order to implement *recommends* 3 and 4, the relevant RR Appendix 4 data should be used.

NOTE 2 – The coordination arc should apply to coordination only between satellite networks in the FSS using the GSO and operating in the same direction of transmission.

NOTE 3 – The bases for the values in *recommends* 1 are given in Annex 2.

NOTE 4 – In other FSS bands than those listed in *recommends* 1 and those covered by RR Appendix 30B, $\Delta T/T$ of 6% would continue to apply.

ANNEX 1

Information required for identification of administrations and satellite networks based on GSO coordination arcs

- A.1.a: Identity of satellite network
- A.1.f: Country symbol of the notifying administration
- A.3: Operating administration or agency
- A.4.a.1: Nominal geographic longitude of the space station on the GSO
- C.2.a: Assigned frequency
- C.3.a: Assigned frequency band.

NOTE 1 – All information required for identification of administrations and satellite networks based on GSO coordination arcs is also required in RR Appendix 4 for notification or coordination of a GSO network. Accordingly the RR Appendix 4 item numbers are provided.

ANNEX 2

Coordination identification between GSO FSS networks**1 Introduction**

This Annex deals with the appropriate coordination arc which may be adopted for identifying the need for coordination between GSO FSS networks in the bands 6/4 GHz, 13-14/11-12 GHz, and 30/20 GHz. The objective of the calculation is to define an orbital separation angle, α , beyond which the increase in noise temperature of the network subject to interference will not exceed 6%. Coordination would be required when a GSO network is within $\pm\alpha^\circ$ from the proposed network.

The approach used is to examine the excess interference in typical FSS systems caused by other typical FSS systems at varying angular separations, and assessing the resultant risk created by not coordinating the two networks at the separation value.

2 Results of studies**2.1 Methodology and assumptions**

The methodology used to calculate the separation angle between two GSO FSS networks is described below:

- First, the total carrier to noise + interference ratio ($C/(N + I)$) is calculated for the interfered with system.
- The aggregate interference from other GSO networks into the wanted system is set at 20% of the total system noise.
- The single-entry interference from one GSO network is 6% of the total system noise and allocated equally between the uplink and the downlink direction. Generally, the interference in a link is dominated by the contribution of interference from one direction rather than the other. Thus, this assumption will give a larger separation angle than that in a case of treating each link direction separately with the full 6% allowable interference allocated for each direction.
- The antenna pattern of the receiving earth station is assumed to comply with $29-25 \log \phi$.
- For the uplink direction, the interfering transmitting earth station is assumed to be located at the wanted satellite maximum gain direction and the path losses are assumed to be the same for both the wanted and the interfering direction. The required separation angle will then be determined from the off-axis e.i.r.p. density radiation pattern of the interfering transmitting earth station.
- For the downlink direction, the interfering receiving earth station is assumed to be collocated with the wanted earth station. The required separation angle will then be determined from the interfering satellite e.i.r.p. density and the receiving antenna pattern of the interfered earth station.