

RECOMMENDATION ITU-R S.465-5*

**Reference earth-station radiation pattern for use in coordination
and interference assessment in the frequency range
from 2 to about 30 GHz**

(1970-1974-1986-1990-1992-1993)

The ITU Radiocommunication Assembly,

considering

- a) that, for coordination studies and for the assessment of mutual interference between radiocommunication-satellite systems and between earth stations of such systems and stations of other services sharing the same frequency band, it may be necessary to use a single radiation pattern for the earth-station antenna;
- b) that, for the determination of coordination distance and for the assessment of interference between earth and terrestrial stations, a radiation pattern based on the level exceeded by a small percentage of the side-lobe peaks may be appropriate;
- c) that, for coordination studies and for the assessment of interference between earth stations and space stations, a radiation pattern for the region near the main beam based on the envelope of the peak power of the side lobes in this region may be appropriate;
- d) that, at angles relative to the axis of the main beam where effects peculiar to the particular feed system used do not contribute appreciably to the power in the side lobes, the radiation patterns for numerous existing earth-station antennas show only moderate scatter about a simple generalized radiation pattern, at least within the frequency range 2-30 GHz;
- e) that, for systems of the Cassegrain type over the range of angles relative to the axis of the main beam where contributions to the side-lobe power occur primarily as a result of spill-over, the patterns of a number of existing antennas also show reasonable agreement;
- f) that, at large angles, the likelihood of local ground reflections must be considered;
- g) that the use of antennas with the best achievable radiation patterns will lead to the most efficient use of the radio-frequency spectrum and the geostationary-satellite orbit,

recommends

1 that, in the absence of particular information concerning the radiation pattern of the antenna for the earth station involved, a single reference radiation pattern should be used for:

1.1 coordination studies and interference assessment between earth stations in the fixed-satellite service and stations of other services sharing the same frequency band;

* Radiocommunication Study Group 4 made editorial amendments to this Recommendation in 2001 in accordance with Resolution ITU-R 44 (RA-2000).

1.2 coordination studies and interference assessment between systems in the fixed-satellite service;

2 that subject to Notes 4 and 5, the following reference radiation patterns should be adopted for angles between the direction considered and the axis of the main beam at least for frequencies in the range 2-30 GHz:

$$\begin{aligned} G &= 32 - 25 \log \varphi && \text{dBi} && \text{for } \varphi_{min} \leq \varphi < 48^\circ \\ &= -10 && \text{dBi} && \text{for } 48^\circ \leq \varphi \leq 180^\circ \end{aligned}$$

where $\varphi_{min} = 1^\circ$ or $100 \lambda/D$ degrees, whichever is the greater.

NOTE 1 – The reference radiation pattern should be assumed to be rotationally symmetrical.

NOTE 2 – The reference radiation pattern should be used with caution over the range of angles for which the particular feed system may give rise to relatively high levels of spill-over, and for antennas with D/λ less than 50.

NOTE 3 – For the purpose of determining the maximum permissible levels of interference in Recommendations ITU-R S.466, ITU-R S.483, ITU-R S.523 and ITU-R S.735, receiving earth-station antenna reference patterns no worse than stated in those Recommendations should apply.

NOTE 4 – For earth-station antennas with $D/\lambda \leq 100$ in networks coordinated prior to 1993, the following reference radiation pattern shall apply:

$$\begin{aligned} G &= 52 - 10 \log (D/\lambda) - 25 \log \varphi && \text{dBi} && \text{for } (100 \lambda/D)^\circ \leq \varphi < 48^\circ \\ &= 10 - 10 \log (D/\lambda) && \text{dBi} && \text{for } 48^\circ \leq \varphi \leq 180^\circ \end{aligned}$$

NOTE 5 – For the coordination of new earth station receiving antennas with $D/\lambda < 100$, φ_{min} should be the lesser value of $100 \lambda/D$ or x° . A provisional value of 1° to 2.5° has been suggested for x . Further study is required to determine the final value of x within this range.
