



Recommendation ITU-R S.465-6
(01/2010)

**Reference radiation pattern for earth station
antennas in the fixed-satellite service for
use in coordination and interference
assessment in the frequency range
from 2 to 31 GHz**

S Series
Fixed-satellite service

Foreword

The role of the Radiocommunication Sector is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including satellite services, and carry out studies without limit of frequency range on the basis of which Recommendations are adopted.

The regulatory and policy functions of the Radiocommunication Sector are performed by World and Regional Radiocommunication Conferences and Radiocommunication Assemblies supported by Study Groups.

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Series of ITU-R Recommendations

(Also available online at <http://www.itu.int/publ/R-REC/en>)

Series	Title
BO	Satellite delivery
BR	Recording for production, archival and play-out; film for television
BS	Broadcasting service (sound)
BT	Broadcasting service (television)
F	Fixed service
M	Mobile, radiodetermination, amateur and related satellite services
P	Radiowave propagation
RA	Radio astronomy
RS	Remote sensing systems
S	Fixed-satellite service
SA	Space applications and meteorology
SF	Frequency sharing and coordination between fixed-satellite and fixed service systems
SM	Spectrum management
SNG	Satellite news gathering
TF	Time signals and frequency standards emissions
V	Vocabulary and related subjects

Note: This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.

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RECOMMENDATION ITU-R S.465-6

Reference radiation pattern of earth station antennas in the fixed-satellite service for use in coordination and interference assessment in the frequency range from 2 to 31 GHz

(1970-1974-1986-1990-1992-1993-2010)

Scope

This Recommendation provides reference radiation patterns that are assumed to be rotationally symmetric about the boresight axis and that, in the absence of particular information concerning the radiation pattern of an earth station antenna, should be used for coordination studies and interference assessment between earth stations in the fixed-satellite service (FSS) and stations of other services sharing the same frequency band as well as coordination studies and interference assessment between systems in the FSS.

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, within the frequency range from 2 to 31 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 FSS and stations of other services sharing the same frequency band;

1.2 coordination studies and interference assessment between systems in the FSS;

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 for frequencies in the range from 2 to 31 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:

$$\varphi_{min} = 1^\circ \text{ or } 100 \lambda/D \text{ degrees, whichever is the greater, for } D/\lambda \geq 50.$$

$$\varphi_{min} = 2^\circ \text{ or } 114 (D/\lambda)^{-1.09} \text{ degrees, whichever is the greater, for } D/\lambda < 50.$$

3 that the following Notes should be considered as part of this Recommendation:

NOTE 1 – The reference radiation pattern is assumed to be rotationally symmetric about the boresight axis.

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.

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 applies:

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

NOTE 5 – For the coordination of earth station receiving antennas with $D/\lambda < 33.3$, other than those referred to in Note 4 above, a value of 2.5° should be used for φ_{min} .
