



Recommendation ITU-R BO.2063-0
(09/2014)

**Alternative BSS earth station antenna
radiation pattern for 12 GHz BSS bands
with effective apertures
in the range 55-75 cm**

BO Series
Satellite delivery

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

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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 BO.2063-0

Alternative BSS earth station antenna radiation pattern for 12 GHz BSS bands with effective apertures in the range 55-75 cm

(2014)

Scope

The purpose of this Recommendation is to provide an alternative antenna pattern for broadcasting-satellite service (BSS) receiving earth stations with effective apertures in the range 55-75 cm. This alternative pattern is based on relative gain (dB) and has improved co-polar side lobe suppression (especially in the 2.5°-9° off-axis angular range) and better cross-polar discrimination as compared to the existing reference antenna pattern in Recommendation ITU-R BO.1213, which is based on absolute gain. The alternative pattern could be used for bilateral/multilateral negotiations of new or modified assignments in the Region 2 Plan or Regions 1 and 3 List of additional uses.

Keywords

BSS; earth station; antenna pattern; 12 GHz.

Related ITU Recommendations, Reports

Recommendation ITU-R BO.652-1	Reference patterns for earth-station and satellite antennas for the broadcasting satellite service in the 12 GHz band and for the associated feeder links in the 14 GHz and 17 GHz bands
Recommendation ITU-R BO.1213-1	Reference receiving earth station antenna pattern for the broadcasting-satellite service in the 11.7-12.75 GHz band
Recommendation ITU-R S.1717-0	Electronic data file format for earth station antenna patterns

The ITU Radiocommunication Assembly,

considering

- a) that Resolution **86 (Rev. WRC-07)** of the World Radiocommunication Conference (Geneva, 2007) invites ITU-R and administrations to study possibilities to facilitate the rational, efficient, and economical use of radio frequencies and any associated orbits, including the GSO and the related appendices of the Radio Regulations to reflect the latest technologies, as far as possible;
- b) that the planning of the broadcasting-satellite service (BSS) in the 11.7-12.5 GHz band for Region 1 and in the 11.7-12.2 GHz for Region 3 is based on a radiation pattern of a 60 cm receiving antenna (WRC-2000) having circular polarization that could be used for intra-regional and inter-regional coordination purposes with BSS and other services systems using linear polarization;
- c) that the use of a radiation pattern with improved discrimination for BSS earth station antennas will contribute to more space on the GSO for new assignments in the Regions 1 and 3 List of additional uses;
- d) that the Region 2 BSS Plan is based on an earth station diameter of 1 metre with the relative gain reference radiation pattern for receiving earth stations antennas having comparatively narrower half power beamwidth and steeper slopes allowing comparatively closer location of the GSO positions and use of various antenna design options;

- e) that available measured radiation patterns of 12 GHz band elliptical antenna with antenna major axis length of 70 cm on the plane parallel to the GSO orbit and antenna minor axis length of 50 cm on the plane perpendicular to the GSO orbit demonstrate improvement of the co-polar and cross-polar discrimination compared to the Recommendation ITU-R BO.1213 radiation pattern for a 60 cm circular antenna, which is a consequence of improved antenna technologies and design;
- f) that it would be useful to have an alternative antenna radiation pattern for BSS earth stations in the assessment of interference impact of new or modified assignments in the Region 2 Plan or Regions 1 and 3 List of additional uses;
- g) that the use of antennas which comply with an alternative mask with improved discrimination could contribute to the efficient use of the radio-frequency spectrum and the GSO,

recognizing

- a) that the adoption of an alternative BSS earth station antenna radiation pattern with improved side lobe discrimination as compared to Recommendation ITU-R BO.1213 could motivate antenna manufacturers to make BSS receiving antennas based on this new alternative radiation pattern;
- b) that there is no intention to replace the existing reference antenna pattern in Recommendation ITU-R BO.1213, which has been extensively used in the Plan and in the List, with any recently developed reference antenna pattern;
- c) that the adoption of such alternative BSS earth station antenna radiation pattern with improved side lobe discrimination does not prevent the use of other antenna patterns in BSS systems negotiations between administrations,

noting

that the main lobe of BSS receiving earth stations antenna radiation patterns is described by the quadratic dependence in Recommendation ITU-R BO.652-1,

recommends

that the alternative BSS earth station antenna radiation pattern in Annex 1 may be used, under certain circumstances, in bilateral/multilateral negotiations and interference impact assessment of new or modified assignments in the Region 2 Plan or Regions 1 and 3 List of additional uses without having any regulatory impact on the application of relevant provisions of RR Appendix **30**, as emphasized in *recognizing b)* above.

NOTE – This Recommendation applies to antennas with an effective antenna aperture ranging from 55 cm to 75 cm. (For small antennas less than 55 cm, it is difficult to obtain improved radiation characteristics. For large antennas greater than 75 cm, there is no need for a special design to obtain an improved radiation pattern as compared to Recommendation ITU-R BO.1213.)

Annex 1

Alternative BSS earth station antenna radiation pattern

Antenna pattern formulae:

ϕ_0 is the half power antenna beam width; $\phi_0 = 70(\lambda/D)$, where λ is wavelength and D is the antenna dimension in the plane in which the beam width is defined (e.g. along the GSO arc).

Co-polar component (dB relative to main beam gain)

$-12 (\phi / \phi_0)^2$	for	$0 \leq \phi \leq 0.9 \phi_0$
$-(14 + 93.5 \log (\phi / \phi_0))$	for	$0.9 \phi_0 < \phi \leq 1.23 \phi_0$
-22.5	for	$1.23 \phi_0 < \phi \leq 1.32 \phi_0$
$-(19.5 + 25 \log (\phi / \phi_0))$	for	$1.32 \phi_0 < \phi \leq 8 \phi_0$
-42	for	$8 \phi_0 < \phi$

Cross-polar component (dB relative to main beam gain)

-26	for	$0 \leq \phi \leq 0.25 \phi_0$
$-(16.6 - 15.6 \log (\phi / \phi_0))$	for	$0.25 \phi_0 < \phi \leq 0.45 \phi_0$
-22	for	$0.45 \phi_0 < \phi \leq 0.9 \phi_0$
$-(24.65 + 57.7 \log (\phi / \phi_0))$	for	$0.9 \phi_0 < \phi \leq 1.23 \phi_0$
$-(27.7 + 23.75 \log (\phi / \phi_0))$	for	$1.23 \phi_0 < \phi \leq 4 \phi_0$
-42	for	$4 \phi_0 < \phi$

Example:

The alternative BSS earth station antenna radiation pattern with $D = 0.7$ m is given in Fig. 1.

