RECOMMENDATION ITU-R BO.1296

REFERENCE RECEIVE SPACE STATION ANTENNA PATTERNS FOR PLANNING PURPOSES TO BE USED FOR ELLIPTICAL BEAMS IN THE REVISION OF THE APPENDIX 30A (Orb-88) PLANS OF THE RADIO REGULATIONS AT 14 GHz AND 17 GHz IN REGIONS 1 AND 3

(Question ITU-R 218/11)

(1997)

The ITU Radiocommunication Assembly,

considering

a) that Resolution 531 (WRC-95) (World Radiocommunication Conference (Geneva, 1995)) invites the ITU-R to study the possibilities to improve the efficiency of the Appendix 30A (Orb-88) Plans of the Radio Regulations (RR) by taking due account of the technological progress;

b) that for the feeder link of the broadcasting-satellite service planning purposes a simple receive space station antenna reference pattern is necessary;

c) that the existing RR Appendix 30A (Orb-88) Regions 1 and 3 receive space station antenna patterns are no longer appropriate due to technological improvements;

d) that measured data in support of an improved receive antenna reference pattern is available;

e) that the use of antennas with the best achievable radiation pattern will lead to the most efficient use of the radio-spectrum and the geostationary-satellite orbit,

recognizing

1 that the adoption of improved reference receive space station antenna patterns for planning purposes does not prevent the use of other antennas that have been coordinated or will be coordinated in the future on the basis of different patterns;

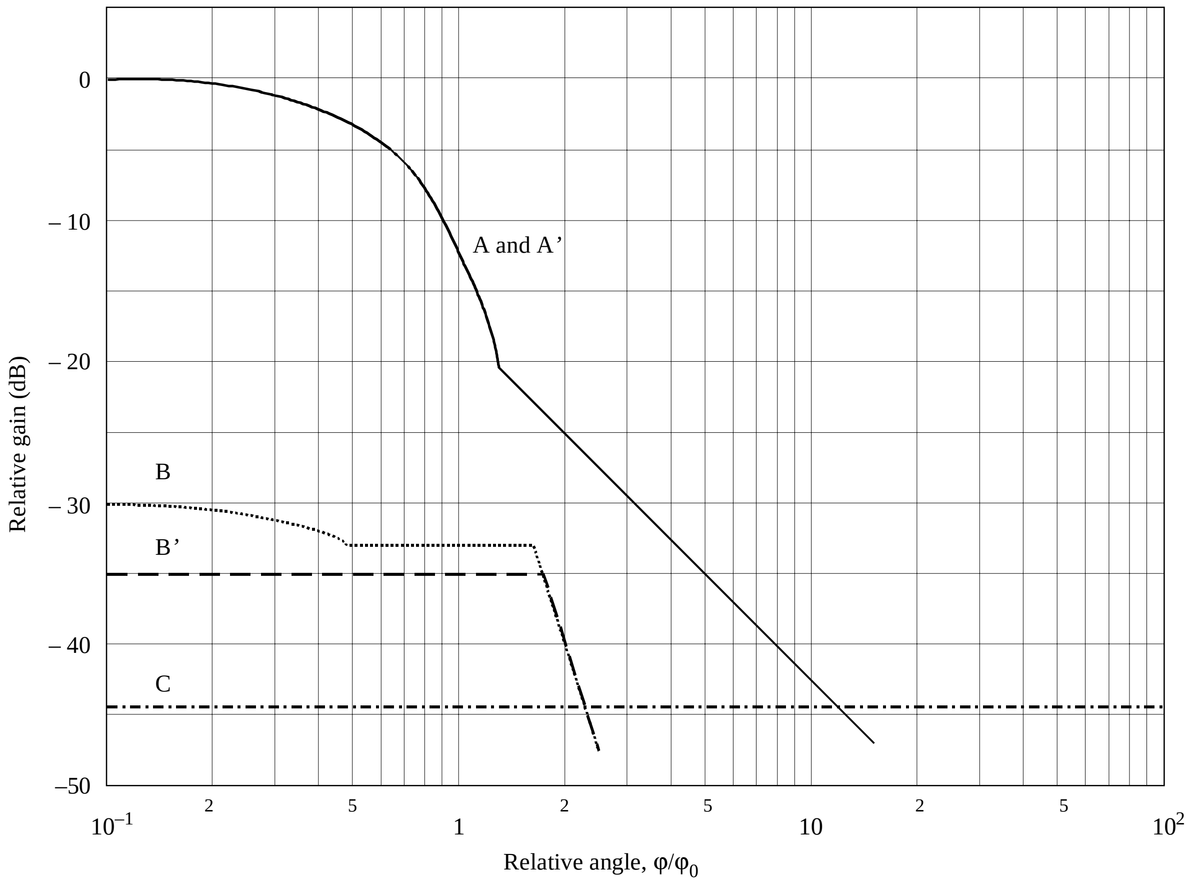
2 that these patterns may become part of the Plan,

recommends

1 the use of the circularly polarized reference antenna co-polar and cross-polar patterns given in Fig. 1 together with their associated formulae provided in Annex 1, for elliptical beams for planning purposes in the revision of the RR Appendix 30A (Orb-88) Plans in Regions 1 and 3.

FIGURE 1

Receiving space station circularly polarized antenna co-polar and cross-polar reference patterns for elliptical beams



Curves A’: new receive space station Co-polar (same as Curve A*, Fig.B, RR Appendix 30A (Orb-88) Regions 1 and 3)

B’: new receive space station cross-polar

C: curve C (minus the on-axis gain)

B*: Fig.B, RR Appendix 30A (Orb-88), Regions 1 and 3, cross-polar

* Curves included for information only.

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ANNEX 1

Formulae associated to the curves of Fig. 1

Curve A′: co-polar relative gain (dB):

$G = -12\ (\varphi/\varphi_0)^2$ for $0 \leq \varphi/\varphi_0 < 1.3$

$G = -17.5 - 25 \log (\varphi/\varphi_0)$ for $1.3 \leq \varphi/\varphi_0$

After intersection with Curve C, as Curve C.

Curve B′: cross-polar relative gain (dB):

$G = -35$ for $0 \leq \varphi/\varphi_0 < 1.75$

$G = -40 - 40 \log (\varphi/\varphi_0 - 1)$ for $1.75 \leq \varphi/\varphi_0$

After intersection with Curve C, as Curve C.

Curve C: minus the on-axis gain (Curve C in the above figure illustrates the particular case of an antenna with an on-axis gain of 44.44 dBi),

where:

φ: off-axis angle (degrees)

φ_0: cross-sectional half-power beamwidth in the direction of interest (degrees).

The relationship between the maximum gain of an antenna and the half-power beamwidth can be derived from the expression:

$$G_{max} \text{ (dB)} = 44.44 - 10 \log a - 10 \log b$$

where a and b are the angles (degrees) subtended at the satellite by the major and minor axes of the elliptical cross-section of the beam.