

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**

(Question ITU-R 73/6)

(1995-2005)

Scope

This Recommendation intends to establish reference earth station co-polar and cross-polar antenna patterns for the broadcasting-satellite service (BSS) in the 11.7-12.75 GHz band.

The ITU Radiocommunication Assembly,

considering

- a) that a common reference antenna pattern was used at WRC-97 and WRC-2000 for revising the Regions 1 and 3 broadcasting-satellite service (BSS) Plan;
- b) that this same reference antenna pattern was used at WRC-03 for revising the inter and intraregional/inter- and intraservice sharing criteria contained in Appendix 30 of the Radio Regulations (RR);
- c) that data from measurements of BSS receiving antennas support this same reference antenna pattern¹;
- d) that this same reference antenna pattern may be useful for interservice sharing between the BSS and other services and for other coordination purposes,

recommends

- 1** that the co-polar and cross-polar antenna patterns given by formulae provided in Annex 1 should be recognized as reference earth station antenna patterns for the BSS in the 11.7-12.75 GHz band.

¹ It should be noted that the antenna measurements were performed on single-feed antennas.

Annex 1

Antenna pattern formulae:

These formulae are valid for $D/\lambda \geq 11$:

Co-polar pattern:

$$G_{co}(\varphi) = G_{max} - 2.5 \times 10^{-3} \left(\frac{D}{\lambda} \varphi \right)^2 \quad \text{for } 0 \leq \varphi < \varphi_m$$

where:

$$\varphi_m = \frac{\lambda}{D} \sqrt{\frac{G_{max} - G_1}{0.0025}}$$

$$G_{max} = 10 \log \left(\eta \left(\frac{\pi D}{\lambda} \right)^2 \right)$$

$$G_1 = 29 - 25 \log \varphi_r, \text{ and } \varphi_r = 95 \frac{\lambda}{D}$$

$$G_{co}(\varphi) = G_1$$

$$\text{for } \varphi_m \leq \varphi < \varphi_r$$

$$G_{co}(\varphi) = 29 - 25 \log \varphi$$

$$\text{for } \varphi_r \leq \varphi < \varphi_b \quad \text{where } \varphi_b = 10^{(34/25)}$$

$$G_{co}(\varphi) = -5 \text{ dBi}$$

$$\text{for } \varphi_b \leq \varphi < 70^\circ$$

$$G_{co}(\varphi) = 0 \text{ dBi}$$

$$\text{for } 70^\circ \leq \varphi < 180^\circ$$

Cross-polar pattern:

$$G_{cross}(\varphi) = G_{max} - 25$$

$$\text{for } 0 \leq \varphi < 0.25 \varphi_0$$

$$\text{where } \varphi_0 = 2 \frac{\lambda}{D} \sqrt{\frac{3}{0.0025}}$$

$$= 3 \text{ dB beamwidth}$$

$$G_{cross}(\varphi) = G_{max} - 25 + 8 \left(\frac{\varphi - 0.25 \varphi_0}{0.19 \varphi_0} \right)$$

$$\text{for } 0.25 \varphi_0 \leq \varphi < 0.44 \varphi_0$$

$$G_{cross}(\varphi) = G_{max} - 17$$

$$\text{for } 0.44 \varphi_0 \leq \varphi < \varphi_0$$

$$G_{cross}(\varphi) = G_{max} - 17 + C \left| \frac{\varphi - \varphi_0}{\varphi_1 - \varphi_0} \right|$$

$$\text{for } \varphi_0 \leq \varphi < \varphi_1 \text{ where } \varphi_1 = \frac{\varphi_0}{2} \sqrt{10.1875}$$

$$\text{and } C = 21 - 25 \log(\varphi_1) - (G_{max} - 17)^*$$

$$G_{cross}(\varphi) = 21 - 25 \log \varphi$$

$$\text{for } \varphi_1 \leq \varphi < \varphi_2 \quad \text{where } \varphi_2 = 10^{(26/25)}$$

$$G_{cross}(\varphi) = -5 \text{ dBi}$$

$$\text{for } \varphi_2 \leq \varphi < 70^\circ$$

$$G_{cross}(\varphi) = 0 \text{ dBi}$$

$$\text{for } 70^\circ \leq \varphi < 180^\circ$$

* The value of C must be less than 0 for any combination of antenna efficiency (η) and D/λ .