

## RECOMMENDATION ITU-R BO.1658

**Continuous curves of  $\text{epfd}_{\downarrow}$  versus the geostationary broadcasting-satellite service earth station antenna diameter to indicate the protection afforded by systems complying with the limits of antennas with diameters other than those in Article 22 of the Radio Regulations**

(Resolution 137 (WRC-2000))

(2003)

The ITU Radiocommunication Assembly,

*considering*

- a) that the 11.7-12.75 GHz frequency band is available to GSO systems in the BSS and non-GSO systems in the FSS;
- b) that earth stations in the BSS employing satellites in GSO orbits need to be protected from unacceptable interference by satellites in non-GSO orbits transmitting in the shared frequency bands;
- c) that in order to provide the requisite protection from such interference, WRC-2000 adopted validation single-entry limits on the maximum permissible equivalent power flux densities ( $\text{epfd}$ 's) which satellites in non-GSO orbits may radiate in some frequency bands, for certain specified earth station antenna diameters;
- d) that the Radiocommunication Bureau will certify compliance with the maximum permissible  $\text{epfd}_{\downarrow}$  validation limits only for those earth station antenna diameters specified in Article 22 of the Radio Regulations (RR);
- e) that, as indicated in Resolution 137 (WRC-2000), there is a need for operators to be able to assess the level of interference generated by a non-GSO system meeting the  $\text{epfd}_{\downarrow}$  limits for earth station antennas with diameters other than those specified in RR Article 22,

*recommends*

- 1 that the methodology in Annex 1 should be used within the specified context, for the guidance of designers of GSO BSS links on the maximum expected  $\text{epfd}$  levels for earth station antenna diameters other than those specified in RR Article 22 (see Notes 1, 2 and 3).

NOTE 1 – It is emphasised that the continuous curves, as a function of antenna diameter, are strictly in reference to single-entry regulatory limits given for the specific antenna diameters as tabulated in Table 1D of RR Article 22. The guidance to the GSO BSS designers is to be taken in this context: the continuous curves provide an approximation of how the regulatory limits of RR Article 22 could appear if they were defined for an arbitrary antenna diameter. In this respect these continuous curves are intended to provide guidelines on the upper boundary of interference that GSO BSS earth stations might receive.

NOTE 2 – The  $\text{epfd}_{\downarrow}$  levels in this Recommendation are referenced to a bandwidth of 40 kHz. To convert to other bandwidths, a correction factor of  $10 \log(B/40)$  is added to the value of  $\text{epfd}_{\downarrow}$ , where  $B$  is the required bandwidth (kHz).

NOTE 3 – Other significantly improved methods may be developed in the future that could replace the method in this Recommendation.

## Annex 1

### Methodology to derive continuous curves of $\text{epfd}_{\downarrow}$ versus BSS earth station antenna diameter in the frequency band 11.7-12.75 GHz

The proposed methodology consists of deriving curves by curve-fitting the validation  $\text{epfd}_{\downarrow}$  limits given in RR Table 22-1D applicable for the protection of GSO BSS systems with inclination angles less than  $2.5^\circ$  and for earth stations at latitudes below  $57.5^\circ$ . These curves, hereafter referred to as validation limit reference curves, are constructed by linear interpolation between values of  $\text{epfd}_{\downarrow}$  (dB) and by logarithmic interpolation between values of percentage of time for which the  $\text{epfd}_{\downarrow}$  may be exceeded.

These reference validation limits on the basis of which the curve fitting is performed, are described in § 1.1.

The resulting curves are best approximations and may not completely match the values tabulated in RR Article 22. Examples of such curves for  $\text{epfd}_{\downarrow}$  are given in § 1.2.

#### 1.1 RR Article 22 validation limits in the frequency band 11.7-12.75 GHz

The validation limits for the frequency band 11.7-12.75 GHz are given in terms of the percentage of time during which the  $\text{epfd}_{\downarrow}$  level may be exceeded. These limits are shown in Table 1.

TABLE 1

**Limits to the  $\text{epfd}_{\downarrow}$  radiated by non-GSO FSS systems in certain frequency bands into 30 cm, 45 cm, 60 cm, 90 cm, 120 cm, 180 cm, 240 cm and 300 cm BSS antennas**

| Frequency band (GHz)   | $\text{epfd}_{\downarrow}$ (dB(W/m <sup>2</sup> )) | Percentage of time during which $\text{epfd}_{\downarrow}$ level may be exceeded | Reference bandwidth (kHz) | Reference antenna diameter and radiation pattern |
|------------------------|----------------------------------------------------|----------------------------------------------------------------------------------|---------------------------|--------------------------------------------------|
| 11.7-12.5 in Region 1; | -165.841                                           | 100                                                                              | 40                        | 30 cm Recommendation ITU-R BO.1443, Annex 1      |
|                        | -165.541                                           | 75                                                                               |                           |                                                  |
| 11.7-12.2 and          | -164.041                                           | 4.0                                                                              |                           |                                                  |
| 12.5-12.75             | -158.6                                             | 1.143                                                                            |                           |                                                  |
| in Region 3;           | -158.6                                             | 0.571                                                                            |                           |                                                  |
|                        | -158.33                                            | 0.571                                                                            |                           |                                                  |
| 12.2-12.7              | -158.33                                            | 0                                                                                |                           |                                                  |
| in Region 2            |                                                    |                                                                                  |                           |                                                  |