

RECOMMENDATION ITU-R BO.1835

**Sharing between broadcasting-satellite service (BSS) networks using the
Region 2 17.3-17.8 GHz BSS allocation and feeder links of BSS networks
using the worldwide 17.3-17.8 GHz fixed-satellite service (FSS)
(Earth-to-space) allocation**

(2007)

Scope

This Recommendation addresses the design and coordination of new Region 2 BSS networks that will use the 17.3-17.8 GHz BSS allocation that took effect on 1 April 2007. Annex 1 to the Recommendation provides detailed parametric analyses of the two cases where coordination might be required with BSS networks that use the worldwide 17.3-17.8 GHz FSS (Earth-to-space) allocation for feeder links. The substance of the Recommendation is that coordination may not be required if the results of these analyses are taken into account in the design of Region 2 BSS networks intended for use in this new BSS allocation.

The ITU Radiocommunication Assembly,

considering

- a) that, in all three ITU Regions, the 17.3-17.8 GHz band is subject to the broadcasting-satellite service (BSS) feeder-link Plans of Appendix 30A of the Radio Regulations (RR);
- b) that the 17.3-17.8 GHz band is also allocated to BSS in Region 2;
- c) that there is the possibility of interference from the Region 2 BSS transmitting satellite to Regions 1, 2 and 3 BSS feeder-link receiving satellites operating under Appendix 30A of the RR;
- d) that Annex 4 of Appendix 30A of the RR provides threshold values for determining when coordination is required between transmitting space stations in the broadcasting-satellite service and a receiving space station in the feeder-link Plans in the frequency band 17.3-17.8 GHz;
- e) that the criterion for determining when coordination is required is that the power flux-density from the Region 2 BSS transmit satellite arriving at the receiving space station of a broadcasting-satellite feeder link of another administration would cause an increase in the noise temperature of the feeder-link space station which exceeds a threshold value of $\Delta T/T$ corresponding to 6%;
- f) that there may be unacceptable interference in the case of closely spaced Region 2 BSS transmit satellites and BSS feeder-link receive satellites, or in the case of interference from a Region 2 BSS satellite to a receive BSS feeder-link satellite located across the limb of the Earth,

recognizing

- 1 that studies described in Annex 1 show that very close spacing is feasible between Region 2 BSS satellites and BSS feeder-link receive satellites without exceeding the criterion contained in Annex 4 of Appendix 30A of the RR;
- 2 that studies described in Annex 1 show that interference across the limb of the Earth is limited to very few geometric scenarios that may not occur in practice;

3 that the key parameters in determining the proximity with which Region 2 BSS satellites and BSS feeder-link receive satellites could be deployed are the off-axis gain discriminations of the transmitting and receiving satellite antennas, the peak transmitting satellite equivalent isotropically radiated power (e.i.r.p.) levels, and the receiving satellite system noise temperature,

recommends

1 that administrations in Region 2 should take into account the analyses and results contained in Annex 1 when designing and deploying BSS networks in the 17.3-17.8 GHz band.

Annex 1

Parametric analyses on sharing between BSS networks using the Region 2 17.3-17.8 GHz BSS allocation and feeder links of BSS networks using the worldwide 17.3-17.8 GHz FSS (Earth-to-space) allocation

1 Introduction

The Region 2 allocation for the broadcasting-satellite service (BSS) in the 17.3-17.8 GHz band came into effect on 1 April 2007. This BSS band is paired with the 24.75-25.25 GHz FSS (Earth-to-space) band for its feeder links. The 17.3-17.8 GHz band, in accordance with Appendix 30A of the RR, is also allocated in the Earth-to-space direction for feeder links to the Appendix 30 12 GHz BSS networks in all three Regions. The term “reverse-band” typically refers to the situation where a frequency band is used for both Earth-to-space and space-to-Earth transmissions. The BSS networks operating under Appendices 30 and 30A are referred to as “17/12 GHz” networks, while those operating in the 17 GHz Region 2 BSS allocation are referred to as “24/17 GHz” networks.

This 17.3-17.8 GHz reverse-band operation creates the potential for the two interference paths illustrated schematically in Fig. 1:

- between the transmitting space stations and the receiving space stations in the 17 GHz band (satellite-to-satellite), and
- between the transmitting feeder-link earth stations and the receiving earth stations in the 17 GHz band.

This text addresses only the satellite-to-satellite case.

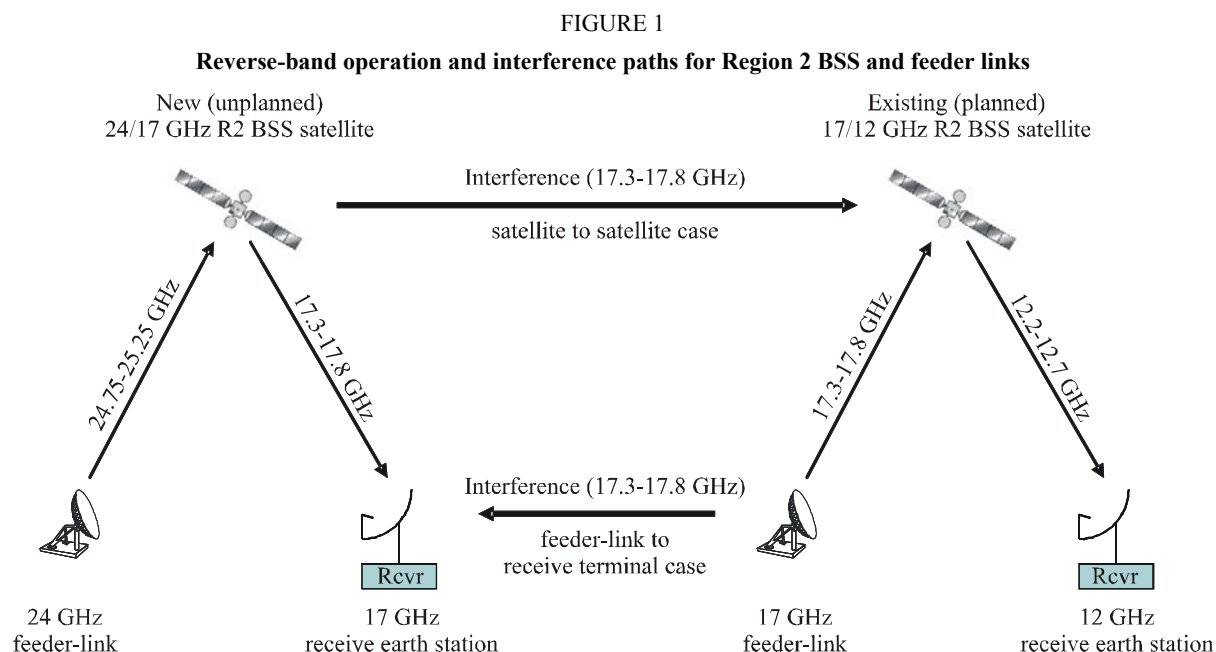
The satellite-to-satellite interference path will occur when the signals from the transmitting 24/17 GHz satellite impinge on the receiving antenna of the 17/12 GHz satellite in 17.3-17.8 GHz. The amount of interference is determined by the physical separation between the satellites, the e.i.r.p. level of the transmitting 24/17 GHz BSS satellite, the off-axis gains of the 17 GHz transmitting and receiving satellite antennas towards each other, and the noise temperature of the receiving satellite.

The criterion for determining if coordination is required between a transmitting space station of a 24/17 GHz network and a receiving space station of a 17/12 GHz network is provided in § 1 of Annex 4 of Appendix 30A of the RR, and is defined as a $\Delta T/T$ of 6%.

There are two cases for this potential interference:

- Case 1:** the adjacent-satellite case, where the 17/12 GHz and 24/17 GHz satellites are closely spaced along the orbital arc, and
- Case 2:** the equatorial-limb case, where the 17/12 GHz and 24/17 GHz satellites are separated by approximately 162.6° along the orbital arc, i.e. across the equatorial limb of the Earth.

Analyses for these two cases are presented below in § 2 and 3, respectively.



1835-01

2 Adjacent-satellite case

This section addresses closely-spaced satellites. A parametric analysis was conducted to determine the required orbital separation between a 24/17 GHz transmitting BSS space station and a 17/12 GHz receiving BSS space station that are located very close to each other along the geostationary arc. The key operational parameters in determining the required separation in order to meet the $\Delta T/T$ of 6% condition are the transmit e.i.r.p. of the 24/17 GHz satellite, the off-axis discriminations of the transmit and receive satellite antennas, and the receive satellite noise temperature of the 17/12 GHz satellite.

The off-axis angle relative to boresight for both transmit and receive antennas is approximately 90 degrees. These large off-boresight angles lead to antenna off-axis gains that are substantially below the peak of the boresight gain. Examination of published diagrams for receive gain toward the GSO arc for Region 2 assignments and modifications shows typical values between 0 and -5 dBi. These diagrams envelope the actual receive antenna patterns.