

RECOMMENDATION ITU-R BO.1504

**Effective utilization of spectrum assigned to the
broadcasting-satellite service (sound)***

(Question ITU-R 219/10)

(2000)

The ITU Radiocommunication Assembly,

considering

- a) that Resolution 528 (WARC-92) calls for the convening of a competent conference to plan the use of the bands allocated to the broadcasting-satellite service (BSS) (sound);
- b) that it is necessary to conduct the appropriate technical studies in ITU-R in order to prepare for such a conference;
- c) that the studies requested by Resolution 528 (WARC-92) are complex and require urgent answers,

further considering

- a) the limited amount of available spectrum, the near omnidirectional nature of the receiving antennas, especially for vehicular reception, which translates into negligible spectrum reuse through orbital separation, the wide coverage area of typical systems and the limitation in satellite antenna directivity at these frequencies due to practical physical size limitations, all this contributing to a potential for considerable intra-service interference;
- b) that various types of BSS (sound) will be implemented before such a conference is convened;
- c) the diversity of technical characteristics for the systems so far notified to the Radiocommunication Bureau (BR);
- d) that administrations wishing to implement BSS (sound) could benefit from a set of spectrum management guidelines to enhance the effective use of the spectrum and provide equitable access,

noting

- a) that there is a need to share the spectrum with other co-primary services and that many of these have a low tolerance to external interference and this will make management of the spectrum difficult;
- b) that BSS (sound) receivers may also have low tolerance to external interference, since the receiving antennas need to be typically omnidirectional;
- c) that Appendix S3 to the Radio Regulations (RR) indicates the levels of spurious emission that space stations need to meet to avoid interference into passive services;

* This Recommendation deals only with BSS (sound) intra-service sharing.

d) that the spectrum management of BSS (sound) is further complicated by the need to cater for both the satellite and complementary terrestrial sound broadcasting services,

recommends

1 that in the interim period prior to the holding of a conference as per Resolution 528 (WARC-92), the guidelines set out in Annex 1 be used by administrations planning to notify a BSS (sound) system in order to allow for the most efficient use of the spectrum/orbit resource and facilitate the management of the allocated BSS (sound) bands in the frequency range 1 400-2 700 MHz. The rationale for these guidelines can be found in Annex 2;

2 that the technical studies required in preparation for the conference continue as a matter of urgency, and the results be the subject of (a) further Recommendation(s),

invites BR

1 to advise Working Party (WP) 6S (formerly JWP 10-11S) on the possibility of extending the request for the satellite transmit antenna pfd contours on the surface of the Earth, as part of the system notifications, down to -30 dB relative to the maximum power-flux density (pfd) in steps of 3 dB;

2 to advise WP 6S (formerly JWP 10-11S) on the possibility of extending the request for the RF spectrum mask expected for the emitted signal from the satellite, as part of the BSS (sound) system notifications, down to levels of -27 dBs relative to the in-channel power.

ANNEX 1

Spectrum management guidelines for BSS (sound)

1 To the maximum extent possible, parameters should be chosen according to the values shown in this Table 1 (see Notes 1 and 2):

TABLE 1

Maximum transmit antenna side-lobe gain relative to the maximum antenna gain	-30 dB ⁽¹⁾
Equivalent out-of-band (OoB) emission in the adjacent channel relative to the in-channel power ⁽²⁾	-27 dB
Adjacent channel selectivity at the receiver	35 dB

(1) This value might be relaxed for side lobes directed towards areas where no BSS (sound) using the same frequency band is expected to be implemented.

(2) The variability of the channel bandwidth among the different sound BSS systems was taken into account by considering the integration of the energy per unit bandwidth (4 kHz) of the interferer, over the extent of its channel bandwidth, over the overlapping portion of the bandwidth of the interfered-with signal (see Annex 2).

NOTE 1 – This Table was developed assuming a spread of maximum pfd of 10 dB among the various BSS (sound) systems considered (see Annex 2). A reduced spread would be preferable since homogeneity in received pfd levels is an important factor in increasing the spectrum efficiency as described in Annex 2. If a system is outside the assumed range of maximum pfd: -128 to -138 dB(W/(m² · 4 kHz)), tighter or more relaxed values than those appearing in the Table would need to be considered

NOTE 2 – The values in Table 1 were established based on the following partitioning of the interference: 40% of the noise budget (equivalent to a 2.2 dB margin for interference) is set aside for the aggregate interference from: two co-channel interferers and two adjacent channel interferers each contributing for 10% of the noise budget (equivalent to 10 dB additional interference isolation) (see Annex 2).

2 Although first generation BSS (sound) system implementations may be aimed at wide coverage services due to satellite transmit antenna size limitations, narrower beam implementations should be considered as the preferred solution as the satellite technology develops. The use of narrower beams will enhance the prospect of more satellite systems operating over a given geographical area and permit greater frequency reuse especially if the antenna side lobes are well controlled thus increasing the possibility of greater access to the limited spectrum resource.

ANNEX 2

Rationale for the guidelines to secure maximum spectrum efficiency in the introduction of BSS (sound) in the frequency range 1-3 GHz

The required discrimination between different BSS (sound) emissions to allow maximum frequency reuse and spectrum occupancy can be derived from four key factors. These are: the satellite transmit antenna directivity, the satellite transponder spectrum regrowth performance, the receiver channel selectivity and the receiver antenna directivity. With respect to the last factor, such receiving antenna directivity is minimal if the service is to be provided to vehicle and portable receivers. This receiving antenna directivity will therefore be neglected in the following discussion. The discrimination values available from the three first factors are compared to the isolation requirement between the various BSS (sound) systems. Given the required isolation among BSS (sound) systems, general guidelines can be deduced from such comparison.

1 Variables related to BSS (sound) intra-service sharing

The BSS (sound) can rely on a limited number of means to maximize the efficiency and utilization of the frequency bands that were allocated to it by WARC-92 (40 MHz at 1.5 GHz, 50 MHz at 2.3 GHz and 120 MHz at 2.5 GHz). When a number of satellite broadcasting systems are used to provide the service, they can only rely on the following means to secure enough isolation to avoid mutual interference:

- very large satellite orbital separation so that the potentially interfering satellite is beyond the horizon in the service area of interest;