

RECOMMENDATION ITU-R RA.1031-2*

**Protection of the radio astronomy service in frequency
bands shared with other services**

(Question ITU-R 145/7)

(1994-1995-2007)

Scope

This Recommendation gives a practicable guideline for the case when one or more administrations, during negotiation, establish coordination zones around radio astronomy stations to protect the radio astronomy service from interference caused by terrestrial radiocommunication services or transmitting earth stations used for space radiocommunication services that share frequency bands with the radio astronomy service.

The ITU Radiocommunication Assembly,

considering

- a) that the radio astronomy service is based on the reception of natural emissions at much lower power levels than are generally used in other radio services, and that the radio astronomy service is therefore particularly vulnerable to interference from transmitters in shared frequency bands;
- b) that many frequency bands allocated to the radio astronomy service are also allocated to other services which transmit in those bands;
- c) that protection from interference is essential to the advancement of the radio astronomy service, and that the preferred frequency bands for radio astronomy are given in Recommendation ITU-R RA.314;
- d) that threshold levels of interference detrimental to the radio astronomy service and levels of data loss criteria are given in the relevant RA Series of ITU-R Recommendations;
- e) that the detailed characteristics of the interference and the particular type of radio astronomical measurement may need to be taken into account when developing sharing criteria;
- f) that radio astronomy sites are carefully chosen, and that site characteristics may strongly affect the sharing calculations;
- g) that frequency sharing is generally impossible for transmitters within direct line-of-sight of a radio astronomy antenna,

recommends

- 1** that, in making assignments to services which share frequency bands with the radio astronomy service, administrations should take all practicable steps to avoid interference detrimental to the radio astronomy service;

* This Recommendation should be brought to the attention of Radiocommunication Study Groups 1, 4, 6, 8 and 9.

2 that consideration be given to protecting radio astronomy sites from interference from transmitters used for terrestrial radiocommunications or from transmitting earth stations used for space radiocommunications in bands shared with the radio astronomy service with equal rights through the establishment of coordination zones around radio astronomy sites;

3 that the coordination zone may be calculated, taking account of the methodology contained in Annex 1.

Annex 1

Coordination considerations

1 General

Radio astronomy sites are chosen specifically to minimize interference from Earth based transmitters. The sites are usually at a considerable distance from the major fixed sources of terrestrial interference and may be screened by nearby high ground.

Many radio astronomy measurements can tolerate levels of interference from a shared service which exceed these thresholds for 2% of the measurement period, assuming no other data loss mechanism is involved. However, certain other types of measurements such as those involving transient phenomena and those depending upon simultaneous observations at many sites on Earth, may be severely damaged by interference at inopportune times.

2 Separation distances required for sharing

If geographical sharing is to be successful the interfering transmitter and the interfered-with receiver must be separated by a distance at which the interference is not considered harmful. Appendix 7 to the Radio Regulations defines a basic transmission loss $L_b(p)$ as:

$$L_b(p) = P_t + G_t + G_r - P_r(p) \quad (1)$$

where:

- $L_b(p)$: minimum permissible basic transmission loss for $p\%$ of the time; this value must be exceeded by the actual transmission loss for all but $p\%$ of the time (dB)
- P_t : transmitting power level in the reference bandwidth at the input to the antenna (dBW)
- G_t : gain of the transmitting antenna in the direction of the radio astronomy antenna (dBi)
- G_r : gain of the radio astronomy antenna in the direction of the transmitter (dBi)
- $P_r(p)$: maximum permissible interference power in the reference bandwidth to be exceeded for no more than $p\%$ of time at the receiver input (dBW).

For a radio astronomy observation, however, the power received is integrated over a period of time T , in order to reach a better sensitivity. The result of this integration is called an observation in the following paragraphs.