RECOMMENDATION 496-3*

LIMITS OF POWER FLUX-DENSITY OF RADIONAVIGATION TRANSMITTERS TO PROTECT SPACE STATION RECEIVERS IN THE FIXED-SATELLITE SERVICE IN THE 14 GHz BAND

(1974-1982-1986-1992)

The CCIR,

considering

a) that Earth-to-space transmissions of the fixed-satellite service (FSS) share the band 14-14.3 GHz with the radionavigation service;

b) that the World Administrative Radio Conference (Geneva, 1979) has asked the CCIR to study the criteria for frequency sharing in this band (Recommendation No. 708, § 2.12);

c) that Radio Regulation No. 856 requires that the use of this band by the radionavigation service shall be such as to provide sufficient protection to space stations in the FSS;

d) that, in the band 14-14.3 GHz, sufficient protection for geostationary satellites in the FSS can be obtained by limiting the power flux-density produced at the geostationary-satellite orbit by stations of the radionavigation service;

e) that some kinds of radionavigation device, such as small ship radars and motor vehicle collision avoidance devices, although generally of comparatively low power, may be used in very large numbers,

recommends

1. that in order to provide sufficient protection to space station receivers of the FSS, the following limits for non-pulsed radionavigation transmitters should apply:

1.1 that where the value of D, as defined below, is less than 2×10^{-4}, the maximum value of the peak power flux-density produced at any point in the geostationary-satellite orbit by any radionavigation transmitter in the band 14-14.3 GHz should not exceed –150 dB(W/m^2) in any 1 MHz band;

1.2 that where the value of D, as defined below, exceeds 2×10^{-4}, the maximum value of peak power flux-density produced at the geostationary-satellite orbit by any radionavigation transmitter should not exceed:

$$-187 - 10 \log D \qquad \text{dB(W/m}^2\text{)} \qquad (1)$$

in any 1 MHz band, where D is the estimated geographical density of radionavigation transmitters per km^2 simultaneously active in any 1 MHz band, taking into account future needs and averaged over the territory of the administration concerned or over an area of 10^6 km^2, whichever is less.

Note 1 – An analysis concerning sharing criteria for the protection of receiving space stations in the 14-14.3 GHz FSS band is given in Annex 1.

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* This Recommendation should be brought to the attention of Study Group 4.

ANNEX 1

Analysis in support of sharing criteria for the protection of receiving space stations in the fixed-satellite service in the band 14-14.3 GHz

1. Protection criteria for the FSS receiving space station

The FSS satellite receiving system noise temperature is assumed to be 1 500 K. The level of permissible interference, considered to be 10% of the thermal noise at the satellite receiver input in a 1 MHz reference bandwidth, is therefore –147 dBW – 10 log *n*, where *n* is the number of simultaneous in-beam interference entries.

1.2 Interference from transmitters in the radionavigation service (14-14.3 GHz)

This criterion, expressed in power flux-density at the input of the satellite receiving antenna assumed to have an effective aperture relative to 1 m^2 of –3 dB, is –144 dB(W/m^2) – 10 log *n*.

Assuming that the radionavigation antennas are randomly oriented in the horizontal plane, the number of simultaneous in-beam interference entries in a 1 MHz band, received by a satellite antenna which is illuminating the Earth at a low angle of elevation is given by:

$$n = D\,A\,\frac{\theta}{360}$$

where:

- D: average density per km^2 of the radionavigation transmitters simultaneously active, within the 1 MHz band
- A: area of the Earth's surface covered by the satellite receiving antenna (km^2)
- θ: representative average value for the beamwidth of the radionavigation transmitting antennas (degrees).

Assuming that the average value for θ is taken as 6°, and the coverage area A is 1.2×10^6 km^2, then:

$$n = D \times 2 \times 10^4$$

Thus the maximum value of peak power flux-density which any transmitter may produce at the geostationary-satellite orbit would be given by:

$$-187 - 10 \log D \qquad \text{dB(W/m}^2\text{)} \qquad \text{in any 1 MHz band.}$$