

## RECOMMENDATION ITU-R S.1418

**METHOD FOR CALCULATING SINGLE ENTRY CARRIER-TO-INTERFERENCE  
RATIOS FOR LINKS IN INTER-SATELLITE SERVICE  
USING GEOSTATIONARY ORBIT**

(Question ITU-R 239/4)

(1999)

The ITU Radiocommunication Assembly,

*considering*

- a) that Question ITU-R 239/4 for the World Radiocommunication Conference (Geneva, 1997) (WRC-97) calls for “very urgent and priority studies” to determine sharing criteria and coordination guidelines for systems utilizing the inter-satellite service (ISS);
- b) that there is extensive planned use of the ISS between satellites in the geostationary orbit (GSO);
- c) that GSO ISS networks typically require wide bandwidths, and typically form high data rate trunk links for the space segments of networks;
- d) that high data rate trunk lines must have high availability;
- e) that a method is required to evaluate the level of interference between such systems,

*recommends*

- 1 that the method described in Annex 1 be used to calculate  $C/I$  ratios for inter-satellite links in the GSO.

## ANNEX 1

## Method for calculating single entry $C/I$ for links of ISS using GSO

### 1 Inputs

The required inputs for the calculation of single entry  $C/I$  are shown in Table 1.

TABLE 1  
Inputs for methodology for calculation of single entry  $C/I$

| Item                                         | Symbol     |
|----------------------------------------------|------------|
| Centre frequency (MHz)                       | $f_c$      |
| <i>Victim system</i>                         |            |
| Longitude of receiver (degrees)              | $V_{rx}$   |
| Longitude of transmitter (degrees)           | $V_{tx}$   |
| Transmit power (dBW)                         | $P_v$      |
| Transmit gain (dBi)                          | $G_{v,tx}$ |
| Transmit bandwidth (MHz)                     | $B_v$      |
| Receive gain (dBi)                           | $G_{v,rx}$ |
| Receive antenna diameter (m) <sup>(1)</sup>  | $d_{v,rx}$ |
| <i>Interfering system</i>                    |            |
| Longitude of receiver (degrees)              | $I_{rx}$   |
| Longitude of transmitter (degrees)           | $I_{tx}$   |
| Transmit power (dBW)                         | $P_i$      |
| Transmit gain (dBi)                          | $G_{i,tx}$ |
| Transmit bandwidth (MHz)                     | $B_i$      |
| Receive gain (dBi)                           | $G_{i,rx}$ |
| Transmit antenna diameter (m) <sup>(1)</sup> | $d_{i,tx}$ |

<sup>(1)</sup> The antenna diameters are sometimes required for calculation of antenna discrimination.

### 2 Method

#### 2.1 Carrier power

To calculate carrier power, it is necessary to calculate the range loss between the satellites. The range between victim satellites is given by:

$$R = 2r_{GSO} \sin(|V_{tx} - V_{rx}|/2) \quad \text{km}$$

where:

$V_{tx}$ : longitude of the victim transmitter

$V_{rx}$ : longitude of the victim receiver

$r_{GSO}$ : radius of the GSO (42 164 km)

$R$ : range between satellites (km).