

RECOMMENDATION ITU-R SA.1029-1

INTERFERENCE CRITERIA FOR SATELLITE PASSIVE REMOTE SENSING

(Question ITU-R 140/7)

(1994-1997)

The ITU Radiocommunication Assembly,

considering

- a) that certain frequency bands, including some absorption bands of atmospheric gases (O₂ and H₂O), have been allocated for spaceborne passive microwave remote sensing;
- b) that some of these bands are also allocated to other radio services;
- c) that performance criteria for satellite passive remote sensing are contained in Recommendation ITU-R SA.1028;
- d) that interference criteria should be compatible with performance objectives;
- e) that interference criteria are a necessary prerequisite to the establishment of sharing criteria;
- f) that interference criteria can be stated in terms of interference power within a reference bandwidth;
- g) that passive microwave remote sensing is performed in absorption bands to obtain important three-dimensional atmospheric data that are used in particular to initialize numerical weather prediction (NWP) models;
- h) that studies have established that measurements in absorption bands are extremely vulnerable to interference because, in general, there is no possibility to detect and to reject data that are contaminated by interference, and because propagation of undetected contaminated data into NWP models may have a destructive impact on the reliability/quality of weather forecasting;
- j) that three-dimensional measurements of atmospheric temperature or gas concentration are performed in the absorption bands including those in the range 50.2-61.3 GHz and bands near 118 GHz and 183 GHz;
- k) that the sensitivities of radiometric passive sensors are generally expressed as a temperature differential, ΔT_e , given by:

$$\Delta T_e = \alpha T_s / \sqrt{B t} \quad \text{K}$$

where:

α : receiver system constant

T_s : operating noise temperature (the sum of the receiver noise referred to the antenna terminal and that noise entering via the antenna) (K)

B : receiver bandwidth (Hz)

t : total time of observation (s);

- l) that the radiometer threshold, or minimum discernible power change, is given by:

$$\Delta P = k \Delta T_e B \quad \text{W}$$

where k is Boltzmann's constant, 1.38×10^{-23} J/K,

recommends

- 1** that harmful interference to passive sensors may occur when unwanted signal levels exceed 20% of ΔP ;
- 2** that permissible interference levels and reference bandwidths for the frequency bands preferred for passive sensing of the Earth's land, oceans and atmosphere are as in Table 1;

TABLE 1

Frequency (GHz)	Permissible interference level (dBW)	Interference reference bandwidth (MHz)
Near 1.4	-171	27
Near 2.7	-174	10
Near 4	-161	100
Near 6	-164	100
Near 11	-163	20
Near 15	-166	50
Near 18	-155	100
Near 21	-163	100
22.235	-160	100
Near 24	-163	100
Near 31	-163	100
Near 37	-156	100
50.2-50.4	-161/-166 ⁽¹⁾	100
52.6-59.0	-161/-166 ⁽¹⁾	100
60.3-61.3	-161/-166 ⁽¹⁾	100
Near 90	-153	200
100.49	-160	200
110.80	-160	200
115-122	-160	200
125.61	-160	200
150.74	-160	200
155.5-158.5	-160	200
164-168	-160	200
167.20	-160	200
175-192	-160	200
200.98	-160	200
217-231	-160	200
235.71	-160	200
237.15	-160	200
251.21	-160	200
276.33	-160	200
301.44	-160	200
325.10	-160	200
345.80	-160	200
364.32	-160	200
380.20	-160	200

⁽¹⁾ Second number for pushbroom sensors.

3 that in shared frequency bands (except in the absorption bands), the interference levels given above can be exceeded for less than 5% of all measurement cells within a sensor's service area in the case where the loss occurs randomly, and for less than 1% of measurement cells in the case where the loss occurs systematically at the same locations;

4 that the interference levels given above can be exceeded for less than 0.01% of the time in the sensor's service area for three-dimensional measurements of atmospheric temperature or gas concentration, as noted in § j).