

RECOMMENDATION ITU-R S.726-1*

**Maximum permissible level of spurious emissions
from very small aperture terminals (VSATs)**

(1992-1993)

The ITU Radiocommunication Assembly,

considering

- a) that it is necessary to protect other terrestrial and satellite radio services from the operation of VSAT earth stations;
- b) that it is necessary to protect the transmissions of satellite services on the same satellite as the VSAT services;
- c) that the number of VSAT earth stations may increase significantly as their popularity grows;
- d) that unreasonably stringent values for spurious emissions could hinder the increase in popularity;
- e) that some VSAT earth stations are receive-only earth stations and others are transmit-receive earth stations;
- f) that at any given time most transmit-receive VSAT earth stations will be receiving and not transmitting simultaneously;
- g) that spurious frequencies from VSAT networks operating at different frequencies are usually different so that the spurious emissions will not sum up at the same frequency;
- h) that the spurious emission from carrier-off state VSATs is greatly suppressed since a carrier-on/off switch is usually provided in the RF amplifier stage of the VSAT transmitter;
- j) that CISPR Publication 22 (1985) specifies the limits and methods of measurement of radio interference characteristics of information technology equipment to which the digital processing circuits of the VSATs are similar;
- k) that the carrier close-in spurious emissions and harmonics are more difficult to suppress than other spurious emissions and hence more precise assessment is needed to ensure compatibility with other services,

recommends

- 1 that VSAT earth stations should satisfy the limits for radiated interference field strength specified in CISPR Publication 22 (1985) applicable to the Class A equipment over the frequency range from 30 MHz to 960 MHz;

* Radiocommunication Study Group 4 made editorial amendments to this Recommendation in 2001 in accordance with Resolution ITU-R 44 (RA-2000).

2 that outside the band allocated to the fixed-satellite service (FSS) (Earth-to-space) within which the VSAT operating frequency is assigned, the off-axis spurious e.i.r.p. from VSATs shall be below the following limits for off-axis angles greater than 7°:

2.1 carrier-off case (including receive-only VSATs) except for the cases and frequency ranges given in § 2.3:

960 MHz to 10.7 GHz	48 dBpW in any 100 kHz band
10.7 GHz to 21.2 GHz	54 dBpW in any 100 kHz band
21.2 GHz to 40 GHz	60 dBpW in any 100 kHz band

2.2 carrier-on case for transmit/receive VSATs except for the cases and frequency ranges given in § 2.4 and 2.5:

960 MHz to 3 400 MHz	49 dBpW in any 100 kHz band
3 400 MHz to 10.7 GHz	55 dBpW in any 100 kHz band
10.7 GHz to 21.2 GHz	61 dBpW in any 100 kHz band
21.2 GHz to 40 GHz	67 dBpW in any 100 kHz band

2.3 exceptions for the carrier-off cases of transmit-receive VSATs which are put into service prior to 1 January, 1994:

5 450 MHz to 6 825 MHz	58 dBpW in any 20 MHz band (for VSATs operating in 6 GHz band)
13.6 GHz to 14.9 GHz	63 dBpW in any 20 MHz band (for VSATs operating in 14 GHz band)
26.5 GHz to 31.3 GHz	68 dBpW in any 20 MHz band (for VSATs operating in 30 GHz band)

2.4 exceptions for the carrier-on cases of transmit/receive VSATs which are put into service prior to 1 January, 1994:

5 450 MHz to 6 825 MHz	88 dBpW in any 20 MHz band (for VSATs operating in 6 GHz band)
13.6 GHz to 14.9 GHz	88 dBpW in any 20 MHz band (for VSATs operating in 14 GHz band)
28 GHz to 29 GHz	88 dBpW in any 20 MHz band (for VSATs operating in 14 GHz band)
26.5 GHz to 31.3 GHz	88 dBpW in any 20 MHz band (for VSATs operating in 30 GHz band)

2.5 exceptions for the carrier-on cases of transmit/receive VSATs which are put into service after 1 January, 1994:

5 450 MHz to 6 825 MHz	78 dBpW in any 20 MHz band (for VSATs operating in 6 GHz band)
13.6 GHz to 14.9 GHz	78 dBpW in any 20 MHz band (for VSATs operating in 14 GHz band)

28 GHz to 29 GHz	78 dBpW in any 20 MHz band (for VSATs operating in 14 GHz band)
26.5 GHz to 31.3 GHz	78 dBpW in any 20 MHz band (for VSATs operating in 30 GHz band)

- 3** that inside the band allocated to the FSS (Earth-to-space) within which the VSAT operating frequency is assigned, the on-axis spurious e.i.r.p. shall not exceed 4 dBW in any 100 kHz band;
- 4** that the values in this Recommendation be revised to ensure their compatibility with other services;
- 5** that the following Notes should be regarded as part of this Recommendation:

NOTE 1 – In § 1, the outdoor unit, the indoor unit and the connecting cable shall be included. For transmit-receive VSAT earth stations the antenna may be removed for this measurement, in which case the transmitter output port shall be terminated by a terminating circuit.

NOTE 2 – According to CISPR Publication 22 (1985) “in some countries the Class A equipment may be subject to restrictions on its sale or use” because “the Class A limits may be too liberal for domestic establishments and some residential areas”. In order to avoid such restrictions being applied to the sale or use of VSATs, the limits applicable to the Class B equipment should be satisfied in those countries.

NOTE 3 – The worst-case off-axis spurious e.i.r.p. can be estimated from the measurement of the input power to the antenna transmission line assuming the antenna gain is 8 dBi or using measured antenna gain data at off-axis angles greater than 7°.

NOTE 4 – Intermodulation and spectral regrowth limits inside the band allocated to the fixed-satellite service (Earth-to-space) within which the VSAT operating frequency is assigned are to be determined by the system design, subject to the satellite operator specifications and not covered by this Recommendation.

NOTE 5 – For systems in which the VSAT earth stations are expected to transmit simultaneously at the same frequency, e.g. for systems employing CDMA, the limits given in § 3 should be reduced by $10 \log N$ (dB), where N is the maximum number of VSAT earth stations which are expected to transmit simultaneously at the same frequency within the overlapping band.

NOTE 6 – The limit in § 3 applies to the VSATs operating in the 14 GHz band. The limit for VSATs operating in the 6 GHz and other frequency bands is under study.

NOTE 7 – The on-axis and off-axis spurious e.i.r.p. levels are related by the difference in the on-axis and off-axis antenna gain. Usually the off-axis limits in § 2 are tighter than the on-axis limits in § 3.

NOTE 8 – For the transmit-receive VSATs operating in the 6 GHz band and put into service before 1 January 1995, the limit of 88 dBpW in any 20 MHz band may be applied instead of the limit in § 2.2 for the carrier-on case in the frequency range from 4 500 MHz to 5 450 MHz.