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Satellite Earth Stations and Systems (SES); Transmit-only or transmit-and-receive Very Small Aperture Terminals (VSATs) used for communications operating in the Fixed Satellite Service (FSS) 6 GHz and 4 GHz frequency bands

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Foreword

This second edition European Telecommunication Standard (ETS) has been produced by the Satellite Earth Stations and Systems (SES) Technical Committee of the European Telecommunications Standards Institute (ETSI).

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1 Scope

This European Telecommunication Standard (ETS) provides specifications for the standardization of the characteristics of transmit-only or transmit-and-receive Very Small Aperture Terminals (VSATs) operating as part of a satellite network (e.g. star, mesh or point-to-point) used for the distribution and/or exchange of information between users.

In such a network a Centralised Control and Monitoring Function (CCMF) is responsible for the monitoring and control of transmit-only and transmit-and-receive VSATs.

These VSATs have the following characteristics:

- operating in the shared part of the C-band allocated to the Fixed Services (FS) and to the Fixed Satellite Services (FSS), 5,850 GHz to 6,650 GHz (earth-to-space), 3,400 GHz to 4,200 GHz (space-to-earth);

- in these frequency bands circular and linear polarization are normally used;

- the VSAT operates through geostationary satellites at least 3° away from any other geostationary satellite operating in the same frequency band and covering the same area;

- designed usually for unattended operation;

- antenna diameter not exceeding 7,3 m, or equivalent corresponding effective area.

The equipment considered in this ETS comprises both the "outdoor unit", usually composed of the antenna sub-system and associated power amplifier and Low Noise Block (LNB), and the "indoor unit" composed of the remaining part of the communication chain, including the cable between these two units.

This ETS applies to the VSAT with its ancillary equipment and its various terrestrial ports, and operated under the conditions which are within the ranges of humidity, temperature and supply voltage declared by the manufacturer.

There are no EMC specifications under this ETS, however ETS 300 673 [3] contains the EMC specifications for VSATs.

This ETS does not contain any specification or information on the installation of the VSATs.

The specifications have been selected to ensure an adequate level of compatibility for VSATs. The levels, however, do not cover extreme cases which may occur in any location but with a low probability of occurrence. In such a case it may be necessary to use special protection supplied to either the source of interference, or the interfered part or both.

This ETS deals with two types of specification:

- specifications defined in order to protect other users of the frequency spectrum, both satellite and terrestrial, from unacceptable interference. In addition, these specifications are specified for the purposes of structural safety and lightning protection as well as protection from harmful interference;

- specifications related to characteristics which contribute to the quality of reception by providing the VSAT with minimum interference protection from other radio systems. These specifications apply if required by the manufacturer.

2 Normative references

This ETS incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to, or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1] ITU-R Recommendation 732 (1992): "Method for statistical processing of earth station antenna side-lobe peaks".

[2] EN 50083-1 (1993): "Cabled distribution systems for television and sound signals - Part 1: Safety requirements".

[3] ETS 300 673 (1996): "Radio Equipment and Systems (RES); ElectroMagnetic Compatibility (EMC) standard for 4/6 GHz and 11/12/14 GHz Very Small Aperture Terminal (VSAT) equipment and 11/12/13/14 GHz Satellite News Gathering (SNG) Transportable Earth Station (TES) equipment".

[4] ETS 300 456: "Satellite Earth Stations and Systems (SES); Test Methods for Very Small Aperture Terminals (VSATs) operating in the 11/12/14 GHz frequency bands".

[5] ETS 300 160: "Satellite Earth Stations and Systems (SES); Control and monitoring functions at a Very Small Aperture Terminal VSAT".

[6] ETS 300 161: "Satellite Earth Stations and Systems (SES); Centralised control and monitoring functions for VSAT networks".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this ETS, the following definitions apply:

ancillary equipment: Equipment used in connection with the VSAT is considered ancillary if the three following conditions are met:

a) the equipment is intended for use in conjunction with the VSAT to provide additional operational and/or control features (e.g. to extend control to another position or location); and

b) the equipment cannot be used on a stand alone basis, to provide user functions independently of the VSAT; and

c) the absence of the equipment does not inhibit the operation of the VSAT.

carrier-on state: A VSAT is in this state when it is authorized by the CCMF to transmit and when it transmits a signal.

carrier-off state: A VSAT is in this state when it is authorized by the CCMF to transmit, but when it does not transmit any signal.

NOTE 1: The existence of a carrier-off state depends on the system of transmission used. For VSATs designed for continuous transmission mode there may be no carrier-off state.

cross-polarization discrimination: The ratio of the on-axis co-polar gain to the cross-polar gain in a given direction, at a transmit or receive frequency.

indoor unit: Is composed of that part of the VSAT which is not part of the outdoor unit. It is generally installed inside a building and is connected to the outdoor unit. The connection cable between the outdoor and indoor unit is considered part of the indoor unit.

nominated bandwidth: The bandwidth of the VSAT radio frequency transmission is nominated by the manufacturer. The nominated bandwidth is centred on the transmit frequency and does not exceed 5 times the occupied bandwidth.

NOTE 2: The nominated bandwidth is wide enough to encompass all spectral elements of the transmission which have a level greater than the specified spurious radiation limits. The nominated bandwidth is wide enough to take account of the transmit carrier frequency stability. This definition is chosen to allow flexibility regarding adjacent channel interference levels which will be taken into account by operational procedures depending on the exact transponder carrier assignment situation.

occupied bandwidth: For a digital modulation scheme - the width of the signal spectrum 10 dB below the maximum inband density. For an analogue modulation scheme - the width of a frequency band such that, below the lower and above the upper frequency limits, the mean power emitted is equal to 0,5 % of the total mean power of the emission.

outdoor unit: The part of the VSAT intended to be installed outdoor, as declared by the manufacturer, or as indicated in the user documentation.

The outdoor unit usually comprises three main parts:

a) the antenna sub-system which converts the incident radiation field into a guided wave and vice versa;

b) the Low Noise Block (LNB) down converter, which is a device that amplifies, with very low internal noise, the received signals in the Radio Frequency (RF) band and converts them to intermediate frequencies;

c) the up converter and the power amplifier which convert from the intermediate frequency to RF and amplify the low level signals for transmission through the antenna subsystem.

NOTE 3: The installation equipment (means of attachment) is outside the scope of this ETS. However, the antenna structures and other components directly mounted on the antenna and forming an integral part of it, are subject to the specifications of this ETS.

spurious radiation: Any radiation outside the nominated bandwidth.

transmission disabled state: A VSAT is in this state when it is not authorized by the CCMF to transmit.

voltage axial ratio: The voltage axial ratio of an antenna at a transmit or a receive frequency is the ratio r equal to $(x + 1)/(x - 1)$ where x is the square root of the cross-polarization discrimination (not expressed in dB).

3.2 Abbreviations

For the purposes of this ETS, the following abbreviations apply:

CCMF	Centralised Control and Monitoring Functions
EIRP	Equivalent Isotropically Radiated Power
EMC	ElectroMagnetic Compatibility
FS	Fixed Service
FSS	Fixed Satellite Service
LNB	Low Noise Block (low noise amplifier and down converter)
RF	Radio Frequency
VSAT	Very Small Aperture Terminal

4 Test report

The test report shall be similar to the one specified in ETS 300 456 [4] and shall contain:

- the value of the nominated bandwidth declared by the manufacturer;
- the value of the nominated bandwidth shall not exceed 5 times the occupied bandwidth ITU-R Recommendation 732 [1];
- the results of the tests;
- all operational conditions and parameters.

5 Safety

5.1 Mechanical construction

Purpose:

Protection of operating personnel, the public and goods from insecure structures of the VSAT itself.

Specification:

This specification applies to the outdoor unit only including mounted and structural components, and does not apply to the means of attachment.

The outdoor unit, shall be designed to support the following main loads due to:

- the weight of the antenna and structural components;
- the wind speed.

Loading due to snow and ice is not considered.

At wind speeds up to 180 km/h, referred to standard atmosphere temperature and pressure (293 K and $1{,}013 \times 10^5$ Pa (1 013 mbar)) none of the components shall be torn away.

Verification:

The test method specified in subclause 5.1 of ETS 300 456 [4] shall apply.

5.2 Lightning

Purpose:

To avoid dangerous potential differences between the outdoor unit and any other conductive structure.

Specification:

Means shall be provided to permit the attachment of bonding conductors of dimension indicated in EN 50083-1 [2], subclause 10.2.3.

Verification:

The test method specified in subclause 5.2 of ETS 300 456 [4] shall apply.

6 Radio Frequency (RF)

The test methods of ETS 300 456 [4] shall apply for verifications where applicable.

6.1 Spurious radiation

Purpose:

To limit the level of interference to terrestrial and satellite radio services.

Specification:

a) The VSAT shall not exceed the limits for radiated interference field strength over the frequency range from 30 MHz to 1,0 GHz specified in table 1a.

Table 1a: Radiated field strength at a distance of 10 m

Frequency range MHz	Quasi-peak limits dB(µV/m)	
	Class A	Class B
30 to 230	40	30
230 to 1 000	47	37
NOTE: The lower limits shall apply at the transition frequency.		

The applicable class A or B limits shall be designated by the manufacturer and indicated in the data sheet of the test report.

b) When the VSAT is in the transmission disabled state, the off-axis spurious Equivalent Isotropically Radiated Power (EIRP) from the VSAT, in any 100 kHz band, shall not exceed the limits in table 1b, for all off-axis angles greater than 7°.

Table 1b: Limits of spurious EIRP - transmission disabled state

Frequency band	EIRP limit (dBpW)
1,0 GHz to 10,7 GHz	48
10,7 GHz to 21,2 GHz	54
21,2 GHz to 40,0 GHz	60
NOTE: The lower limits shall apply at the transition frequency.	

c) This specification applies outside the nominated bandwidth.

For both the carrier-on and carrier-off states, the off-axis spurious EIRP from the VSAT, in any 100 kHz band shall not exceed the limits in table 2, for all off-axis angles greater than 7°.

Table 2: Limits of spurious EIRP

Frequency band	EIRP limit (dBpW)
1,0 GHz to 3,4 GHz	49
3,4 GHz to 5,7GHz	55
5,7 GHz to 5,85 GHz	75 (note)
6,65 GHz to 6,8 GHz	75 (note)
6,8 GHz to 10,7 GHz	55
10,7 GHz to 21,2 GHz	61
21,2 GHz to 40 GHz	67
NOTE: This limit may be exceeded in a frequency band which shall not exceed 50 MHz, centred on the carrier frequency, provided that the on-axis EIRP density at the considered frequency is 50 dB below the maximum on-axis EIRP density of the signal (within the nominated bandwidth) expressed in dBW/100 kHz.	

The lower limits shall apply at the transition frequency.

In the frequency bands 5,450 GHz to 5,700 GHz and 6,800 GHz to 7,050 GHz, for any 20 MHz band within which one or more spurious signals exceeding the above limit of 55 dBpW are present, then the power of each of those spurious signals exceeding the limit shall be added in watts, and the sum shall not exceed 78 dBpW.

In the frequency band 11,700 GHz to 13,300 GHz, for any 20 MHz band within which one or more spurious signals exceeding the above limit of 61 dBpW are present, then the power of each of those spurious signals exceeding the limit shall be added in watts, and the sum shall not exceed 78 dBpW.

For VSATs designed to transmit simultaneously several different carriers (multi-carrier operation), the above limits apply to each individual carrier when transmitted alone.

d) These limits are applicable to the complete VSAT equipment, comprising of the indoor and outdoor units with at least 10 m of cable connecting them.

Verification:

The test method specified in subclause 6.6 of ETS 300 456 [4] shall apply.

The tests for specification c) shall be limited to the carrier-on state.

6.2 On-axis spurious radiation

Purpose:

To limit the level of interference to satellite radio services.

Specification 1:

Carrier-on state.

In the 5,850 GHz to 6,650 GHz band the EIRP spectral density of the spurious radiation outside the nominated bandwidth shall not exceed 4 - 10 log N dBW in any 100 kHz band.

In a bandwidth of 5 times the occupied bandwidth centred on the carrier centre frequency, the EIRP spectral density of the spurious radiation outside the nominated bandwidth, shall not exceed 18 -10 log N dBW in any 100 kHz band.

N is the maximum number of VSATs which are expected to transmit simultaneously in the same carrier frequency band. This number shall be declared by the manufacturer.

NOTE 1: The on-axis spurious radiation, outside the 5,850 GHz to 6,650 GHz band, are indirectly limited by the off-axis limits given in subclause 6.1. Consequently no specification is needed.

NOTE 2: Inter-modulation limits inside the band 5,850 GHz to 6,650 GHz are to be determined by system design, subject to satellite operator specifications.

For VSATs designed to transmit simultaneously several different carriers (multicarrier operation), the above limits apply to each individual carrier when transmitted alone.

Specification 2:

Carrier-off state and transmission disabled state.

In the 5,850 GHz to 6,650 GHz band the EIRP spectral density of the spurious radiation outside the nominated bandwidth shall not exceed -21 dBW in any 100 kHz band.

Verification:

The test method specified in subclause 6.7 of ETS 300 456 [4] shall apply.

Due to the vicinity of the carrier the measurement shall be performed with a measurement bandwidth of 3 kHz.

6.3 Transmit carrier centre frequency stability

Purpose:

Protection of transmissions on the same satellite.

Specification:

The transmitted carrier centre frequency shall not deviate from its nominal value by more than an amount which allows the carrier (and its spectral components which have a spectral power density greater than the specified spurious levels) to remain within its nominated bandwidth. This frequency tolerance refers to the initial frequency adjustment plus long-term drift. Long-term drift shall be assumed to be at least one month.

Verification:

The test method specified in subclause 6.5 of ETS 300 456 [4] shall apply.

6.4 Off-axis EIRP emission density (co-polar and cross-polar) within the band 5,850 GHz to 6,650 GHz

Purpose:

Protection of other satellite (uplink) systems.

Specification:

The maximum EIRP in any 4 kHz band within the nominated bandwidth of the co-polarized component in any direction Φ degrees from the antenna main beam axis shall not exceed the limits in table 3.

Table 3

Direction Φ	EIRP limit (dBW)
$2,5° \leq \Phi \leq 7°$	32 - 25 log Φ - 10 log N
$7° < \Phi \leq 9,2°$	11 - 10 log N
$9,2° < \Phi \leq 48°$	35 - 25 log Φ - 10 log N
$\Phi > 48°$	- 7 - 10 log N

Where Φ is the angle, in degrees, between the main beam axis and the direction considered, and N is the maximum number of VSATs which may transmit simultaneously in the same carrier frequency band. This number shall be indicated by the manufacturer.

For $\Phi > 70°$ the values given above may be increased to 4 - 10 log N dBW over the range of angles for which the particular feed system may give rise to relatively high levels of spill-over.

For antennas designed for minimum off-axis gain in the direction of the geostationary orbit, the specification for Φ between 2,5° and 20° need only be met within ± 3° of a plane bisected by the main beam axis. This plane shall be marked and identified on the antenna in order to be able to align it tangentially to the geostationary orbit. There shall be an axis of rotation along or parallel to the main-beam axis, with adjustment capability to an accuracy of 0,5°. The antenna shall be capable of having the above plane aligned with the geostationary orbit plane.

In addition the maximum EIRP in any 4 kHz band within the nominated bandwidth of the cross-polarized component in any direction Φ degrees from the antenna main beam axis shall not exceed the limits in table 4.

Table 4

Direction Φ	EIRP limit (dBW)
2,5° ≤ Φ ≤ 7°	22 - 25 log Φ - 10 log N
7° < Φ ≤ 9,2°	1 - 10 log N

Where Φ is the angle, in degrees, between the main beam axis and the direction considered, and N is the maximum number of VSATs which may transmit simultaneously in the same carrier frequency band. This number shall be declared by the manufacturer.

Verification:

The test method specified in subclause 6.1 of ETS 300 456 [4] shall apply.

6.5 Carrier suppression

Purpose:

To allow for the satisfactory suppression of transmissions of a VSAT by the CCMF.

Specification:

When the VSAT carrier is suppressed the VSAT shall be in the transmission disabled state, and the EIRP density shall not exceed 4 dBW in any 4 kHz band within the nominated bandwidth.

Verification:

The test method specified in subclause 6.7 of ETS 300 456 [4] shall apply.

6.6 Antenna transmit gain pattern (co-polar and cross-polar)

Purpose:

Protection of other satellite (uplink) systems and terrestrial services.

Specification 1:

Protection of terrestrial services, mean values.

The gain G(Φ) in dB relative to an isotropic antenna of the main lobe and of at least 90 % of the side-lobe peaks shall not exceed the limits in table 5.

Table 5

Direction Φ	Gain limit (dBi)
2,5° ≤ Φ ≤ 7°	29 - 25 log Φ
7° < Φ ≤ 9,2°	8
9,2° < Φ ≤ 48°	32 - 25 log Φ
Φ > 48°	- 10

For Φ > 70° the values given above may be increased to 0 dBi over the range of angles for which the particular feed system may give rise to relatively high levels of spill-over.

Additionally, the cross-polar gain G(Φ) in dB relative to an isotropic antenna of at least 90 % of the peaks shall not exceed the limits in table 6.

Table 6

Direction Φ	Cross-polar gain limit (dBi)
2,5° ≤ Φ ≤ 7°	19 - 25 log Φ
7° < Φ ≤ 9,2°	- 2

Where Φ is the angle, in degrees, between the main beam axis and the direction considered.

The method of statistical processing of side-lobe peaks and the definition of a peak is dealt with in annex II of ITU-R Recommendation 732 [1].

Specification 2:

Protection of terrestrial services, peak values.

The gain G(Φ) in dB relative to an isotropic antenna of the main lobe and of the side-lobe peaks shall not exceed the limits in table 7.

Table 7

Direction Φ	Gain limit (dBi)
2,5° ≤ Φ ≤ 7°	32 - 25 log Φ
7° < Φ ≤ 12°	11
12° < Φ ≤ 33°	38 - 25 log Φ
Φ > 33°	0

Additionally, the cross-polar gain G(Φ) in dB relative to an isotropic antenna of the peaks shall not exceed the limits in table 8.

Table 8

Direction Φ	Cross-polar gain limit (dBi)
2,5° ≤ Φ ≤ 7°	22 - 25 log Φ
7° < Φ ≤ 9,2°	1

Where Φ is the angle, in degrees, between the main beam axis and the direction considered.

Specification 3 :

Protection of adjacent satellites between 2,5° and 20°.

Specification 1 and 2 shall be met.

For antennas designed for minimum off-axis gain in the direction of the geostationary orbit, the specification for Φ between 2,5° and 20° need only be met within ± 3° of a plane bisected by the main beam axis. This plane shall be marked and identified on the antenna in order to be able to align it tangentially to the geostationary orbit. There shall be an axis of rotation along or parallel to the mainbeam axis, with adjustment capability to an accuracy of 0,5°. The antenna shall be capable of having the above plane aligned with the geostationary orbit plane.

Verification:

The test method specified in subclause 6.1.3.3 of ETS 300 456 [4] shall apply.

6.7 Transmit polarization discrimination (linear) or voltage axial ratio (circular)

Purpose:

Protection of signals on the orthogonal polarization.

Specification 1:

When linear polarization is used, the polarization discrimination of the antenna in the transmit frequency band shall exceed the limits of table 9.

When circular polarization is used, the voltage axial ratio of the antenna in the transmit frequency band shall be less than the limits of table 9.

Table 9

Antenna diameter D	Linear polarization	Circular polarization
	Cross-polarization discrimination limit	Voltage axial ratio limit
D ≤ 4,5 m	25 dB	1,3
D > 4,5 m	27 dB	1,09

The above specification applies to all off-axis angles of less than 0,1° plus the pointing accuracy (see subclause 7.2, specification 1).

NOTE 1: Some satellite operators may require a better performance.

Specification 2:

When linear polarization is used, the polarization discrimination of the antenna in the transmit frequency band shall exceed 20 dB within the -10 dB contour of the main beam.

NOTE 2: Some satellite operators may require a better performance.

Verification:

The test method specified in subclause 6.3 of ETS 300 456 [4] shall apply.

6.8 Antenna receive gain pattern (co-polar and cross-polar)

Purpose:

Protection of the wanted signals from interference from terrestrial services and from the same satellite or adjacent satellites.

Specification 1:

Protection from terrestrial services, mean values.

This specification applies if required by the manufacturer.

The gain G(Φ) in dB relative to an isotropic antenna of the main lobe and of at least 90 % of the side-lobe peaks shall not exceed the limits in table 10.

Table 10

Direction Φ	Gain limit (dBi)
2,5° ≤ Φ ≤ 7°	29 - 25 log Φ
7° < Φ ≤ 9,2°	8
9,2° < Φ ≤ 48°	32 - 25 log Φ
Φ > 48°	- 10

For Φ > 70° the values given above may be increased to 0 dBi over the range of angles for which the particular feed system may give rise to relatively high levels of spill-over.

Additionally, the cross-polar gain G(Φ) in dB relative to an isotropic antenna of at least 90 % of the peaks shall not exceed the limits in table 11.

Table 11

Direction Φ	Cross-polar gain limit (dBi)
2,5° ≤ Φ ≤ 7°	19 - 25 log Φ
7° < Φ ≤ 9,2°	- 2

Where Φ is the angle, in degrees, between the main beam axis and the direction considered.

The method of statistical processing of side-lobe peaks and the definition of a peak is dealt with in annex II of ITU-R Recommendation 732 [1].

Specification 2:

Protection from adjacent satellites between 2,5° and 20°.

This specification applies if required by the manufacturer.

Specification 1 shall be met.

For antennas designed for minimum off-axis gain in the direction of the geostationary orbit, the specification for Φ between 2,5° and 20° need only be met within ± 3° of a plane bisected by the main beam axis. This plane shall be marked and identified on the antenna in order to be able to align it tangentially to the geostationary orbit. There shall be an axis of rotation along or parallel to the mainbeam axis, with adjustment capability to an accuracy of 0,5°. The antenna shall be capable of having the above plane aligned with the geostationary orbit plane.

Verification:

The test method specified in subclause 6.2.3 of ETS 300 456 [4] shall apply.

6.9 Receive polarization discrimination

Purpose:

To provide protection of the wanted signals from signals on the orthogonal polarization.

Specification:

This specification applies if required by the manufacturer.

When linear polarization is used, the polarization discrimination of the antenna system in the receive frequency band shall exceed the limits of table 12.

When circular polarization is used, the voltage axial ratio of the antenna in the receive frequency band shall be less than the limits of table 12.

Table 12

Antenna diameter D	Linear polarization	Circular polarization
	Cross-polarization discrimination limit	Voltage axial ratio limit
D ≤ 4,5 m	25 dB	1,3
D > 4,5 m	27 dB	1,09

The above specification applies to all off-axis angles of less than 0,1° plus the pointing accuracy (see subclause 7.2, specification 1).

NOTE: Some satellite operators may require a better performance.

Verification:

The test method specified in subclause 6.4 of ETS 300 456 [4] shall apply.

7 Mechanical

7.1 Pointing stability

Purpose:

To prevent interference to and from adjacent satellites during severe wind conditions.

Specification:

Under the condition of 100 km/h maximum wind speed, with gusts of 130 km/h lasting 3 seconds, the installation shall not show any sign of permanent distortion and shall not need re-pointing after the application of the wind load.

Verification and test procedure:

The test method specified in subclause 7.4 of ETS 300 456 [4] shall apply.

7.2 Antenna pointing accuracy capability

Purpose:

To enable precise antenna pointing in order to avoid interference to adjacent satellites.

Specification 1:

Main beam pointing accuracy.

The antenna mount shall allow the position of the antenna transmit main beam axis to be maintained with an accuracy better than the off-axis angle measured when the main beam gain has decreased by 1 dB at any frequency in the equipment operating band, over the full range of azimuth and elevation movement available to the antenna.

Specification 2:

Non-symmetrical main beam orientation.

This specification applies to antennas designed for minimum off-axis gain in the direction of the geostationary orbit (e.g. elliptical antennas). The plane bisected by the main beam axis and where the off-axis gain is minimum shall be marked on the antenna. There shall be an axis of rotation along or parallel to the main beam axis, with adjustment capability to an accuracy of 0,5°. The antenna shall be capable of having the above plane aligned with the geostationary orbit plane.

Verification:

The test method specified in subclause 7.3 of ETS 300 456 [4] shall apply.

7.3 Linear polarization angle alignment capability

Purpose:

To enable precise antenna linear polarization alignment in order to avoid interference to and from the same satellite and also adjacent satellites.

Specification 1:

When linear polarization is used, the polarization angle shall be continuously adjustable in a range of at least 180°.

Specification 2:

When linear polarization is used, it shall be possible to fix the transmit antenna polarization angle with an accuracy of at least 1°.

Verification:

The test method specified in subclause 7.5 of ETS 300 456 [4] shall apply.

8 Control and monitoring

Relevant information is contained in ETS 300 160 [5] and ETS 300 161 [6].

History

Document history			
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