SLOVENSKI STANDARD
SIST ETS 300 456 E1:2006

01-februar-2006

Satelitske zemeljske postaje in sistemi (SES) ï Preskusne metode za satelitske terminale z zelo majhno antensko odprtino (VSATs), ki delujejo v frekvenļ nih pasovih 11/12/14 GHz

Satellite Earth Stations and Systems (SES); Test methods for Very Small Aperture Terminals (VSATs) operating in the 11/12/14 GHz frequency bands

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Ta slovenski standard je istoveten z: **ETS 300 456 Edition 1**

ICS:

33.060.30	Radiorelejni in fiksni satelitski komunikacijski sistemi	Radio relay and fixed satellite communications systems

SIST ETS 300 456 E1:2006 **en**

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

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EUROPEAN TELECOMMUNICATION STANDARD

ETS 300 456

November 1995

Source: ETSI TC-SES

Reference: DE/SES-02008

ICS: 33.060.30

Key words: VSAT, testing

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Foreword

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

Transposition dates	
Date of adoption of this ETS:	15 September 1995
Date of latest announcement of this ETS (doa):	28 February 1996
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	31 August 1996
Date of withdrawal of any conflicting National Standard (dow):	31 August 1996

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1 Scope

This European Telecommunication Standard (ETS) covers the test methods for both transmit/receive and receive only Very Small Aperture Terminals (VSAT) used for digital communications within the 11/12/14 GHz frequency bands of the Fixed Satellite Service (FSS) utilising satellites spaced three degrees (3°) apart. These VSATs are defined and their basic characteristics are specified in the referenced ETSs, ETS 300 159 [1] and ETS 300 157 [2]. This ETS specifies the test methods for demonstration of compliance with the specifications of the reference ETS, and also with those for which the reference ETS allows verification at the manufacturer's discretion.

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] ETS 300 159: "Satellite Earth Stations and Systems (SES); Transmit/receive Very Small Aperture Terminals (VSATs) used for data communications operating in the Fixed Satellite Service (FSS) 11/12/14 GHz frequency bands".

[2] ETS 300 157: "Satellite Earth Stations and Systems (SES); Receive-only Very Small Aperture Terminals (VSATs) used for data distribution operating in the 11/12 GHz frequency bands".

[3] IEC 510-1 (1975): "Methods of measurement for radio equipment used in satellite earth stations; Part 1: General".

[4] CISPR 16-1 (1993): "Specification for radio disturbance and immunity measuring apparatus and methods: Part 1: Radio disturbance and immunity measuring apparatus".

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

[6] ITU-R Recommendation S.732 (1990): "Method for statistical processing of Earth station antenna side-lobe peaks".

[7] EN 50081-1 (1991): "Electromagnetic compatibility - Generic emission standard. Part 1: residential, commercial and light industry".

[8] EN 55022 (1993): "Limits and methods of measurement of radio interference characteristics of information technology equipment".

[9] EN 50082-1 (1991): "Electromagnetic compatibility - Generic immunity standard. Part 1: residential, commercial and light industry".

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3 Definitions and abbreviations

3.1 Definitions

For the purposes of this ETS the following definitions apply:

Definitions are generally included in the subclause in which they occur. The definitions have been taken, where possible, from "International Electrotechnical Vocabulary (2nd Edition), Group 60, Radiocommunications" published by the International Electrotechnical Commission. Other sources include, but are not limited to, documentation produced by IEC, ETSI and CISPR.

The definitions below are of a general nature and apply throughout this ETS.

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indoor unit: That part of the equipment which does not form part of the outdoor unit. It is generally installed inside the buildings and is connected to the outdoor unit. The connection cable between the outdoor and indoor units belongs to the indoor unit.

Ku-band: That part of the frequency spectrum which occupies the frequency band 10,7 GHz to 18 GHz.

nominated bandwidth: The bandwidth of the VSAT radio frequency transmission nominated by the manufacturer. The nominated bandwidth is wide enough to encompass all spectral elements of the transmission which have a density greater than the specified spurious levels, and to take into account the transmit carrier frequency stability.

NOTE: 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 assignment situation.

outdoor unit: That part of the terminal installed in a position within line of sight to the satellite and which is intended to be operated in outdoor environment conditions.

spurious radiation: Any radiation outside the nominated bandwidth.

transmissions disabled state: A VSAT is in the transmissions disabled state when it is not authorised by the Centralised Control and Monitoring Functions (CCMF) to transmit.

transmissions enabled state: A VSAT is in the transmissions enabled state when it is authorised by the CCMF to transmit.

3.2 Abbreviations

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For the purposes of this ETS the following abbreviations apply:

CCMF	Centralised Control and Monitoring Functions
EIRP	Equivalent Isotropically Radiated Power
EMC	Electro-Magnetic Compatibility
EUT	Equipment Under Test
HPA	High Power Amplifier
LNB	Low Noise Block (low noise amplifier and down-converter)
QTMA	Quality of Transmission Measurement Apparatus
RF	Radio Frequency
VSAT	Very Small Aperture Terminal

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4 General test arrangements

4.1 General

Five possible test sites are described in this clause: outdoor far-field test sites, anechoic chambers, open area test sites, compact antenna test ranges and semi-anechoic chambers. The test sites used for the measurements shall be validated and, where appropriate, calibrated, to reduce measurement uncertainty and the probability of measurement error. Other test sites may be used providing that they are proven to produce results consistent with those produced by the appropriate test site described in this clause.

Any measurement involving either antenna gain patterns or polarisation measurements shall be performed in the far field obtainable on an outdoor far-field test site, through a compact antenna test range or by any other recognised method that can be proved to give the same results over the concerned frequency range.

The test site shall be on a reasonable level surface or ground and it shall be free from reflecting objects so that the measurement results are not unduly affected. Sufficient precautions shall be taken to ensure that reflections from objects adjacent to the test site do not degrade the measurement methods.

Any measurement involving system radiation and electromagnetic immunity shall be performed with the VSAT in a continuous transmission mode. Any facilities necessary shall be provided by the manufacturer and shall be described in the test report.

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The ambient noise of the test site shall be at least 6 dB lower than the lowest limit to which the measurements have to be compared. All test cables shall be as short as possible and shall be adequately screened.

In the case where the outdoor unit is manufactured without an accessible interface between the antenna subsystem and the Low Noise Block (LNB), it is impossible to carry out the tests to verify compliance with the specifications. In this case the manufacturer shall provide suitable fixtures.

4.2 Outdoor far-field test site

4.2.1 General

This test site shall be such that any covering or environmental protection as well as the site itself shall be transparent to electromagnetic waves at the frequencies under consideration. The distance between the measuring and measured antennas shall be such that they are each in the far-field region of the other antenna. Reflections from both natural and artificial objects shall be at a minimum and of known amplitude and effect.

4.2.2 Description

The far-field distance of an antenna is defined as:

$$R > 2D^2 / \lambda$$

where:

R is the far-field distance;
D is the largest dimension of the antenna under test;
λ is the free space wavelength at the test frequency.

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Even at this distance, the path difference between the ray from the source to the centre of the aperture and the ray from the source to the edge of the aperture is at the most $\lambda/16$ and the resulting phase deviation of the incident wavefront is at the most 22,5° which corresponds to an error of about 0,1 dB in antenna gain.

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The structure supporting the Equipment Under Test (EUT) shall have means of adjustment in polarity, elevation angle and azimuth angle so that the received signal can be maximised.

To eliminate errors caused by reflection coefficient variation from one measurement geometry to another, the ground reflections shall be minimised. Sufficient precautions shall be taken to ensure that reflections from extraneous objects adjacent to the site do not degrade the measurement results and that all test cables are as short as possible and adequately screened.

If the near-field scanner technology to convert near-field measurements to far-field results is proven and sufficiently accurate by reference to tests taken in both regions then antenna measurements may be taken in the near field.

4.3 Anechoic chamber

4.3.1 General

An anechoic chamber is a well shielded chamber covered inside with radio frequency absorbing material and simulating a free space environment. Absolute or relative measurements can be performed. Absolute measurements of field strength require the anechoic chamber to be calibrated. This is the type of chamber often used for immunity measurements.

4.3.2 Description

An anechoic chamber shall meet appropriate requirements for shielding effectiveness and wall return loss. Figure 1 shows an example of such requirements. Figure 2 shows an example of the construction of an anechoic chamber having a base area of 5 m by 10 m and a height of 5 m, usually used for Electro Magnetic Compatibility (EMC) measurements. The ceiling and walls are coated with pyramidal-formed absorbers approximately 1 m high. The base is covered with special absorbers which form the floor. The

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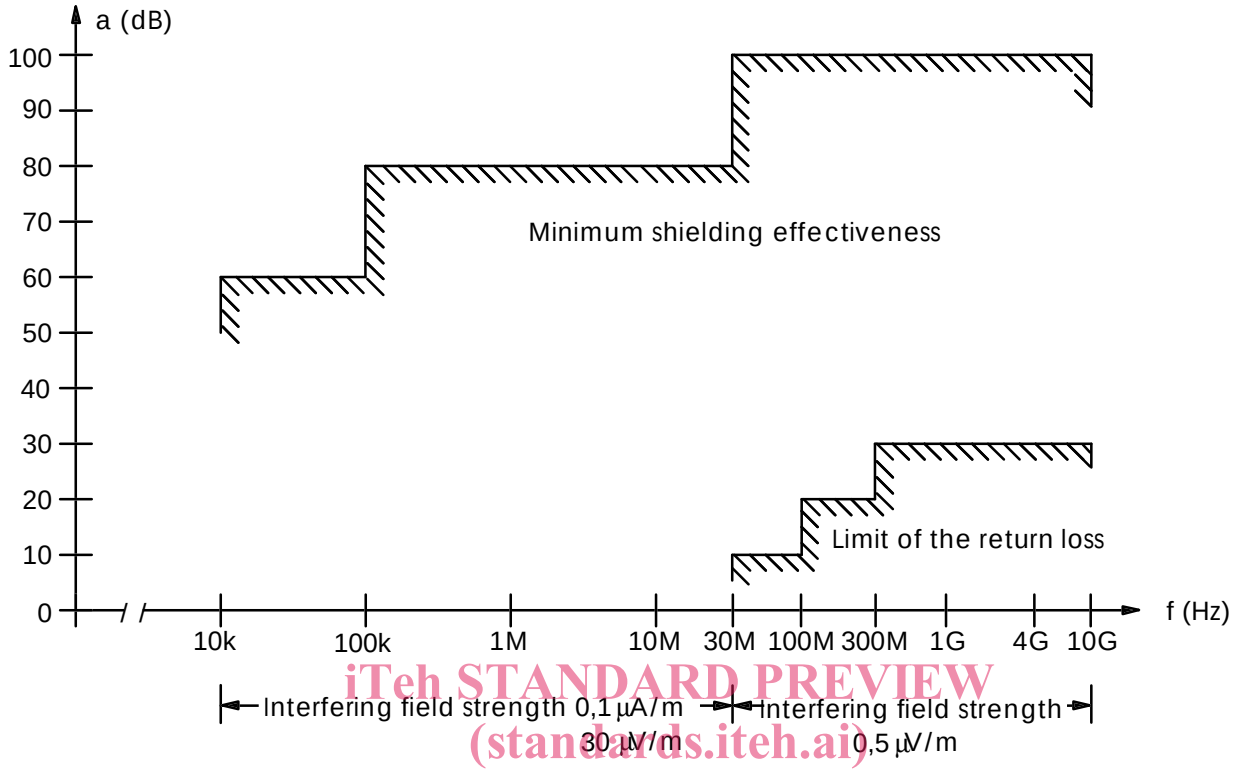
available internal dimensions of the chamber are 3 m by 8 m by 3 m, so that a maximum measuring distance of 5 m in the middle axis of this chamber is available. The floor absorbers reject floor reflections so that the test antenna height need not be changed during the calibration procedures. Figure 3 shows an example of a chamber that can be used for higher frequencies. Anechoic chambers of other dimensions may be used.



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where: a is attenuation;
f is frequency.

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Figure 1: Example of an anechoic shielded chamber for simulated free-space measurements

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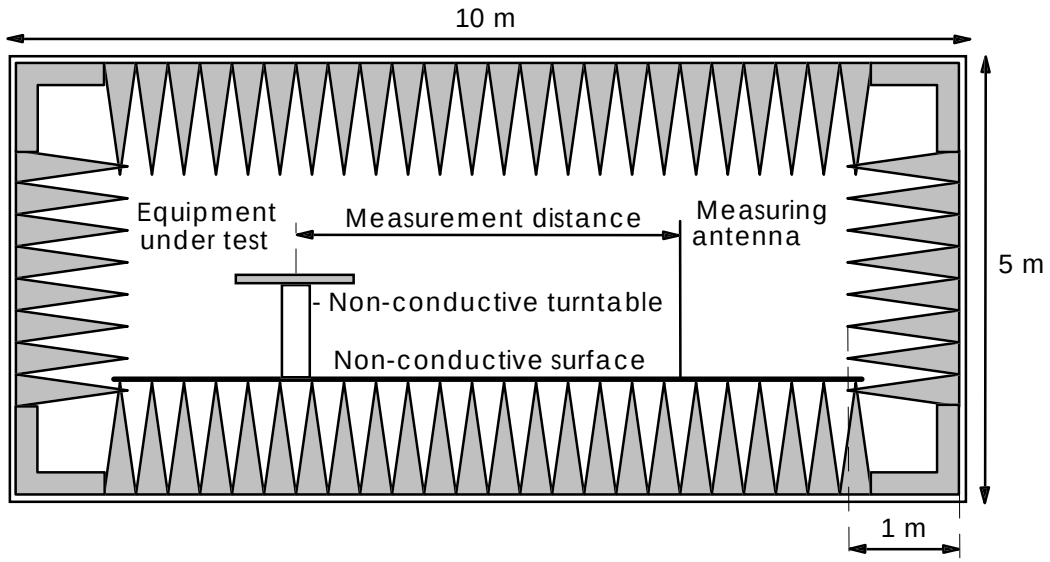

Ground plan

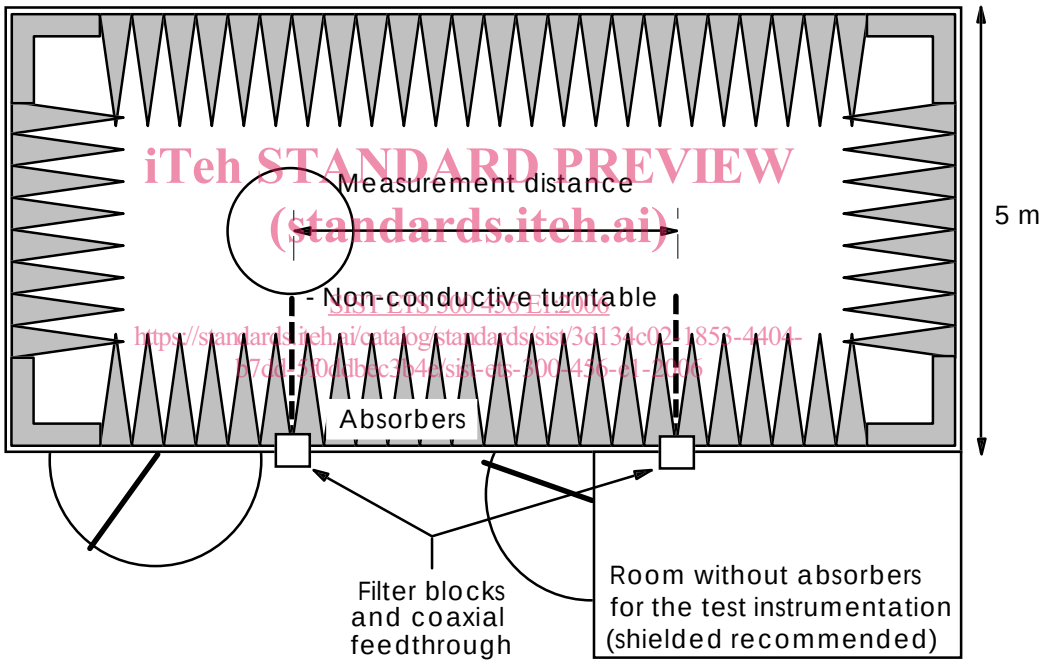

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Figure 2: Example of an anechoic shielded chamber for simulated free-space measurements below 3 GHz