



# SLOVENSKI STANDARD

## SIST EN 301 459 V1.4.1:2007

01-december-2007

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Satellite Earth Stations and Systems (SES) - Harmonized EN for Satellite Interactive Terminals (SIT) and Satellite User Terminals (SUT) transmitting towards satellites in geostationary orbit in the 29,5 GHz to 30,0 GHz frequency bands covering essential requirements under article 3.2 of the R&TTE Directive

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### ICS:

33.060.30	Radiorelejni in fiksni satelitski komunikacijski sistemi	Radio relay and fixed satellite communications systems
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# ETSI EN 301 459 V1.4.1 (2007-06)

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*Harmonized European Standard (Telecommunications series)*

**Satellite Earth Stations and Systems (SES);  
Harmonized EN for Satellite Interactive Terminals (SIT)  
and Satellite User Terminals (SUT)  
transmitting towards satellites in geostationary orbit  
in the 29,5 GHz to 30,0 GHz frequency bands  
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under article 3.2 of the R&TTE Directive**

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## Foreword

This Harmonized European Standard (Telecommunications series) has been produced by ETSI Technical Committee Satellite Earth Stations and Systems (SES).

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC [1] (as amended) laying down a procedure for the provision of information in the field of technical standards and regulations.

The present document is intended to become a Harmonized Standard, the reference of which will be published in the Official Journal of the European Communities referencing the Directive 1999/5/EC [2] of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity ("the R&TTE Directive").

Technical specifications relevant to Directive 1999/5/EC [2] are given in annex A.

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## Introduction

The present document is part of a set of standards developed by ETSI and is designed to fit in a modular structure to cover all radio and telecommunications terminal equipment within the scope of the R&TTE Directive. The modular structure is shown in EG 201 399 (see bibliography).

### Remarks on the present document

The present document applies to Satellite Interactive Terminals (SITs) and Satellite User Terminals (SUTs) either for individual or collective use.

The present document deals with the specification defined to protect other users of the frequency spectrum, both satellite and terrestrial, from harmful interference.

The determination of the parameters of the user earth stations using a given geostationary satellite for the protection of the spectrum allocated to that satellite, is considered to be under the responsibility of the satellite operator or the satellite network operators.

The requirements have been selected to ensure an adequate level of compatibility with other radio services. The levels, however, do not cover extreme cases which may occur in any location but with a low probability of occurrence.

The present document may not cover those cases where a potential source of interference which is producing individually repeated transient phenomena or a continuous phenomenon is present, e.g. a radar or broadcast site in the near vicinity. In such a case it may be necessary to use special protection applied to the source of interference, or the interfered part or both.

The present document does not contain any requirement, recommendation or information about the installation of SITs and SUTs.

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# 1 Scope

The present document applies to Satellite Interactive Terminals (SIT) and Satellite User Terminals (SUT) operating as part of a bi-directional satellite network. Satellite Terminal (ST) is used in the present document as a generic name that refers equally to a SIT and/or a SUT.

In such a network a Network Control Facility (NCF) is responsible for the monitoring and control of the transmit functions of the STs. These STs have the following characteristics:

- in the case of SITs reception is in the Fixed Satellite Service (FSS) frequency ranges from 10,70 GHz to 11,70 GHz and from 12,50 GHz to 12,75 GHz, as well as the Broadcast Satellite Service (BSS) frequency range from 11,70 GHz to 12,50 GHz;
- in the case of SUTs reception is in the Fixed Satellite Service (FSS) frequency ranges from 19,70 GHz to 20,20 GHz and from 17,70 GHz to 19,70 GHz, as well as the Broadcast Satellite Service (BSS) frequency range from 21,40 GHz to 22,00 GHz;
- in all cases ST transmission is in the frequency band allocated to FSS on a primary basis from 29,5 GHz to 30,0 GHz;
- STs transmit towards geostationary satellites with spacing down to 2° away from any other geostationary satellite operating in the same frequency band and covering the same area;
- linear or circular polarization is used for transmission or reception;
- the received signals may be analogue and/or digital;
- the transmitted signals are always of digital nature;
- the ST antenna diameter does not exceed 1,8 m, or equivalent effective area;
- the ST is designed for unattended operations.

The equipment considered in the present document comprises both the outdoor unit, usually composed of the antenna subsystem and associated upconverter, power amplifier and Low Noise Block (LNB) downconverter, and the indoor unit, usually composed of receive and transmit logic as well as the modulator, including cables between these two units.

The present document applies to the ST with its ancillary equipment and its various ports and when operated within the boundary limits of all the operational environmental profile declared by the applicant and when installed as required by the applicant by declaration or in the user documentation.

All parts of the indoor unit related to reception, processing and presentation of the received information except the control channel are not within the scope of the present document. The syntax of the control channel messages is outside the scope of the present document.

The present document is intended to cover the provisions of Directive 1999/5/EC [2] (R&TTE Directive) article 3.2, which states that "... radio equipment shall be so constructed that it effectively uses the spectrum allocated to terrestrial/space radio communications and orbital resources so as to avoid harmful interference".

In addition to the present document, other ENs that specify technical requirements in respect of essential requirements under other parts of article 3 of the R&TTE Directive [2] may apply to equipment within the scope of the present document.

NOTE: A list of such ENs is included on the web site <http://www.newapproach.org/>.

## 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

- [1] Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations.
- [2] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).
- [3] CISPR 16-1-4 (Edition 2.0): "Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-4: Radio disturbance and immunity measuring apparatus - Ancillary equipment - Radiated disturbances".

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## 3 Definitions and abbreviations

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### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in the R&TTE Directive [2] and the following apply:

**ancillary equipment:** equipment used in connection with an ST is considered as ancillary if the three following conditions are met:

- the equipment is intended for use in conjunction with the ST to provide additional operational and/or control features; and
- the equipment can not be used on a stand alone basis, to provide user functions independently of the ST; and
- the absence of the equipment does not inhibit the operation of the ST

**applicant:** manufacturer or his authorized representative within the European Community or the person responsible for placing the apparatus on the market

**"carrier-off" radio state:** radio state in which the ST may transmit and does not transmit any carrier

NOTE 1: The expression "the ST may transmit" means that all the conditions for transmission are satisfied (e.g. in a state where transmissions are permitted and no failure detected).

NOTE 2: The existence of a "Carrier-off" radio state depends on the system of transmission used. For STs designed for continuous transmission mode there may be no "Carrier-off" radio state.

**"carrier-on" radio state:** radio state in which the ST may transmit and effectively transmits a carrier

**Control Channel (CC):** channel or channels by which STs receive control information from the NCF for their network

NOTE: Typically the CC(s) is/are carried via the same or collocated satellite as used for transmission of user data and within the internal protocol structure of the broadcast system.

**EIRP<sub>max</sub>:** maximum e.i.r.p. capability of the ST as declared by the applicant

**EIRP<sub>nom</sub>:** nominal e.i.r.p. which is either:

- a) when uplink power control is not implemented, equal to EIRP<sub>max</sub>; or
- b) when uplink power control is implemented, equal to the maximum required e.i.r.p. of the ST under clear sky condition as declared by the applicant

NOTE: The applicant may declare different values of EIRP<sub>max</sub> and EIRP<sub>nom</sub> for each combination of occupied bandwidth and transmission parameters (see clause 4.2.1).

**emissions disabled radio state:** radio state in which the ST must not transmit a carrier

NOTE: This radio state only applies in certain CMF states as defined in clause 4.1.2 (e.g. before System Monitoring Pass (SMP), before the control channel is received, when a failure is detected, when the ST is commanded to disable). The "Emissions disabled" radio state requires lower unwanted emissions than the "Carrier-off" radio state.

**environmental profile:** range of environmental conditions under which equipment within the scope of the present document is required to comply with the provisions of the present document

**indoor unit:** it is composed of that part of the ST which is not part of the outdoor unit

NOTE: It is generally installed inside a building and is connected to the outdoor unit.

**integral antenna:** antenna which may not be removed during the tests according to the applicant's statement

**nominated bandwidth:** bandwidth of the ST radio frequency transmission nominated by the applicant

NOTE 1: The nominated bandwidth 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:** width of the signal spectrum 10 dB below the maximum inband power density

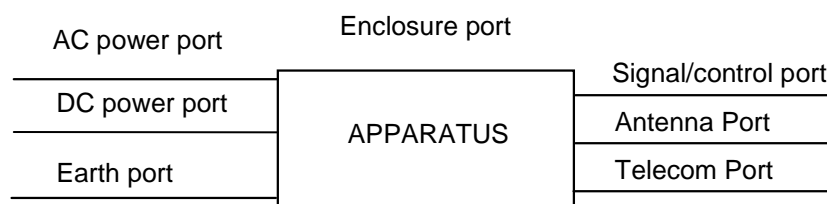
**outdoor unit:** parts of the ST intended to be installed outdoor, as declared by the applicant, or as indicated in the user documentation

NOTE 1: 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) downconverter, 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 (IF);
- c) the upconverter and the power amplifier which convert from the IF to RF and amplify the low level RF signals for transmission through the antenna subsystem.

NOTE 2: The installation equipment is outside the scope of the present document. 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 the present document.

**port:** particular interface of the specified apparatus with the external electromagnetic environment (figure 1)



**Figure 1: Examples of ports**

**removable antenna:** antenna which may be removed during the tests according to the applicant's statement

**Satellite Terminal (ST):** throughout the present document either a SIT or a SUT

**spurious radiation:** any radiation outside the nominated bandwidth

**transmission disabled state:** ST is in this state when it is not authorized by the NCF to transmit

**uplink power density control:** control of the e.i.r.p. and/or occupied bandwidth and/or other transmission parameters (e.g. FEC, modulation, symbol rate) of the transmitted signal in order to adjust the e.i.r.p. in a given measurement bandwidth

NOTE: Uplink power density control may be used to respond to uplink fade conditions.

## 3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

BSS	Broadcast Satellite Service
CC	Control Channel
CCF	Control Channel reception Failure
CCR	Control Channel correctly Received
CDMA	Code Division Multiple Access
CISPR	Comité International Spécial des Perturbations Radioélectriques (International Special Committee on Radio Interference)
CMF	Control and Monitoring Functions
EIRP, e.i.r.p.	Equivalent Isotropically Radiated Power
EUT	Equipment Under Test
FDMA	Frequency Division Multiple Access
FEC	Forward Error Correction
FSS	Fixed Satellite Service
GSO	Geostationary Satellite Orbit
HPA	High Power Amplifier
IF	Intermediate Frequencies
LNB	Low Noise Block downconverter
LO	Local Oscillator
NCF	Network Control Facility
R&TTE	Radio and Telecommunications Terminal Equipment
RF	Radio Frequency
SIT	Satellite Interactive Terminal
SMF	System Monitoring Fail
SMP	System Monitoring Pass
ST	Satellite Terminal
STE	Special Test Equipment
SUT	Satellite User Terminal
TDMA	Time Division Multiple Access
TxD	Transmission Disable command
TxE	Transmission Enable command

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## 4 Technical requirements specifications

### 4.1 General

#### 4.1.1 Environmental profile

The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be declared by the applicant. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the declared operational environmental profile.

The environmental profile for operation of the equipment shall include the ranges of humidity, temperature and supply voltage.

#### 4.1.2 ST states and radio states

For the purpose of the present document the following four ST states are defined, without presuming the effective implementation of the ST state machine:

- "Non valid";
- "Initial phase";
- "Transmission disabled"; and
- "Transmission enabled".

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The four ST states are represented in figure 2 and are used in clause 4.2.7 for the specification of the Control and Monitoring Functions (CMFs).

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In the "Non-valid" state and in the "Transmission disabled" state the ST is not allowed to transmit. In the "Transmission-enabled" state the ST is allowed to transmit. In the "Initial phase" state the ST is only allowed to transmit initial bursts or is waiting for a transmit enable/disable command.

The ST "may transmit" when all the conditions for transmission are satisfied (e.g. in a state where transmissions are permitted, no failure detected).

The following radio states of the ST are defined:

- "Emissions disabled" when the ST must not transmit any carrier;
- "Carrier-off" when the ST may transmit and does not transmit any carrier;
- "Carrier-on" when the ST may transmit and transmits a carrier.

Table 1 gives the only possible combinations of the ST states and radio states which shall apply, with some examples of associated events.

When the ST transmits several carriers having different frequencies, an ST state machine as described above may be associated with each carrier or each set of carriers.

**Table 1: ST states and Radio states**

ST states	Radio states	Examples of events
"Non valid"	"Emissions disabled"	After-power on; or After any failure; or During the checking phase
"Initial phase"	"Emissions disabled"	When waiting for a transmission enable or disable command from the NCF Between initial bursts
	"Carrier-on"	During the transmission of each initial burst
"Transmission enabled"	"Carrier-on"	During transmission of carrier(s)
	"Carrier-off"	When no carrier is transmitted
"Transmission disabled"	"Emissions disabled"	When a disable command from the NCF has been received and waiting for a transmission enable command from the NCF

## 4.2 Conformance requirements

### 4.2.1 General

Under operational conditions an ST may dynamically change the occupied bandwidth and/or other transmission parameters (e.g. FEC, modulation, symbol rate) of the transmitted signal. For each combination of occupied bandwidth and other transmission parameters, an  $EIRP_{max}$ , an  $EIRP_{nom}$  and a nominated bandwidth shall be declared by the applicant. The following specifications apply to the ST for each combination of occupied bandwidth and other transmission parameters.

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The nominated bandwidth shall not exceed 5 times the occupied bandwidth.

### 4.2.2 Off-axis spurious radiation

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#### 4.2.2.1 Purpose

<https://standards.iteh.ai/catalog/standards/sist/d7b0fb96-f9e2-4866-816e-dfaa67a7a058/sist-en-301-459-v1-4-1-2007>

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

#### 4.2.2.2 Specification

The following specifications apply to the ST transmitting at e.i.r.p. values up to and including  $EIRP_{max}$ .

- 1) The ST shall not exceed the limits for radiated interference field strength over the frequency range from 30 MHz to 1 000 MHz specified in table 2a.

**Table 2a: Limits of radiated field strength at a test distance of 10 m in a 120 kHz bandwidth**

Frequency range	Quasi-peak limits
30 MHz to 230 MHz	30 dB $\mu$ V/m
230 MHz to 1 000 MHz	37 dB $\mu$ V/m

The lower limit shall apply at the transition frequency.

- 2) When the ST is in the "Emissions disabled" radio state, the off-axis Equivalent Isotropically Radiated Power (e.i.r.p.) of spurious radiation from the ST, in any 100 kHz band, shall not exceed the limits in table 2b, for all off-axis angles greater than 7°.