ETSI EN 301 360 V2.1.1 (2016-06)

Satellite Earth Stations and Systems (SES);
Harmonised Standard for Satellite Interactive Terminals (SIT) and Satellite User Terminals (SUT) transmitting towards satellites in geostationary orbit, operating in the 27,5 GHz to 29,5 GHz frequency bands covering the essential requirements of article 3.2 of the Directive 2014/53/EU

Reference
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Foreword

This Harmonised European Standard (EN) has been produced by ETSI Technical Committee Satellite Earth Stations and Systems (SES).

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.4] to provide one voluntary means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC [6].

Once the present document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of the present document given in table A.1 confers, within the limits of the scope of the present document, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

National transposition dates	
Date of adoption of this EN:	16 May 2016
Date of latest announcement of this EN (doa):	31 August 2016
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	28 February 2017
Date of withdrawal of any conflicting National Standard (dow):	28 February 2018

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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Introduction

The present document is part of a set of standards developed by ESI and is designed to fit in a modular structure to cover all radio equipment under the Directive 2014/53/EU [6]. The modular structure is shown in ETSI EG 201 399 [i.3].

Figure 1: Void

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 unacceptable 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.

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 from 27,50 GHz to 29,50 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 2014/53/EU [6] (RE Directive) article 3.2, which states that "*… radio equipment shall be so constructed that it both effectively uses and supports the efficient use of radio spectrum in order 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 Directive 2014/53/EU [6] 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

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) 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.

The following referenced documents are necessary for the application of the present document.

[1] Void.

[2] CISPR 16-1-4 (2010): "Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-4: Radio disturbance and immunity measuring apparatus - Ancillary equipment - Radiated disturbances".

[3] Void.

[4] Void.

[5] Void.

[6] Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC (RE Directive).

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI TR 102 375: "Satellite Earth Stations and Systems (SES); Guidelines for determining the parts of satellite earth station antenna radiation patterns concerned by the geostationary satellite orbit protection".

[i.2] ETSI TR 102 215: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Recommended approach, and possible limits for measurement uncertainty for the measurement of radiated electromagnetic fields above 1 GHz".

[i.3] ETSI EG 201 399 (V3.1.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); A guide to the production of Harmonized Standards for application under the Radio & Telecommunication Terminal Equipment Directive 1999/5/EC (R&TTE) and a first guide on the impact of the Radio Equipment Directive 2014/53/EU (RED) on Harmonized Standards".

[i.4] Commission Implementing Decision C(2015) 5376 final of 4.8.2015 on a standardisation request to the European Committee for Electrotechnical Standardisation and to the European Telecommunications Standards Institute as regards radio equipment in support of Directive 2014/53/EU of the European Parliament and of the Council.

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in the Directive 2014/53/EU [6] and the following apply:

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

a) the equipment is intended for use in conjunction with the ST to provide additional operational and/or control features; and

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

c) 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 phrase "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 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.

$EIRP_{max}$: maximum e.i.r.p. capability of the ST as declared by the applicant

$EIRP_{nom}$: either

a) when uplink power control is not implemented $EIRP_{max}$; or

b) when uplink power control is implemented, 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 $EIRP_{max}$ and $EIRP_{nom}$ for each combination of occupied bandwidth and transmission parameters (see clause 4.2.1).

emissions disabled radio state: radio state in which the ST is not transmitting 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, 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: 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

nominal antenna diameter: antenna diameter declared by the manufacturer that is a parameter in performance characteristics and that allows reference to a certain performance

NOTE: An antenna with circular aperture of diameter equal to the nominal diameter does typically have the performance specified.

Network operators might request antennas of a certain diameter. Then an antenna that is compliant with the requirement for nominal antenna diameter equal to the requested antenna diameter can be used. Manufacturers can mark their equipment with antenna diameters used in the requirements during compliance test.

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.

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

The outdoor unit usually comprises of 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: 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 (see figure 2)

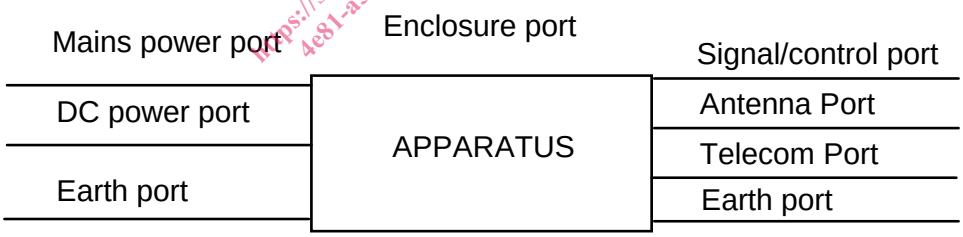

Figure 2: Examples of ports

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.

Wanted signal occupied bandwidth (BW): width of the signal spectrum 10 dB below the maximum inband density

3.2 Symbols

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

dBsd	Ratio expressed in decibels relative to the spectral density

3.3 Abbreviations

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

BW	Wanted signal occupied bandwidth
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
EFTA	European Free Trade Association
EIRP, e.i.r.p.	Equivalent Isotropically Radiated Power
EMC	Electromagnetic Compatibility
EUT	Equipment Under Test
FDMA	Frequency Division Multiple Access
FEC	Forward Error Correction
FSS	Fixed Satellite Service
GEUT	Gain of EUT
GSO	Geostationary Satellite Orbit
HPA	High Power Amplifier
IDU	Indoor Unit
IF	Intermediate Frequencies
LNB	Low Noise Block downconverter
LO	Local Oscillator
LV	Low Voltage
NCF	Network Control Facility
R&TTE	Radio and Telecommunications Terminal Equipment
RE	Radio Equipment
RED	Radio Equipment Directive
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

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".

The four ST states are represented in figure 4 and are used in clause 4.2.7 for the specification of the Control and Monitoring Functions (CMFs).

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 does 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 1a 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.