



SLOVENSKI STANDARD
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Satelitske zemeljske postaje in sistemi (SES) - Harmonizirani standard, ki zajema bistvene zahteve člena 3.2 direktive 2014/53/EU, za sledenje zemeljskim postajam na vlakih (EST), delujočim v frekvenčnih pasovih 14/12 GHz

Satellite Earth Stations and Systems (SES) - Harmonised Standard for tracking Earth Stations on Trains (ESTs) operating in the 14/12 GHz frequency bands covering the essential requirements of article 3.2 of the Directive 2014/53/EU

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ETSI EN 302 448 V2.1.1 (2016-05)



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Harmonised Standard for tracking
Earth Stations on Trains (ESTs)
operating in the 14/12 GHz frequency bands
covering the essential requirements
of article 3.2 of the Directive 2014/53/EU**

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Contents

Intellectual Property Rights	6
Foreword.....	6
Modal verbs terminology.....	6
Introduction	6
1 Scope	7
2 References	8
2.1 Normative references	8
2.2 Informative references.....	8
3 Definitions, symbols and abbreviations	9
3.1 Definitions	9
3.2 Symbols.....	11
3.3 Abbreviations	11
4 Technical requirements specifications	12
4.1 General	12
4.1.1 Environmental profile	12
4.1.2 Operational configurations	13
4.1.3 EST states and radio states.....	13
4.2 Conformance requirements	14
4.2.1 Off-axis spurious radiation	14
4.2.1.1 Justification	14
4.2.1.2 Specification.....	14
4.2.1.3 Conformance tests.....	15
4.2.2 On-axis spurious radiation for EST	15
4.2.2.1 Justification	15
4.2.2.2 Specification.....	16
4.2.2.2.1 "Carrier-on" radio state.....	16
4.2.2.2.2 "Carrier-off" and "Emissions disabled" radio states	16
4.2.2.3 Conformance tests.....	16
4.2.3 Off-axis e.i.r.p. emission density within the band.....	16
4.2.3.0 General	16
4.2.3.1 Justification	17
4.2.3.2 Specification.....	17
4.2.3.3 Conformance tests.....	18
4.2.4 Carrier suppression	18
4.2.4.1 Justification	18
4.2.4.2 Specification.....	18
4.2.4.3 Conformance tests.....	18
4.2.5 Antenna pointing and polarization alignment for ESTs.....	18
4.2.5.1 Justification	18
4.2.5.2 Specification.....	19
4.2.5.3 Conformance tests.....	20
4.2.6 Cessation of emissions of the EST.....	20
4.2.6.1 Justification	20
4.2.6.2 Specification.....	20
4.2.6.2.1 Specification 1: Mode of cessation of emissions.....	20
4.2.6.2.2 Specification 2: Conditions under which the EST shall cease emissions	20
4.2.6.2.3 Specification 3: Cessation of emissions	21
4.2.6.2.4 Specification 4: Fault conditions	21
4.2.6.3 Conformance tests.....	21
4.2.7 Identification of EST	21
4.2.7.1 Justification	21
4.2.7.2 Specification.....	21
4.2.7.3 Conformance tests.....	22
4.2.8 Control and Monitoring Functions (CMFs).....	22

4.2.8.1	CMF state diagram	22
4.2.8.2	Processor monitoring	23
4.2.8.2.1	Justification	23
4.2.8.2.2	Specification	23
4.2.8.2.3	Conformance tests	23
4.2.8.3	Transmit subsystem monitoring	23
4.2.8.3.1	Justification	23
4.2.8.3.2	Specification	23
4.2.8.3.3	Conformance tests	23
4.2.8.4	Power-on/Reset	23
4.2.8.4.1	Justification	23
4.2.8.4.2	Specification	23
4.2.8.4.3	Conformance tests	24
4.2.8.5	Control Channel (CC) and Response Channel (RC)	24
4.2.8.5.1	Justification	24
4.2.8.5.2	Specification	24
4.2.8.5.3	Conformance tests	25
4.2.8.6	Network control commands	25
4.2.8.6.1	Justification	25
4.2.8.6.2	Specification	25
4.2.8.6.3	Conformance test	25
4.2.8.7	Initial burst transmission	25
4.2.8.7.1	Justification	25
4.2.8.7.2	Specification	25
4.2.8.7.3	Conformance tests	26
4.2.8.8	Inhibition of transmissions	26
4.2.8.8.1	Justification	26
4.2.8.8.2	Specification	26
4.2.8.8.3	Conformance tests	26
4.2.9	Receive antenna off-axis gain pattern	26
4.2.9.1	Justification	26
4.2.9.2	Specification	26
4.2.9.3	Conformance tests	27
4.2.10	Blocking performance	27
4.2.10.1	Justification	27
4.2.10.2	Specification	27
4.2.10.3	Conformance tests	27
4.2.11	Adjacent Signal Selectivity	27
4.2.11.1	Justification	27
4.2.11.2	Specification	28
4.2.11.3	Conformance tests	28
5	Testing for compliance with technical requirements	28
5.1	Environmental conditions for testing	28
5.2	Essential radio test suites	28
6	Test methods for all aspects of the EST	28
6.1	General	28
6.2	Off-axis spurious radiation	29
6.2.0	General	29
6.2.1	Test method	29
6.3	On-axis spurious radiation	29
6.3.0	General	29
6.3.1	Test method	30
6.4	Off-axis e.i.r.p. emission density within the band	30
6.4.0	General	30
6.4.1	Test method	30
6.4.1.1	General	30
6.4.1.2	Transmit output power density	30
6.4.1.3	Antenna transmit gain	31
6.4.1.4	Antenna transmit radiation patterns	31
6.4.2	Computation of results	31

6.5	Carrier suppression.....	31
6.5.1	Test method	31
6.6	Antenna pointing for EST	31
6.6.1	General.....	31
6.6.2	Test method	32
6.7	Antenna mechanical stability	32
6.7.1	Test method	32
6.8	Polarization angle alignment capability	32
6.8.1	Test method	32
6.9	Cessation of emissions of the EST	32
6.9.0	General.....	32
6.9.1	Test Method.....	33
6.9.1.1	Required documentation	33
6.9.1.2	Cessation of emissions from the "Transmission enabled" state	33
6.9.1.3	Cessation of emission from the "Transmission disabled" state	33
6.9.1.4	Cessation of emission from the "Initial Phase" state.....	33
6.9.1.4.1	EUTs transmitting initial bursts.....	33
6.9.1.4.2	EUTs not transmitting initial bursts.....	34
6.9.1.5	"Single action" means of cessation of emissions.....	34
6.9.1.6	Fault conditions	35
6.10	Identification of EST	35
6.10.1	Test arrangement	35
6.10.2	Test method	35
6.11	Control and monitoring functions	35
6.11.0	General.....	35
6.11.1	Test arrangement	35
6.11.2	Processor monitoring- Test method	36
6.11.3	Transmit subsystem monitoring-Test method.....	36
6.11.4	Power-on/Reset-Test method.....	36
6.11.5	Control Channel and Response Channel -Test method.....	37
6.11.6	Network Control commands-Test method.....	37
6.11.7	Initial burst transmission-Test method.....	39
6.11.8	Inhibition of transmission-Test method.....	39
6.12	Receive antenna off-axis gain pattern	39
6.12.1	Test Method.....	39
6.12.1.1	Test site	39
6.12.1.2	Method of measurement.....	39
6.13	Blocking performance	40
6.13.1	Test method	40
6.14	Adjacent Signal Selectivity	41
6.14.1	Test method	41
Annex A (normative):	Relationship between the present document and the essential requirements of Directive 2014/53/EU	42
Annex B (informative):	Mechanical stability methodology	44
Annex C (informative):	Bibliography.....	46
History		47

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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.5] 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 [4].

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.

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National transposition dates	
Date of adoption of this EN:	16 May 2016
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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 ETSI and is designed to fit in a modular structure to cover all radio equipment within the scope of the Directive 2014/53/EU [4]. The modular structure is shown in ETSI EG 201 399 [i.3].

1 Scope

The present document applies to Earth Stations located on board Trains, which have the following characteristics.

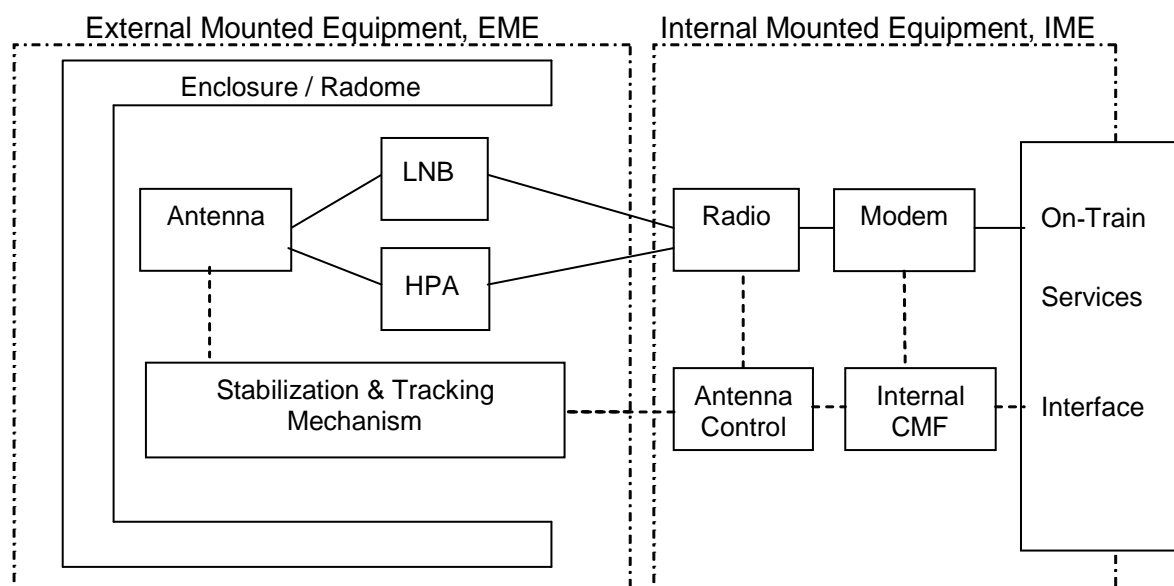


Figure 1: EST System Overview

- The EST may transmit and receive data when the train is in motion and also when the train is stationary.
- The EST operates in a railway environment and, therefore, may be subject to occasional disturbances and interruptions in the satellite link.
- The EST is operating as part of a satellite network (e.g. star, mesh or point-to-point) used for the distribution and/or exchange of information.
- The EST is comprised of all the equipment, electrical and mechanical, from the antenna itself to the interface with other communications equipment on a train (usually referred to as the terrestrial interface).
- The EST transmits on single carrier in the frequency range 14,00 GHz to 14,25 GHz, which is a portion of a band allocated to the Fixed Satellite Services (FSS) (Earth-to-space).
- The EST receives in one or more frequencies within the range from 10,70 GHz to 12,75 GHz in bands allocated to the Fixed Satellite Services (FSS) (space-to-Earth) or the Broadcast Satellite Service (BSS) (space-to-Earth), depending on the ITU Region where the EST is located.
- The EST uses linear or circular polarization.
- The EST is designed to operate through a geostationary satellite (or a cluster of co-located geostationary satellites) that is at least 3° away from any other geostationary satellite operating in the same frequencies and over the same coverage area.
- The EST transmits at elevations greater than or equal to 7° relative to the local horizon.
- The EST is designed for unattended operation.
- The EST is controlled and monitored by a Network Control Facility (NCF). The NCF is outside the scope of the present document.

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

The present document is intended to cover the provisions of Directive 2014/53/EU [4] (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*".

NOTE 1: Operational requirements are defined by national administrations and by relevant ECC Decisions.

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 [4] (RE Directive) may apply to equipment within the scope of the present document.

NOTE 2: 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.

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<https://standards.iteh.ai/catalog/standards/sist/4ea05fab-e08d-49db-af32-1141c5781614>
- [1] Void.
 - [2] Void.
 - [3] CISPR 16-1-5 (2014): "Specification for radio disturbance and immunity measuring apparatus and methods; Part 1-5: Radio disturbance and immunity measuring apparatus - Antenna calibration sites and reference test sites for 5 MHz to 18 GHz".
 - [4] 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

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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] Void.
- [i.2] CEPT Recommendation T/R 25-09: "Designation of frequencies in the 900 MHz band for railway purposes".
- [i.3] ETSI EG 201 399: "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] ETSI TR 102 215 (2004): "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.5] 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.
- [i.6] CENELEC EN 50155: "Railway applications - Electronic equipment used on rolling stock".
- [i.7] CENELEC BS EN 60068: "Environmental testing. Test methods for vibration and shock".
- [i.8] CENELEC EN 61373: "Railway applications. Rolling stock equipment. Shock and vibration tests".
- [i.9] CENELEC EN 60945: "Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results".
- [i.10] CENELEC EN 55022: "Limits and methods of measurement of radio disturbance characteristics of information technology equipment".
- [i.11] ETSI TR 102 375 (2005): "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".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in Directive 2014/53/EU [4] and the following apply:

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

- the equipment is intended for use in conjunction with the EST to provide additional operational and/or control features (e.g. to extend control to another position or location); and
- the equipment cannot be used on a stand alone basis, to provide user functions independently of the EST; and
- the absence of the equipment does not inhibit the operation of the EST.

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 EST may transmit and does not transmit any carrier

NOTE 1: The phrase "the EST may transmit" means that all the conditions for transmission are satisfied (e.g. in a state where transmissions are permitted, no failure detected, and the EST is correctly pointed towards the satellite).

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

carrier-on radio state: radio state in which the EST may transmit and transmits a carrier

Control Channel (CC): channel or channels by which ESTs receive control information from the NCF

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

emissions disabled radio state: radio state in which the EST does not emit

NOTE: Examples of cases where the EST is in this radio state: before system monitoring pass, before the control channel is received, when a failure is detected, when an EST is commanded to disable, and when the EST is in a location requiring cessation of emissions.

external control channel: control channel which is either (i) carried by the EST network via the same or another satellite, but not within the internal protocol of the EST system, or (ii) carried by any other radio communication system

external response channel: response channel which is either (i) carried by the EST network via the same or another satellite, but not within the internal protocol of the EST system, or (ii) carried by any other radio communication system

Externally Mounted Equipment (EME): that part of the EST intended to be installed on the outside of the train (usually the roof), as declared by the applicant, or as indicated in the user documentation

NOTE 1: The EME unit is usually comprised of the following 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 RF signals for transmission through the antenna subsystem.
- d) The stabilization and tracking mechanics that ensure pointing of the antenna main beam towards the satellite within the required accuracy.

NOTE 2: The installation equipment (means of attachment) 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.

NOTE 3: Certain configurations may include more than one EME per EST. As for example, the EST may have separate transmit and receive antennas or it may have redundant transmit/receive antenna units.

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

internal control channel: control channel which is carried by the EST network via the same satellite as used for transmission of user data and within the internal protocol structure of the EST system

internal response channel: response channel which is carried by the EST network via the same satellite as used for transmission of user data and within the internal protocol structure of the EST system

Internally Mounted Equipment (IME): part of the EST equipment which is installed inside the train and its connection cables with the EME

NOTE: The IME is usually comprised of:

- a) the modem and the IF radio equipment;
- b) the control logic, including that for the internal control and monitoring subsystem and the antenna tracking subsystem; and
- c) the interfaces to equipment and services onboard the train.

maximum relative wind speed: addition of the magnitudes of the maximum wind speed and the maximum train velocity

Network Control Facility (NCF): set of functional entities that, at system level, monitor and control the correct operation of all ESTs in a network

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 EST radio frequency transmission nominated by the applicant. The nominated bandwidth is centred on the transmit frequency and does not exceed 5 times the occupied bandwidth

NOTE: 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.

off-axis angle: angle between the direction of the axis of the antenna main beam and the considered direction

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

Response Channel (RC): channel by which EST transmit monitoring information to the NCF

spurious radiation: any radiation outside the nominated bandwidth

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

transmission enabled state: EST is in this state when it is authorized by the NCF to transmit

Wanted signal occupied Bandwidth (BW):

- for a digital modulation scheme: the width of the signal spectrum 10 dB below the maximum in-band 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.

3.2 Symbols

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

dBc	ratio expressed in decibels relative to the e.i.r.p. of the unmodulated carrier
dB _i	ratio of an antenna gain to the gain of an isotropic antenna, expressed in decibels
dBsd	Ratio expressed in decibels relative to the spectral density
dBW	ratio of a power to 1 watt, expressed in decibels
dBpW	ratio of a power to 1 picowatt, expressed in decibels
dB μ V/m	ratio of an electric field to 1 μ V/m, expressed in decibels (20 log(electric field / 1 μ V/m))

3.3 Abbreviations

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

BW	Bandwidth
BSS	Broadcast Satellite Service
CC	Control Channel
CCF	Control Channel reception Failure
CCR	Control Channel correctly Received
CENR	Cessation of Emissions Not Requested
CEPT	Conférence Européenne des Postes et Télécommunications (European Conference of Postal and Telecommunications Administrations)
CER	Cessation of Emissions Requested