



**ElectroMagnetic Compatibility (EMC)
standard for radio equipment and services;
Part 12: Specific conditions for Very Small Aperture
Terminal, Satellite Interactive Earth Stations operated
in the frequency ranges between 4 GHz and 30 GHz
in the Fixed Satellite Service (FSS);
Harmonised Standard for ElectroMagnetic Compatibility**

Reference

REN/ERM-EMC-404

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Foreword

This draft Harmonised European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), and is now submitted for the combined Public Enquiry and Vote phase of the ETSI standards EN Approval Procedure.

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.6] 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 [i.5].

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.

The present document is part 12 of a multi-part deliverable. Full details of the entire series can be found in part 1 [1].

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
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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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1 Scope

The present document specifies technical characteristics and methods of measurement for the Earth Stations (ESs) operating in the frequency ranges between 3,625 GHz and 30 GHz in the Fixed Satellite Service (FSS) bands, and associated ancillary equipment in respect of ElectroMagnetic Compatibility (EMC).

Technical specifications related to the antenna port and emissions from the enclosure port of the Earth Stations (ESs) are not included in the present document. Such technical specifications are found in the relevant product standards for the effective use of the radio spectrum, see table 1.

Table 1: Radio Technologies in scope of the present document

Technology	ETSI Standard
VSAT for Transmit-only, transmit/receive or receive-only satellite Earth Stations operating in the 10,70 GHz to 14,50 GHz frequency bands	ETSI EN 301 428 [i.7]
ES for Satellite News Gathering Transportable Earth Stations (SNG TESS) operating in the 10,70 GHz to 14,50 GHz frequency bands	ETSI EN 301 430 [i.8]
VSAT for Transmit-only, transmit-and-receive, receive-only satellite Earth Stations operating in the 3,625 GHz to 6,425 GHz frequency bands	ETSI EN 301 443 [i.9]
ES for Satellite Interactive Terminals (SIT) and Satellite User Terminals (SUT) transmitting towards satellites in geostationary orbit in the 19,70 GHz to 30,0 GHz frequency bands	ETSI EN 301 459 [i.10]
ES for Satellite User Terminals (SUT) transmitting towards satellites in geostationary orbit in the 17,70 GHz to 29,5 GHz frequency bands	ETSI EN 301 360 [i.11]
ES for Earth Stations On Mobile Platforms (ESOMP) transmitting towards satellites in geostationary orbit, operating in the 17,70 GHz to 30,0 GHz frequency bands	ETSI EN 303 978 [i.12]

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Definitions of the type of Earth Stations (ESs) operating in the frequency ranges between 3,625 GHz and 30 GHz in the Fixed Satellite Service (FSS) covered by the present document are given in annex B. The environmental classification used in the present document are as stated in ETSI EN 301 489-1 [1].

NOTE: The relationship between the present document and essential requirements of article 3.1(b) of Directive 2014/53/EU [i.5] is given in annex A.

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 <https://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] ETSI EN 301 489-1 (V2.2.3) (11-2019): "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibility".
- [2] EN 61000-3-3 (2013) + A1 (2019): "Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection", (produced by CENELEC).

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.

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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] Void.
- [i.3] ERC/DEC(00)08: "ERC Decision of 19 October 2000 on the use of the band 10.7 - 12.5 GHz by the fixed service and Earth stations of the broadcasting-satellite and fixed-satellite Service (space-to-Earth)".
- [i.4] Void.
- [i.5] 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.
- [i.6] 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.7] ETSI EN 301 428: "Satellite Earth Stations and Systems (SES); Harmonized Standard for Very Small Aperture Terminal (VSAT); Transmit-only, transmit/receive or receive-only satellite earth stations operating in the 11/12/14 GHz frequency bands covering the essential requirements of article 3.2 of the Directive 2014/53/EU".
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- [i.8] ETSI EN 301 430: "Satellite Earth Stations and Systems (SES); Harmonised Standard for Satellite News Gathering Transportable Earth Stations (SNG TES) operating in the 11 GHz to 12 GHz/13 GHz to 14 GHz frequency bands covering the essential requirements of article 3.2 of the Directive 2014/53/EU".
- [i.9] ETSI EN 301 443: "Satellite Earth Stations and Systems (SES); Harmonised Standard for Very Small Aperture Terminal (VSAT); Transmit-only, transmit-and-receive, receive-only satellite earth stations operating in the 4 GHz and 6 GHz frequency bands covering the essential requirements of article 3.2 of the Directive 2014/53/EU".
- [i.10] ETSI EN 301 459: "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 29,5 GHz to 30,0 GHz frequency bands covering the essential requirements of article 3.2 of the Directive 2014/53/EU".
- [i.11] ETSI EN 301 360: "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".
- [i.12] ETSI EN 303 978: "Satellite Earth Stations and Systems (SES); Harmonised Standard for Earth Stations on Mobile Platforms (ESOMP) transmitting towards satellites in geostationary orbit, operating in the 27,5 GHz to 30,0 GHz frequency bands covering the essential requirements of article 3.2 of the Directive 2014/53/EU".
- [i.13] ITU Radio Regulations (2020).

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI EN 301 489-1 [1] and the following apply:

ancillary equipment: electrical or electronic equipment, that is intended to be used with a receiver or transmitter

NOTE 1: It is considered as an ancillary equipment if:

- the equipment is intended for use with a receiver or transmitter to provide additional operational and/or control features to the radio equipment (e.g. to extend control to another position or location);
- the ancillary equipment cannot be used without being connected to radio equipment to provide user functions independently of a receiver or transmitter; and
- the receiver or transmitter, to which it is connected, is capable of providing some intended operation such as transmitting and/or receiving without the ancillary equipment (i.e. it is not a sub-unit of the main equipment essential to the main equipment basic functions).

NOTE 2: An example of ancillary equipment would be a docking station for radio equipment whose interface is dedicated to a particular product or range of products.

carrier-off state: state in which the ES is authorized to transmit, and when it does not transmit any signal, either authorized by a Centralized Control and Monitoring Functions (CCMF) or a Network Control Facility (NCF) when designed for unattended operation or by local control when designed for attended operation

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

carrier-on state: state in which the ES is authorized to transmit, and when it transmits a signal, either authorized by a CCMF or a NCF when designed for unattended operation or by local control when designed for attended operation

critical stored data: data that is essential for an EUT to perform a primary function in accordance with that EUT's specification

NOTE: This may include data previously stored by the user.

drive equipment: equipment used to enable the EUT to operate as intended during the test process

terrestrial port: a port for interconnecting earth-based equipments

transmission disabled state: state in which the ES is not authorized to transmit either by a CCMF or a NCF respectively when designed for unattended operation or by local control when designed for attended operation

3.2 Symbols

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

P_{\min} minimum power required to establish a communication link

3.3 Abbreviations

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

AC	Alternating Current
AMSS	Aeronautical Mobile Satellite Service
BSS	Broadcast Satellite Service
CCMF	Centralized Control and Monitoring Functions
CEPT	European Conference of Postal and Telecommunications administrations

DC	Direct Current
EFTA	European Free Trade Association
EIRP	Equivalent Isotropically Radiated Power
EMC	ElectroMagnetic Compatibility
EME	Externally Mounted Equipment
ES	Earth Station
ESOMP	Earth Stations On Mobile Platforms
EST	Earth Station on Trains
EUT	Equipment Under Test
FS	Fixed Services
FSS	Fixed Satellite Service
IME	Internally Mounted Equipment
kV	kilo Volt
LMSS	Land Mobile Satellite Service
LNB	Low Noise Block converter
MMSS	Marine Mobile Satellite Service
MSS	Mobile Satellite Service
NCF	Network Control Facility
QTMA	Quality of Transmission Measurement Apparatus
RF	Radio Frequency
SIT	Satellite Interactive Terminals
SNG	Satellite News Gathering
SUT	Satellite User Terminals
TES	Transportable Earth Station
VSAT	Very Small Aperture Terminal

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4 Test conditions

4.1 General

[ETSI EN 301 489-12 V3.1.2 \(2021-03\)](https://standards.iteh.ai/catalog/standards/sist/07862811-ac3b-48f3-b6a2-11e9-9543ec6018)

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For the purposes of the present document, the test conditions of ETSI EN 301 489-1 [1], clause 4 shall apply with the following additions. Further product type related test conditions for Earth Stations are specified in the present document.

For Earth Stations with or without ancillary equipment, and/or various terrestrial ports, the selection of test configurations shall be determined. The assessment shall include sufficient representative configurations of the ES to adequately exercise the equipment. These configurations shall be recorded in the test report.

In clauses 4.2 and 4.3, the Equipment Under Test (EUT) is an ES with the selected configuration of ancillary equipment.

4.2 Arrangements for test signals

4.2.0 General

The provisions of ETSI EN 301 489-1 [1], clause 4.2.0 shall apply with the following additions.

In order to measure the system emissions and electromagnetic immunity under operational conditions, the following arrangements shall be provided:

- a) a drive equipment to put the ES terminal in its normal operating mode, and providing the ES with a receive signal to emulate the operational conditions of reception. This equipment shall control the EUT, when it is capable of transmission, so that it switches between the transmission disabled, carrier-on and carrier-off states;
- b) a Quality of Transmission Measurement Apparatus (QTMA).

For the measurement of the quality of transmission, a communications link shall be established and the wanted input signal shall be applied to the Radio Frequency (RF) input of the receiver via the antenna.

The QTMA and the source of the wanted input signal shall be located outside the test environment.

4.2.1 Arrangements for test signals at the input of transmitters

The provisions of ETSI EN 301 489-1 [1], clause 4.2.1 shall apply.

4.2.2 Arrangements for test signals at the output of transmitters

The provisions of ETSI EN 301 489-1 [1], clause 4.2.2 shall apply.

4.2.3 Arrangements for test signals at the input of receivers

The provisions of ETSI EN 301 489-1 [1], clause 4.2.3 shall apply with the following addition.

For radiated immunity, the level of the wanted signal at the input of the receiver or the enclosure port of the EUT, shall be 20 dB (± 3 dB) above the P_{\min} for the EUT. For all other tests the level of the wanted signal, required to establish a communication link, shall be representative of the EUT intended use.

NOTE: A simple method to establish the required communication link is establish link, reduce power to point of link failure then increase by 20 dB.

4.2.4 Arrangements for test signals at the output of receivers

The provisions of ETSI EN 301 489-1 [1], clause 4.2.4 shall apply.

4.3 Exclusion bands

4.3.1 Exclusion band for transmitters or the transmitter part of transceivers

The provisions of ETSI EN 301 489-1 [1], clause 4.3.2 shall apply.

4.3.2 Exclusion band for receivers or the receiver part of transceivers

For EUT that operate above 6 GHz, there is no exclusion band specified as test ranges stop at 6 GHz.

For EUT that operate below 6 GHz, the provisions of ETSI EN 301 489-1 [1], clause 4.3.3 shall apply.

5 Performance assessment

5.1 General

The provision of ETSI EN 301 489-1 [1], annex C should apply. In addition, the following information should be recorded in the test report:

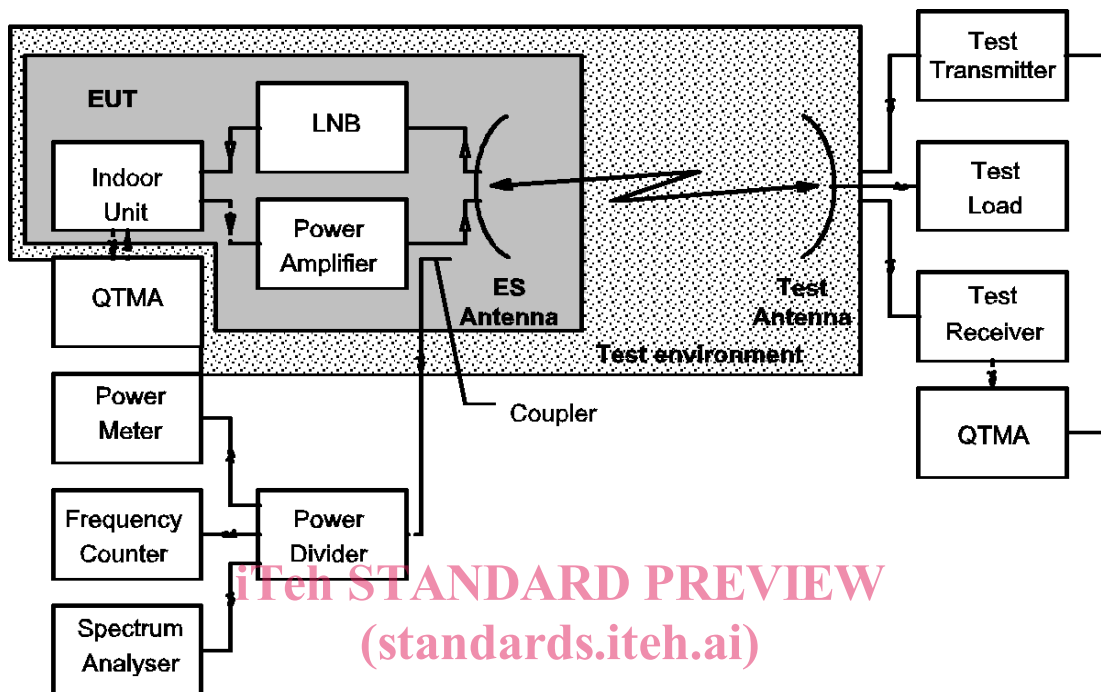
- the dedicated class (A or B) for the ES in accordance with the information contained in the instructions accompanying the ES (see clause 5.3);
- the ranges of the operational parameters, e.g. the power delivered to the antenna, the frequency ranges;
- the minimum quality of transmission, and the method to be used to assess it.

This information shall be in accordance with the documentation accompanying the equipment.

5.2 Equipment configuration(s)

For radiation measurements in carrier-on state, the ES shall be put in a continuous transmit mode or to the maximum burst rate where applicable. The ES shall be operated at the maximum operating Equivalent Isotropically Radiated Power (EIRP).

Test configuration is shown in figure 1.



ETSI EN 301 489-12 V3.1.2 (2021-03)
Figure 1: Test configuration
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For the tests, the ES antenna reflector and the test antenna may be removed at their flanges and be replaced by one direct wave guide connection.

The following test equipment shall be the means whereby the correct operation of the EUT is verified:

- the power meter measures the output power and is used to confirm the transmission disabled, carrier-on and carrier-off states and output level consistency;
- the frequency counter measures the centre frequency of the radiated carrier in the absence of modulation;
- the spectrum analyser measures the bandwidth of the transmission;
- the test receiver is used to demodulate the transmitted signal;
- the two QTMA are used in conjunction with each other to assess the quality of transmission;
- the test transmitter is used to control the switching between transmission disabled, carrier-on and carrier-off states by transmitting the control and monitoring signals.

5.3 Equipment classification

The equipment are classified into the two classes:

- class A of ES is where no loss of function is accepted during immunity testing with EMC transient phenomena as defined in clause 6.2;
- class B ES is where any loss of function during immunity testing with EMC transient phenomena shall be in accordance with performance criteria defined in clause 6.3.