



**Satellite Earth Stations and Systems (SES);  
Harmonised Standard for Earth Stations on  
Mobile Platforms (ESOMP) transmitting towards satellites in  
non-geostationary orbit, operating in the 27,5 GHz to 29,1 GHz  
and 29,5 GHz to 30,0 GHz frequency bands  
covering the essential requirements of  
article 3.2 of the Directive 2014/53/EU**

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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.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.8].

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 latest announcement of this EN (doa):	31 January 2017
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 July 2017
Date of withdrawal of any conflicting National Standard (dow):	31 July 2018

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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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## 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 [i.8]. The modular structure is shown in ETSI EG 201 399 [i.2].

The present document is largely based on ETSI EN 303 978 [i.5], for ESOMPs operating with GSO satellites.

The present document may also be applicable to the frequency bands 30,0 GHz to 31,0 GHz (Earth-to-space) and 20,2 GHz to 21,2 GHz (space-to-Earth) subject to national regulation.



Annex A (normative) provides HS Requirements specifications.

Annex B (informative) provides information on Linear Polarization Alignment Error Calculation.

Annex C (normative) provides specifications concerning radiated measurements.

Annex D (normative) provides specifications concerning conducted measurements.

Annex E (informative) provides general information concerning RF cables.

Annex F (informative) provides information concerning RF waveguides.

Annex G (informative) covers other supplementary information.

The present document is intended to cover the provisions of Directive 2014/53/EU [i.8] (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".

Recital 10 of Directive 2014/53/EU [i.8] states that "*in order to ensure that radio equipment uses the radio spectrum effectively and supports the efficient use of radio spectrum, radio equipment should be constructed so that: in the case of a transmitter, when the transmitter is properly installed, maintained and used for its intended purpose it generates radio waves emissions that do not create harmful interference, while unwanted radio waves emissions generated by the transmitter (e.g. in adjacent channels) with a potential negative impact on the goals of radio spectrum policy should be limited to such a level that, according to the state of the art, harmful interference is avoided; and, in the case of a receiver, it has a level of performance that allows it to operate as intended and protects it against the risk of harmful interference, in particular from shared or adjacent channels, and, in so doing, supports improvements in the efficient use of shared or adjacent channels.*"

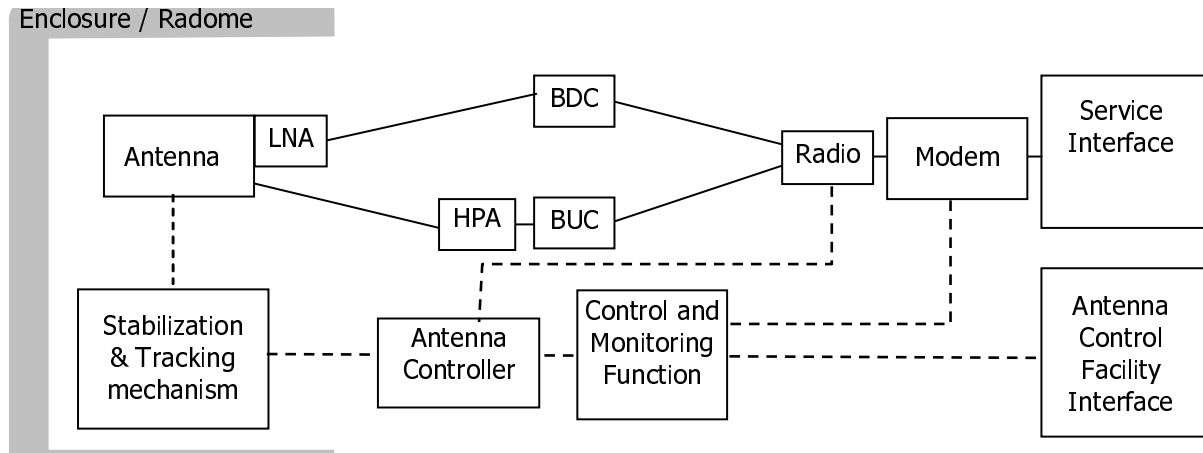
Recital 11 of Directive 2014/53/EU [i.8] states that "*although receivers do not themselves cause harmful interference, reception capabilities are an increasingly important factor in ensuring the efficient use of radio spectrum by way of an increased resilience of receivers against harmful interference and unwanted signals on the basis of the relevant essential requirements of Union harmonisation legislation.*"

As a consequence, the present document includes both transmitting and receiving parameters aiming to maximize the efficient use of radio spectrum.



# 1 Scope

The present document applies to Earth Stations on Mobile Platforms (ESOMP), which have the following characteristics.



**Figure 1: ESOMP System Overview**

- The ESOMP is designed for both mobile and stationary operation.
- The ESOMP operates on various mobile platforms such as trains, maritime vessels, aircraft and other vehicles and, therefore, may be subject to occasional disturbances and interruptions in the satellite link.
- The ESOMP 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 ESOMP is comprised of all the equipment, electrical and mechanical, from the antenna itself to the interface with other communications equipment on a mobile platform (usually referred to as the terrestrial interface).
- The ESOMP comprises of one or more emitters and the system overview given in figure 1 should be interpreted accordingly.
- The transmit and receive frequencies are shown in table 1.

**Table 1: Frequency bands**

	Frequency Bands/frequencies
Transmit (Earth-to-space)	27,5 GHz to 29,1 GHz and 29,5 GHz to 30,0 GHz
Receive (space-to-Earth)	17,30 GHz to 20,20 GHz

- The ESOMP transmits within the frequency range from 27,5 GHz to 29,1 GHz and 29,5 GHz to 30,0 GHz, which is a band allocated to the Fixed Satellite Services (FSS) (Earth-to-space) among other services. National regulations will specify the bands available for the operation of the ESOMP. Such regulations may designate some parts of the frequency range 27,5 GHz to 29,1 GHz to terrestrial services such as the Fixed Service. However, the operation of the ESOMP may be permitted under national regulations in the 29,50 GHz to 30,00 GHz band since this band is allocated on a primary basis to the Fixed Satellite Service.
- The ESOMP receives in one or more frequencies within the range from 17,30 GHz to 20,20 GHz (FSS).
- The ESOMP uses linear or circular polarization.
- The ESOMP operates through non-geostationary satellites.
- The ESOMP is designed for unattended operation.

- The ESOMP is controlled and monitored by a Network Control Facility (NCF). This function may be performed centrally (e.g. for a network of ESOMPs with a central hub) or it could be performed within the ESOMP for autonomous control. The NCF is outside the scope of the present document.
- The ESOMP operating in the 27,5 GHz to 28,6 GHz and 29,5 GHz to 30 GHz bands: epfd limits given in article 22 of the ITU Radio Regulations [i.4] apply for the ESOMPs operating with the NGSO system for the protection of the GSO networks (see No 22.5D of the ITU RR [i.4]).
- ESOMP operating in the 28,6 GHz to 29,1 GHz band: No 9.11A of the ITU RR [i.4] applies to the NGSO network of the ESOMP, meaning that the NGSO will be required to coordinate with earlier filed GSO networks or NGSO systems (See No. 5.523A of the ITU RR [i.4]).

The present document applies to the ESOMP 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 [i.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*".

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/EU [i.6] 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/>.

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## 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] ETSI TR 100 028 (all parts) (V1.4.1) (12-2001): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".
- [2] ETSI TR 102 273 (all parts) (V1.2.1) (12-2001): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties".
- [3] ANSI C63.5 (2006): "American National Standard for Calibration of Antennas Used for Radiated Emission Measurements in Electro Magnetic Interference".
- [4] CISPR 16-1-1 (2015): "Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus".
- [5] CISPR 16-1-4:(2010)+AMD1:2012 CSV: "Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-4: Radio disturbance and immunity measuring apparatus - Antennas and test sites for radiated disturbance measurements".

## 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] 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.3] ETSI TS 103 052: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Radiated measurement methods and general arrangements for test sites up to 100 GHz".
- [i.4] ITU Radio Regulations (edition 2016).
- [i.5] ETSI EN 303 978 (V2.1.2): "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.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] IEC 153 (all parts): "Hollow metallic waveguides".
- [i.8] 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).

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## 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 [i.8] and the following apply:

**ancillary equipment:** equipment used in connection with an ESOMP

NOTE: Equipment is considered as ancillary if the three following conditions are met:

- the equipment is intended for use in conjunction with the ESOMP 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 ESOMP; and
- the absence of the equipment does not inhibit the operation of the ESOMP.

**antenna controller:** equipment used to maintain antenna stabilization and tracking accuracy based on inputs from the Control and Monitoring Function

**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 ESOMP may transmit and does not transmit any carrier

NOTE 1: The phrase "the ESOMP 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 ESOMP is correctly pointed towards the satellite).

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

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

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

**EIRP<sub>Aggregate</sub>:** sum of the EIRP (Watts) within the nominated bandwidth of the ESOMP network

**EIRP<sub>max</sub>:** maximum EIRP capability of the ESOMP as declared by the applicant

**emissions disabled radio state:** radio state in which the ESOMP is not emitting

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

**equivalent power flux density:** as defined in the ITU Radio Regulations [1.4] footnote 22.5C.1, the sum of the power flux-densities produced at a geostationary-satellite system receive station on the Earth's surface or in the geostationary orbit, as appropriate, by all the transmit stations within a non-geostationary-satellite system, taking into account the off-axis discrimination of a reference receiving antenna assumed to be pointing in its nominal direction

**external control channel:** control channel which is either:

- (i) carried by the ESOMP network via the same or another satellite, but not within the internal protocol of the ESOMP system; or
- (ii) carried by any other radio communication system

**external response channel:** response channel which is either:

- (i) carried by the ESOMP network via the same or another satellite, but not within the internal protocol of the ESOMP system; or
- (ii) carried by any other radio communication system

**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 ESOMP network via the same satellite as used for transmission of user data and within the internal protocol structure of the ESOMP system

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

**mobile platform:** any non-stationary platform such as a train, a vessel, an aircraft or other vehicles

**Network Control Facility (NCF):** set of functional entities that, at system level, monitor and control the correct operation of the ESOMP and, if appropriate, all of the ESOMPs 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 1: An antenna with circular aperture of diameter equal to the nominal diameter does typically have the performance specified.

NOTE 2: 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 ESOMP radio frequency transmission nominated by the applicant

NOTE 1: The nominated bandwidth is centred on the transmit frequency and 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.

**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 ESOMP transmit monitoring information to the NCF

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

**transmission disabled state:** radio state in which the ESOMP is not authorized to transmit by the NCF

**transmission enabled state:** radio state in which the ESOMP is authorized to transmit by the NCF

**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 EIRP of the unmodulated carrier
dBi	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 $\mu$ V/m	ratio of an electric field to 1 $\mu$ V/m, expressed in decibels ( $20 \log(\text{electric field} / 1 \mu\text{V/m})$ )

## 3.3 Abbreviations

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

BW	BandWith
CC	Control Channel
CCF	Control Channel reception Failure
CCR	Control Channel correctly Received
CENR	Cessation of Emissions Not Required
CEPT	Conférence Européenne des Postes et Télécommunications (European Conference of Postal and Telecommunications)