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**Satellite Earth Stations and Systems (SES);  
Earth Stations on Mobile Platforms (ESOMP)  
communicating with satellites in geostationary orbit,  
operating in the 27,5 GHz to 30,0 GHz and  
17,3 GHz to 20,2 GHz frequency bands;  
Harmonised Standard for access to radio spectrum**

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# Foreword

This draft Harmonised European Standard (EN) has been produced by ETSI Technical Committee Satellite Earth Stations and Systems (SES), and is now submitted for the combined Public Enquiry and Vote phase of the ETSI Standardisation Request deliverable Approval Procedure.

The present document is a revision of ETSI EN 303 978 (V2.1.2). Major changes concern the off-axis eirp density. Editorial clarifications have also been introduced.

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.9] 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.11].

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.

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
Date of withdrawal of any conflicting National Standard (dow):	18 months after doa



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## Introduction

The Earth Stations on Mobile Platforms (ESOMPs) system overview is given in figure 1 and has the following characteristics:

- The ESOMP operates 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 transmits in the frequency range from 27,50 GHz to 30,00 GHz, and receives in one or more frequencies within the range from 17,30 GHz to 20,20 GHz (FSS) which are bands allocated to the Fixed Satellite Services (FSS) (Earth-to-space) among other services.
- The ESOMP uses linear or circular polarization.
- 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 operates through a geostationary satellite (or a cluster of co-located geostationary satellites) that is at least 2° away from any other geostationary satellite operating in the same frequencies and over the same coverage area.
- The geostationary satellite network with which the ESOMP communicates is assumed to have completed coordination per ITU requirements with the neighbouring geostationary satellite networks.
- The coordination agreement or agreements above would allow the ESOMP to operate with the coordinated parameters, such as off-axis EIRP density and other parameters.

NOTE: ESOMPs may operate with satellites that are more closely spaced than 2° with additional operational constraints that are beyond the scope of the present document.

Enclosure / Radome

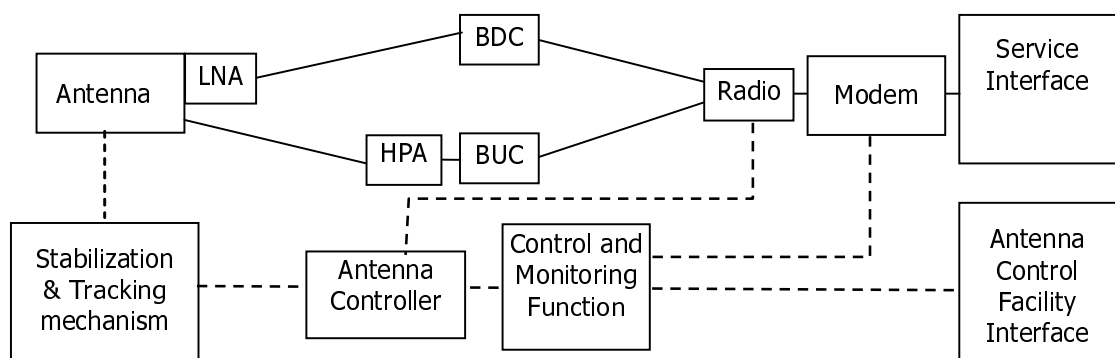


Figure 1: ESOMP System Overview

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 (informative) provides HS Requirements specifications.

Annex B is void.

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 selection of receiver conformance parameters.

Annex H (informative) covers maximum measurement uncertainty.

Annex I (informative) provides bibliographical references.

Annex J (informative) change history.

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# 1 Scope

The present document specifies technical characteristics and methods of measurements for Earth Stations on Mobile Platforms (ESOMP) equipment with the following characteristics:

- 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.
- 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 transmit and receive frequencies are shown in table 1.

**Table 1: Frequency bands**

	Frequency Bands/frequencies (GHz)
Transmit (Earth-to-space)	27,50 to 30,00
Receive (space-to-Earth)	17,30 to 20,20

NOTE: The relationship between the present document and essential requirements of article 3.2 of Directive 2014/53/EU [i.11] 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.

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

- [1] Void.
- [2] Void.
- [3] Void.
- [4] [CISPR 16-1-1 \(2019\)](#): "Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus".
- [5] [CISPR 16-1-4:2019+AMD1:2020+AMD2:2023 CSV Consolidated version](#): "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".
- [6] [ANSI C63.5-2006](#): "American National Standard for Calibration of Antennas Used for Radiated Emission Measurements in Electro Magnetic Interference".

## 2.2 Informative references

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- [i.1] Void.
- [i.2] Void.
- [i.3] Void.
- [i.4] 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.5] Void.
- [i.6] Void.
- [i.7] Void.
- [i.8] Void.
- [i.9] [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.10] IEC 153 (all parts): "Hollow metallic waveguides".
- [i.11] [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).
- [i.12] ETSI TR 103 896: "Satellite Earth Stations and Systems (SES); Considerations on off-axis EIRP density mask applicability for Ka band GSO ESOMPs in relation to potential revision to ETSI EN 303 978 (V2.1.2)".
- [i.13] ETSI EG 203 336 (V1.2.1) (05-2020): "Guide for the selection of technical parameters for the production of Harmonised Standards covering article 3.1(b) and article 3.2 of Directive 2014/53/EU".
- [i.14] ETSI TR 103 581 (V1.1.1) (11-2019): "Use of measurement detectors in radio measurement methods".
- [i.15] 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".
- [i.16] ETSI TR 100 028: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".

## 3 Definitions of terms, symbols and abbreviations

### 3.1 Terms

For the purposes of the present document, the terms given in Directive 2014/53/EU [i.11] and the following apply:

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

- 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 Functions (CMF)

**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>Pcs</sub>:** clear sky EIRP of the ESOMP

**EIRP<sub>max</sub>:** maximum EIRP capability of the ESOMP provided with the equipment for the intended use

**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.

**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

**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 platform such as a train, a vessel, an aircraft or other vehicles capable of moving.

**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 in meters for the intended use. For non circular antennas the nominal diameter is that of the widest dimension

NOTE : 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. Equipment can be marked with antenna diameters used in the requirements during compliance test.

**nominated bandwidth:** bandwidth of the ESOMP radio frequency transmission provided with the equipment for the intended use

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. The nominated bandwidth allows identification of adjacent channel interference levels which will be taken into account by operational procedures depending on the exact transponder carrier assignment situation.

**occupied bandwidth:** for a digital modulation scheme the width of the signal spectrum 10 dB below the maximum in-band density

**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 intended use

**Response Channel (RC):** channel by which ESOMP transmit monitoring information to the ACF

**Special Test Equipment (STE):** specific equipment needed for a test

EXAMPLE: NCF, downlink beacon frequencies, etc.

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

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

**transmission enabled state:** ESOMP 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 EIRP of the unmodulated carrier
dB <sub>i</sub>	ratio of an antenna gain to the gain of an isotropic antenna, expressed in decibels
dB <sub>m</sub>	ratio of a power to 1 milliwatt, expressed in decibels
dB <sub>pW</sub>	ratio of a power to 1 picowatt, expressed in decibels
dB <sub>sd</sub>	ratio expressed in decibels relative to the spectral density
dB <sub>W</sub>	ratio of a power to 1 watt, expressed in decibels
dB <sub>μV/m</sub>	ratio of an electric field to 1 μV/m, expressed in decibels (20 log(electric field / 1 μV/m))