

Draft **ETSI EN 301 489-20** V2.1.0 (2017-10)



**ElectroMagnetic Compatibility (EMC) standard  
for radio equipment and services;  
Part 20: Specific conditions for Mobile Earth Stations (MES)  
used in the Mobile Satellite Services (MSS)**

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Reference

REN/ERM-EMC-366-20

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Keywords

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# Contents

Intellectual Property Rights .....	5
Foreword.....	5
Modal verbs terminology.....	5
1 Scope .....	6
2 References .....	6
2.1 Normative references .....	6
2.2 Informative references.....	7
3 Definitions and abbreviations.....	7
3.1 Definitions .....	7
3.2 Abbreviations .....	8
4 Test conditions .....	8
4.1 General .....	8
4.2 Arrangements for test signals .....	8
4.2.1 Arrangements for test signals at the input of transmitters.....	8
4.2.2 Arrangements for test signals at the output of transmitters.....	9
4.2.3 Arrangements for test signals at the input of receivers .....	9
4.2.4 Arrangements for test signals at the output of receivers .....	10
4.2.5 Arrangements for testing transmitter and receiver together (as a system) .....	10
4.3 Exclusion bands.....	10
4.3.0 General.....	10
4.3.1 Transmitter exclusion band.....	10
4.3.2 Receiver exclusion band .....	10
4.4 Narrow band responses of receivers.....	10
5 Performance assessment.....	11
5.1 General .....	11
5.2 MES connected to host equipment .....	11
5.2.0 General.....	11
5.2.1 Alternative A: combined equipment .....	11
5.2.2 Alternative B: use of a test jig.....	11
5.3 Ancillary equipment .....	11
5.4 Equipment classification .....	12
6 Performance criteria .....	12
6.1 General .....	12
6.2 Performance criteria for Continuous Phenomena (CP) .....	12
6.3 Performance criteria for Transient Phenomena (TP).....	12
7 Applicability overview .....	13
7.1 Emission.....	13
7.1.1 General.....	13
7.1.2 Special conditions .....	13
7.2 Immunity .....	13
7.2.1 General.....	13
7.2.2 Special conditions.....	13
<b>Annex A (informative): Relationship between the present document and the essential requirements of Directive 2014/53/EU .....</b>	<b>14</b>
<b>Annex B (normative): Definitions of MESs within the scope of the present document.....</b>	<b>16</b>
B.0 General .....	16
B.1 MESs operating within 1,6 GHz/2,4 GHz band .....	16
B.2 MESs operating within the 1,5 GHz/1,6 GHz.....	16

B.3	MESs operating within 2,0 GHz band.....	16
B.4	MESs operating below 1 GHz.....	17
B.5	MESs operating in the 11 GHz/12 GHz/14 GHz frequency bands .....	17
<b>Annex C (informative):</b>	<b>Bibliography.....</b>	<b>18</b>
<b>Annex D (informative):</b>	<b>Change history .....</b>	<b>19</b>
History .....		20

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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.2] 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.1].

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 20 of a multi-part deliverable. Full details of the entire series can be found in part 1 [1].

<b>Proposed national transposition dates</b>	
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, together with ETSI EN 301 489-1 [1], covers the assessment of Mobile Earth Stations (MES) as defined in annex B used within Satellite radio services, and ancillary equipment in respect of ElectroMagnetic Compatibility (EMC).

Technical specifications related to the antenna port and emissions from the enclosure port of the equipment 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.

The present document specifies the applicable test conditions, performance assessment and performance criteria for MESs and for the associated ancillary equipment.

In case of differences (for instance concerning special conditions, definitions, abbreviations) between the present document and ETSI EN 301 489-1 [1], the provisions of the present document take precedence.

The environmental classification and the emission and immunity requirements used in the present document are as stated in ETSI EN 301 489-1 [1], except for any special conditions included in the present document. The applicable environment(s) referred to in ETSI EN 301 489-1 [1] where the MES may be used, should be declared by the manufacturer.

For a multimode radio station, the present document only applies to the radio station when operated in the Mobile Satellite Service mode.

NOTE: The relationship between the present document and essential requirements of article 3.1b of Directive 2014/53/EU [i.1] is given in Annex A.

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## 2 References

### 2.1 Normative references

References are specific, identified by date of publication and/or edition number or version number. Only the cited version 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 (V2.2.0) (02-2017): "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU".
- [2] ITU-R Radio Regulations (2016).

## 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] 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.2] 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.

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## 3 Definitions and abbreviations

### 3.1 Definitions

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

**carrier-on state (allocated a channel):** state of an MES when it is transmitting a signal in a continuous or a non-continuous mode

**carrier-off state (idle mode):** state of an MES when it is powered-on but not transmitting a signal, i.e. not in a carrier-on state

**host equipment:** any equipment which has complete user functionality when not connected to the MES, and to which connection is necessary for the MES to offer additional functionality

**Installable Equipment (IE), Internally Mounted Equipment (IME) and Externally Mounted Equipment (EME):** equipment which is intended to be installed in a vehicle

NOTE: An IE may consist of one or several modules. The IE is composed of modules intended to be externally mounted and declared by the manufacturer as Externally Mounted Equipment (EME). The remaining module(s) are defined as Internally Mounted Equipment (IME).

**multimode MES:** equipment that accommodates radio stations of different radio systems

**occupied bandwidth:** See ITU-R Radio Regulations [2], part A, chapter 1, Terminology RR 147.

**Portable Equipment (PE):** equipment generally intended to be self-contained, free standing and portable

NOTE 1: A PE would normally consist of a single module, but may consist of several interconnected modules.

NOTE 2: More than one of the equipment classifications can apply to certain equipment, as described in clause 5.4, dependent upon the manufacturer's declaration of normal intended use.

**transmission disabled state:** state of an MES when it is not authorized to transmit by the Network Control Facilities (NCF)

## 3.2 Abbreviations

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

CP	performance criteria for Continuous Phenomena
EMC	ElectroMagnetic Compatibility
EME	Externally Mounted Equipment
EUT	Equipment Under Test
F-MES	Fixed MES
IE	Installable Equipment
IME	Internally Mounted Equipment
LBRDC	Low Bit Rate Data Communication
LEO	Low Earth Orbit
MES	Mobile Earth Station
MSS	Mobile Satellite Service
NCF	Network Control Facilities
PCN	Personal Communication Network
PE	Portable Equipment
PEP	Peak Envelope Power
P-MES	Portable MES
QTMA	Quality of Transmission Measurement Apparatus
RF	Radio Frequency
S-PCN	Satellite Personal Communications Network
STE	Special Test Equipment
TP	performance criteria for Transient Phenomena
V-MES	Vehicle mounted MES

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## 4 Test conditions

### 4.1 General

For the purposes of the present document, the test conditions of ETSI EN 301 489-1 [1], clause 4, shall apply as appropriate. Further product related test conditions for MES are specified in the present document.

For MESs with ancillary equipment and/or various ports, the number of test configurations shall be determined. The assessment shall include sufficient representative configurations of the MES to adequately exercise the equipment. These configurations shall be recorded in the test report.

In the following clauses, the Equipment Under Test (EUT) is the MES with the selected configuration of ancillary equipment.

The EUT operational frequencies used during the test, shall be recorded in the test report.

For testing and if physically separated from the MES, any voltage converter shall form part of the EUT.

Whenever the Equipment Under Test (EUT) is provided with an integral antenna, the EUT shall be tested with the antenna fitted in a manner typical of normal intended use.

For MES for which connection to a host equipment is necessary to offer additional functionality, the test configuration shall be as defined in clause 5.2.

### 4.2 Arrangements for test signals

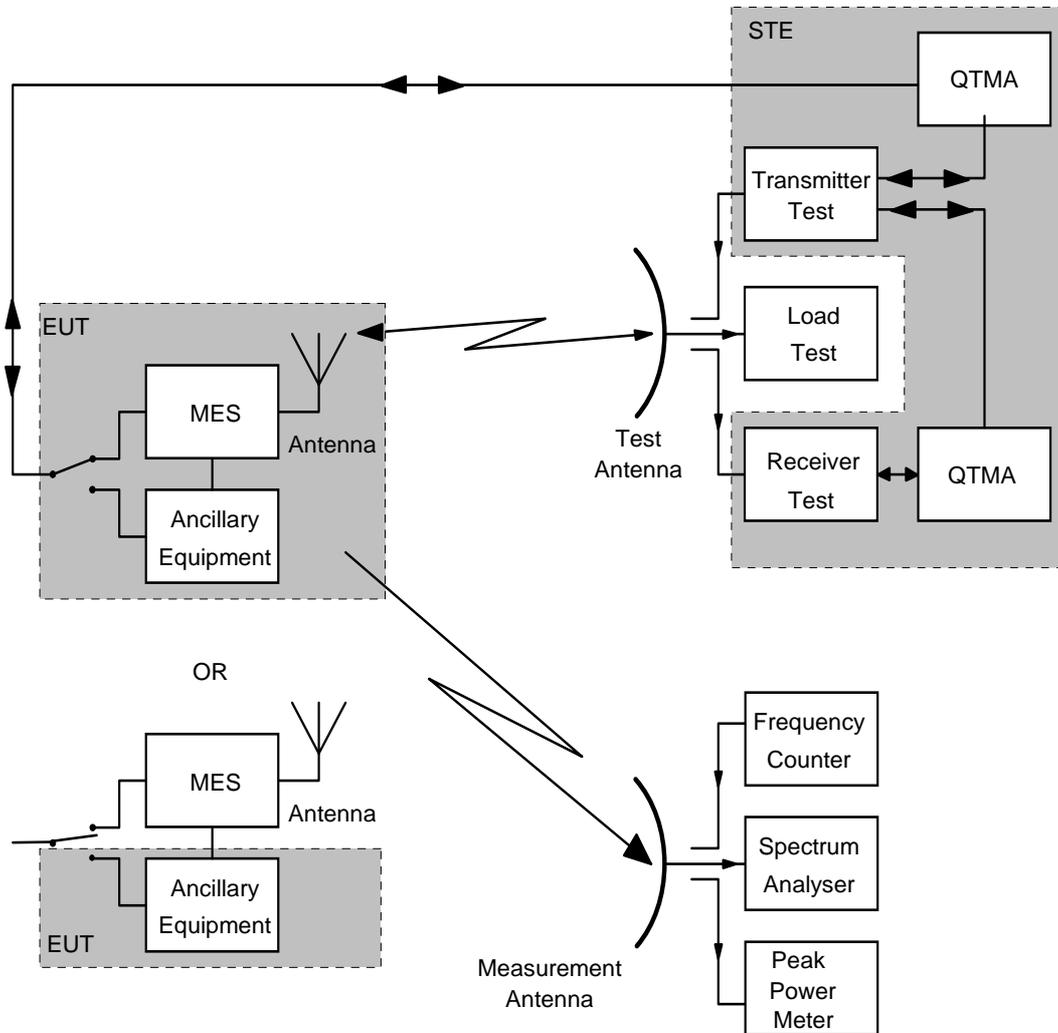
#### 4.2.1 Arrangements for test signals at the input of transmitters

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 with the following modifications.

For transmitters, the EUT shall be operated at its maximum rated RF output Peak Envelope Power (PEP), or at a level not less than -6 dB relative to that power level in the event of declared thermal limitations. The transmitter shall be modulated with a test signal which represents normal operation as specified by the manufacturer. A communication link shall be established at the start of the test and be maintained throughout the test. A suggested test configuration is shown in figure 1.



**Figure 1: Suggested test configuration**

## 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 modifications.

For the immunity tests of receivers, the wanted input signal, coupled to the receiver, shall be modulated with a test signal specified by the manufacturer which represents normal operation.

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. Signal level adjustment may be performed by adjustment of the test transmitter output level such that the received signal level is as close to the normal operation signal level as possible.

The Special Test Equipment (STE), the QTMA and the source of the wanted input signal shall be located outside the test environment.

## 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 with the following modifications.

For the quality of transmission measurements the MES may be put in a specific mode of operation where the received data are looped back to the modulation input of the transmitter part of the EUT.

## 4.2.5 Arrangements for testing transmitter and receiver together (as a system)

The provisions of ETSI EN 301 489-1 [1], clause 4.2.5 shall apply.

## 4.3 Exclusion bands

### 4.3.0 General

The provision of ETSI EN 301 489-1 [1], clause 4.3 shall apply with the following modifications:

- the transmitter exclusion band and the receiver exclusion band as defined below shall apply,
- there shall be no exclusion bands for the ancillary equipment.

### 4.3.1 Transmitter exclusion band

The transmitter exclusion band is the band of frequencies over which no tests of radiated immunity of a transmitter are made.

The lower frequency of the transmitter exclusion band is the centre frequency minus twice the occupied bandwidth.

The upper frequency of the transmitter exclusion band is the centre frequency plus twice the occupied bandwidth.

### 4.3.2 Receiver exclusion band

The receiver exclusion band is the band of frequencies over which no tests of radiated immunity of a receiver are made.

The lower frequency of the receiver exclusion band is the lower frequency of the complete receive band of the EUT minus 5 % of that lower frequency.

The upper frequency of the receiver exclusion band is the upper frequency of the complete receive band of the EUT plus 5 % of that upper frequency.

## 4.4 Narrow band responses of receivers

The provisions of ETSI EN 301 489-1 [1], clause 4.4 shall not apply.

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## 5 Performance assessment

### 5.1 General

The provision of ETSI EN 301 489-1 [1], clause 5.1 shall apply with the following modification.

In addition, the manufacturer shall, at the time of submission of the equipment for test, declare comprehensively the intended use of the equipment, and provide full and complete documentation necessary for user operation, testing and evaluation purposes. The present documentation shall include, but need not be limited to:

- the ranges of the operational parameters, e.g. the power delivered to the antenna, the frequency ranges, the operational frequencies;
- the ancillary equipment and/or host equipment to be combined with the MES for testing, if applicable;
- the user-control functions that are required for normal operation;
- the method and criteria to be used to assess the quality of transmission.

This information shall be in accordance with the documentation and the information leaflet accompanying the equipment and shall be recorded in the test report.

### 5.2 MES connected to host equipment

#### 5.2.0 General

For MES parts for which connection to or integration with a host equipment is necessary in order to offer additional functionality, two alternative approaches are permitted. The manufacturer shall declare which alternative shall be used.

#### 5.2.1 Alternative A: combined equipment

A combination of a MES and a specific type of host equipment is used for testing according to the present document.

Where more than one such combination is intended, testing shall not be repeated for combinations of MES and other host equipment where the latter are substantially similar, in particular such that host models are unlikely to significantly influence the intrinsic immunity and unwanted emissions of the MES.

Where more than one such combination is intended and host equipment are not substantially similar, one combination shall be tested against all requirements of the present document; all other combinations shall be tested separately for emissions only.

#### 5.2.2 Alternative B: use of a test jig

Where the MES is intended for use with a variety of host equipment, the manufacturer shall supply a suitable test jig that is representative of the range of host equipment in which the device is intended to be used. The test jig shall allow the MES part to be powered and stimulated in a way similar to the way it would be powered and stimulated when connected to or inserted into the host equipment. Measurements shall be made to all requirements of the present document.

The test jig shall be designed such that alteration of the MES's intrinsic immunity and unwanted emissions is minimized.

### 5.3 Ancillary equipment

The provision of ETSI EN 301 489-1 [1], clause 5.4 shall apply.

## 5.4 Equipment classification

The provision of ETSI EN 301 489-1 [1], clause 5.5 shall apply with the following modifications.

The MES shall be classified in one or a combination of the following classes:

- vehicle mounted MES (V-MES) intended to be powered by the vehicle main battery, **shall meet the requirements for mobile equipment;**
- portable MES (P-MES) powered by a stand alone battery, **shall meet the requirements for portable equipment;**
- fixed MES (F-MES) powered either by a DC or AC mains, **shall meet the requirements for base station equipment.**

A V-MES is an Installable Equipment (IE); a P-MES is a Portable Equipment (PE).

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## 6 Performance criteria

### 6.1 General

The equipment shall meet the minimum performance criteria as specified in clauses 6.2 and 6.3.

The establishment of a communications link at the start of the test, the maintenance of the communications link and the assessment of the recovered signal information is used as the performance criteria to ensure that the essential functions of the EUT are evaluated during and after the test.

### 6.2 Performance criteria for Continuous Phenomena (CP)

The following procedures shall apply:

- during each individual exposure in the test sequence it shall be verified by the QTMA supplied by the manufacturer that the communications link is maintained, and that the quality of transmission observed is no worse than that declared by the manufacturer;
- at the conclusion of the test:
  - the EUT shall operate as intended with no loss of user control functions or stored data, as declared by the manufacturer;
  - the communications link has been maintained during the test; and
  - the quality of transmission observed is no worse than that declared by the manufacturer.
- under no circumstances shall the transmitter operate unintentionally.

### 6.3 Performance criteria for Transient Phenomena (TP)

The following procedures shall apply:

- after each exposure in the test sequence it shall be verified by the QTMA supplied by the manufacturer, that the communications link is maintained, and that the quality of transmission observed is no worse than that declared by the manufacturer;

- at the conclusion of the total test comprising a series of individual exposures it shall be verified that:
  - the EUT operates as intended with no loss of user control functions or stored data, as declared by the manufacturer;
  - the communications link has been maintained during the test; and
  - the quality of transmission observed is no worse than that declared by the manufacturer.
- under no circumstances shall the transmitter operate unintentionally.

## 7 Applicability overview

### 7.1 Emission

#### 7.1.1 General

ETSI EN 301 489-1 [1], table 1, contains the applicability of EMC emission measurements to the relevant ports of radio and/or associated ancillary equipment.

#### 7.1.2 Special conditions

No special condition applies to MESs within the scope of the present document.

### 7.2 Immunity

#### 7.2.1 General

ETSI EN 301 489-1 [1], table 2, contains the applicability of EMC immunity measurements to the relevant ports of radio and/or associated ancillary equipment.

#### 7.2.2 Special conditions

The following special conditions set out in table 1, relate to the immunity test methods and performance criteria used in ETSI EN 301 489-1 [1], clause 9.

**Table 1: Special conditions for EMC immunity tests**

Reference to clauses in ETSI EN 301 489-1 [1]	Special product-related conditions, additional to or modifying the test conditions in ETSI EN 301 489-1 [1], clause 9
9.7.3 Performance criteria; Voltage dips and interruptions	For a voltage dip corresponding to a reduction of the supply voltage of 30 % for 10 ms the performance criteria CP shall apply (see clause 6.2).

## Annex A (informative): Relationship between the present document and the essential requirements of Directive 2014/53/EU

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.2] 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.1].

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.

**Table A.1: Relationship between the present document and the essential requirements of Directive 2014/53/EU**

Harmonised Standard ETSI EN 301 489-20				
Requirement			Requirement Conditionality	
No	Description	Reference: Clause No	U/C	Condition
1	Emissions: Enclosure of ancillary equipment measured on a stand alone basis	ETSI EN 301 489-1 [1], clause 8.2	U	
2	Emissions: DC power input/output ports	Clause 7.1 and ETSI EN 301 489-1 [1], clause 8.3	C	Only where equipment has DC power input and/or output ports with a cable length greater than 3 m or from a vehicle power supply
3	Emissions: AC mains power input/output ports	Clause 7.1 and ETSI EN 301 489-1 [1], clause 8.4	C	Only where equipment has AC mains power input and/or output ports
4	Emissions: Harmonic current emission (AC mains input port)	Clause 7.1 and ETSI EN 301 489-1 [1], clause 8.5	C	Only where equipment has AC mains power input ports
5	Emissions: Voltage fluctuations and flicker (AC mains input ports)	Clause 7.1 and ETSI EN 301 489-1 [1], clause 8.6	C	Only where equipment has AC mains power input ports
6	Emissions: Wired network ports	Clause 7.1 and ETSI EN 301 489-1 [1], clause 8.7	C	Only where equipment has wired network ports
7	Immunity: Radio frequency electromagnetic field (80 MHz to 6 000 MHz)	Clause 7.2 and ETSI EN 301 489-1 [1], clause 9.2	U	
8	Immunity: Electrostatic discharge	Clause 7.2 and ETSI EN 301 489-1 [1], clause 9.3	U	
9	Immunity: Fast transients common mode	Clause 7.2 and ETSI EN 301 489-1 [1], clause 9.4	C	Only where equipment has AC mains power input ports or DC power ports or wired network ports with cables longer than 3 m
10	Immunity: Radio frequency common mode	Clause 7.2 and ETSI EN 301 489-1 [1], clause 9.5	C	Only where equipment has AC mains power input ports or DC power ports or wired network ports with cables longer than 3 m
11	Immunity: Transients and surges in the vehicular environment	Clause 7.2 and ETSI EN 301 489-1 [1], clause 9.6	C	Only where equipment is fitted to a vehicle power supply
12	Immunity: Voltage dips and interruptions	Clause 7.2 and ETSI EN 301 489-1 [1], clause 9.7	C	Only where equipment has AC mains power input ports
13	Immunity: Surges, line to line and line to ground	Clause 7.2 and ETSI EN 301 489-1 [1], clause 9.8	C	Only where equipment has AC mains power input ports and/or wired network ports

**Key to columns:****Requirement:**

**No** A unique identifier for one row of the table which may be used to identify a requirement.

**Description** A textual reference to the requirement.

**Essential requirements of Directive**

Identification of article(s) defining the requirement in the Directive.

**Clause(s) of the present document**

Identification of clause(s) defining the requirement in the present document unless another document is referenced explicitly.

**Requirement Conditionality:**

**U/C** Indicates whether the requirement is unconditionally applicable (U) or is conditional upon the manufacturer's claimed functionality of the equipment (C).

**Condition** Explains the conditions when the requirement is or is not applicable for a requirement which is classified "conditional".

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## Annex B (normative): Definitions of MESs within the scope of the present document

### B.0 General

The present document covers types of MES equipment as set out below.

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### B.1 MESs operating within 1,6 GHz/2,4 GHz band

The present document applies to Mobile Earth Stations (MESs), with both transmit and receive capabilities for operation in a Satellite Personal Communication Network (S-PCN).

MES equipment may be handheld, portable or vehicle mounted. Unless otherwise stated in the present document, the present document only applies to the MES component of a multi-mode terminal.

The Mobile Satellite Service (MSS) frequency bands within which the MESs operate are given in table B.1.

**Table B.1: Mobile Satellite Service (MSS) frequency bands**

Mode of operation	MSS frequency bands
MESs transmit	1 610 MHz to 1 626,5 MHz
MESs receive	1 613,8 MHz to 1 626,5 MHz 2 483,5 MHz to 2 500 MHz

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### B.2 MESs operating within the 1,5 GHz/1,6 GHz

The present document applies to Mobile Earth Stations (MESs), with both transmit and receive capabilities for operation in a Satellite Personal Communication Network (S-PCN).

MES equipment may be portable, vehicle mounted or fixed. Unless otherwise stated in the present document, the present document only applies to the MES component of a multi-mode terminal.

The Mobile Satellite Service (MSS) frequency bands within which the MESs operate are given in table B.2.

**Table B.2: Mobile Satellite Service (MSS) frequency bands**

Mode of operation	MSS frequency bands
MESs transmit	1 626,5 MHz to 1 660,5 MHz
	1 668,0 MHz to 1 675,0 MHz
MESs receive	1 518 MHz to 1 559 MHz

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### B.3 MESs operating within 2,0 GHz band

The present document applies to Mobile Earth Stations (MESs), with both transmit and receive capabilities for operation in a Satellite Personal Communication Network (S-PCN).

MES equipment may be handheld, portable or vehicle mounted. Unless otherwise stated in the present document, the present document only applies to the MES component of a multi-mode terminal.

The Mobile Satellite Service (MSS) frequency bands within which the MESs operate are given in table B.3.

**Table B.3: Mobile Satellite Service (MSS) frequency bands**

Mode of operation	MSS frequency bands
MESs transmit	1 980 MHz to 2 010 MHz
MESs receive	2 170 MHz to 2 200 MHz

---

## B.4 MESs operating below 1 GHz

The present document applies to Mobile Earth Stations (MESs), with both transmit and receive capabilities for operation in a Low Earth Orbits (LEO) Network providing Low Bit Rate Data Communications (LBRDC).

MES equipment may be handheld, portable or vehicle mounted.

The Mobile Satellite Service (MSS) frequency bands within which the MESs operate are given in table B.4.

**Table B.4: Mobile Satellite Service (MSS) frequency bands**

Mode of operation	MSS frequency bands
MESs transmit	148 MHz to 150,05 MHz 235 MHz to 322 MHz 335,4 MHz to 399,9 MHz 399,9 MHz to 400,05 MHz
MESs receive	137 MHz to 138 MHz 235 MHz to 322 MHz 335,4 MHz to 399,9 MHz 400,15 MHz to 401 MHz

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## B.5 MESs operating in the 11 GHz/12 GHz/14 GHz frequency bands

The present document applies to Mobile Earth Stations (MESs), transmitting data via geostationary satellites.

MES equipment may be vehicle mounted or portable.

The frequency bands within which the MESs operate are given in table B.5.

**Table B.5: Frequency bands**

Mode of operation	MSS frequency bands
MESs transmit	14,00 GHz to 14,25 GHz
MESs receive	10,70 GHz to 11,70 GHz 12,50 GHz to 12,75 GHz

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## Annex C (informative): Bibliography

- ETSI EN 301 426: "Satellite Earth Stations and Systems (SES); Harmonized EN for Low data rate Land Mobile satellite Earth Stations (LMES) operating in the 1,5/1,6 GHz frequency bands covering essential requirements under Article 3.2 of the Directive 2014/53/EU".
- ETSI EN 301 427: "Satellite Earth Stations and Systems (SES); Harmonized EN for Low data rate Land Mobile satellite Earth Stations (LMES) operating in the 11/12/14 GHz frequency bands covering essential requirements under article 3.2 of the Directive 2014/53/EU".
- ETSI EN 301 441: "Satellite Earth Stations and Systems (SES); Harmonized EN for Mobile Earth Stations (MESs), including handheld earth stations, for Satellite Personal Communications Networks (S-PCN) in the 1,6/2,4 GHz bands under the Mobile Satellite Service (MSS) covering essential requirements under Article 3.2 of the Directive 2014/53/EU".
- ETSI EN 301 442: "Satellite Earth Stations and Systems (SES); Harmonized EN for Mobile Earth Stations (MESs), including handheld earth stations, for Satellite Personal Communications Networks (S-PCN) in the 2,0 GHz bands under the Mobile Satellite Service (MSS) covering essential requirements under Article 3.2 of the Directive 2014/53/EU".
- ETSI EN 301 444: "Satellite Earth Stations and Systems (SES); Harmonized EN for Land Mobile Earth Stations (LMES) operating in the 1,5 GHz and 1,6 GHz bands providing voice and/or data communications covering essential requirements under Article 3.2 of the Directive 2014/53/EU".
- ETSI EN 301 721: "Satellite Earth Stations and Systems (SES); Harmonized EN for Mobile Earth Stations (MES) providing Low Bit Rate Data Communications (LBRDC) using Low Earth Orbiting (LEO) satellites operating below 1 GHz covering essential requirements under Article 3.2 of the Directive 2014/53/EU".
- ETSI EN 301 681: "Satellite Earth Stations and Systems (SES); Harmonised Standard for Mobile Earth Stations (MES) of Geostationary mobile satellite systems, including handheld earth stations, for Satellite Personal Communications Networks (S-PCN) under the Mobile Satellite Service (MSS), operating in the 1,5 GHz and 1,6 GHz frequency bands covering the essential requirements of article 3.2 of the Directive 2014/53/EU".
- ETSI EN 301 473: "Satellite Earth Stations and Systems (SES); Harmonised Standard for Aircraft Earth Stations (AES) providing Aeronautical Mobile Satellite Service (AMSS)/Mobile Satellite Service (MSS) and/or the Aeronautical Mobile Satellite on Route Service (AMS(R)S)/Mobile Satellite Service (MSS), operating in the frequency band below 3 GHz covering the essential requirements of article 3.2 of the Directive 2014/53/EU".

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## Annex D (informative): Change history

Version	Information about changes
2.0.0	Updated for RED compliance

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## History

<b>Document history</b>		
V1.1.1	December 2000	Publication
V1.2.1	November 2002	Publication
V2.1.0	October 2017	EN Approval Procedure AP 20180115: 2017-10-17 to 2018-01-15