ETSI EN 301 489-20 V2.2.1.1 (2019-04 (2021-11)

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);
Harmonised Standard ~~covering the essential requirements~~for
ElectroMagnetic Compatibility
~~of article 3.1(b) of Directive 2014/53/EU~~

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ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° w061004871

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Foreword

This Harmonised European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

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].

National transposition dates	
Date of adoption of this EN:	~~15 January 2018~~19 November 2021
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Date of withdrawal of any conflicting National Standard (dow):	31 ~~January 2021~~August 2023

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).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

1 Scope

The present document~~, together with ETSI EN 301 489-1 [1], covers the assessment~~ specifies technical characteristics and methods of measurement for Mobile Earth Stations (MES) operating in the Mobile Satellite Services (MSSs) 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, see table 1.

~~The~~ Emissions requirements in the present document ~~specifies the applicable test conditions, performance assessment and performance criteria~~are only specified for ~~MESs and for~~frequencies above 9 kHz.

Table 1: Radio Technologies in the ~~associated ancillary equipment.~~scope of the present document

~~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.~~

Technology	ETSI Standard
Low data rate Land Mobile satellite Earth Stations (LMES) and Maritime Mobile satellite Earth Stations (MMES) operating in the 1 518 MHz to 1 675 MHz frequency bands	ETSI EN 301 426 [i.3]
Low data rate Land Mobile satellite Earth Stations (LMES) operating in the 11/12/14 GHz frequency bands	ETSI EN 301 427 [i.4]
Mobile Earth Stations (MES), including handheld earth stations, for Satellite Personal Communications Networks (S-PCN) in the 1 610 MHz to 2 500 MHz frequency bands under the Mobile Satellite Service (MSS)	ETSI EN 301 441 [i.5]
Mobile Earth Stations (MES), including handheld earth stations, for Satellite Personal Communications Networks (S-PCN) in the 1 980 MHz to 2 200 MHz frequency bands under the Mobile Satellite Service (MSS)	ETSI EN 301 442 [i.6]
Land Mobile Earth Stations (LMES) and Maritime Mobile Earth Stations (MMES) operating in the 1 518 MHz to 1 675 MHz frequency bands providing voice and/or data communications	ETSI EN 301 444 [i.7]
Mobile Earth Stations (MES) providing Low Bit Rate Data Communications (LBRDC) using Low Earth Orbiting (LEO) satellites operating in the 137 MHz to 401 MHz frequency bands	ETSI EN 301 721 [i.8]
Land Mobile Earth Stations (LMES) and Maritime Mobile Earth Stations (MMES) 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 1 518 MHz to 1 675 MHz frequency bands	ETSI EN 301 681 [i.9]
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 1 518 MHz to 2 500 MHz frequency bands	ETSI EN 301 473 [i.10]

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.~~1].

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 3.1(b) of Directive 2014/53/EU [i.1] 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.~~0) (03-2017~~3) (11-2019): "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~~for ElectroMagnetic Compatibility".

[2] Void.

[3] Void.

[4] ITU-R Radio Regulations (~~2016~~2020).

[5] Void.

[6] Void.

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.

~~3 Definitions~~[i.3] ETSI EN 301 426: "Satellite Earth Stations and Systems (SES); Harmonised Standard for Low data rate Land Mobile satellite Earth Stations (LMES) and Maritime Mobile satellite Earth Stations (MMES) not intended for distress and safety communications operating in the 1,5 GHz/1,6 GHz frequency bands covering the essential requirements of article 3.2 of the Directive 2014/53/EU".

[i.4] ETSI EN 301 427: "Satellite Earth Stations and Systems (SES); Harmonised Standard for low data rate Mobile satellite Earth Stations (MES) except aeronautical mobile 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".

[i.5] ETSI EN 301 441: "Satellite Earth Stations and Systems (SES); Harmonised Standard for Mobile Earth Stations (MES), including handheld earth stations, for Satellite Personal Communications Networks (S-PCN) operating in the 1,6 GHz/2,4 GHz frequency band under the Mobile Satellite Service (MSS) covering the essential requirements of article 3.2 of the Directive 2014/53/EU".

[i.6] ETSI EN 301 442: "Satellite Earth Stations and Systems (SES); Harmonised Standard for NGSO Mobile Earth Stations (MES) including handheld earth stations, for Satellite Personal Communications Networks (S-PCN) operating in the 1 980 MHz to 2 010 MHz (earth-to-space) and 2 170 MHz to 2 200 MHz (space-to-earth) frequency bands under the Mobile Satellite Service (MSS) covering the essential requirements of article 3.2 of the Directive 2014/53/EU".

[i.7] ETSI EN 301 444: "Satellite Earth Stations and Systems (SES); Land Mobile Earth Stations (LMES) and Maritime Mobile Earth Stations (MMES) providing voice and/or data communications, operating in the 1,5 GHz and 1,6 GHz frequency bands; Harmonised Standard for access to radio spectrum".

[i.8] ETSI EN 301 721: "Satellite Earth Stations and Systems (SES); Harmonised Standard for Mobile Earth Stations (MES) providing Low Bit Rate Data Communications (LBRDC) using Low Earth Orbiting (LEO) satellites operating below 1 GHz frequency band covering the essential requirements of article 3.2 of the Directive 2014/53/EU".

[i.9] 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".

[i.10] 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".

3 Definition of terms, symbols and abbreviations

3.1 ~~Definitions~~Terms

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~~

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

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

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

Externally Mounted Equipment (EME): equipment consisting of those of the modules of the Installable Equipment (IE) which are intended to be mounted externally to the vehicle as stated by the manufacturer

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~~fitted to a vehicle

NOTE: An IE may consist of one or several interconnected modules.~~ The IE is composed of~~

integral antenna: antenna designed for permanent connection to the equipment and considered part of the enclosure port

Internally Mounted Equipment (IME): IE modules ~~intended to be externally mounted and declared by the manufacturer as Externally Mounted Equipment (EME). The remaining module(s)~~which are not defined as ~~Internally Mounted Equipment (IME).~~EME

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

occupied bandwidth: See ITU-R Radio Regulations [~~2~~4], part A, chapter 1, Terminology RR 147.

Portable Equipment (PE): radio equipment ~~generally~~ intended ~~to be self-contained, free-standing and~~ for portable use and powered by integral batteries or battery

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 Symbols

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

Pmin minimum power required to establish a communication link

3.3 Abbreviations

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

~~CP performance criteria for Continuous Phenomena~~
AC Alternating Current
AES Aircraft Earth Stations
BER Bit Error Ratio
DC Direct Current
EFTA European Free Trade Association
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~~Communications
LEO	Low Earth Orbit
LMES	Land Mobile Earth Stations
MES	Mobile Earth ~~Station~~Stations
MMES	Maritime Mobile Earth Stations
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~~Networks
~~STE~~	~~Special Test Equipment~~
~~TP~~	~~performance criteria for Transient Phenomena~~
V-MES	Vehicle mounted MES

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.~~with the following additions. Further product related test conditions for MES are specified in the present document.

For ~~MESs~~MES with ancillary equipment and/or various ports, the ~~number~~selection 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 4.2 and 4.3, the Equipment Under Test (EUT) is the MES with the selected ~~configuration~~configurations of ancillary equipment.

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

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

~~Whenever the Equipment Under Test (EUT) is~~ Where radio equipment is provided with an integral antenna, ~~the EUT~~it shall be tested with the antenna fitted in a manner ~~typical~~representative 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

4.2.0 General

The provisions of ETSI EN 301 489-1 [1], clause 4.2 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 MES terminal in its normal operating mode, and providing the MES 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. This Equipment may also be used to achieve loop back mode operation;

b) a Quality of Transmission Measurement Apparatus (QTMA).

EXAMPLE: The quality of transmission may concern:

- the audio signal;
- the BER;
- the message throughput;
- the continuity of the communication link; or
- a combination of them.

For the immunity tests of the EUT, a communications link shall be established between the EUT and the testing system. The EUT shall be placed in the normal operating mode.

4.2.1 Arrangements for test signals at the input of transmitters

The provisions of ETSI EN 301 489-1 [~~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~~1], clause 4.2.2 shall apply with the following ~~modifications~~additions.

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.

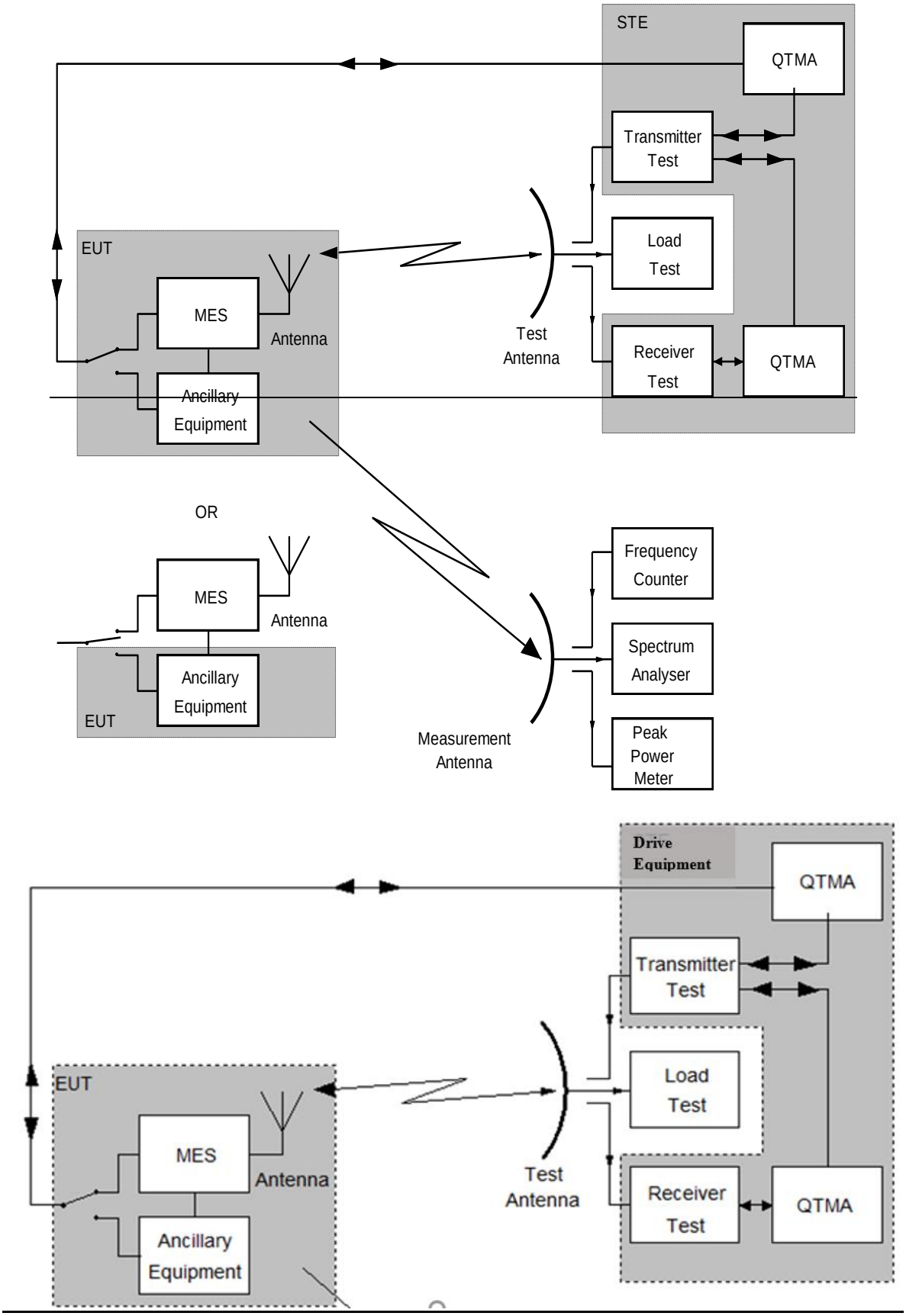

Figure 1: ~~Suggested test~~Test configuration

4.2.3 Arrangements for test signals at the input of receivers

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

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

~~For~~ or the ~~measurement~~enclosure terrestrial port of the ~~quality of transmission, a communications link~~EUT, shall be ~~established and~~20 dB (±3 dB) above the ~~wanted input signal shall be applied to~~ Pmin for the ~~Radio Frequency (RF) input~~ EUT. For all other tests the level of the ~~receiver. Signal level adjustment may be performed by adjustment~~wanted signal, required to establish a communication link, shall be representative of the ~~test transmitter output level such that the received signal level is as close to the normal operation signal level as possible~~EUT intended use.

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

NOTE: A simple method to establish the required communication link is to establish a link, reduce power to the 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~~1], clause 4.2.4 shall apply with the following ~~modifications~~additions.

For the quality of transmission measurements the MES ~~may~~shall 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~~Exclusion bands shall be in accordance with clauses 4.3.1 and 4.3.2. 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.~~

5 Performance assessment

5.1 ~~General~~Void

~~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~~shall be 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~~shall 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~~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~~Vehicle mounted MES (V-MES) intended to be powered by the vehicle main battery~~, **shall meet the requirements for mobile equipment**~~;.
- ~~portable~~Portable MES (P-MES) powered by a stand~~-~~alone battery~~, **shall meet the requirements for portable equipment**~~;.
- ~~fixed~~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).

6 Performance criteria

6.1 General

Only the performance criteria specified in the present document or in ETSI EN 301 489-1 [1] where referenced shall apply.

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.~~

The EUT shall be considered to satisfy the immunity requirements if the provisions of ETSI EN 301 489-1 [1], clause 6.1 are met.

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

The EUT shall be considered to satisfy the immunity requirements if the provisions of ETSI EN 301 489-1 [1], clause 6.2 are met.

7 Requirements

7.1 Emission

7.1.1 General

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

Table 2: Emission requirements

Phenomenon	Port	Applicability			Reference clause
		Fixed equipment	Vehicular equipment	Portable equipment	
Radiated emission	Enclosure port of ancillary equipment	Applicable	Applicable	Applicable	ETSI EN 301 489-1 [1], clause 8.2
Conducted emission	DC power input/output port	Applicable	Applicable	Not applicable	7.1.2
Conducted emission	AC mains input/output port	Applicable	Not applicable	Not applicable	ETSI EN 301 489-1 [1], clause 8.4
Conducted emission	Wired network port	Applicable	Not applicable	Not applicable	ETSI EN 301 489-1 [1], clause 8.7

7.1.2 Special conditions

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

The following special conditions set out in table 3 relate to the EMC emission measurements and limits used in ETSI EN 301 489-1 [1], clause 8.

Table 3: Special conditions for EMC emission 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 8
8.3 DC power input/output ports	The requirements of ETSI EN 301 489-1 [1] clause 8.3 shall be applied where the cable length exceeds 3 m or is connected to a vehicle power supply.

7.2 Immunity

7.2.1 General

~~ETSI EN 301 489-1 [1], table 2,~~Table 4 contains the applicability of EMC immunity measurements to the relevant ports of radio and/or associated ancillary equipment.

Table 4: Immunity requirements

Phenomenon	Port	Applicability			Reference clause	Performance criteria clause
		Fixed equipment	Vehicular equipment	Portable equipment		
RF electromagnetic field (80 MHz to 6 000 MHz)	Enclosure	Applicable	Applicable	Applicable	ETSI EN 301 489-1 [1], clause 9.2	6.2
Electrostatic discharge	Enclosure	Applicable	Applicable	Applicable	ETSI EN 301 489-1 [1], clause 9.3	6.3
Fast transients common mode	Signal, wired network and control	Applicable	Not applicable	Not applicable	ETSI EN 301 489-1 [1], clause 9.4	6.3
	DC power	Applicable	Not applicable	Not applicable		
	AC mains power	Applicable	Not applicable	Not applicable		
RF common mode 0,15 MHz to 80 MHz	signal, wired network and control	Applicable	Not applicable	Not applicable	ETSI EN 301 489-1 [1], clause 9.5	6.2
	DC power	Applicable	Applicable	Not applicable		
	AC mains power	Applicable	Applicable	Not applicable		
Transients and surges in the vehicular environment	DC power input	not applicable	Applicable	Not applicable	ETSI EN 301 489-1 [1], clause 9.6	6.3
Voltage dips and interruptions	AC mains power input	Applicable	Not applicable	Not applicable	ETSI EN 301 489-1 [1], clause 9.7 and clause 7.2.2 of present document	6.3
Surges, line to line and line to ground	AC mains power input ports, wired network ports	Applicable	Not applicable	Not applicable	ETSI EN 301 489-1 [1], clause 9.8	6.3
	Wired network	Applicable	Not applicable	Not applicable		

Portable equipment, or combinations of equipment, capable of being powered for intended use by the main battery of a vehicle shall additionally be considered as vehicular equipment.

Portable or vehicular equipment, or combinations of equipment, capable of being powered for intended use by AC mains shall additionally be considered as fixed equipment.

7.2.2 Special conditions

The following special conditions set out in table ~~1~~5, relate to the immunity test methods and performance criteria used in ETSI EN 301 489-1 [1], clause 9.

Table ~~1~~5: 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	Essential requirements of Directive	Reference: Clause No(s) of the present document	U/C	Condition
1	Emissions: Enclosure of ancillary equipment measured on a stand-alone basis	ETSI EN 301 489-1 [1], clause 8.23.1(b)	7.1	U	
2	Emissions: DC power input/output ports	Clause 7.1 and ETSI EN 301 489-1 [1], clause 8.33.1(b)	7.1	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	3.1(b)	Clause 7.1 and ETSI EN 301 489-1 [1], clause 8.47.1	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
64	Emissions: Wired network ports	3.1(b)	Clause 7.1 and ETSI EN 301 489-1 [1], clause 8.77.1	C	Only where equipment has wired network ports
75	Immunity: Radio frequency electromagnetic field (80 MHz to 6 000 MHz)	3.1(b)	Clause 7.2 and ETSI EN 301 489-1 [1], clause 9.27.2	U	
86	Immunity: Electrostatic discharge	3.1(b)	Clause 7.2 and ETSI EN 301 489-1 [1], clause 9.37.2	U	
97	Immunity: Fast transients common mode	3.1(b)	Clause 7.2 and ETSI EN 301 489-1 [1], clause 9.47.2	C	Only where equipment has AC mains power input ports or DC power ports or wired network ports with cables longer than 3 m

Harmonised Standard ETSI EN 301 489-20					
Requirement				Requirement Conditionality	
No	Description	Essential requirements of Directive	Reference: Clause No(s) of the present document	U/C	Condition
108	Immunity: Radio frequency common mode	3.1(b)	Clause 7.2 and ETSI EN 301 489-1 [1], clause 9.57.2	C	Only where equipment has AC mains power input ports or DC power ports or wired network ports with cables longer than 3 m
119	Immunity: Transients and surges in the vehicular environment	3.1(b)	Clause 7.2 and ETSI EN 301 489-1 [1], clause 9.67.2	C	Only where equipment is fitted to a vehicle power supply
1210	Immunity: Voltage dips and interruptions	3.1(b)	Clause 7.2 and ETSI EN 301 489-1 [1], clause 9.77.2	C	Only where equipment has AC mains power input ports
1311	Immunity: Surges, line to line and line to ground	3.1(b)	Clause 7.2 and ETSI EN 301 489-1 [1], clause 9.87.2	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 Number(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".

Presumption of conformity stays valid only as long as a reference to the present document is maintained in the list published in the Official Journal of the European Union. Users of the present document should consult frequently the latest list published in the Official Journal of the European Union.

Other Union legislation may be applicable to the product(s) falling within the scope of the present document.

Annex B (~~normative~~informative): Definitions of ~~MESs~~MES within the scope of the present document

B.0 General

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

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

The present document applies to Mobile Earth Stations (~~MESs~~MES), 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~~

~~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~~

~~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~~Communications Networks (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~~MES operate are given in table B.1.

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

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

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

The present document applies to Mobile Earth Stations (MES), with both transmit and receive capabilities for operation in a Satellite Personal Communications Networks (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 MES operate are given in table B.2.

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

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

B.3 MES operating within 2,0 GHz band

The present document applies to Mobile Earth Stations (MES), with both transmit and receive capabilities for operation in a Satellite Personal Communications Networks (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 MES operate are given in table B.3.

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

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

B.4 ~~MESs~~MES operating below 1 GHz

The present document applies to Mobile Earth Stations (~~MESs~~MES), with both transmit and receive capabilities for operation in a Low Earth Orbits (~~LEO~~LEOs) 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~~MES operate are given in table B.4.

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

Mode of operation	MSS frequency bands
~~MESs~~MES 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~~MES receive	137 MHz to 138 MHz 235 MHz to 322 MHz 335,4 MHz to 399,9 MHz 400,15 MHz to 401 MHz

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

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

MES equipment may be vehicle mounted or portable.

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

Table B.5: Frequency bands

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

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".~~

~~Annex D (informative):~~
Change history

Version	Information about changes
2.~~0.0~~1.1	Updated for RED compliance
2.1.2	Alignment with EC feedback and the mapping of requirements with ETSI EN 301 489-1 (V2.2.3)
2.2.0	Updated with ENAP comment resolutions

History

Document history		
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~~
V2.1.1	April 2019	Publication
V2.1.2	March 2021	EN Approval Procedure AP 20210622: 2021-03-24 to 2021-06-22
V2.2.0	September 2021	Vote V 20211119: 2021-09-20 to 2021-11-19
V2.2.1	November 2021	Publication