ETSI EN 301 444 V2.2.1 (2021-04)

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

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Foreword

This Harmonised European Standard (EN) has been produced by ETSI Technical Committee Satellite Earth Stations and Systems (SES).

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The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.3] 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.6].

Once the present document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of the present document given in table A.1 confers, within the limits of the scope of the present document, a presumption of conformity with the corresponding essential requirements of that Directive and associated EFTA regulations.

National transposition dates	
Date of adoption of this EN:	12 April 2021
Date of latest announcement of this EN (doa):	31 July 2021
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 January 2022
Date of withdrawal of any conflicting National Standard (dow):	31 January 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).

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Introduction

Following the WRC-03 decision [i.4] to allocate to MSS the bands 1 518 MHz to 1 525 MHz (space to Earth) and 1 668 MHz to 1 675 MHz (Earth to space) and the conclusions of WRC-07 [i.5], a new set of emission requirements for LMESs and MMESs that are capable of transmitting in the frequency band from 1 668,0 MHz to 1 675,0 MHz is specified.

The two parts of the L-band frequency allocations are treated as two sub-bands which may be used separately or in any combination. The standard L-band allocation is referenced in the present document as "sub-band 1" and the extended L-band is referenced as "sub-band 2".

Table 2c is applicable for LMESs and MMESs that are capable of transmitting in any combination of either or both of these sub-bands. Table 2c is recommended for all new LMESs and MMESs including LMES and MMES that can only operate in sub-band 1.

The manufacturer may choose between tables 2b and 2c for new LMESs and MMES that are capable of transmitting in only the sub-band 1. The manufacturer has to declare which alternative is used.

The present document specifies a new set of receiver performance requirements for LMESs and MMESs under the new Radio Equipment Directive 2014/53/EU [i.6].

Figure 1: Void

The present document is intended to cover the provisions of Directive 2014/53/EU [i.6] (RE Directive) article 3.2 which states that "*….radio equipment shall be so constructed that it both effectively uses and supports the efficient use of radio spectrum in order to avoid harmful interference*".

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Recital 10 of Directive 2014/53/EU [i.6] states that "*in order to ensure that radio equipment uses the radio spectrum effectively and supports the efficient use of radio spectrum, radio equipment should be constructed so that: in the case of a transmitter, when the transmitter is properly installed, maintained and used for its intended purpose it generates radio waves emissions that do not create harmful interference, while unwanted radio waves emissions generated by the transmitter (e.g. in adjacent channels) with a potential negative impact on the goals of radio spectrum policy should be limited to such a level that, according to the state of the art, harmful interference is avoided; and, in the case of a receiver, it has a level of performance that allows it to operate as intended and protects it against the risk of harmful interference, in particular from shared or adjacent channels, and, in so doing, supports improvements in the efficient use of shared or adjacent channels*".

Recital 11 of Directive 2014/53/EU [i.6] states that "*although receivers do not themselves cause harmful interference, reception capabilities are an increasingly important factor in ensuring the efficient use of radio spectrum by way of an increased resilience of receivers against harmful interference and unwanted signals on the basis of the relevant essential requirements of Union harmonisation legislation*".

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

1 Scope

The present document applies to Land Mobile Earth Stations (LMESs) and Maritime Mobile Earth Stations (MMESs) radio equipment with an EIRP of greater than or equal to 15 dBW and less than or equal to 33 dBW and which have the following characteristics:

- the LMES could be either vehicle mounted or portable equipment;
- these MMESs are installable equipment on ships;
- these LMESs and MMESs are controlled and monitored by a Network Control Facility (NCF). The NCF is outside the scope of the present document;
- the LMES and MMES operate through geostationary satellites as part of a network providing voice and/or data communications;
- these LMESs and MMESs operate with user bit-rates greater than 9,6 kbits/s;
- the LMES and MMESs are capable of operating in any combination of all or any part of the frequency ranges sub-band 1 and sub-band 2 defined in table 1a.

Table 1a: Land and Maritime Mobile Satellite Service frequency bands

Sub-Band	Direction of transmission	LMSS frequency bands
1	Transmit 1 (Earth to space)	1 626,5 MHz to 1 660,5 MHz
	Receive 1 (space to Earth)	1 525,0 MHz to 1 559,0 MHz
2	Transmit 2 (Earth to space)	1 668,0 MHz to 1 675,0 MHz
	Receive 2 (space to Earth)	1 518,0 MHz to 1 525,0 MHz

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The present document is intended to cover the provisions of Directive 2014/53/EU [i.6] (RE Directive) article 3.2 which states that "….*radio equipment shall be so constructed that it both effectively uses and supports the efficient use of radio spectrum in order to avoid harmful interference*".

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NOTE: The relationship between the present document and essential requirements of article 3.2 of Directive 2014/53/EU [i.6] 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] Void.

[2] CISPR 16-1-4 (2019): "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".

[3] Void.

[4] Void.

[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.

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The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] Void.

[i.2] Void.

[i.3] 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.4] World Radiocommunication Conference 2003 (WRC-03) Final Acts.

[i.5] World Radiocommunication Conference 2007 (WRC-07) Finals Acts.

[i.6] 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.7] The latest version of the ITU Master International Frequency Register (MIFR), available from the ITU website.

[i.8] ETSI EG 203 336 (V1.2.1): "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".

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3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in Directive 2014/53/EU [i.6] and the following apply:

antenna transmit gain: ratio, expressed in decibels, of the power that would have to be supplied to an isotropic radiator to the power supplied to the antenna being considered, so that they produce the same field strength at the same distance in the same direction

carrier-off state: state in which the LMES or MMES is not transmitting a carrier

carrier-on state: state in which the LMES or MMES is transmitting a carrier

Control Channel (CC): channel or channels by which LMES and MMES receive control information from the NCF for their network

effective receive operating band: receive band within 1 518 MHz to 1 559 MHz where the tests associated with table 5 are met; the effective receive operating band shall be indicated by the manufacturer

environmental profile: range of environmental conditions under which equipment within the scope of the present document is required to comply with the provisions of the present document

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

in-band signals: signals which are located in the operating band plus an offset of 10 MHz outside this operating band

Installable Equipment (IE): equipment which is intended to be fitted to a vehicle

NOTE: An IE may consist of one or several interconnected modules.

Internally Mounted Equipment (IME): modules of the IE which are not declared by the manufacturer as EME are defined as Internally Mounted Equipment (IME)

manufacturer: any natural or legal person who manufactures radio equipment or has radio equipment designed or manufactured, and markets that equipment under his name or trade mark

nominated bandwidth: bandwidth of the LMES or MMES radio frequency transmission nominated by the manufacturer

NOTE: The nominated bandwidth is wide enough to encompass all spectral elements of the transmission which have a level greater than the specified unwanted emissions limits. The nominated bandwidth is wide enough to take account of the transmit carrier frequency stability. The nominated bandwidth is within the transmit frequency band within which the LMES and MMES operates.

operating band: frequency range over which the receiving equipment is able to operate as intended

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

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

sub-band: contiguous portion of the operating band

NOTE: Two sub-bands are defined (see table 1a).

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transition frequency: frequency which separates adjacent frequency ranges in a table of limits

unwanted emissions: emissions falling outside the nominated bandwidth

3.2 Symbols

Void.

3.3 Abbreviations

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

BER	Bit Error Rate
BW	BandWidth
CC	Control Channel
CDMA	Code-Division Multiple Access
CISPR	International Special Committee on Radio Interference
CMF	Control and Monitoring Functions
CW	Continuous Wave
EFTA	European Free Trade Association
EIRP	Equivalent Isotropically Radiated Power
EMC	ElectroMagnetic Compatibility
EME	Externally Mounted Equipment
ETS	European Telecommunication Standard
EUT	Equipment Under Test
IE	Installable Equipment
IME	Internally Mounted Equipment

LMES	Land Mobile Earth Station
LMSS	Land Mobile Satellite Service
LO	Local Oscillator
LTE	Long Term Evolution
MES	Mobile Earth Station
MMES	Maritime Mobile Earth Station
MSS	Mobile Satellite Service
NCF	Network Control Facility
PE	Portable Equipment
R&TTE	Radio and Telecommunications Terminal Equipment
RA	Radio Astronomy
RE	Radio Equipment
RED	Radio Equipment Directive
RF	Radio Frequency
SNR	Signal to Noise Ratio
STE	Special Test Equipment
TBR	Technical Basis for Regulation
TC-SES	Technical Committee-Satellite Earth Stations and Systems
WRC	World Radiocommunication Conference

4 Technical requirement specifications

4.1 Environmental profile

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The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be in accordance with its intended use. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the operational environmental profile defined by its intended use. The environmental profile for operation of the equipment shall include the ranges of humidity, temperature and supply voltage.

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4.2 Conformance requirements

4.2.0 Maximum EIRP

4.2.0.1 Justification

Protection of other radio services from in band emissions.

4.2.0.2 Specification

The EIRP of the LMES and MMES shall not exceed 33 dBW.

4.2.0.3 Conformance test

Conformance test shall be carried out in accordance with clause 5.2.6.

4.2.1 Unwanted emissions outside the band 1 625,8 MHz to 1 661,2 MHz and outside the band 1 667,3 MHz to 1 675,7 MHz

4.2.1.1 Justification

The technical requirements presented in this clause shall apply to all LMESs and MMESs that are capable of transmitting either in sub-band 1 or sub-band 2, or in both sub-bands as defined in table 1a for the purpose of:

- protection of terrestrial and satellite services from emissions caused by LMES and MMES outside the band 1 625,8 MHz to 1 661,2 MHz; and
- protection of terrestrial and satellite services from emissions caused by LMES and MMES outside the band 1 667,3 MHz to 1 675,7 MHz.

4.2.1.2 Specification

Unwanted emissions from LMESs and MMESs outside the band 1 625,8 MHz to 1 661,2 MHz and outside the band 1 667,3 MHz to 1 675,7 MHz shall be below the following limits.

Unless otherwise stated the specification in this clause shall apply to all types of LMESs and MMESs notwithstanding their transmitting capabilities within the frequency bands as defined in table 1a.

The lower limit shall apply at the transition frequency.

1) The unwanted emissions over the frequency range 30 MHz to 1 000 MHz shall not exceed the limits in table 1b.

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Table 1b: Limits of unwanted emissions up to 1 000 MHz at a measuring distance of 10 m

Frequency (MHz)	Quasi-peak limits (dB(µV/m))	Measurement Bandwidth (kHz)
30 to 230	30	100
230 to 1 000	37	100

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2) For LMES and MMES that are capable of transmitting within only the sub-band 1 frequency band as defined in table 1a, the unwanted emissions Equivalent Isotropically Radiated Power (EIRP) above 1 000 MHz in the measurement bandwidth and in all directions shall not exceed limits of either tables 2b or 2c. Which alternative to use shall be determined by the intended use as indicated by the manufacturer.

3) For LMES and MMES that are capable of transmitting within only the sub-band 2 frequency band or within both sub-band 1 and sub-band 2 frequency bands as defined in table 1a, the unwanted emissions Equivalent Isotropically Radiated Power (EIRP) above 1 000 MHz in the measurement bandwidth and in all directions shall not exceed the limits in table 2c.

Table 2a: Void

Table 2b: Limits of unwanted emissions above 1 000 MHz and outside the band 1 625,8 MHz to 1 661,2 MHz

Frequency range	Carrier-on		Carrier-off	
(MHz)	EIRP limit (dBpW)	Measurement bandwidth (kHz)	EIRP limit (dBpW)	Measurement bandwidth (kHz)
1 000,0 to 1 525,0	49	100	48	100
1 525,0 to 1 559,0	49	100	17	3
1 559,0 to 1 580,42	**50**	**1 000**	**50**	**1 000**
1 580,42 to 1 605,0	**50**	**1 000**	**50**	**1 000**
1 605,0 to 1 610,0	**(note 5)**	**100**	**(note 6)**	**100**
1 610,0 to 1 625,8	74	100	48	100
1 625,8 to 1 661,2	(note 1)	(note 1)	(note 1)	(note 1)
1 661,2 to 1 690,0	74	100	48	100
1 690,0 to 3 400,0	49 (note 2)	100	48	100
3 400 to 10 700	55 (notes 3 and 4)	100	48	100
10 700 to 21 200	61	100	54	100
21 200 to 40 000	67	100	60	100

NOTE 1: The unwanted emissions in the band 1 625,8 MHz to 1 661,2 MHz are limited by clause 4.2.2.
NOTE 2: In the band 3 253,0 MHz to 3 321,0 MHz the maximum EIRP in one, and only one, 100 kHz measurement bandwidth shall not exceed 82 dBpW. Elsewhere in this band the power limit in table 2b shall be applied.
NOTE 3: In each of the bands 4 879,5 MHz to 4 981,5 MHz, 6 506,0 MHz to 6 642,0 MHz and 8 132,5 MHz to 8 302,5 MHz the maximum EIRP in one, and only one, 100 kHz measurement bandwidth shall not exceed 72 dBpW. Elsewhere in this band the power limit in table 2b shall be applied.
NOTE 4: In the band 9 759,0 MHz to 9 963,0 MHz the maximum EIRP in one, and only one, 100 kHz measurement bandwidth shall not exceed 61 dBpW. Elsewhere in this band the power limit in table 2b shall be applied.
NOTE 5: Linearly interpolated from 40 dBpW in 100 kHz at 1 605,0 MHz to 74 dBpW in 100 kHz at 1 610,0 MHz.
NOTE 6: Linearly interpolated from 40 dBpW in 100 kHz at 1 605,0 MHz to 48 dBpW in 100 kHz at 1 610,0 MHz.

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Table 2c: Limits of unwanted emissions above 1 000 MHz and outside the band 1 625,8 MHz to 1 661,2 MHz and the band 1 667,3 MHz to 1 675,7 MHz

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https://standards.iteh.ai/catalog/standards/sist/ed899b6d-9f33-44a6-9b2c-0cb92e23d827/etsi-en-301-444-v2-2-1-2021-04

Frequency range	Carrier-on		Carrier-off	
(MHz)	EIRP limit (dBpW)	Measurement bandwidth (kHz)	EIRP limit (dBpW)	Measurement bandwidth (kHz)
1 000,0 to 1 518	60	1 000	48 (note 7)	100
1 518,0 to 1 525,0	60	1 000	17	3
1 525,0 to 1 559,0	49	100	17	3
1 559,0 to 1 580,42	50	1 000	50	1 000
1 580,42 to 1 605,0	50	1 000	50	1 000
1 605,0 to 1 610,0	(note 5)	100	(note 6)	100
1 610,0 to 1 625,8	74	100	48	100
1 625,8 to 1 661,2	(note 1)	(note 1)	(note 1)	(note 1)
1 661,2 to 1 661,7	(note 8)	100	48	100
1 661,7 to 1 666,8	74	100	48	100
1 666,8 to 1 667,3	(note 9)	100	48	100
1 667,3 to 1 675,7	(note 2)	(note 2)	(note 2)	(note 2)
1 675,7 to 1 676,2	(note 10)	100	48	100
1 676,2 to 1 704,5	74	100	48	100
1 704,5 to 2 250,0	49	100	43 (note 7)	100
2 250,0 to 3 400,0	60 (note 3)	1 000	43 (note 7)	1 000
3 400 to 10 700	60 (note 4)	1 000	43 (note 7)	1 000
10 700 to 21 200	60	1 000	43 (note 7)	1 000
21 200 to 40 000	60	1 000	43 (note 7)	1 000