Final draft ETSI EN 301 473 V2.1.1 (2016-07)

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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Foreword

This final draft Harmonised European Standard (EN) has been produced by ETSI Technical Committee Satellite Earth Stations and Systems (SES), and is now submitted for the 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.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 [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.

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Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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Introduction

An AES to be effectively used on board an aircraft will also be subject to airworthiness approval. This approval will refer to additional requirements (e.g. ISO 7137 equivalent to EUROCAE ED-14D and RTCA DO-160D [1]). Foreseeable evolution of the GNSS (i.e. Galileo or GPS L5) would result in the coming years in specific requirements to protect the use of the GNSS signals on board aircraft. Therefore these new GNSS frequency bands may require different protection than currently stated in the present document.

1 Scope

The present document specifies certain minimum technical performance requirements of Aircraft Earth Station (AES) equipment with both transmit and receive capabilities for operation in the Aeronautical Mobile Satellite Service (AMSS)/Mobile Satellite Service (MSS), and/or in the Aeronautical Mobile Satellite on Route Service (AMS(R)S)/Mobile Satellite Service (MSS), in the frequency bands given in table 1.

Table 1: Aeronautical Mobile Satellite Service (AMSS)/Mobile Satellite Service (MSS), and/or Aeronautical Mobile Satellite on Route Service (AMS(R)S)/ Mobile Satellite Service (MSS) frequency bands

	AMSS/MSS and/or AMS(R)S/MSS frequency bands
AES transmit	1 610 MHz to 1 626,5 MHz
AES receive	1 613,8 MHz to 1 626,5 MHz
AES receive	2 483,5 MHz to 2 500 MHz
AES transmit	1 626,5 MHz to 1 660,5 MHz
AES receive	1 525 MHz to 1 559 MHz
AES transmit	1 668 MHz to 1 675 MHz
AES receive	1 518 MHz to 1 525 MHz
AES transmit	1 980 MHz to 2 010 MHz
AES receive	2 170 MHz to 2 200 MHz

The technical requirements in the present document are in three major categories:

- **emission limits:** to protect other radio services and systems from harmful interference generated by the AES in normal use;
- **AES Control and Monitoring Functions (CMF):** to protect other radio services and systems from unwanted transmissions from the AES. The CMF in each AES is capable of answering to commands from the Network Control Facilities (NCF) for its supporting satellite network;
- **receiver performance specifications:** to enable reception of a wanted signal in presence of other high power signals on the adjacent channel and/or adjacent band.

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NOTE 1: The requirements for Network Control Facilities (NCF) for S-PCN MES transmitting in the 1 610 MHz to 1 626,5 MHz band or the 1 980 MHz to 2 010 MHz band are contained in ETSI ETS 300 735 [4]; these requirements are also applicable to AES transmitting in those bands.

An AES may be subject to additional or alternative requirements in other standards depending on its functionality, in particular if it supports a service which is considered a justified case for regulation of terminal equipment interworking via the public telecommunications network. An AES will also be subject to additional airworthiness certification requirements.

The present document is intended to cover the provisions of Directive 2014/53/EU [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*".

In addition to the present document, other ENs that specify technical requirements in respect of essential requirements under other parts of article 3 of the RE Directive [6] may apply to equipment within the scope of the present document.

NOTE 2: A list of such ENs is included on the web site http://www.newapproach.org.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

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

[1] ISO 7137 (1995) equivalent to EUROCAE ED-14D and RTCA DO-160D: "Aircraft - Environmental conditions and test procedures for airborne equipment".

[2] Recommendation ITU-T O.153 (1992): "Basic parameters for the measurement of error performance at bit rates below the primary rate".

[3] RTCA DO-210D (04-2000): "Minimum Operational Performance Standards (MOPS) for Geosynchronous Orbit Aeronautical Mobile Satellite Services (AMSS) Avionics".

[4] ETSI ETS 300 735 (edition 1) (10-1997): "Satellite Personal Communications Networks (S-PCN); Network Control Facilities (NCF) for Mobile Earth Stations (MES), including handheld earth stations, for S-PCN in the 1,6/2,4 GHz and the 2,0 GHz bands, providing voice and/or data communications under the Mobile Satellite Service (MSS)".

[5] ITU Radio Regulations (2008).

[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).

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2.2 Informative references

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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] ECC/DEC (04)09: "ECC Decision of 12 November 2004 on the designation of the band 1518 to 1525 MHz and 1670 to 1675 MHz for the Mobile-Satellite Service".

[i.2] ICAO Annex 10 Volume I: "Radio Navigation Aids" (Aeronautical Telecommunications) to the convention on International Civil Aviation.

[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.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

antenna subsystem: includes all those RF components from the physical aperture of the antenna(s) to a single antenna port where the interconnecting cable to the transceiver is to be attached; and related ancillary components; e.g. beam-steering units and RF relays, if present

applicant: party seeking an approval, or to place an AES on the European market, i.e. the manufacturer of the equipment, or his authorized representative, or an equipment supplier to the European market

carrier-off state (idle mode): state when AES is powered on but not transmitting a signal, i.e. not in the carrier-on state

carrier-on state (allocated a channel): state when AES is transmitting a signal in a continuous or non-continuous mode

conducted measurement: measurement of emissions from an antenna port of the AES made by direct wired connection to the port

Effective Isotropically Radiated Power (EIRP): product of transmitter power and maximum antenna gain, equivalent to an isotropic source radiating uniformly in all directions

Externally Mounted Equipment (EME): IE module which is intended to be externally mounted, as declared 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 an aircraft

Internally Mounted Equipment (IME): IE module which is not defined as Externally Mounted Equipment (EME)

Laboratory Test Equipment (LTE): logical grouping that contains the standard test equipment provided by a test laboratory

MSS band: continuous range of frequencies allocated by the ITU to the MSS

narrow-band system: system in which the nominal carrier frequency spacing for AESs in the Earth-to-Space direction is less than 300 kHz

network control channel: channel by which an AES receives general control information from the NCF of its network

NCF control message: message, normally originating from a network, to a specified terminal or set of terminals of the network which indicates to the terminal or set of terminals that it/they should carry out some specific action or should enter or maintain some specific state

NOTE: For test purposes NCF control messages may originate from Special Test Equipment.

nominated Bandwidth (Bn): bandwidth of the Aircraft Earth Station (AES) radio frequency transmission

NOTE 1: Bn is wide enough to encompass all spectral elements of the transmission which have a level greater than the specified levels of unwanted emissions. See annex D.

NOTE 2: The Bn is defined relative to the AES actual carrier frequency f_c.

Bn is the width of the frequency interval [f_c - a, f_c + b], where a and b, which is specified by the terminal manufacturer and may vary with f_c.

The frequency interval [f_c - a, f_c + b] does not encompass more than either:

i) when a = b, 4 nominal carrier frequencies for narrow-band systems;

ii) when a ≠ b, 1 nominal carrier frequency for narrow-band systems; or

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iii) 1 nominal carrier frequency for wideband systems.

The frequency interval [f_c - a, f_c + b] is within the operational band of the AES.

operational band: sub-portion of an MSS band which has been assigned in the earth-to-space direction to the MSS network within which the AES is operating

radiated measurement: measurement of an actual radiated field

Special Test Equipment (STE): equipment provided by the applicant which allows a test laboratory to control the AES so that the tests required by the present document can be performed

test laboratory: laboratory which performs conformance testing

test load: substantially non-reactive, non-radiating power attenuator which is capable of safely dissipating the power from the transmitter(s)

transceiver subsystem: subsystem which includes transmitter, receiver and diplexer/LNA (if used) that interfaces at RF at the antenna port where it connects to the interconnecting cable, and with other on-board avionics equipment

unwanted emissions: unwanted emissions are those falling outside the nominated bandwidth in the carrier-on state, and those generated in the carrier-off state

wideband system: system in which the nominal carrier frequency spacing for AESs in the Earth-to-Space direction is equal to or greater than 300 kHz

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3.2 Abbreviations

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

AES	Aircraft Earth Station
AMS(R)S	Aeronautical Mobile Satellite on Route Service
AMSS	Aeronautical Mobile Satellite Service
ARINC	Aeronautical Radio Inc.
BE_L	Lower Band Edge of the operating band
BE_U	Upper Band Edge of the operating band
Bn	nominated Bandwidth
BW	Bandwidth
CDMA	Code Division Multiple Access
CMF	Control and Monitoring Functions
CW	Continuous Wave
dBW	deciBels relative to 1 Watt
ECC	Electronic Communications Committee
ED-14D	EUROCAE Document 14D
EFTA	European Free Trade Association
EIRP	Effective Isotropically Radiated Power
EME	Externally Mounted Equipment
EN	European Standard
ETS	European Telecommunications Standard
EUROCAE	EURopean Organization for Civil Aviation Equipment
EUT	Equipment Under TEst
GES	Ground Earth Station
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GSO	Geo-Synchronous Orbit
HLD	HPA and LNA/D
HPA	High Power Amplifier
ICAO	International Civil Aviation Organization
IE	Installable Equipment
IME	Internally Mounted Equipment
ISO	International Organization for Standardization
ITU	International Telecommunications Union