SLOVENSKI STANDARD
SIST EN 301 473 V1.3.1:2006

01-februar-2006

Satelitske zemeljske postaje in sistemi (SES) – Letalske zemeljske postaje (AES), ki obratujejo v letalski mobilni satelitski storitvi (AMSS) in mobilni satelitski storitvi (MSS) oziroma v letalski mobilni satelitski storitvi na poti (AMS(R)S) in mobilni satelitski storitvi (MSS)

Satellite Earth Stations and Systems (SES); Aircraft Earth Stations (AES) operating under the 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)

Ta slovenski standard je istoveten z: **EN 301 473 Version 1.3.1**

ICS:

33.060.30	Radiorelejni in fiksni satelitski komunikacijski sistemi	Radio relay and fixed satellite communications systems

SIST EN 301 473 V1.3.1:2006 **en**

ETSI EN 301 473 V1.3.1 (2004-08)

European Standard (Telecommunications series)

Satellite Earth Stations and Systems (SES); Aircraft Earth Stations (AES) operating under the 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)

Reference
REN/SES-00073

Keywords
AMSS, aeronautical, earth station, mobile, MSS, satellite

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Sous-Préfecture de Grasse (06) N° 7803/88

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Foreword

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

National transposition dates	
Date of adoption of this EN:	13 August 2004
Date of latest announcement of this EN (doa):	30 November 2004
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 May 2005
Date of withdrawal of any conflicting National Standard (dow):	31 May 2005

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	1 980 MHz to 2 010 MHz
AES receive	2 170 MHz to 2 200 MHz

The technical requirements in the present document are in two 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.

NOTE: 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 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.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

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

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

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

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

[4] ETSI ETS 300 735: "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)".

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

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

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

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.

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 shall be specified by the terminal manufacturer, may vary with f_c.

The frequency interval [f_c - a, f_c + b] shall 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
iii) 1 nominal carrier frequency for wideband systems.

The frequency interval [f_c - a, f_c + b] shall be 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 EN301 473 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

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.
Bn	nominated Bandwidth
CDMA	Code Division Multiple Access
CMF	Control and Monitoring Functions
dBW	deciBels relative to 1 Watt
EIRP	Effective Isotropically Radiated Power
EME	Externally Mounted Equipment
EN	European Standard
ETS	European Telecommunications Standard
EUROCAE	EURopean Organization for Civil Aviation Equipment
GES	Ground Earth Station
HLD	HPA and LNA/D
HPA	High Power Amplifier
IE	Installable Equipment
IME	Internally Mounted Equipment
ITU	International Telecommunications Union
LNA/D	Low Noise Amplifier/Diplexer
LRU	Line Replaceable Unit
LTE	Laboratory Test Equipment
MES	Mobile Earth Station

MIC	MES (or AES) unique Identification Code (within its satellite network)
MSS	Mobile Satellite Service
NCF	Network Control Facility
PE	Portable Equipment
RF	Radio Frequency
RTCA	Radio Technical Commission for Aeronautics, a company incorporated in the USA
SARP	Standard And Recommended Practice
SES	Satellite Earth Stations and systems
S-PCN	Satellite-Personal Communications Network
STE	Special Test Equipment
STU	Satellite Terminal Unit
TDMA	Time Division Multiple Access
TTE	Telecommunications Terminal Equipment

4 General

4.1 Presentation of equipment for testing purposes

The applicant may provide to a test laboratory one or more preliminary or production models of the AES equipment, as appropriate, for testing for conformance against the technical requirements of the present document.

If the AES is intended for use with an active antenna, this shall be provided as part of the AES.

If a statement of conformance with the EN is given by the test laboratory on the basis of tests on a preliminary model, then the statement of conformance shall apply to corresponding production models only if they are identical in all technical respects with the preliminary model tested.

4.2 Aircraft earth stations

Aircraft Earth Stations are Installable Equipments (IE).

AES for public transport aircraft typically consist of up to four major modules known in the avionics world as Line Replaceable Units (LRU), interconnected by ARINC standard interwiring. These four major modules are:

1) the Satellite Terminal Unit (STU);

2) the High Power Amplifier (HPA);

3) the Low Noise Amplifier/Diplexer (LNA/D);

4) the antenna subsystem.

NOTE: The HPA and LNA/D are sometimes referred to together as the HLD.

Items 1, 2 and 3 above, are Internally Mounted Equipments (IME); item 4 above, is an externally mounted equipment (EME).

AES for non-public transport aircraft may have other arrangements.

The control panel for the AES may be part of a unit common with other communications systems on board, or it may be a dedicated, separate unit, or it may be integrated into a self contained AES.

If the control panel is part of a shared communications panel, the control panel and its interwiring are not regarded as part of the AES. However they, or a simulation of them, may be required to activate the AES for test purposes.

In the other cases, the control panel and any interconnecting cables are regarded as part of the AES and are subject to the requirements of the present document.

4.3 Description of equipment

The applicant shall provide to the test laboratory a statement which contains all of the information related to the AES and its testing environment which will enable the test laboratory to run an appropriate test suite against the AES.

This shall include:

- AES configuration (description of IME, EME, interconnecting cables);
- for each AES component equipment, the applicable Equipment Categories as defined in ISO 7137 equivalent to EUROCAE ED-14D and RTCA DO-160D [1];
- the method by which the equipment can be switched into its test modes (see note);
- the fault conditions which cause transmission shut-down;
- the maximum antenna gain;

and, if appropriate, at the choice of the applicant:

- the maximum antenna gain at the frequency of particular measured unwanted emissions;
- the multicarrier capability;
- in an information leaflet:

  1) the name of the network with which the AES is designed to operate;
  2) if applicable, the maximum value of nominated bandwidth for that network, as defined by the network operator;
  3) if applicable, the a and b values of the nominated bandwidth for each nominal carrier frequency of the AES;
  4) the operating frequency range(s) of the AES;
  5) if applicable, the frequency sub-bands and operating conditions for which different EIRP density limits apply;
  6) the maximum gross data rate at which the AES is designed to operate;
  7) the agreement of the network operator to the above information.

NOTE: If Special Test Equipment (STE) is required see clause A.2.

5 Requirements for AES transmitting in the band 1 610 MHz to 1 626,5 MHz

5.1 Unwanted emissions limits outside the band 1 610 MHz to 1 626,5 MHz and the band 1 626,5 MHz to 1 628,5 MHz (carrier-on)

5.1.1 Purpose

Protection of other radio services operating outside the band 1 610 MHz to 1 628,5 MHz from emissions caused by AESs operating within the band 1 610 MHz to 1 626,5 MHz.