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Satellite Earth Stations and Systems (SES); Receive-Only Mobile Earth Stations (ROMESs) operating in the 1,5 GHz band providing data communications; Radio Frequency (RF) specifications

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Foreword

This final draft European Telecommunication Standard (ETS) has been produced by the Satellite Earth Stations and Systems (SES) Technical Committee of the European Telecommunications Standards Institute (ETSI), and is now submitted for the Voting phase of the ETSI standards approval procedure.

Proposed transposition dates	
Date of latest announcement of this ETS (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

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1 Scope

This final draft European Telecommunication Standard (ETS) provides Radio Frequency (RF) specifications above 30 MHz for the standardization of Receive-Only Mobile Earth Stations (ROMESs).

This ETS does not cover Electro-Magnetic Compatibility (EMC) or safety specifications for such equipment.

The satellite systems referred to in this ETS operate under the Land Mobile Satellite Service (LMSS). The ROMESs operate as part of a satellite system providing one-way data communications.

This ETS applies to ROMESs which operate under the LMSS space-to-earth bands 1 525 MHz to 1 544 MHz and 1 555 MHz to 1 559 MHz, allocated by the Radio Regulations [1].

ROMESs could have several configurations, including:

- either Portable Equipment (PE) or vehicle Installed Equipment (IE);

- a number of modules including a display/control interface to the user.

This ETS deals with specifications defined in order to limit interference to radiocommunication services.

2 Normative references

This ETS incorporates, by dated or undated references, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1] ITU Radio Regulations.

[2] ETS 300 133-5 (1992): "Paging Systems; European Radio Messaging System (ERMES); Part 5: Receiver conformance specification".

3 Definition and abbreviations

3.1 Definition

For the purposes of this ETS, the following definition applies:

operating frequency band: The frequency bands over which the ROMES is capable of operation.

3.2 Abbreviations

For the purposes of this ETS, the following abbreviations apply:

EIRP	Equivalent Isotropically Radiated Power
EMC	Electro-Magnetic Comapatability
EUT	Equipment Under Test
IE	Installed Equipment
LMSS	Land Mobile Satellite Service
PE	Portable Equipment
RF	Radio Frequency
rms	root mean square
ROMES	Receive-Only Mobile Earth Station
STE	Special Test Equipment

4 Test conditions

4.1 Test voltages

The nominal and extreme operational power supply voltages shall be stated by the manufacturer.

4.2 Test report

The test report shall contain:

- the results of the tests;
- all parameters and operational conditions;
- the value of the highest frequency conversion oscillator.

4.3 Special Test Equipment (STE)

To enable the tests specified in this ETS to be carried out, the use of STE, supplied by the manufacturer or system provider, may be necessary. Since the STE will be specific for the particular equipment, it is not possible to provide detailed specifications in this ETS. However, the following baseline is provided:

- the STE shall enable the ROMES to tune to every channel in the operating frequency band, to enable spurious emissions to be measured;
- if the connection of the STE affects any of the parameters specified in this ETS then the effects shall clearly be stated by the manufacturer.

4.4 Equipment Under Test (EUT)

The EUT shall include all units necessary for the intended operation.

5 RF emission limits

Purpose:

To protect terrestrial and satellite radio services from emissions caused by ROMESs to which this ETS applies.

Specification:

The radiated power from the equipment, including its antenna, shall not exceed the limits in table 1.

Table 1

Frequency range (note 1)	**EIRP limit (note 1)**	**Measurement bandwidth**
MHz	**dBpW**	**kHz**
30,0 - 1 000,0	33	100
1 000,0 - 1 525,0	43 (note 2)	100
1 525,0 - 1 559,0	17	3
1 559,0 - 12 750,0	43 (note 2)	100
12 750,0 - 21 200,0	48 (note 3)	100
21 200,0 - 40 000,0	60	100
NOTE 1: The lower limits shall apply at the transition frequency. NOTE 2: These figures shall be 48 dBpW prior to 1st. January 1997. NOTE 3: This figure shall be 54 dBpW prior to 1st. January 1997.		

Verification:

All RF tests in this subclause shall be carried out with the test conditions given in annex A.

The equipment shall be tested according to the test procedure given in annex B. The upper frequency to which tests shall be performed shall be at least the 10th. harmonic of the highest frequency conversion oscillator or ten times the highest operational frequency, whichever is greater.

Annex A (normative): Environmental test conditions

The temperature range shall be - 10°C to + 55°C and relative humidity from 20 % to 70 % non-condensing. The test voltages shall be the extreme operational power supply voltages declared by the manufacturer.

Annex B (normative): RF emissions - test procedure

B.1 Introduction

This annex, based on procedures described in ETS 300 133-5 [2], describes the method of measurement of unwanted emissions generated by a ROMES terminal.

B.2 Measuring apparatus

In order to carry out the test, the following elements are required, as a minimum:

- a set of substitution antennas covering the frequency range of interest calibrated at 1,5 m above the ground plane;

- a set of test antennas covering the frequency range of interest;

- the necessary post test antenna amplification devices;

- spectrum analyzer(s) covering the frequency range of interest.

For the apparatus utilized, it shall be verified that the response of the apparatus, including any antenna and associated amplification system, to a constant amplitude sine wave signal remains within ± 1 dB of calibration across the frequency range of interest.

B.3 Equipment Under Test (EUT)

For purpose of the test, the ROMES terminal comprises:

- the IE or PE with any deployable parts in their normal operating configuration;

- any externally mounted accessories;

- any necessary power supply cables or other cable to ensure proper functioning of the terminal.

B.4 Special Test Equipment (STE)

In order to measure the system radiation under operational conditions, proper arrangement shall be made available (by the manufacturer) to put the ROMES terminal in its normal operating mode and tuned to any channel within its operating frequency band. This may require the use of STE provided by the manufacturer (see subclause 4.3).

B.5 Measurement procedure

a) The test site shall be such that its level of spurious radiation, in the directions of measurement to be used, over the frequency range of measurements, is at least 10 dB lower than the limits of spurious radiation for the EUT to be measured. The measurement antenna shall be oriented for vertical polarization and connected to a spectrum analyzer. The bandwidth of the spectrum analyzer shall be between 3 kHz and 100 kHz. The specified height range of the centre of the measurement antenna shall be between 1 metre and 3 metres.

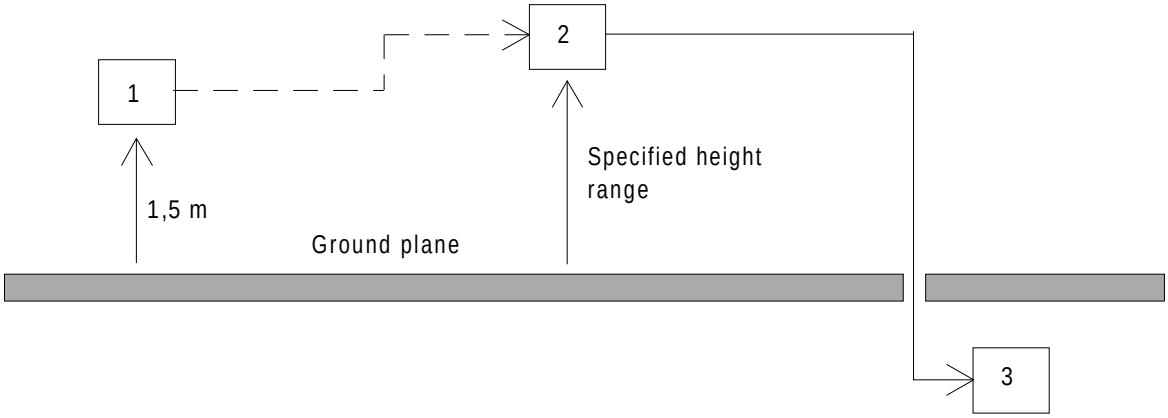
b) Using the measurement arrangement shown in figure B.1, the EUT shall be placed on a non-conducting support in its standard position. The EUT shall be tuned to the lowest frequency in the operating frequency band and shall be operated under normal transmission conditions with data received. The measuring antenna shall then be placed such that each antenna is positioned outside the near field of the other antenna.

The minimum far-field distance is defined as:

$$R > 2 * D^2/\lambda$$

where:

R is the minimum far-field distance;
D is the largest dimension of the antenna;
λ is the free space wavelength at the test frequency.



1) EUT
2) Measurement antenna
3) Spectrum analyzer

Figure B.1: Measurement arrangement number 1

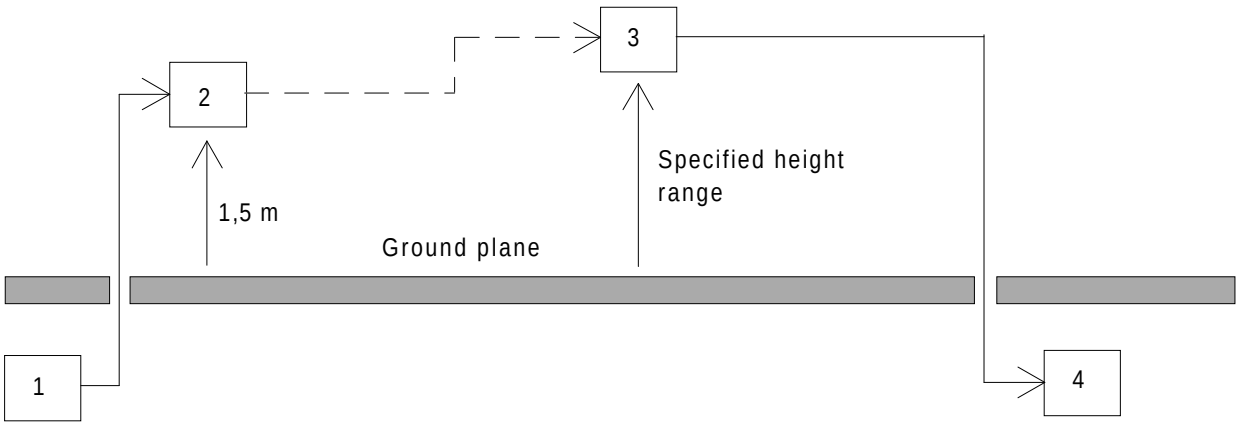
c) The radiation of any spurious component shall be detected by the measurement antenna and spectrum analyzer over the specified frequency range. The frequency of each component shall be recorded. If the test site is disturbed by radiation coming from outside, this qualitative search may be performed in a screened room with temporarily reduced distance between the EUT and the measurement antenna.

d) At each frequency at which a component has been detected, the measurement antenna height shall be adjusted through the range until the maximum signal level is detected on the spectrum analyzer.

e) The EUT shall be rotated up to 360° around a vertical axis to further maximise the signal level detected on the spectrum analyzer.

f) The measurement antenna height shall again be adjusted through the range until the maximum signal level is detected on the spectrum analyzer. This level shall be recorded.

g) Using the measurement arrangement shown in figure B.2, the substitution antenna shall replace the receiver antenna in the same position and in vertical polarisation. It shall be connected to the signal generator.



1) Signal generator
2) Substitution antenna
3) Measurement antenna
4) Spectrum analyzer

Figure B.2: Measurement arrangement number 2

h) For each frequency at which an emission has been detected, the signal generator and spectrum analyzer shall be tuned and the measurement antenna shall be raised or lowered throughout the specified height range until the maximum signal level is detected. The level of the signal generator shall be adjusted to give the same level as previously recorded. This value, after correction due to the gain of the substitution antenna and the loss of the interconnecting cable, is the EIRP at this frequency and this shall be recorded.

i) All of the tests a) to h) shall be repeated with the test and substitution antennas oriented for horizontal polarization and with the EUT tuned to the centre and highest frequency in the operating frequency band.

History

Document history			
April 1995	Public Enquiry	PE 82:	1995-04-10 to 1995-09-01
February 1996	Vote	V 98:	1996-02-19 to 1996-04-12