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Avalanche Beacons operating at 457 kHz; Transmitter-receiver systems; Part 1: Harmonised Standard for access to radio spectrum

Reference
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Keywords
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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 - NAF 742 C
Association à but non lucratif enregistrée à la
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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 1 of a multi-part deliverable covering avalanche beacons operating at 457 kHz transmitter-receiver systems, as identified below:

Part 1: "Harmonised Standard for access to radio spectrum";

Part 2: "Harmonised Standard for features for emergency services".

National transposition dates	
Date of adoption of this EN:	18 December 2017
Date of latest announcement of this EN (doa):	31 March 2018
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 September 2018
Date of withdrawal of any conflicting National Standard (dow):	30 September 2019

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 specifies technical characteristics and methods of measurements for avalanche beacons operating at 457 kHz transmitter-receiver systems.

NOTE: The relationship between the present document and essential requirements of article 3.2 of Directive 2014/53/EU [i.1] is given in annex A.

2 References

2.1 Normative references

References are specific, identified by date of publication and/or edition number or version number. Only the cited version applies.

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

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

[1] CISPR 16-1-1 (2015): "Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus".

[2] CISPR 16-1-4 (2010): "Part 1-4: Radio disturbance and immunity measuring apparatus - Antennas and test sites for radiated disturbance measurements".

[3] CISPR 16-1-5 (2014): "Specification for radio disturbance and immunity measuring apparatus and methods; Part 1-5: Radio disturbance and immunity measuring apparatus - Antenna calibration sites and reference test sites for 5 MHz to 18 GHz".

[4] ETSI EN 300 718-2 (V2.1.1) (01-2018): "Avalanche Beacons operating at 457 kHz; Transmitter-receiver systems; Part 2: Harmonised Standard for features for emergency services".

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] 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.

[i.3] ITU Radio Regulations (2012), Appendix 1 (REV.WRC-12): "Classification of emissions and necessary bandwidths".

[i.4] ETSI TR 100 028 (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

avalanche beacons: portable radio systems used for locating avalanche victims, for the purpose of direct rescue

NOTE: I.e. for rescue by comrades not buried by the avalanche.

artificial antenna: tuned reduced-radiating dummy load equal to the nominal impedance specified by the manufacturer

conducted measurements: measurements which are made using a direct connection to the equipment under test

E-field: electric component of the field measured as voltage per unit length

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

H-field: magnetic component of the field measured as current per unit length

H-field test antenna: electrically screened loop or equivalent antenna, with which the magnetic component of the field can be measured

integral antenna: antenna designed as an indispensable part of the equipment, with or without the use of an antenna connector

radiated measurements: measurements which involve the absolute measurement of a radiated field

(S + N)/N: ratio, expressed in Decibels, between the sum of the wanted signal plus the noise floor and the noise floor

3.2 Symbols

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

A1A Class of emission

NOTE: See ITU Radio Regulations [i.3].

E Electrical field strength
Eo Reference electrical field strength

NOTE: See annex B.

f Frequency
H Magnetic field strength
Ho Reference magnetic field strength

NOTE: See annex B.

N Newton
P Power
R Distance
Ro Reference distance

NOTE: See annex B.

t Time
Z Wave impedance

l Wavelength

NOTE: See annex B.

3.3 Abbreviations

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

RF Radio Frequency

4 Technical requirements specifications

4.1 Environmental profile

The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be declared by the manufacturer. The equipment shall comply with all the technical requirements of the present document which are identified as applicable in annex A at all times when operating within the boundary limits of the declared operational environmental profile.

4.2 Conformance requirements for transmitters

4.2.1 Modulation and carrier keying

4.2.1.1 Definition

The modulation is the method for generating the RF carrier. The carrier keying defines the on and off times for a non-continuous carrier.

4.2.1.2 Method of measurement

The carrier keying shall be measured by means of an oscilloscope connected to a suitable coil antenna. The measurements shall be done under normal as well as under extreme test conditions.

4.2.1.3 Limits

The modulation shall be of type A1A, i.e. double sideband amplitude modulation with no modulating auxiliary carrier, as used for telegraphy.

The carrier keying shall be as shown in figure 1:

- on time: 70 ms minimum;
- off time: 400 ms minimum;
- period: 1 000 ms ± 300 ms (on time plus off time).

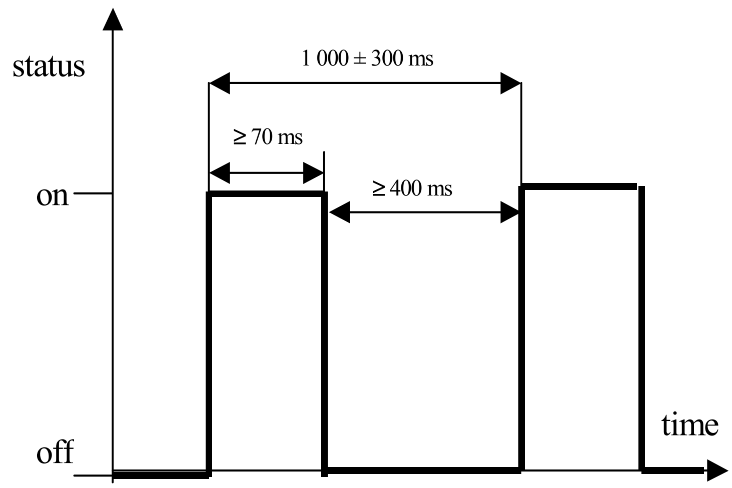

Figure 1

4.2.2 Frequency error

4.2.2.1 Definition

The frequency error of the transmitter system is the difference between the measured carrier frequency and the nominal carrier frequency.

4.2.2.2 Method of measurement

The carrier frequency shall be measured by means of a test fixture (see annex B, clause B.1.2). The measurements shall be done under normal as well as under extreme test conditions as defined in clause 5.

4.2.2.3 Limits

The frequency error shall not exceed ±80 Hz at 457 kHz.

4.2.3 Output field strength (H-field)

4.2.3.1 Definition

The H-field is measured in the direction of maximum field strength under specified conditions of measurement.

4.2.3.2 Method of measurement

The H-field produced by the equipment shall be measured on the axis of the transmitting antenna at distances of 10 m on an outdoor test site (see annex B).

4.2.3.3 Limits

4.2.3.3.1 Minimum transmitted field

The minimum transmitted field strength at 457 kHz shall not be lower than -6 dBµA/m (0,5 µA/m) at a distance of 10 m.

4.2.3.3.2 Maximum transmitted field

The maximum transmitted field strength at 457 kHz shall not exceed 7 dBµA/m (2,23 µA/m) at a distance of 10 m.

4.2.4 Transmitter spurious emissions

4.2.4.1 Definition

Spurious emissions are emissions at frequencies other than those of the carrier and sidebands associated with normal modulation. The level of spurious emissions shall be measured at normal conditions as their effective radiated power or field strength radiated by the cabinet and the integral antenna.

4.2.4.2 Radiated H-field

4.2.4.2.1 Method of measurement (< 30 MHz)

The field strength shall be measured for frequencies below 30 MHz. The equipment under test shall be measured at a distance of 10 m on an outdoor test site. The test antenna shall be a calibrated shielded magnetic field antenna. The equipment under test and test antenna shall be arranged as stated in annex B, clause B.2.

The equipment under test shall be switched on in transmit mode (see clause 4.2). The measuring receiver shall be tuned over the frequency range 9 kHz to 30 MHz, except for the frequency band ±20 kHz from the frequency on which the transmitter is intended to operate.

At each frequency at which a spurious signal is detected the equipment under test and the test antenna shall be rotated until maximum field strength is indicated on the measuring receiver. This level shall be noted.

The limits are quoted in dBμA or dBμA/m, so it is necessary to reduce the reading as explained in annex D for measuring equipment calibrated in dBμV or dBμV/m.

4.2.4.2.2 Limits

Radiated emissions below 30 MHz shall not exceed the generated H-field at 10 m given in table 2.

Table 2

State	Frequency 9 kHz ≤ f < 10 MHz	Frequency 10 MHz ≤ f < 30 MHz
Transmit	27 dBμA/m descending 3 dB/oct	-3,5 dBμA/m

A graphical representation is shown in annex C, figure C.1.

4.2.4.3 Effective radiated power

4.2.4.3.1 Method of measurement (≥ 30 MHz)

On a test site, selected from annex B, the equipment shall be placed at the specified height on a non-conducting support and in the position closest to normal use as declared by the manufacturer.

The test antenna shall be oriented for vertical polarization. The output of the test antenna shall be connected to a measuring receiver.

The equipment shall be switched on in transmit mode, and the measuring receiver shall be tuned over the frequency range 30 MHz to 1 000 MHz.

At each frequency at which a spurious component is detected, the test antenna shall be raised and lowered through the specified range of heights until a maximum signal level is detected on the measuring receiver.

The equipment shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.

The maximum signal level detected by the measuring receiver shall be noted.

The substitution antenna shall be oriented for vertical polarization and calibrated for the frequency of the spurious component detected.