



**Electromagnetic compatibility and
Radio spectrum Matters (ERM);
Maritime Personal Homing Beacon
intended for use on the frequency 121,5 MHz for
search and rescue purposes only;
Part 1: Technical characteristics and methods of measurement**

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Foreword

This European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

The present document is part 1 of a multi-part deliverable covering the Electromagnetic compatibility and Radio spectrum Matters (ERM); Maritime Personal Homing Beacon intended for use on the frequency 121,5 MHz (radio beacons) as identified below:

- Part 1: "Technical characteristics and methods of measurement";**
- Part 2: "Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive";
- Part 3: "Harmonized EN covering the essential requirements of article 3.3 (e) of the R&TTE Directive".

The present document lays down the minimum requirements for maritime "Personal Homing Radio Beacon for 121,5 MHz search and rescue purposes", and incorporates the relevant provisions of the International Telecommunication Union (ITU) radio regulations.

National transposition dates

Date of adoption of this EN:	2 July 2013
Date of latest announcement of this EN (doa):	31 October 2013
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 April 2014
Date of withdrawal of any conflicting National Standard (dow):	30 April 2015

Introduction

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC [i.2] laying down a procedure for the provision of information in the field of technical standards and regulations.

1 Scope

The present document lays down the minimum requirements for maritime "Personal Homing Radio Beacon for 121,5 MHz search and rescue purposes", and incorporates the relevant provisions of the International Telecommunication Union (ITU) radio regulations.

Operational radio beacons described in the present document are intended only for transmission of radio signals on the frequency 121,5 MHz for locating purposes.

Beacons for training purposes will be frequency programmed in accordance with national licensing. It should be noted that licensing for such use is also dependent on the administration responsible for the waters where the equipment is operated and not the registered flag state.

The present document applies to radio beacons intended for short-range maritime personal homing applications. For this application, both the radiated power and the length of time of operation are reduced to enable the equipment to be sufficiently small and light to be worn comfortably at all times.

2 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 reference 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.

2.1 Normative references

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

- [1] Recommendation ITU-R M.690-2 (2012): "Technical characteristics of emergency position-indicating radio beacons (EPIRBs) operating on the carrier frequencies of 121.5 MHz and 243 MHz".
- [2] ETSI TR 100 028 (V1.4.1) (all parts): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".
- [3] ETSI TR 102 273-7 (V1.2.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties; Part 7: Artificial human beings".

2.2 Informative references

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] ANSI C63.5-2006: "American National Standard for Calibration of Antennas Used for Radiated Emission Measurements in Electro Magnetic Interference".
- [i.2] Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations.
- [i.3] IEC 60489-3 (edition 2.0) and Amendment 1: "Methods of measurement for radio equipment used in the mobile services. Part 3: Receivers for A3E or F3E emissions", appendix F.

- [i.4] ETSI TR 102 273 (V1.2.1) (Parts 2, 3 and 4): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

homing device: 121,5 MHz radio beacon primarily intended for transmitting homing signals

3.2 Symbols

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

ε	permittivity
σ	conductivity
λ	wavelength
cSt	centi-Stokes
dB	decibel
div	division
S	Siemens

3.3 Abbreviations

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

ASK	Amplitude Shift Keying
ASTM	American Society for Testing and Materials
CSP	Channel SPacing
CW	Continuous Wave
DF	Direction Finding
ERP	Effective Radiated Power
ERPEP	Effective Radiated Peak Envelope Power
EUT	Equipment Under Test
OATS	Open Area Test Site
RF	Radio Frequency
SINAD	(Signal+Noise+Distortion) to (Noise + Distortion)
VSWR	Voltage Standing Wave Ratio

4 General requirements

4.1 Construction

4.1.1 Common Requirements

The manufacturer shall declare that compliance to the requirements of clause 4 is achieved and shall provide relevant documentation.

In all respects, the mechanical and electrical design and the construction and finish of the equipment shall conform with good engineering practice.

The equipment shall be designed to minimize the risk of internal and external damage during use or stowage.

The exterior of the equipment shall have no sharp edges or projections that could easily damage inflatable rafts or injure personnel.

The general construction and method of operation shall provide a high degree of proof against inadvertent operation due to magnetic influences, handling, stowage and transit, whilst still providing a simple means of operation in an emergency.

The equipment shall be portable, lightweight, compact and be designed as one integral unit. The radio beacon shall derive its energy from a battery forming a part of the equipment and incorporate a permanently attached antenna which may be either fixed length or extendible.

The radio beacon may be fitted with a test facility by which the functioning of the transmitter and battery can be easily tested without the use of any external equipment.

The equipment shall be capable of being used by an unskilled person.

The radio beacon shall be watertight.

The equipment shall not be unduly affected by sea water or oil and shall be resistant to deterioration by prolonged exposure to sunlight.

Necessary operating instructions shall be provided with the equipment.

4.1.2 Requirements for operational beacons

A substantial part of the equipment shall be of highly visible yellow or orange colour to assist visual location.

It shall not be possible for the user to change the frequency of operation from 121,5 MHz.

4.1.3 Requirements for training beacons

Beacons for training purposes shall not be substantially yellow or orange but shall be another clearly different colour.

It shall not be possible for the user to change the frequency of operation from the designated training frequency.

4.1.4 Categories of equipment

Two categories are defined:

- Category 1 radio beacons shall have sufficient positive buoyancy to float in fresh water.
- Category 2 radio beacons intended to be incorporated into or attached to a buoyancy device are not required to float.

The user manual or instructions for Category 2 beacons shall include necessary information to allow the user to fit or attach the beacon.

4.2 Controls

The equipment shall be initially activated by the use of two simple, but independent mechanical actions, neither of which on its own shall activate the equipment. The second mechanical action may be replaced by an immersion sensor.

It shall only be possible to activate the equipment after a seal or other mechanical restraint has been removed from the first mechanical action. After activation it shall be simple to de-activate the equipment and the means to deactivate the equipment shall be clearly marked.

The switch that operates any test facility (clause 4.1) shall be so designed that it returns automatically to the off-position when released.

4.3 Indicators

The equipment shall be provided with a visual indication that signals are being emitted. The indicator shall be sufficiently bright to be seen in bright sunlight. The indicator shall not be green in colour.

4.4 Labelling

The equipment shall be provided with a label, or labels, permanently affixed to the exterior of the equipment, containing the following information.

4.4.1 Common Requirements

- Frequency of operation of the equipment;
- serial number of the equipment;
- type designation of the equipment;
- adequate instructions to enable the equipment to be activated and de-activated;
- the type of battery as specified by the manufacturer of the radio beacon;
- the duty cycle (where a transmitting duty cycle of less than 100 % is used at any time);
- for Category 2 beacons a warning that this radio beacon does not float.

4.4.2 Requirements for operational beacons

- A warning to the effect that the radio beacon should not be operated except in an emergency;
- the date on which the battery will need to be replaced. Simple means shall be provided for changing this date when the battery is replaced.

4.4.3 Requirements for training beacons

- The beacon shall be clearly marked "for training use only".

4.5 Power source

4.5.1 Battery requirements

The type of battery and designation specified by the manufacturer for use in the equipment shall be clearly and indelibly marked on the equipment.

For operational beacons the battery shall be clearly and durably marked with the expiry date.

4.5.2 Safety precautions

Provisions shall be made for protecting the equipment from damage due to the accidental reversal of polarity of the battery.

5 Technical requirements

5.1 Radio beacon transmission characteristics

When activated, the radio beacon shall transmit continuously on the frequency 121,5 MHz (or the designated training frequency for training beacons) for at least 60 minutes, thereafter the transmitting duty cycle may be reduced to not less than 25 %.

Duty cycle shall be labelled on the device if less than 100 % after the first hour.

The class of emission shall be A3X as defined in Recommendation ITU-R M.690-2 [1]. However, the signal may include information of the identity of the beacon. If included, this information should be transmitted automatically as defined in clause 8.2.1.

5.2 Radio beacon power source

5.2.1 Battery requirements

The battery provided as a power source shall be a primary battery and have sufficient capacity to operate the equipment for an uninterrupted period of at least 6 hours, under all temperature conditions, (clause 6.6), within the requirements of the present document.

6 General conditions of measurement

6.1 Conformity Test frequencies

For the purpose of conformity testing all radiated measurements shall be performed in an anechoic chamber.

Radio beacons shall be tested on 121,5 MHz.

Beacons solely intended for training purposes shall be tested on their designated frequency.

6.2 Test fixture

In the case of integral antenna equipment, if the equipment does not have an internal permanent 50 Ω connector then it is permitted to supply a second sample of the equipment with a temporary antenna connector fitted to facilitate testing. Alternatively a test fixture may be used provided that it complies with the requirements below.

The test fixture is a device for coupling the integral antenna of the equipment under test to a 50 Ω radio frequency terminal at the working frequency. This allows certain measurements to be performed using the conducted measurement methods. Only relative measurements shall be performed and only those at or near the frequency for which the test fixture has been calibrated.

The test fixture normally shall be provided by the manufacturer.

The performance characteristics of the test fixture shall conform to the following basic parameters:

- a) the coupling loss shall not be greater than 30 dB;
- b) a coupling loss variation over the frequency range used in the measurement which does not exceed 2 dB;
- c) circuitry associated with the Radio Frequency (RF) coupling shall contain no active or non linear devices;
- d) the VSWR at the 50 Ω socket shall not be greater than 1,5 over the frequency range of the measurements;