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Navigation radar used on inland waterways;
Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU

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Foreword

This draft Harmonised European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM), and is now submitted for the combined Public Enquiry and 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 [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.

Proposed national transposition dates	
Date of latest announcement of this EN (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	18 months after doa

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 applies to radar equipment intended for the navigation of vessels on inland waterways subject to the requirements of the Central Commission for the Navigation on the Rhine (CCNR) and the Danube Commission (DC). The present document contains the minimum technical, operational and functional requirements, describes the tests and the conditions under which the tests take place in order to establish that the equipment meets these minimum requirements.

Additional facilities, which may be provided on this equipment, e.g. Inland ECDIS functions, automatic steering functions or additional interfaces, are not covered by the present document, and other appropriate standards may apply.

The installation of radar equipment intended for the navigation on inland waterways is subject to additional conditions which are described in annex E.

These radio equipment types are capable of operating in all or any part of the frequency bands given in table 1.

Table 1: Radionavigation service frequencies

	Radionavigation service frequencies
Transmit	9 300 MHz to 9 500 MHz
Receive	9 300 MHz to 9 500 MHz

The present document contains requirements to demonstrate 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*" [i.1].

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] ITU Radio Regulation (2015).

[2] IMO Recommendation A.278 (VIII) (1973): "Symbols for controls on marine navigational radar equipment".

[3] IEC EN 60945 Edition 4 (2002): "Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results".

[4] Recommendation ITU-R M.1177-4 (04/2011): "Techniques for measurement of unwanted emissions of radar systems".

[5] ISO 25862:2009: "Ships and marine technology - Marine magnetic compasses, binnacles and azimuth reading devices".

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.

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 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] Void.

[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.".

[i.4] ETSI TR 100 028-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1".

[i.5] ETSI TR 100 028-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2".

[i.6] Recommendation ITU-R M.824-2: "Technical parameters of radar beacons (RACONS)".

[i.7] Recommendation ITU-R SM.328-10: "Spectra and bandwidth of emissions".

[i.8] Recommendation ITU-R SM.1541-1: "Unwanted emissions in the out-of-band domain".

[i.9] Recommendation ITU-R SM.329-8: "Unwanted emissions in the spurious domain".

[i.10] "Regional Arrangement on the Radiocommunication Service for Inland Waterways (RAINWAT)"; Bucaresti, 14 October 2014".

[i.11] ZKR 1989-II-34 (1990): "Regulations regarding the minimum requirements and test conditions for rate of turn indicators used for inland waterways navigation. (Vorschriften betreffend die Mindestanforderungen und Prüfbedingungen für Wendegeschwindigkeitsanzeiger für die Binnenschifffahrt)".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

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

standard reflector: radar reflector with a Radar Cross Section (RCS) of RCS = 10 m^2 at a frequency of 9 400 MHz

supplier: entity referred to in the Radio Equipment Directive responsible for the placing on the market of an equipment within the scope of the Directive

3.2 Symbols

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

λ	Wavelength
cd/m^2	Unit of the luminance (density of light in candela per m^2)
σ	Radar Cross Section (RCS)
Q	Resonance factor

3.3 Abbreviations

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

AC	Alternating Current
ACP	Azimuth Clock Pulse
AR	Azimuthal Resolution
ARP	Azimuth Reference Pulse
CCNR	Central Commission for Navigation on the Rhine
DC	Danube Commission
EBL	Electronic Bearing Line
ECDIS	Electronic Chart Display and Information System
EUT	Equipment Under Test
FTC	Fast Time Constant
IMO	International Maritime Organisation
Inland ECDIS	Inland Electronic Chart Display and Information System
L	Luminance
L_{BG}	Luminance of the background area

NOTE: No echoes, no lines.

L_{FG}	Luminance of the foreground area

NOTE: Radar echoes, lines, symbols.

LNA	Low Noise Amplifier
MR	Minimum Range
OoB	Out of Band
PEP	Peak Envelope Power
PRT	Pulse Repetition Time
R&TTE	Radio and Telecommunication Terminal Equipment
RCS	Radar Cross Section
RF	Radio Frequency
RJ	Rotary Joint
ROT	Rate Of Turn
rpm	rotation per minute
RR	Radial Resolution
SHM	Ships Head Marker
STBY	STand BY mode of the radar equipment
STC	Sensitive Time Control
Tr	Trigger
V	Video
VRM	Variable Range Marker

4 General requirements

4.1 Purpose of the radar equipment

The radar equipment shall facilitate the navigation of vessels on inland waterways by providing an intelligible radar picture of their position in relation to buoys, shorelines and other navigational marks as well as enabling the reliable and timely recognition of other ships and obstructions protruding above the water surface.

4.2 Construction and design

Mechanical and electrical construction and design of the radar equipment shall be suitable for operation on board vessels navigating on inland waterways.

4.3 Operating frequency range

This radar equipment shall operate in the frequency range of 9 300 MHz to 9 500 MHz allocated to the radio navigation service as defined in article 5 of the ITU Radio Regulations [1].

4.4 Operational controls

The equipment shall be designed in such a way that incorrect operation will not cause the equipment to fail.

One person shall be able to operate the radar equipment and watch the display simultaneously.

When the control panel is provided as a separate unit, it shall contain all controls used directly for radar navigation. The use of cordless remote controls is not permitted.

The equipment shall not have more controls than are necessary for its correct operation. The design, markings and controls of the equipment shall enable simple, unambiguous and fast operation. The arrangement shall be such that the possibility of operating mistakes is minimized.

All controls shall be arranged in such a way that when a control is operated the associated indication remains visible and that the radar navigation can continue without restriction.

The effect of operation of controls shall be such that movements to the right or upwards shall have a positive effect on the manipulated variable, while movements to the left or downwards have a negative effect.

If pushbuttons are used, they shall be designed in such a way that they can also be found by touch. Moreover they shall have a noticeable pressure point (tactile feedback).

Controls to switch off the equipment shall be protected against unintentional operation.

All controls and indicators shall be equipped with a dazzle-free source of lighting suitable for use under all conditions of light which can be adjusted to zero by means of an independent control.

All controls and indicators shall be provided with symbols and/or a description in English and, if possible, switchable to the users language. Symbols shall meet the requirements of IMO Recommendation No. A.278 (VIII) [2].

The height of all indicative markings shall be at least 4 mm unless this is not technically feasible and therefore a reduction to 3 mm will be allowed.

Any functions additional to the minimum functions specified in the present document, as well as any connections for external apparatus, shall not impair the capability to meet the minimum requirements contained in the present document.

The antenna unit may have a safety switch by means of which the transmitter and the rotator drive can be switched off. After switching the equipment to the STBY or to the ON state, a message shall occur on the display, if the safety switch is activated.

4.5 Interfaces

4.5.1 Fail safe design

All interfaces shall be designed fail safe, so that connecting, disconnecting or a failure of the connected equipment or a short circuit shall not cause any deterioration of the radar equipment performance.

4.5.2 Display of data received via interfaces

Unless otherwise specified, all information received via an interface shall be displayed outside of the radar picture. Existing requirements concerning the presentation of such received data shall be fulfilled.

4.5.3 Operation of equipments connected via interfaces

Unless otherwise specified all operation menus for equipments connected via interfaces shall be placed outside of the radar picture. Existing requirements concerning the presentation and the functionality of such menus shall be fulfilled.

4.5.4 Interpretation and presentation of data delivered via interfaces

If the radar acts as a display for an external device it shall receive and display all information including alarms or status messages concerning the quality of the input data.

4.6 Software

4.6.1 Software performance

Software used in equipment of the present document is assumed to be a safety critical part of a navigation system. Manufacturers of navigation systems shall make sure that all software components allow secure navigation in every situation. Software components have to be clearly designed by means of established software design methods and ergonomic criteria.

4.6.2 Software protection

Measures shall be provided to protect all operational software incorporated in the equipment. Any software required in equipment to ensure operation in accordance with its equipment standard, including that for its initial activation or reactivation, shall be permanently installed within the equipment, in such a way that it is not possible for the operator to have access to this software. It shall not be possible for the operator to augment, amend or erase any software in the equipment required for operation in accordance with its equipment standard.

4.7 Equipment labelling

Each unit of the equipment including any external power supply, shall be clearly and indelibly marked on the exterior with the identification of the manufacturer, the type designation of the equipment, the serial number of the unit. All operating controls, indicators and terminals shall be clearly marked in accordance with IEC EN 60945 [3]. The compass safety distance shall be stated on the outdoor unit and on the display unit.

4.8 Operating and service manuals

A detailed operating manual and a summarized operating manual on a durable medium shall be supplied with each equipment in the language(s) of the country(ies) in which it is intended to be placed on the market.

The detailed version of the operating manual shall contain at least the following information:

- activation and operation;
- maintenance and servicing;
- instructions as to the correct technical installation, and that the installation shall follow the procedure and meet the requirements of the Regional Arrangement on the Radiocommunication Service for Inland Waterways (RAINWAT) [i.10];
- general safety instructions with special reminders of safety risks due to the rotating antenna, and of the power flux density of the microwave radiation compared with the actual limits.

Each detailed operating manual shall contain a manufacturer's statement to the effect that the equipment meets the requirements of the present document.

Service manuals may be written in the English language only.

5 Testing for compliance with technical requirements

5.1 Environmental conditions for testing

Tests defined in the present document shall be carried out at representative points within the boundary limits of the declared operational environmental profile which, as a minimum, shall be that specified in the test conditions contained in the present document.

As technical performance varies subject to environmental conditions, tests shall be carried out under a sufficient variety of environmental conditions as specified in the present document to give confidence of compliance for the affected technical requirements.