



IEC 62742

Edition 1.0 2021-08

INTERNATIONAL STANDARD

**Electrical and electronic installations in ships – Electromagnetic
compatibility (EMC) – Ships with a non-metallic hull**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.100; 47.020.60

ISBN 978-2-8322-5380-9

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	7
4 General	9
5 Electromagnetic environment (EME).....	9
5.1 General.....	9
5.2 Susceptibility study	10
5.3 Unintentional radiators installed near VHF antennas	10
6 Shielding	10
6.1 General.....	10
6.2 Function of shielding.....	11
6.3 Ship layout.....	11
6.4 Room layout	11
7 Antenna layout	13
7.1 General.....	13
7.2 Whip antenna.....	13
7.2.1 General	13
7.2.2 Transmitter location	13
7.2.3 Antenna ground plane.....	13
7.3 Loop antenna.....	14
8 Earthing and equipotential bonding system.....	15
8.1 General.....	15
8.2 Earthing systems	16
8.3 Protective earth	17
8.4 Earth plate	18
8.4.1 Material	18
8.4.2 Location	18
8.4.3 Dimensioning and construction	18
8.4.4 Number	18
8.5 Communication transmitter system	19
8.6 Dimensions of earth conductors	20
8.7 Lightning conductor	20
8.8 Unbalanced systems.....	21
9 Cable installation	21
9.1 Cable routing	21
9.2 Electrical connection (bonding) of cable shields.....	21
9.3 Protection against RF fields	21
9.4 Protection against induced currents	22
9.5 Filtering	22
10 Overvoltage protection	22
11 Maintenance test and inspection.....	22
Annex A (normative) Comparison of IEC 60533:2015, Clause 4 to Clause 8, with this document.....	23

Annex B (informative) Comparison of IEC 60533:2015, Annex A (informative) and Annex B (informative) with this document	25
Bibliography.....	28
Figure 1 – Principle of single protection layer.....	12
Figure 2 – Principle of multiple protection layers	12
Figure 3 – Unshielded cable penetrating the antenna ground plane	14
Figure 4 – Radiation pattern of a vertically installed loop antenna (seen from above), showing the main direction of radiation	15
Figure 5 – Double-tree earthing system	16
Figure 6 – Example of an earthing system with shielded spaces	17
Figure 7 – Antenna ground plane, strap connection of base plate with earth plate.....	19
Figure 8 – Antenna ground plane, tape connection of base plate with earth plate.....	20
Table A.1 – Connection of this document with IEC 60533:2015 – Allocation, additions or modifications	23
Table B.1 – Connection of this document with IEC 60533:2015 – Allocation, additions or modifications	25

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICAL AND ELECTRONIC INSTALLATIONS IN SHIPS –
ELECTROMAGNETIC COMPATIBILITY (EMC) –
SHIPS WITH A NON-METALLIC HULL**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62742 has been prepared by Technical committee 18: Electrical installations of ships and of mobile and fixed offshore units.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
18/1725/FDIS	18/1733/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

It is important that electrical installations of ships with electric and/or electronic systems operate under a wide range of environmental conditions. The control of undesired electromagnetic emission ensures that no other device on board will be unduly influenced by the equipment under consideration. On the other hand, the equipment is expected to function without degradation in the normal electromagnetic environment. It is also important to take into account special risks, for instance lightning strikes, transients from the operation of circuit breakers and electromagnetic radiation from radio transmitters.

Experience related to the EMC of non-metallic ships can be expected in the area of defence technology. But most of this information including the documents is classified and therefore not publicly available. This document was derived from the NATO document ANEP 45 (unclassified), MIL-STD-1310H (NAVY) and VG 95375 (all parts) due to lack of information from other sources, for example from yards which had already built such kind of ships.

This document can assist to achieve electromagnetic compatibility of all electrical and electronic installations in ships with non-metallic hull, for example manufactured from wood or composite.

Composite structures typically comprise of resin and fibre laminate layers combined with a core material (colloquially referred to as a "sandwich"). The most widely used being glass fibre reinforced plastic (GRP or FRP). Many composites are non-conductive and offer no inherent electromagnetic shielding. Carbon fibre technology has the important characteristic of a conductive material that can provide electromagnetic shielding.

This document should be used during the ship design process and not as a problem solving procedure. The intent is to decrease the number of special EMI/EMC problems which could occur as a consequence of the use of non-metallic constructions.

Originally, this document had been designed as a "stand-alone-document" which covers the complete field of EMC similar to IEC 60533. But with progressing work, it became more and more clear that many repetitions of requirements already contained in IEC 60533 would have been necessary to fulfil the stand-alone demand: most of the requirements are identical, no matter whether composite or metal is used.

Finally, the project team came to the conclusion that it would be better to avoid repetitions. Therefore, this document was further prepared to align with, and refer to IEC 60533.

ELECTRICAL AND ELECTRONIC INSTALLATIONS IN SHIPS – ELECTROMAGNETIC COMPATIBILITY (EMC) – SHIPS WITH A NON-METALLIC HULL

1 Scope

This document specifies minimum requirements for emission, immunity and performance criteria regarding electromagnetic compatibility (EMC) of electrical and electronic equipment for ships with non-metallic hull.

NOTE Requirements for metallic hull are given by IEC 60533. This document acts an extension of IEC 60533 to cater for EMC effects on non-metallic hull.

This document further gives guidance on how to achieve electromagnetic compatibility (EMC) on ships whose hull (surface) is made from non-metallic material and can also be useful for ships with hull comprising of a metallic hull, but with non-metallic superstructure or components.

This document assists in meeting the requirements of IMO resolution A.813(19).

It does not specify basic safety requirements such as protection against electric shock and dielectric tests for equipment. Electromagnetic effects on human beings are not the subject of this document.

NOTE More information on 'Basic safety' can be found in IEC guide 104.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60092-101, *Electrical installations in ships – Part 101: Definitions and general requirements*

IEC 60092-401, *Electrical installations in ships – Part 401: Installation and test of completed installation*

IEC 60092-507, *Electrical installations in ships – Part 507: Small vessels*

IEC 60533:2015, *Electrical and electronic installations in ships – Electromagnetic compatibility (EMC) – Ships with a metallic hull*