

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Transmitting and receiving equipment for radiocommunication – Radio-over fibre technologies and their performance standard –
Part 3: Radio-over-fibre-based remote radar for foreign object debris (FOD) detection systems**

**Matériaux émetteurs et récepteurs pour les radiocommunications –
Technologies radio sur fibre et leur norme de performance –
Partie 3: Radar distant fondé sur la radio sur fibre pour système de détection des objets intrus (FOD)**



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2022 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, ...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 300 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 19 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Transmitting and receiving equipment for radiocommunication – Radio-over fibre technologies and their performance standard –
Part 3: Radio-over-fibre-based remote radar for foreign object debris (FOD) detection systems**

**Matériaux émetteurs et récepteurs pour les radiocommunications –
Technologies radio sur fibre et leur norme de performance –
Partie 3: Radar distant fondé sur la radio sur fibre pour système de détection des objets intrus (FOD)**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 33.060.20

ISBN 978-2-8322-6087-6

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references	6
3 Terms, definitions and abbreviated terms	6
3.1 Terms and definitions.....	6
3.2 Abbreviated terms.....	7
4 RoF system in remote radar system.....	7
4.1 General.....	7
4.2 Structures	7
4.3 Operating frequency range.....	8
4.4 Operating environment.....	8
5 Testing	9
5.1 General.....	9
5.2 Temperature	9
5.3 Warming-up of the measuring equipment	9
6 Specifications for RoF links of remote radar systems.....	9
6.1 General.....	9
6.2 Laser safety	9
6.3 Physical interface of the RoF system	9
6.3.1 RF interfaces	9
6.3.2 Optical interfaces.....	9
6.3.3 Power supply interface	9
6.4 Optical specifications	10
6.4.1 Wavelength	10
6.4.2 Operating optical output power	10
6.4.3 Operating optical input power	10
6.4.4 Absolute optical output limit	10
6.4.5 Optical return loss	10
6.5 RF specifications	10
6.5.1 Operating RF range	10
6.5.2 Dynamic range	10
6.5.3 Absolute RF input power.....	10
6.5.4 RF return loss.....	10
6.5.5 Multiplication factor.....	10
Annex A (informative) Examples of the architecture of remote radars	11
A.1 Example of a remote radar system for FOD detection	11
A.2 Example of a multi-static remote radar system for FOD detection	12
Bibliography.....	15
Figure 1 – Structure of a remote radar system	8
Figure A.1 – Structure of a FOD detection system	11
Figure A.2 – Structure of a multi-static radar system.....	12
Table 1 – Operating environment.....	8
Table A.1 – Specifications of an RoF transceiver interface for a remote radar system.....	12
Table A.2 – Specifications of RoF transceiver interfaces for a multi-static radar system.....	13

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**TRANSMITTING AND RECEIVING EQUIPMENT FOR
RADIOCOMMUNICATION – RADIO-OVER-FIBRE
TECHNOLOGIES AND THEIR PERFORMANCE STANDARD –**

**Part 3: Radio-over-fibre-based remote radar for foreign
object debris (FOD) detection systems**

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, issue 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.

IEC 63098-3 has been prepared by IEC technical committee 103: Transmitting and receiving equipment for radiocommunication. It is an International Standard.

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

Draft	Report on voting
103/245/FDIS	103/250/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/publications.

A list of all parts in the IEC 63098 series, published under the general title *Transmitting and receiving equipment for radiocommunication – Radio-over-fibre technologies and their performance standard*, can be found on the IEC website.

Future documents in this series will carry the new general title as cited above. Titles of existing documents in this series will be updated at the time of the next edition.

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

A remote radar system generally consists of a central station (CS) and remote radar heads (RRHs) connected by radio over fibre (RoF). Each RRH has a maximum detection range of several hundred metres because millimetre waves theoretically undergo a larger propagation loss compared with conventional aeronautical frequencies below 10 GHz. The RoF system is key to enhancing the radar coverage and connecting the CS with the RRHs located along a runway for its entire coverage.

To ensure the connection between the CS and RRHs, radio frequency (RF) and optical interfaces should be categorized according to their specifications, specifically, their link characteristics.

Currently in preview, click buy full version

TRANSMITTING AND RECEIVING EQUIPMENT FOR RADIOCOMMUNICATION – RADIO-OVER-FIBRE TECHNOLOGIES AND THEIR PERFORMANCE STANDARD –

Part 3: Radio-over-fibre-based remote radar for foreign object debris (FOD) detection systems

1 Scope

This part of IEC 63098 provides the specifications of the RoF interface connecting the central station (CS) with the remote radar heads (RRHs) in a remote radar system, along with the necessary information to ensure compatibility between vendors and, hence, choose appropriate systems to cover any type of RoF systems for delivering the signal.

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 62149-10:2018, *Fibre optic active components and devices – Performance standards – Part 10: Radio-over-fibre (RoF) transceivers for mobile fronthaul*

IEC 60825-1, *Safety of laser products – Part 1: Equipment classification and requirements*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia, available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1.1

system input level

electrical or optical input level to the system

3.1.2

system output level

electrical or optical output level from the system

3.1.3

frequency multiplication factor

order of harmonic RF output that is derived from the optical or electrical system

3.1.4

input frequency range

RF frequency range accepted by the system