

# INTERNATIONAL STANDARD



---

**Transmitting and receiving equipment for radiocommunication –  
Radio-over-fibre technologies and their performance standard –  
Part 4: Radio-over-fibre-based indoor distributed antenna system (DAS) for 5G**



**THIS PUBLICATION IS COPYRIGHT PROTECTED**  
**Copyright © 2023 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.

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

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://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](http://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 It also gives information on projects, replaced and withdrawn publications.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](http://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](http://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](mailto:sales@iec.ch).

**IEC Products & Services Portal - [products.iec.ch](http://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](http://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.



IEC 63098-4

Edition 1.0 2023-05

# INTERNATIONAL STANDARD



---

**Transmitting and receiving equipment for radiocommunication –  
Radio-over-fibre technologies and their performance standard –  
Part 4: Radio-over-fibre-based indoor distributed antenna system (DAS) for 5G**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 31.240

ISBN 978-2-8322-6991-6

**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, definitions and abbreviated terms .....	7
3.1 Terms and definitions.....	7
3.2 Abbreviated terms.....	8
4 RoF based DAS.....	9
4.1 System overview.....	9
4.2 System configurations.....	9
4.2.1 General .....	9
4.2.2 Point-to-point configuration.....	9
4.2.3 Point-to-multipoint configuration .....	10
5 System interfaces .....	10
5.1 General.....	10
5.2 Electrical interfaces .....	11
5.2.1 MHU .....	11
5.2.2 RAU .....	11
5.3 Optical interfaces.....	12
5.3.1 MHU .....	12
5.3.2 RAU .....	12
6 Testing.....	12
6.1 General.....	12
6.2 Performance testing.....	12
7 Environmental specifications .....	13
7.1 General safety .....	13
7.2 Laser safety .....	13
7.3 Temperature and environment .....	13
Annex A (informative) System performance specifications for radio-over-fibre-based indoor distributed antenna system (DAS) for 5G .....	14
A.1 General.....	14
A.2 Downlink.....	14
A.2.1 MHU .....	14
A.2.2 RAU .....	14
A.3 Uplink .....	15
A.3.1 MHU .....	15
A.3.2 RAU .....	16
Bibliography.....	17
Figure 1 – Basic structure of a distributed antenna system (DAS) for 5G .....	9
Figure 2 – Point-to-point configuration of DAS .....	10
Figure 3 – Point-to-multipoint configuration of DAS.....	10
Figure 4 – System interfaces of DAS for 5G.....	11
Table 1 – Abbreviated terms .....	8

Table 2 – Definitions and functions of the electrical interfaces of the MHU ..... 11

Table 3 – Definitions and functions of the electrical interfaces of the RAU ..... 11

Table 4 – Definitions and functions of the optical interfaces of the MHU ..... 12

Table 5 – Definitions and functions of the optical interfaces of the RAU ..... 12

Table A.1 – System performance specifications of the MHU for downlink ..... 14

Table A.2 – System performance specifications of the RAU for downlink ..... 15

Table A.3 – System performance specifications of the MHU for uplink ..... 15

Table A.4 – System performance specifications of the RAU for uplink ..... 16

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

**Part 4: Radio-over-fibre-based indoor  
distributed antenna system (DAS) for 5G**

## 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.

IEC 63098-4 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
103/253/FDIS	103/254/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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://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](http://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.

**IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

## INTRODUCTION

This document provides the performance standards of the RoF-based 5G indoor distributed antenna system (DAS) network for cost-effectively offering quality of service (QoS) guaranteed 5G mobile communication services with high bandwidth and low-latency characteristics without radio shadowing in an indoor environment. First of all, the system overview, system configurations, and the elements of the system are presented and then the electrical and optical interfaces for each system element are defined. Finally, the detail system performance specifications of each element are described for downlink and uplink configurations.

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

## Part 4: Radio-over-fibre-based indoor distributed antenna system (DAS) for 5G

### 1 Scope

This part of IEC 63098 specifies a radio-over-fibre-based indoor distributed antenna system (DAS) for fifth generation wireless technology 5G.

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

IEC 60950-1, *Information technology equipment – Safety – Part 1: General requirements*

3GPP TS 38.104 V15.3.0 (2018-10), 5G; NR; *Base Station (BS) radio transmission and reception*

### 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 <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

##### 3.1.1

##### radio over fibre

##### RoF

communication technology in which radio-frequency signals are modulated on light and transmitted over fibre optics

##### 3.1.2

##### distributed antenna system

##### DAS

network of spatially separated antenna nodes connected to a common source via a transport medium that provides wireless service within a geographic area or structure