



TECHNICAL REPORT



**Transmitting equipment for radiocommunication – Radio-over-fibre technologies
and their performance standard –
Part 1: System applications of radio over fibre technology**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.060.20: 33.180.99

ISBN 978-2-8322-4826-3

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.....	7
4 Advantages and disadvantages of RoF	8
5 Practical applications.....	9
5.1 List of applications	9
5.2 Mobile communication system.....	9
5.2.1 General	9
5.2.2 Features	10
5.2.3 System configuration	10
5.2.4 Specifications	10
5.3 Relay station for digital terrestrial TV	11
5.3.1 General	11
5.3.2 Features	11
5.3.3 System configuration	11
5.3.4 Specifications	12
5.4 Airport multilateration system.....	12
5.4.1 General	12
5.4.2 Features	13
5.4.3 System configuration	13
5.4.4 Specifications	13
6 Examples of standardization activities	14
Annex A (informative) Radio-over-fibre system in accordance with spectral emission standards	15
A.1 General.....	15
A.2 Reference model.....	15
A.3 Equipment	16
A.3.1 General	16
A.3.2 Down link transmission signal	16
A.3.3 Physical specifications.....	18
A.3.4 Example of EO and OE performance	18
A.4 Measurement methods.....	19
A.4.1 Spectrum mask and unwanted emission	19
A.4.2 Examples of measurement items	19
Bibliography.....	21
Figure 1 – Usage Image of each Multi Drop Optical Feeder (MoF) [1]	10
Figure 2 – System configuration [2].....	12
Figure 3 – System configuration of the advanced MLAT "OCTPASS"	13
Figure A.1 – RoF system reference model	16
Figure A.2 – Spectrum mask.....	17

Table 1 – Application examples	9
Table 2 – Specification of RoF links	11
Table 3 – Specifications of an RoF system.....	12
Table 4 – Specifications of an RoF system for multilateration	14
Table A.1 – Transmission spectrum break points	17
Table A.2 – Unwanted emission specifications for DTTB.....	18
Table A.3 – Example of EO and OE performance.....	19
Table A.4 – Example of measurement items for factory and on-site inspections	20

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

Part 1: System applications of radio over fibre technology

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.

The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a technical report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

IEC TR 63098-1, which is a Technical Report, has been prepared by IEC technical committee 103: Transmitting equipment for radiocommunication.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
103/153/DTR	103/168/RVDTR

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

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 63098 series, published under the general title *Transmitting equipment for radiocommunication*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<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.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication 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

Using radio-over-fibre technology, RF modulated optical carriers and signals can be transmitted in optical fibre with very low loss. Fundamentally, radio-over-fibre (RoF) is an analogue transmission system that allows radio frequency signals to be transmitted and processed without being digitized. Remote antenna systems including distributed antenna system (DAS) which use RoF technology in terrestrial broadcasting and mobile communications have also become established infrastructures.

In terrestrial broadcasting, the conventional microwave links for studio-transmitter links (STLs), transmitter-studio links (TSLs), transmitter-transmitter links (TTLs) and field pickup units (FPU) have been replaced by RoF systems, particularly in Japan.

RoF technology is a promising technology for broadband access networks combined with the mobility and the flexibility of wireless access. An advantage of RoF technology is multiplexing of RF signals. Multiple RF signals can be converged on the physical layer and they are transmitted to the remote site transparently. RoF technology can also be used for multiplexed transmission that supports CATV (cable television) trunk line systems, cellular phone systems, etc. for blind spots, such as inside buildings, underground areas and subways. RoF systems are also used in digital signage systems and rapid and agile deployment of broadcasting and communication services.

This document provides information on the current and latest applications of radio-over-fibre technology, which are already implemented or will be in the near future. This document will also be beneficial to system developers and system users in the fields of mobile communications and optical fibre technologies.

An example of the technical specification of a radio over fibre (RoF) link in accordance with the spectral emission standard for digital terrestrial television broadcasting in Japan is given in Annex A.

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

Part 1: System applications of radio over fibre technology

1 Scope

The purpose of this document is to provide information on the current and latest applications of radio-over-fibre technology. Wireless communication, broadcasting, and airport multilateration systems, which are already implemented or will be in the near future, are introduced. This document includes the basic concept, a brief outline and related standards of the applications of RoF technology.

2 Normative references

There are no normative references in this document.