IEC 62803

Edition 1.0 2016-07

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Transmitting equipment for radiocommunication – Frequency response of optical-to-electric conversion device in high-frequency radio over fibre systems – Measurement method

Matériels émetteurs pour les radiocommunications – Réponse en fréquence des dispositifs de conversion optique-electrique dans des systèmes de transmission radio sur fibre haute fréquence – Méthode de mesure

IEC 62803:2016-07(en-fr)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
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 corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue
The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub
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 It also gives information on projects, replaced and withdrawn publications.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 also once a month by email.

Electropedia - www.electropedia.org
The world's leading online dictionary of electronic and electrical terms containing 20 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
65 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

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: csc@iec.ch.

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.

Catalogue IEC - webstore.iec.ch/catalogue
Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub
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 aussi une fois par mois par email.

Electropedia - www.electropedia.org
Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 15 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary
65 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

IEC 62803

Edition 1.0 2016-07

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Transmitting equipment for radiocommunication – Frequency response of optical-to-electric conversion device in high-frequency radio over fibre systems – Measurement method

Matériels émetteurs pour les radiocommunications – Réponse en fréquence des dispositifs de conversion optique-electrique dans des systèmes de transmission radio sur fibre haute fréquence – Méthode de mesure

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 33.060.20

ISBN 978-2-8322-3392-4

CONTENTS

FOREWORD....4
INTRODUCTION....6
1 Scope....7
2 Normative references....7
3 Terms, definitions and abbreviations....7
3.1 Terms and definitions....7
3.2 Abbreviations....9
4 Optical-to-electrical (O/E) conversion device....9
4.1 Photo diode (PD)....9
4.1.1 General....9
4.1.2 Component parts....9
4.1.3 Structure....9
4.1.4 Requirements for PD....10
4.2 DFG device....10
4.2.1 General....10
4.2.2 Component parts....10
4.2.3 Structure....10
4.2.4 Requirements for DFG device....10
5 Sampling for quality control....11
5.1 Sampling....11
5.2 Sampling frequency....11
6 Measurement method of frequency response....11
6.1 Circuit diagram....11
6.2 Measurement condition....12
6.2.1 Temperature and environment....12
6.2.2 Warming up of measurement equipment....12
6.3 Principle of measurement method....12
6.4 Measurement procedure....13
Annex A (normative) Power balanced two-tone signal generation by using a high extinction-ratio MZM [2]....15
Annex B (informative) Requirements for the optical amplifier with automatic level control....17
B.1 Introductory remark....17
B.2 Block diagram....17
B.2.1 Optical amplifier....17
B.2.2 Automatic level control....18
B.3 Function and capabilities....18
B.4 Requirements....19
B.4.1 Optical amplifier....19
B.4.2 Automatic level control (ALC)....20
Annex C (informative) Frequency-response measurement system and automatic level control EDFA....21
C.1 Frequency response measurement system for optical-to-electric conversion devices with a two-tone generator....21
C.2 Automatic level control EDFA (ALC-EDFA)....22
Bibliography....24

Figure 1 – Definition of "conversion efficiency " 8
Figure 2 – Optical-to-electrical conversion by photo diode 10
Figure 3 – DFG device 10
Figure 4 – Circuit diagram 11
Figure B.1 – Block diagram of the optical amplifier 17
Figure B.2 – Block diagram of the automatic level control 18
Figure B.3 – Frequency characteristics 19
Figure C.1 – System configuration for the frequency response measurement system 21
Figure C.2 – ALC-EDFA system configuration 22
Figure C.3 – Frequency response measurement examples 23

Table C.1 – Typical specifications of the frequency response measurement system 22
Table C.2 – Typical specifications of the ALC-EDFA system 23

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

TRANSMITTING EQUIPMENT FOR RADIOCOMMUNICATION – FREQUENCY RESPONSE OF OPTICAL-TO-ELECTRIC CONVERSION DEVICE IN HIGH-FREQUENCY RADIO OVER FIBRE SYSTEMS – MEASUREMENT METHOD

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.

International Standard IEC 62803 has been prepared by IEC technical committee 103: Transmitting equipment for radiocommunication.

The text of this standard is based on the following documents:

FDIS	Report on voting
103/147/FDIS	103/148/RVD

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

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

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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

INTRODUCTION

A variety of microwave-photonic devices are used in wireless communication and broadcasting systems. A photo-receiver is an interface which converts an optical signal to an electronic signal. This International Standard has been prepared to provide methods for evaluating and calibrating high speed photo-receivers to be used in Radio over Fibre systems.

The method utilizes a Mach-Zehnder modulator for generating two-tone lightwaves as stimulus signals, to provide simpler and easier methods than the conventional method utilizing a complex two-laser system phase-locked with each other.

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent concerning a calibration method and device for light intensity measuring instrument, as it relates to Clause 6.

Related part	Patent holder	Patent number
Clause 6	National Institute of Information and Communications Technology	JP 4753137B EP1956353A US7864330B

IEC takes no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has assured the IEC that he/she is willing to negotiate licences either free of charge or under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with IEC. Information may be obtained from:

National Institute of Information and Communications Technology
4-2-1 Nukui-Kitamachi, Koganei, Tokyo 184-8795, Japan

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those identified above. IEC shall not be held responsible for identifying any or all such patent rights.

ISO (www.iso.org/patents) and IEC (http://patents.iec.ch) maintain on-line data bases of patents relevant to their standards. Users are encouraged to consult the data bases for the most up to date information concerning patents.

TRANSMITTING EQUIPMENT FOR RADIOCOMMUNICATION – FREQUENCY RESPONSE OF OPTICAL-TO-ELECTRIC CONVERSION DEVICE IN HIGH-FREQUENCY RADIO OVER FIBRE SYSTEMS – MEASUREMENT METHOD

1 Scope

This International Standard provides a method for measuring the frequency response of optical-to-electric conversion devices in wireless communication and broadcasting systems.

The frequency range covered by this standard goes up to 100 GHz (practically limited up to 110 GHz by precise RF power measurement) and the wavelength band concerned is 0,8 μm to 2,0 μm.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

There are no normative references in this document.

3 Terms, definitions and abbreviations

3.1 Terms and definitions

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

3.1.1
conversion efficiency
ratio of the output current to the input optical power defined by

$$k = \frac{\Delta I_{\text{out}}}{\Delta P_{\text{in}}} \tag{1}$$

Note 1 to entry: See Figure 1.