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Fibre optic active components and devices - Test and measurement procedures -- Part 4: Relative intensity noise using a time-domain optical detection system (IEC 62150-4:2009 (EQV))

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 62150-4

January 2010

ICS 33.180.20

English version

Fibre optic active components and devices - Test and measurement procedures - Part 4: Relative intensity noise using a time-domain optical detection system

(IEC 62150-4:2009)

Composants et dispositifs actifs à fibres optiques - Procédures d'essais et de mesures - Partie 4: Intensité relative du bruit en utilisant un système de détection optique dans le domaine temporel (CEI 62150-4:2009)

Aktive Lichtwellenleiter-Bauteile und -Bauelemente - Grundlegende Prüf- und Messverfahren - Teil 4: Messung des relativen Intensitätsrauschens unter Anwendung eines optischen Zeitbereichs-Empfangssystems (IEC 62150-4:2009)

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 86C/918/FDIS, future edition 1 of IEC 62150-4, prepared by SC 86C, Fibre optic systems and active devices, of IEC TC 86, Fibre optics, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62150-4 on 2009-12-01.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2010-09-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2012-12-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62150-4:2009 was approved by CENELEC as a European Standard without any modification.

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Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application 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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 61280-2-2	-	Fibre optic communication subsystem test procedures - Part 2-2: Digital systems - Optical eye pattern, waveform and extinction ratio measurement	EN 61280-2-2	-
IEC 61300-3-6	-	Fibre optic interconnecting devices and passive components - Basic test and measurement procedures - Part 3-6: Examinations and measurements - Return loss	EN 61300-3-6	-
IEC 62007-2	-	Semiconductor optoelectronic devices for fibre optic system applications - Part 2: Measuring methods	EN 62007-2	-
IEEE 802.3	2005	IEEE Standard for Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications	-	-
ITU-T Recommendation G.957	-	Optical interfaces for equipments and systems relating to the synchronous digital hierarchy	-	-

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIBRE OPTIC ACTIVE COMPONENTS AND DEVICES – TEST AND MEASUREMENT PROCEDURES –

Part 4: Relative intensity noise using a time-domain optical detection system

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.
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International Standard IEC 62150-4 has been prepared by subcommittee 86C: Fibre optic systems and active devices, of IEC technical committee 86: Fibre optics.

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

FDIS	Report on voting
86C/918/FDIS	86C/931/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.

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A list of all the parts in the IEC 62150 series, under the general title *Fibre optic active components and devices – Test and measurement procedures*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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.

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 publication using a colour printer.

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INTRODUCTION

Laser intensity noise can be one of the limiting factors in the transmission of analogue or digital signals. It can reduce the signal-to-noise ratio and increase the bit error rate, therefore degrading system performance. Laser intensity noise can vary significantly depending on the properties of the laser and back reflections. In order to optimize communication links, it is essential to accurately characterize the laser intensity noise, compare it with the signal strength, and if necessary allow an appropriate power budget.

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

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 the FFT method for separating noise and deterministic signals given in 5.4.2.

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FIBRE OPTIC ACTIVE COMPONENTS AND DEVICES – TEST AND MEASUREMENT PROCEDURES –

Part 4: Relative intensity noise using a time-domain optical detection system

1 Scope

This part of IEC 62150 specifies test and measurement procedures for relative intensity noise (*RIN*). It applies to lasers, laser transmitters, and the transmitter portion of transceivers. This procedure examines whether the device or module satisfies the appropriate performance specification. The procedure is applicable to single longitudinal mode (SLM). An optional section of the procedure presents a controlled return loss to the device-under-test, but is only applicable to devices coupled to SMF.

The method described in this standard, using a time-domain detection system, provides a single value for *RIN* that averages the noise over the transmission bandwidth. The measurement is made on a modulated laser capturing the *RIN* value under normal operating conditions. It also measures RIN_{OMA}, an alternative definition, as described in IEEE 802.3-2005.

An alternative *RIN* measurement method uses a photoreceiver and electrical spectrum analyzer and provides *RIN* vs. electrical frequency. This method provides a *RIN* value averaged over particular electrical band determined by a filter. For a filter bandwidth and characteristic that duplicates the filtering in a transmission system, this technique provides a result that is appropriate to determine the noise for such a system.

This method is based on the measurement of total intensity noise including and does attempt to subtract the effects of thermal and shot noise.

Background on laser intensity noise is given in Annex A.

2 Normative references

The following referenced documents are indispensable for the application 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 61280-2-2, *Fibre optic communication subsystem test procedures – Part 2-2: Digital systems – Optical eye pattern, waveform and extinction ratio measurement*

IEC 61300-3-6, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-6: Examinations and measurements – Return loss*

IEC 62007-2*, Semiconductor optoelectronic devices for fibre optic system applications – Part 2: Measuring methods*

IEEE 802.3™-2005, *Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*

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