

| | | |
|------------|--|---|
| STN | Optické vlákna Časť 1-54: Metódy merania a skúšobné postupy Ožarovanie gama | STN EN IEC 60793-1-54 35 9213 |
|------------|--|---|

Optical fibres - Part 1-54: Measurement methods and test procedures - Gamma irradiation

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 09/18

Obsahuje: EN IEC 60793-1-54:2018, IEC 60793-1-54:2018

Oznámením tejto normy sa od 16.02.2021 ruší
STN EN 60793-1-54 (35 9213) z augusta 2013

127073

EUROPEAN STANDARD

EN IEC 60793-1-54

NORME EUROPÉENNE

EUROPÄISCHE NORM

March 2018

ICS 33.180.10

Supersedes EN 60793-1-54:2013

English Version

**Optical fibres - Part 1-54: Measurement methods and test
procedures - Gamma irradiation
(IEC 60793-1-54:2018)**

Fibres optiques - Partie 1-54: Méthodes de mesure et
procédures d'essai - Irradiation gamma
(IEC 60793-1-54:2018)

Lichtwellenleiter - Teil 1-54: Messmethoden und
Prüfverfahren - Gammastrahlung
(IEC 60793-1-54:2018)

This European Standard was approved by CENELEC on 2018-02-16. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

EN IEC 60793-1-54:2018 (E)**European foreword**

The text of document 86A/1833/FDIS, future edition 3 of IEC 60793-1-54, prepared by IEC/SC 86A "Fibres and cables, of IEC technical committee 86: Fibre optics" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60793-1-54:2018.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2018-11-16
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2021-02-16

This document supersedes EN 60793-1-54:2013.

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

Endorsement notice

The text of the International Standard IEC 60793-1-54:2018 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

| | | |
|----------------|------|------------------------------|
| IEC 60793-2-10 | NOTE | Harmonized as EN 60793-2-10. |
| IEC 60793-2-20 | NOTE | Harmonized as EN 60793-2-20. |
| IEC 60793-2-50 | NOTE | Harmonized as EN 60793-2-50. |

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

| <u>Publication</u> | <u>Year</u> | <u>Title</u> | <u>EN/HD</u> | <u>Year</u> |
|--------------------|-------------|--|---------------|-------------|
| IEC 60793-1-40 | - | Optical fibres -- Part 1-40: Measurement methods and test procedures - Attenuation | EN 60793-1-40 | - |
| IEC 60793-1-44 | - | Optical fibres -- Part 1-44: Measurement methods and test procedures - Cut-off wavelength | EN 60793-1-44 | - |
| IEC 60793-1-46 | - | Optical fibres -- Part 1-46: Measurement methods and test procedures - Monitoring of changes in optical transmittance | EN 60793-1-46 | - |
| IEC 61280-4-1 | - | Fibre optic communication subsystem test procedures -- Part 4-1: Installed cable plant - Multimode attenuation measurement | EN 61280-4-1 | - |



IEC 60793-1-54

Edition 3.0 2018-01

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Optical fibres –
Part 1-54: Measurement methods and test procedures – Gamma irradiation**

**Fibres optiques –
Partie 1-54: Méthodes de mesure et procédures d'essai – Irradiation gamma**





THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2018 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 Central Office
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 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 - 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 also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing 21 000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67 000 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: sales@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 - 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 aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient 21 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

67 000 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: sales@iec.ch.



IEC 60793-1-54

Edition 3.0 2018-01

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Optical fibres –

Part 1-54: Measurement methods and test procedures – Gamma irradiation

Fibres optiques –

Partie 1-54: Méthodes de mesure et procédures d'essai – Irradiation gamma

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 33.180.10

ISBN 978-2-8322-5209-3

**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 | 4 |
| 1 Scope | 6 |
| 2 Normative references | 6 |
| 3 Terms and definitions | 6 |
| 4 Apparatus | 7 |
| 4.1 General | 7 |
| 4.2 Radiation source | 7 |
| 4.2.1 Testing of environmental background radiation | 7 |
| 4.2.2 Testing of adverse nuclear environments | 7 |
| 4.3 Optical source | 7 |
| 4.4 Optical filters/monochromators | 7 |
| 4.5 Cladding mode stripper | 7 |
| 4.6 Fibre support and positioning apparatus | 7 |
| 4.7 Optical splitter | 7 |
| 4.8 Input launch conditions | 7 |
| 4.8.1 Class A, Category A1 fibres (graded index multimode fibres) | 7 |
| 4.8.2 Class A, Category A2 fibres (quasi-step and step index fibres) | 8 |
| 4.8.3 Class B fibres (single-mode fibres) | 8 |
| 4.9 Detector – Signal detection electronics | 8 |
| 4.10 Optical power meter | 8 |
| 4.11 Radiation dosimeter | 8 |
| 4.12 Temperature-controlled container | 8 |
| 4.13 Test reel | 8 |
| 5 Sampling and specimens | 8 |
| 5.1 Specimens | 8 |
| 5.1.1 Fibre specimen | 8 |
| 5.1.2 Cable specimen | 8 |
| 5.2 Test sample length | 8 |
| 5.3 Test reel | 9 |
| 5.4 Ambient light shielding | 9 |
| 6 Procedure | 9 |
| 6.1 General | 9 |
| 6.2 Calibration of radiation source | 9 |
| 6.3 Preparation and pre-conditioning | 9 |
| 6.4 Attenuation measurement for environmental background radiation | 9 |
| 6.5 Attenuation measurement for adverse nuclear environment | 10 |
| 7 Calculations | 10 |
| 7.1 Change in optical attenuation Δa (environmental background radiation test) | 10 |
| 7.2 Change in optical transmittance, a (adverse nuclear environmental radiation test) | 10 |
| 7.3 Normalisation of the results | 11 |
| 8 Results | 11 |
| 8.1 Information to be provided with each measurement | 11 |
| 8.2 Information available upon request | 11 |
| 9 Specification information | 12 |

Bibliography..... 13

INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPTICAL FIBRES –

Part 1-54: Measurement methods and test procedures – Gamma irradiation

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.

International Standard IEC 60793-1-54 has been prepared by subcommittee 86A: Fibres and cables, of IEC technical committee 86: Fibre optics.

This third edition cancels and replaces the second edition published in 2012. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) test conditions related to photobleaching have been changed;
- b) the test length has been modified to yield a total induced attenuation in the test sample at the end of the irradiation between 3 dB and 10 dB.

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

| FDIS | Report on voting |
|---------------|------------------|
| 86A/1833/FDIS | 86A/1848/RVD |

Full information on the voting for the approval of this International Standard 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 60793 series, published under the general title *Optical fibres*, 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.

OPTICAL FIBRES –

Part 1-54: Measurement methods and test procedures – Gamma irradiation

1 Scope

This document outlines a method for measuring the steady state response of optical fibres and optical cables exposed to gamma radiation. It can be employed to determine the level of radiation-induced attenuation produced in Class B single-mode or Class A, category A1 and A2 multimode optical fibres, in either cabled or uncabled form, due to exposure to gamma radiation.

The attenuation of cabled and uncabled optical fibres generally increases when exposed to gamma radiation. This is primarily due to the trapping of radiolytic electrons and holes at defect sites in the glass (i.e. the formation of "colour centres"). This test procedure focuses on two regimes of interest: the low dose rate regime suitable for estimating the effect of environmental background radiation, and the high dose rate regime suitable for estimating the effect of adverse nuclear environments. The testing of the effects of environmental background radiation is achieved with an attenuation measurement approach similar to IEC 60793-1-40 method A, cut-back. The effects of adverse nuclear environments are tested by monitoring the power before, during and after exposure of the test sample to gamma radiation. The depopulation of colour centres by light (photo bleaching) or by heat causes recovery (lessening of radiation induced attenuation). Recovery can occur over a wide range of time which depends on the irradiation time and annealing temperature. This complicates the characterization of radiation induced attenuation since the attenuation depends on many variables including the temperature of the test environment, the configuration of the sample, the total dose and the dose rate applied to the sample and the light level used to measure it.

This test is not a material test for the non-optical material components of a fibre optic cable. If degradation of cable materials exposed to irradiation is studied, other test methods will be used.

This test method is written to contain a clear, concise listing of instructions. The background knowledge that is necessary to perform correct, relevant and expressive irradiation tests as well as to limit measurement uncertainty is presented separately in IEC TR 62283.

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 60793-1-40, *Optical Fibres – Part 1-40: Measurement methods and test procedures – Attenuation*

IEC 60793-1-44, *Optical fibres – Part 1-44: Measurement methods and test procedures – Cut-off wavelength*

IEC 60793-1-46, *Optical fibres – Part 1-46: Measurement methods and test procedures – Monitoring of changes in optical transmittance*

IEC 61280-4-1, *Fibre-optic communication subsystem test procedures – Part 4-1: Installed cable plant – Multimode attenuation measurement*

koniec náhľadu – text ďalej pokračuje v platenej verzii STN