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Fibre- optic communication subsystem test procedures –
Part 4-2: Installed **cable** cabling plant – Single-mode attenuation and optical
return loss measurements

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIBRE-OPTIC COMMUNICATION SUBSYSTEM TEST PROCEDURES –

Part 4-2: Installed ~~cable~~ cabling plant –
Single-mode attenuation and optical return loss measurements

FOREWORD

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IEC 61280-4-2 has been prepared by subcommittee 86C: Fibre optic systems and active devices, of IEC technical committee 86: Fibre optics. It is an International Standard.

This third edition cancels and replaces the second edition published in 2014. This edition constitutes a technical revision.

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

- a) addition of the equipment cord method;
- b) addition of test limit adjustment related to test cord grades;
- c) refinements on measurement uncertainties.

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

Draft	Report on voting
86C/1912/FDIS	86C/1916/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. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 61280 series, published under the general title *Fibre optic communication subsystem test procedures*, 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 webstore.iec.ch in the data related to the specific document. At this date, the document will be

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INTRODUCTION

~~This second edition of IEC 61280-4-2 for testing single-mode cable plant follows on from the second edition of IEC 61280-4-1, dealing with multimode cable plants.~~

This document is part of a series of IEC standards for measurements of installed fibre optic cabling plants. This document is applicable for the measurement of installed single-mode fibres.

Cabling design standards such as ISO/IEC 11801-1 ~~for commercial premises, ISO/IEC 24702 for industrial premises, ISO/IEC 24764 for data centres and ISO/IEC 15018 for residential cabling contain specifications~~ provide general requirements for this type of cabling. These standards support cabling lengths of up to 2 km for commercial premises and data centres and up to 10 km for industrial premises. ISO/IEC 14763-3, which supports ~~these design standards, makes reference to the test methods of this standard~~ ISO/IEC 11801-1, normatively references IEC 61280-4-2.

Various recommendations from ITU-T have requirements for longer distance applications, including short haul (40 km), long haul (80 km), and ultra-long haul (160 km). The testing of ~~cable~~ cabling plant for these applications is covered in ITU-T Recommendation G.650.3, which refers to the test methods of this document.

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FIBRE-OPTIC COMMUNICATION SUBSYSTEM TEST PROCEDURES –

Part 4-2: Installed ~~cable~~ cabling plant – Single-mode attenuation and optical return loss measurements

1 Scope

This part of IEC 61280 is applicable to the measurements of attenuation and optical return loss of an installed optical fibre ~~cable~~ cabling plant using single-mode fibre. This ~~cable~~ cabling plant can include single-mode optical fibres, connectors, adapters, splices, and other passive devices. The cabling ~~may~~ can be installed in a variety of environments including residential, commercial, industrial and data centre premises, as well as outside plant environments.

This document ~~may be applied~~ is applicable to all single-mode fibre types including those designated by IEC 60793-2-50 as Class B fibres.

The principles of this document ~~may~~ can be applied to ~~cable~~ cabling plants containing branching devices (splitters) and at specific wavelength ranges in situations where passive wavelength selective components are deployed, such as WDM, CWDM and DWDM devices.

This document is not intended to apply to ~~cable~~ cabling plants that include active devices such as fibre amplifiers or dynamic channel equalizers.

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 60793-2-50, Optical fibres – Part 2-50: Product specifications – Sectional specification for class B single-mode fibres~~

IEC 60825-2, *Safety of laser products – Part 2: Safety of optical fibre communication systems (OFCSs)*

~~IEC 60874-14-2, Connectors for optical fibres and cables – Part 14-2: Detail specification for fibre optic connector type SC-PC tuned terminated to single-mode fibre type B1~~

~~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 61300-3-35, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-35: Examinations and measurements – Fibre optic cylindrical connector endface Visual inspection of fibre optic connectors and fibre-stub transceivers*

IEC 61315, *Calibration of fibre-optic power meters*

IEC 61746-1:2009, *Calibration of optical time-domain reflectometers (OTDR) – Part 1: OTDR for single-mode fibres*

IEC TR 62627-01, *Fibre optic interconnecting devices and passive components – Part 01: Fibre optic connector cleaning methods*

3 Terms, definitions, graphical symbols 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 adapter

~~female part of a connector in which one or two plugs are inserted and aligned~~

~~[SOURCE: IEC TR 61931:1998, 2.6.4]~~

device that enables interconnection between terminated optical fibre cables

3.1.2 attenuation

~~measure of the reduction of optical power transmitted through the cabling under test~~

~~Note 1 to entry: Attenuation (L) is determined as the ratio of the input power (P_{in}) to output power (P_{out}) of the cabling under test, given as~~

$$~~L = 10 \times \log_{10} \times (P_{in}/P_{out})~~$$

~~Alternatively attenuation may be expressed as $L = -10 \times \log_{10} \times (P_{out}/P_{in})$. Both equations are mathematically equivalent, resulting in positive decibel values.~~

~~Note 2 to entry: Loss and attenuation are equivalent.~~

reduction of optical power induced through a medium like cabling given as A :

$$A = 10 \times \log_{10} (P_{in}/P_{out})$$

where

P_{in} and P_{out} are the power, typically measured in mW, into and out of the cabling

Note 1 to entry: Attenuation is expressed in dB.

Note 2 to entry: Alternatively, attenuation can be expressed as $A = -10 \times \log_{10} (P_{out}/P_{in})$. Both formulae are mathematically equivalent, resulting in positive decibel values.

3.1.3 bi-directional measurement

two measurements of the same optical fibre made by launching light into opposite ends of that fibre

3.1.4 configuration

form or arrangement of parts or elements such as terminations, connections, and splices