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

**Procédures d'essai des sous-systèmes de télécommunication fibroniques –
Partie 4-2: Installations câblées – Mesures de l'affaiblissement de réflexion
optique et de l'affaiblissement des fibres unimodales**

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CONTENTS

FOREWORD.....	8
INTRODUCTION.....	10
1 Scope.....	11
2 Normative references	11
3 Terms, definitions, graphical symbols and abbreviated terms.....	12
3.1 Terms and definitions.....	12
3.2 Graphical symbols	14
3.3 Abbreviated terms.....	16
4 Measurement methods	16
4.1 General.....	16
4.1.1 Document structure	16
4.1.2 Attenuation	17
4.1.3 Optical return loss	17
4.2 Cabling configurations and applicable test methods	18
4.2.1 Cabling configurations and applicable test methods for attenuation measurements.....	18
4.2.2 Cabling configurations and applicable test methods for optical return loss measurements.....	22
5 Overview of uncertainties for attenuation measurements	22
5.1 General.....	22
5.2 Sources of significant uncertainties.....	22
5.3 Consideration of the power meter	22
5.4 Consideration of test cord and connector grade	23
5.4.1 General	23
5.4.2 Mode field diameter variation.....	23
5.5 Reflections from other interfaces.....	23
5.6 Optical source.....	24
5.7 Output power reference	24
5.8 Bi-directional measurements.....	24
5.9 Typical uncertainties for attenuation methods A, B, C, and D.....	24
5.10 Typical uncertainty values for single-mode attenuation testing for method E	26
6 Apparatus.....	26
6.1 General.....	26
6.2 Light source	26
6.2.1 Stability	26
6.2.2 Spectral characteristics	27
6.3 Launch cord.....	28
6.4 Receive or tail cords	28
6.5 Substitution cord.....	28
6.6 Power meter – LSPM methods only.....	28
6.7 OTDR apparatus.....	29
6.8 Return loss test set.....	29
6.9 Connector end-face cleaning and inspection equipment.....	30
6.10 Adapters	30
7 Procedures.....	31
7.1 General.....	31
7.2 Common procedures.....	31

7.2.1	Care of the test cords	31
7.2.2	Make reference measurements (LSPM and OCWR methods only)	31
7.2.3	Inspect and clean the ends of the fibres in the cabling	31
7.2.4	Make the measurements	32
7.2.5	Make the calculations	32
7.3	Calibration	32
7.4	Safety	32
8	Calculations	32
9	Documentation	32
9.1	Information for each test	32
9.2	Information to be made available	33
Annex A	(normative) One-cord reference method	34
A.1	Applicability of test method	34
A.2	Apparatus	34
A.3	Procedure	34
A.4	Calculation	35
A.5	Components of reported attenuation	36
Annex B	(normative) Three-cord reference method	37
B.1	Applicability of test method	37
B.2	Apparatus	37
B.3	Procedure	37
B.4	Calculations	38
B.5	Components of reported attenuation	38
Annex C	(normative) Two-cord reference method	39
C.1	Applicability of test method	39
C.2	Apparatus	39
C.3	Procedure	39
C.4	Calculations	41
C.5	Components of reported attenuation	41
Annex D	(normative) Equipment cord method	42
D.1	Applicability of the test method	42
D.2	Apparatus	42
D.3	Procedure	42
D.4	Calculation	43
D.5	Components of reported attenuation	44
Annex E	(normative) Optical time domain reflectometer	45
E.1	Applicability of test method	45
E.2	Apparatus	45
E.2.1	General	45
E.2.2	OTDR	45
E.2.3	Test cords	45
E.3	Procedure (test method)	46
E.4	Calculation of attenuation	47
E.4.1	General	47
E.4.2	Connection location	47
E.4.3	Definition of the power levels F_1 and F_2	48
E.4.4	Alternative calculation	49
E.5	Calculation of optical return loss	51

E.6	Calculation of reflectance for discrete components	53
E.7	OTDR uncertainties	55
Annex F (normative)	Continuous wave optical return loss measurement – Method A.....	56
F.1	Applicability of test method	56
F.2	Apparatus	56
F.2.1	General	56
F.2.2	Light source.....	56
F.2.3	Branching device or coupler	56
F.2.4	Power meters	57
F.2.5	Connector interface	57
F.2.6	Low reflection termination.....	57
F.3	Procedure	57
F.3.1	Test set characterization.....	57
F.3.2	Measurement procedure	59
F.3.3	Calculations.....	59
Annex G (normative)	Continuous wave optical return loss measurement – Method B.....	61
G.1	Applicability of test method	61
G.2	Apparatus	61
G.2.1	General requirements	61
G.2.2	Known reflectance termination.....	61
G.3	Procedure	62
G.3.1	Set-up characterization.....	62
G.3.2	Measurement procedure	62
G.3.3	Calculation	63
Annex H (normative)	On the use of reference-grade test cords	64
H.1	General.....	64
H.2	Practical configurations and assumptions.....	64
H.2.1	Component specifications	64
H.2.2	Conventions	65
H.2.3	Reference planes	65
H.3	Impact of using reference-grade test cords for recommended LSPM methods.....	66
H.4	Examples for LSPM measurements.....	66
H.4.1	Example 1 (configuration A, one-cord method, Annex A)	66
H.4.2	Example 2 (configuration B, three-cord method, Annex B)	67
H.4.3	Example 3 (configuration C, two-cord method, Annex C)	67
H.4.4	Example 4 – Long haul system (one-cord reference method).....	68
H.5	Impact of using reference-grade test cords for different configurations using the OTDR test method	68
H.5.1	Cabling configurations A, B and C	68
H.5.2	Cabling configuration D	69
Annex I (informative)	OTDR configuration information.....	71
I.1	Introductory remarks	71
I.2	Fundamental parameters that define the operational capability of an OTDR.....	72
I.2.1	Dynamic range	72
I.2.2	Dynamic margin.....	72
I.2.3	Pulse width.....	72
I.2.4	Averaging time	72
I.2.5	Dead zone	72
I.3	Other parameters.....	73

1.3.1	Index of refraction.....	73
1.3.2	Measurement range.....	73
1.3.3	Distance sampling.....	73
1.4	Other measurement configurations.....	73
1.4.1	General.....	73
1.4.2	Macrobend attenuation measurement.....	73
1.4.3	Splice attenuation measurement.....	74
1.4.4	Measurement with high reflection connectors or short length cabling.....	74
1.4.5	Ghost.....	76
1.5	More on the measurement method.....	77
1.6	Bi-directional measurement.....	78
1.7	OTDR bi-directional trace analysis.....	79
1.8	Non-recommended practices.....	80
1.8.1	Measurement without tail cord.....	80
1.8.2	Two cursors measurement.....	80
Annex J (informative)	Test cord attenuation verification.....	81
J.1	Introductory remarks.....	81
J.2	Apparatus.....	81
J.3	Procedure.....	81
J.3.1	General.....	81
J.3.2	Test cord verification for the one-cord and two-cord reference test methods when using non-pinned or unpinned and non-plug or socket style connectors.....	82
J.3.3	Test cord verification for the one-cord and two-cord reference test methods using pinned-to-unpinned or plug-to-socket style connectors.....	83
J.3.4	Test cord verification for the three-cord reference test method using non-pinned or unpinned and non-plug or socket style connectors.....	85
J.3.5	Test cord verification for the three-cord reference test method using pinned-to-unpinned or plug-to-socket style connectors.....	87
Annex K (informative)	Spectral attenuation measurement.....	89
K.1	Applicability of test method.....	89
K.2	Apparatus.....	89
K.2.1	Broadband light source.....	89
K.2.2	Optical spectrum analyser.....	89
K.3	Procedure.....	90
K.3.1	Reference scan.....	90
K.3.2	Measurement scan.....	90
K.4	Calculations.....	90
Bibliography.....		91
Figure 1 – Connector symbols.....		15
Figure 2 – Symbol for cabling under test.....		16
Figure 3 – Configuration A – Start and end of measured attenuations in RTM.....		19
Figure 4 – Configuration B – Start and end of measured attenuations in RTM.....		20
Figure 5 – Configuration C – Start and end of measured attenuations in RTM.....		20
Figure 6 – Configuration D – Start and end of measured attenuations in RTM.....		21
Figure 7 – Typical OTDR schematic diagram.....		29
Figure 8 – Illustration of return loss test set.....		30

Figure A.1 – One-cord reference measurement.....	35
Figure A.2 – One-cord test measurement.....	35
Figure B.1 – Three-cord reference measurement	37
Figure B.2 – Three-cord test measurement	38
Figure C.1 – Two-cord reference measurement.....	40
Figure C.2 – Two-cord test measurement.....	40
Figure C.3 – Two-cord test measurement for plug-to-socket style connectors	40
Figure D.1 – Reference measurement.....	43
Figure D.2 – Test measurement.....	43
Figure E.1 – Test measurement for OTDR method	47
Figure E.2 – Location of the cabling under test ports	48
Figure E.3 – Graphic construction of F_1 and F_2	49
Figure E.4 – Graphic construction of F_1 , F_{11} , F_{21} and F_2	51
Figure E.5 – Graphic representation of OTDR ORL measurement.....	53
Figure E.6 – Graphic representation of reflectance measurement	54
Figure F.1 – Return loss test set illustration	56
Figure F.2 – Measurement of the system internal attenuation P_{ref2}	58
Figure F.3 – Measurement of the system internal attenuation P_{ref1}	58
Figure F.4 – Measurement of the system reflected power P_{rs}	58
Figure F.5 – Measurement of the input power P_{in}	59
Figure F.6 – Measurement of the reflected power P_r	59
Figure G.1 – Return loss test set illustration	61
Figure G.2 – Measurement of P_{rs} with reflections suppressed	62
Figure G.3 – Measurement of P_{ref} with reference reflector.....	62
Figure G.4 – Measurement of the system reflected power P_{rs}	63
Figure G.5 – Measurement of the reflected power P_r	63
Figure H.1 – Cabling configurations A, B and C tested with the OTDR method.....	68
Figure H.2 – Cabling configuration D tested with the OTDR method.....	70
Figure I.1 – Splice and macrobend attenuation measurement	74
Figure I.2 – Attenuation measurement with high reflection connectors	75
Figure I.3 – Attenuation measurement of a short length cabling	76
Figure I.4 – OTDR trace with ghost	77
Figure I.5 – Cursor positioning	78
Figure I.6 – Bi-directional OTDR trace display	79
Figure I.7 – Bi-directional OTDR trace attenuation analysis	80
Figure J.1 – Obtaining reference power level P_0	83
Figure J.2 – Obtaining power level P_1	83
Figure J.3 – Obtaining reference power level P_0	84
Figure J.4 – Obtaining power level P_1	84
Figure J.5 – Obtaining reference power level P_0	85

Figure J.6 – Obtaining power level P_1	85
Figure J.7 – Obtaining reference power level P_0	86
Figure J.8 – Obtaining power level P_1	87
Figure J.9 – Obtaining power level P_6	87
Figure J.10 – Obtaining reference power level P_0	88
Figure J.11 – Obtaining power level P_1	88
Figure K.1 – Result of spectral attenuation measurement	90
Table 1 – Cabling configurations	18
Table 2 – Test methods and configurations	21
Table 3 – Test limit adjustment and uncertainty related to test cord connector grade	23
Table 4 – Uncertainty for given fibre length and attenuation at 1 310 nm, 1 550 nm and 1 625 nm	25
Table 5 – Uncertainty for a given fibre length at 1 310 nm and 1 550 nm using an OTDR	26
Table 6 – Spectral requirements	27
Table E.1 – Typical launch and tail cord lengths	46
Table H.1 – Expected attenuation for examples	65
Table H.2 – Test limit adjustment when using reference-grade test cords	66
Table H.3 – Test limit adjustment when using reference-grade test cords – OTDR test method	69
Table I.1 – Example of effective group index of refraction values	73

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIBRE-OPTIC COMMUNICATION SUBSYSTEM TEST PROCEDURES –**Part 4-2: Installed 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 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 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 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 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 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 cabling plant using single-mode fibre. This cabling plant can include single-mode optical fibres, connectors, adapters, splices, and other passive devices. The cabling can be installed in a variety of environments including residential, commercial, industrial and data centre premises, as well as outside plant environments.

This document 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 can be applied to 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 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 60825-2, *Safety of laser products – Part 2: Safety of optical fibre communication systems (OFCSS)*

IEC 61300-3-35, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-35: Examinations and measurements – 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

device that enables interconnection between terminated optical fibre cables

3.1.2

attenuation

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

3.1.5

connector

component normally attached to an optical cable or piece of apparatus, for the purpose of providing frequent optical interconnection/disconnection of optical fibres or cables

[SOURCE: IEC TR 61931:1998, 2.6.1, modified – The words in brackets, "(optical) (fibre)", have been omitted from the term.]

3.1.6

light source and power meter

LSPM

test system consisting of a light source (LS), power meter (PM) and associated test cords used to measure the attenuation of an installed cabling plant