

INTERNATIONAL STANDARD

**Fibre optic interconnecting devices and passive components – Basic test and measurement procedures –
Part 3-7: Examinations and measurements – Wavelength dependence of attenuation and return loss of single mode components**

IEC 61300-3-7:2021

<https://standards.iteh.ai/catalog/standards/iec/684f0a41-c55d-48cd-bb5f-f04b18655b57/iec-61300-3-7-2021>





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**FIBRE OPTIC INTERCONNECTING DEVICES
AND PASSIVE COMPONENTS –
BASIC TEST AND MEASUREMENT PROCEDURES –****Part 3-7: Examinations and measurements – Wavelength dependence
of attenuation and return loss of single mode components**

FOREWORD

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IEC 61300-3-7 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics. It is an International Standard.

This third edition cancels and replaces the second edition published in 2009. This edition constitutes a technical revision.

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

- a) reduction of the number of alternative methods proposed to bring in-line with industry practice;
- b) re-statement of the equations for insertion loss and return loss using logarithmic forms more common in the industry;
- c) additional recommendations with respect to the creation of fibre terminations;

- d) additional discussion on the characterization of the optical sources used in this document;
- e) simplification of bi-directional testing;
- f) removal of separate return loss only measurement procedures.

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

Draft	Report on voting
86B/4337/CDV	86B/4425A/RVC

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/standardsdev/publications.

A list of all parts in the IEC 61300 series, published under the general title *Fibre optic interconnecting devices and passive components – Basic test and measurement 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 "<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
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FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – BASIC TEST AND MEASUREMENT PROCEDURES –

Part 3-7: Examinations and measurements – Wavelength dependence of attenuation and return loss of single mode components

1 Scope

This part of IEC 61300-3 describes methods available to measure the wavelength dependence of attenuation and return loss of two-port, single mode passive optical components. It is not, however, applicable to dense wavelength division multiplexing (DWDM) devices. Measurement methods of wavelength dependence of attenuation of DWDM devices are described in IEC 61300-3-29.

There are two measurement cases described in this document:

- a) measurement of attenuation only;
- b) measurement of attenuation and return loss at the same time.

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 60050-731, *International Electrotechnical Vocabulary (IEV) – Part 731: Optical fibre communication* (available at www.electropedia.org)

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

IEC 61755-2-4, *Fibre optic interconnecting devices and passive components – Connector optical interfaces – Part 2-4: Connection parameters of non-dispersion shifted single-mode physically contacting fibres – Non-angled for reference connection applications*

IEC 61755-2-5, *Fibre optic interconnecting devices and passive components – Connector optical interfaces – Part 2-5: Connection parameters of non-dispersion shifted single-mode physically contacting fibres – Angled for reference connection applications*

IEC TR 61931, *Fibre optic – Terminology*

IEC 62074-1, *Fibre optic interconnecting devices and passive components – Fibre optic WDM devices – Part 1: Generic specification*

3 Terms, definitions, abbreviated terms and quantity symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-731, IEC TR 61931 and IEC 62074-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>.

3.2 Abbreviated terms

APC	angled physical contact
ASE	amplified spontaneous emission
BBD	broadband detector
BBS	broadband light source
BD	branching device
BPON	broadband passive optical network
CC	coherent control
CWDM	coarse wavelength division multiplexing
DFB	distributed feedback
DOP	degree of polarization
DUT	device under test
DWDM	dense wavelength division multiplexing
ECL	external cavity laser
EDFA	erbium doped fibre amplifier
EDFL	erbium doped fibre laser
EPON	ethernet passive optical network
FBG	fibre Bragg grating
FEC	forward error correction
FP	Fabry-Perot
GPON	gigabit Ethernet passive optical network
IR	infra-red
LD	laser diode
LED	light emitting diode
NLS	narrow band light source
OADM	optical add drop multiplexer
OFA	optical fibre amplifier
OPM	optical power meter
OSA	optical spectrum analyzer
PDL	polarization dependent loss
PON	passive optical network
RA	reference adapter
RBD	reference branching device
RBW	resolution bandwidth
RL	return loss
RP	reference plug
RTM	reference test method
SLED	super light emitting diode
SMSR	side mode suppression ratio

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SOP	state of polarization
SSE	source spontaneous emission
TJ	temporary joint
TLS	tuneable laser source
TND	tuneable narrow band detection
TNLS	tuneable narrow band light source
UV	ultra violet
WDM	wave division multiplexing

3.3 Quantity symbols

λ_k	array of n ($k = 1$ to n) wavelengths to be measured, expressed in nm
$P_i(\lambda_k)$	input optical power to the device under test (DUT) of the k^{th} wavelength to be measured, expressed in dBm
$P_t(\lambda_k)$	output optical power from the output port of the DUT of the k^{th} wavelength to be measured, expressed in dBm
$P_r(\lambda_k)$	output optical power at the input port of the DUT propagating away from the input port of the k^{th} wavelength to be measured, expressed in dBm
$P_r'(\lambda_k)$	output optical power at the branching port of the reference branching device (RBD) propagating away from the input port of the RBD of the k^{th} wavelength to be measured, expressed in dBm
$A(\lambda_k)$	attenuation of the DUT at k^{th} wavelength, expressed in dB
$RL(\lambda_k)$	return loss of the DUT at k^{th} wavelength, expressed in dB
$RL^*(\lambda_k)$	calculated return loss of the DUT at k^{th} wavelength corrected for measurement apparatus RL, expressed in dB
$RL_0(\lambda_k)$	return loss of the measurement apparatus at k^{th} wavelength, expressed in dB

4 General description

4.1 General

Attenuation, $A(\lambda_k)$, is the relative decrease of transmitted optical power due to the insertion or addition of a component within a fibre-optic system. Return loss, $RL(\lambda_k)$, is the relative optical power reflected from a component inserted within a fibre-optic system. $A(\lambda_k)$ and $RL(\lambda_k)$ are expressed in decibels (dB) and are obtained by comparing the optical power incident on the DUT with the optical powers transmitted or reflected at the ports of the DUT. These terms are defined in IEC TR 61931.

4.2 Light source and detector conditions

$A(\lambda_k)$ and $RL(\lambda_k)$ are measured over a wavelength range defined by the DUT specifications. The spectral properties of the measurement system should be selected for the measurement of the attenuation performance specification of the DUT. These properties should include:

- wavelength setting resolution (wavelength difference between two adjacent data points);
- wavelength setting uncertainty;
- 3 dB spectral bandwidth of the light source or the tuneable narrowband detector (TND);
- source spontaneous emission (SSE) noise floor relative to peak power for the light source;
- degree of polarization (DOP).