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BSI Standards Publication

Guidance for the interpretation of OTDR backscattering traces for single-mode fibres

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The UK participation in its preparation was entrusted to Technical Committee GEL/86/1, Optical fibres and cables.

A list of organizations represented on this committee can be obtained on request to its secretary.

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TECHNICAL REPORT

colour inside

Guidance for the interpretation of OTDR backscattering traces for single-mode fibres

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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GUIDANCE FOR THE INTERPRETATION OF OTDR BACKSCATTERING TRACES FOR SINGLE-MODE FIBRES

FOREWORD

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IEC TR 62316, which is a Technical Report, 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 2007. It constitutes a technical revision.

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

a) the scope has been extended to include single-mode fibres;

a) backscattered power effects are discussed in case of unidirectional trace, including so-called losers and gainers.

b) example of apparent splice loss evaluation for unidirectional OTDR measurements has been added:

c) description of launch and tail cords have been added;

d) figures have been improved.

The text of this Technical Report is based on the following documents:

Enquiry draft	Report on voting
86A/1754/DTR	86A/1768A/RVC

Full information on the voting for the approval of this technical report 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.

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- withdrawn,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.

A bilingual version of this publication may be issued at a later date.

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GUIDANCE FOR THE INTERPRETATION OF OTDR BACKSCATTERING TRACES FOR SINGLE-MODE FIBRES

1 Scope

IEC 62316, which is a Technical Report, aims to provide guidelines for the interpretation of backscattering traces, as obtained by traditional optical time domain reflectometers (OTDRs) – not including polarization OTDRs – for single-mode fibres. Also, backscattered power effects are discussed in case of unidirectional trace.

Full description of the test measurement procedure can be found in Annex C of IEC 60793-1-40:2001.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

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

4 Backscattering phenomenon

4.1 Rayleigh scattering

Rayleigh scattering or backscattering originates from fluctuations in the density, and hence in the index of refraction, of the material constituting the wave-guide; optical fibres are made of amorphous silica, and density fluctuations are a consequence of the manufacturing process.

4.2 Fresnel reflections and dead zone fibres

When a light ray reaches a surface at an angle of incidence from the normal to that surface and that surface separates two media of different index of refraction, part of this light ray is refracted in the second medium and part of it is reflected backward into the first medium. This is the Fresnel reflection, which can be very high, depending on the difference in the index of refraction of the two media, on the aspect of the surface, the surface roughness, the angle of incidence and the surface defects. In most situations, strong Fresnel reflections cause non-linearities at the receiver. These non-linearities can overload the receiver resulting in signal clipping, pulse widening, tailing, and ghosts. The corresponding section of the optical time domain reflectometer (OTDR) trace following the intense Fresnel reflection defines the deadzone. This particular deadzone should not be confused with the manufacturer's specification, always defined with a narrow pulse and small Fresnel reflection. The effect of the strong reflection on the deadzone is usually resolved by cleaning the connector responsible for the reflection. The so-called deadzone eliminator (adding a length of fibre after a strong reflection) does not reduce the deadzone nor the strong reflection. It artificially moves the virtual bulkhead connector to another location and assumes the following connector has a low reflection. Depending on the type of photodetector used in the receiver, the tailing due to a strong reflection can be greater than the fibre length inserted between the OTDR and the fibre under test.