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TECHNICAL REPORT

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Guidance for the interpretation of OTDR backscattering traces

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CONTENTS

FOREWORD.....	3
1 Scope.....	5
2 Normative references	5
3 Backscattering phenomenon.....	5
3.1 Rayleigh scattering.....	5
3.2 Fresnel reflections and dead zone fibres	5
4 Measurement of the backscattered power (OTDR).....	6
4.1 Representation of the backscattered power	6
4.2 Noise and perturbations	7
5 Interpretation of a backscattering trace.....	7
5.1 Unidirectional trace	7
5.2 Bi-directional trace	9
6 Uncertainties, deviation and resolution	12
6.1 Attenuation coefficient measurements	12
6.2 Fault locations.....	12
Bibliography.....	14
Figure 1 – Unidirectional OTDR trace	7
Figure 2 – OTDR traces for fibres with different MFD.....	11
Figure 3 – Schematic drawing of a fibre with two consecutive defects 1 and 2	13

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GUIDANCE FOR THE INTERPRETATION OF OTDR BACKSCATTERING TRACES

FOREWORD

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IEC 62316, which is a technical report, has been prepared by subcommittee 86A: Fibres and Cables, of IEC technical committee 86: Fibre optics.

This second edition cancels and replaces the first edition published in 2003. It constitutes a technical revision. In this edition,

- polarization effects are discussed in case of unidirectional trace;
- a new clause dealing with uncertainties, deviation and resolution has been introduced.

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The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
86A/1090/DTR	86A/1114/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 publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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

GUIDANCE FOR THE INTERPRETATION OF OTDR BACKSCATTERING TRACES

1 Scope

This Technical Report provides guidelines for the interpretation of backscattering traces, as obtained by an optical time domain reflectometer (OTDR).

A full description of the test measurement procedure can be found in Annex C of IEC 60793-1-40.

2 Normative References

The following referenced documents are indispensable for the application 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*

3 Backscattering phenomenon

3.1 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.

3.2 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 some situations, the detected Fresnel reflection is very intense, which can bring the receiver to saturation (flat response vs. time). The corresponding section of the OTDR trace defines the so-called dead zone, i.e. a length of the fibre where the backscattered signal is lower than the reflector's saturated signal, hence not detectable and visible on the OTDR trace. The effect of the dead-zone connected to the Fresnel reflection at the input end of the fibre is often reduced by adopting a short length of a fibre positioned between the OTDR output and the fibre under test. This dead-zone or buffer fibre should preferably be at least one tenth (1/10, in m) of the OTDR pulse-width (in ns), e.g. for a 1 000 ns pulse the dead zone fibre should be ≥ 100 m long.