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Effective area measurements of single-mode optical fibres - Guidance

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IEC TR 62284 has been prepared by subcommittee 86A: Fibres and cables, of IEC technical committee 86: Fibre optics. It is a Technical Report.

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

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

a) improvement of the description of measurement details for B-657 fibre;
b) modification of the minimum distance between the fibre end and the detector for the direct far field scan (Annex A);
c) deletion of Annex H.

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

Draft	Report on voting
86A/2619/DTR	86A/2641/RVDTR

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 Technical Report 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.

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

– reconfirmed,
– withdrawn, or
– revised.

1 Scope

This document applies to single-mode optical fibres. Its object is to document the methods for measuring the effective area (A_{eff}) of these fibres.

It defines three methods of measuring A_{eff}. Information common to all the methods is found in the body of this document. Information specific to each method is found in the annexes. The three methods are:

a) direct far-field (DFF);

b) variable aperture in the far-field (VAMFF);

c) near-field (NF).

The reference method, used to resolve disputes, is method A, direct far-field.

Effective area is an optical attribute that is specified for single-mode fibres and used in system designs probably affected by the non-linear refractive index coefficient, n_2. There is agreement in both national and international standards bodies concerning the definition used in this document. Methods A, B, and C have been recognised as providing equivalent results, provided that good engineering is used in implementation.

The direct far-field is the reference method because it is the most direct method and is named as the reference method for mode field diameter in IEC 60793-1-45 and ITU-T Recommendation G.650.1.

A mapping function is a formula by which the measured results of one attribute are used to predict the value of another attribute on a given fibre. For a given fibre type and design, the mode field diameter (MFD) (IEC 60793-1-45) can be used to predict the effective area with a mapping function. A mapping function is specific to a particular fibre type and design. Mapping functions are generated by doing an experiment in which a sample of fibre is chosen to represent the spectrum of values of MFD and in which the fibres in the sample are measured for both MFD and A_{eff}. Linear regression can be used to determine the fitting coefficient, k, as defined by the following:

$$A_{\text{eff}} = k\pi\left(\frac{\text{MFD}}{2}\right)^2 \tag{1}$$

NOTE 1 Other mathematical models can be used if they are generally more accurate.

NOTE 2 See Annex E for more information.

2 Normative references

There are no normative references in this document.

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[11] ITU-T Recommendation G.650.1:2024, *Definition and test methods for linear, deterministic attributes of single-mode fibre and cable*

[12] ITU-T Recommendation G.650.2:2015, *Definitions and test methods for statistical and non-linear related attributes of single-mode fibre and cable*

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