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TECHNICAL REPORT

Fibre optic communication system design guides – Part 14: Determination of the uncertainties of attenuation measurements in fibre plants

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CONTENTS

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FIBRE OPTIC COMMUNICATION SYSTEM DESIGN GUIDES –

Part 14: Determination of the uncertainties of attenuation measurements in fibre plants

FOREWORD

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IEC 61282-14, which is a technical report, has been prepared by subcommittee 86C: Fibre optic systems and active devices, of IEC technical committee 86: Fibre optics.

This publication contains an attached file titled, "Supplemental Data for Section 8", in the form of an Excel spread sheet. This file is intended to be used as a complement and does not form an integral part of the standard.

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

Enquiry draft	Report on voting
86C/1339/DTR	86C/1351/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.

A list of all parts in the IEC 61282 series, published under the general title *Fibre-optic communication system design guides*, can be found on the IEC website.

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 stability date indicated on the IEC website 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- withdrawn,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.

The contents of the corrigendum of April 2016 have been included in this copy.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

The determination of the uncertainty of every measurement is a key activity, which should be performed by applying dedicated methods as extensively presented in reference documents such as ISO/IEC Guide 98-3:2008, Guide to the uncertainty of measurement (GUM).

This Technical Report shows a practical application of these methods for the determination of the measurement uncertainty of the attenuation of fibre optic cabling using optical light sources and power meters as defined in IEC 61280-4-1 and IEC 61280-4-2.

It includes the review of all contributing factors to uncertainty (such as launch conditions, spectral width, stability of source, power meter polarization, resolution, linearity, quality of test cord reference connectors, etc.) to determine the overall measurement uncertainty. The Technical Report applies to the measurement of single mode or multimode fibres without restrictions to the fibre parameters, including mode field diameter, core diameter and numerical aperture. However, numerical values given in Clause C.2 and typical values given in Annex D are not valid for multimode fibres types A2, A3 and A4.

The list of uncertainties presented in this Technical Report is related to this particular application and should be reconsidered if measurement conditions are not compliant to measurement requirements defined by IEC 61280-4-1 and 61280-4-2.

The reference document for general uncertainty calculations is ISO/IEC Guide 98-3:2008, and this report does not intend to replace it; it only represents an example and should be used in conjunction with ISO/IEC Guide 98-3:2008. A brief introduction to the determination of measurement uncertainty according to ISO/IEC Guide 98-3:2008 is given in Annex A.

This Technical Report is associated with a calculation spreadsheet (Excel) containing practical calculations.

FIBRE OPTIC COMMUNICATION SYSTEM DESIGN GUIDES –

Part 14: Determination of the uncertainties of attenuation measurements in fibre plants

1 Scope

This part of IEC 61282, which is a Technical Report, establishes the detailed analysis and calculation of the uncertainties related to the measurement of the attenuation of both multimode and single mode optical fibre cabling using optical light sources and power meters.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61280-4-1:2009, *Fibre-optic communication subsystem test procedures – Part 4-1: Installed cable plant – Multimode attenuation measurement*

IEC 61280-4-2:2014, *Fibre-optic communication subsystem test procedures – Part 4-2: Installed cable plant – Single-mode attenuation and optical return loss measurement*

ISO/IEC Guide 98-3:2008, *Uncertainty of measurement – Part 3 Guide to the expression of uncertainty in measurement (GUM:1995)*