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BSI Standards Publication

# Fibre optic communication system design guides

## Part 13: Guidance on in-service PMD and CD characterization of fibre optic links

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## National foreword

This Published Document is the UK implementation of IEC/TR 61282-13:2014.

The UK participation in its preparation was entrusted by Technical Committee GEL/86, Fibre optics, to Subcommittee GEL/86/3, Fibre optic systems and active devices.

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

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# TECHNICAL REPORT

colour inside

## Fibre optic communication system design guides – Part 13: Guidance on in-service PMD and CD characterization of fibre optic links

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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# FIBRE OPTIC COMMUNICATION SYSTEM DESIGN GUIDES –

## Part 13: Guidance on in-service PMD and CD characterization of fibre optic links

## FOREWORD

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IEC TR 61282-13, which is a technical report, has been prepared by subcommittee 86C: Fibre optic systems and active devices, of IEC technical committee 86: Fibre optics.

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

| Enquiry draft | Report on voting |
|---|---|
| 86C/1201/DTR | 86C/1236/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.

A list of all parts in the IEC 61280 series, published under the general title *Fibre-optic communication subsystem test procedures*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability 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- withdrawn,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.

# INTRODUCTION

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent concerning optical frequency-sensitive analyser given in 5.1.3.4 and concerning CD measurement using multi-tone probe signal given in 6.1.

IEC takes no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has assured the IEC that he/she is willing to negotiate licences either free of charge or under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with IEC. Information may be obtained from:

Exfo Electro-Optical Engineering Inc.
400 Avenue Grodin
QC G1M 2K2
CANADA

JDS Uniphase Corporation
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# FIBRE OPTIC COMMUNICATION SYSTEM DESIGN GUIDES –

# Part 13: Guidance on in-service PMD and CD characterization of fibre optic links

## 1 Scope

This part of IEC 61282, which is a technical report, presents general information about in-service measurements of polarization mode dispersion (PMD) and chromatic dispersion (CD) in fibre optic links. It describes the background and need for these measurements, the various methods and techniques developed thus far, and their possible implementations for practical applications.

## 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 60793-1-42, *Optical fibres – Part 1-42: Measurement methods and test procedures – Chromatic dispersion*

IEC 61280-4-4, *Fibre optic communication subsystem test procedures – Part 4-4: Cable plants and links– Polarization mode dispersion measurement for installed links*

## 3 Symbols, acronyms and abbreviated terms

| | |
|---|---|
| $D(\lambda)$ | group velocity dispersion coefficient at optical wavelength $\lambda$ |
| $F$ | frequency of amplitude modulation in CD measurement |
| $L$ | length of arc of the SOP rotation on the Poincaré sphere |
| $L_f$ | length of fibre or fibre link |
| $P_p$, $P_s$ | optical signal powers in two orthogonal SOPs |
| $\widehat{P}$ | normalized optical power |
| $\Delta\widehat{P}$ | normalized optical power difference |
| $S_1$ , $S_2$ , $S_3$ | Stokes parameter |
| $\hat{S}$ | normalized Stokes vector |
| $N$ | number of statistically independent effective DGD measurements |
| $N_t$ | number of statistically independent effective DGD measurements in time |
| $N_v$ | number of statistically independent signal wavelengths |
| $c$ | speed of light in vacuum |
| $\Delta f$ | optical frequency interval or spacing |
| $f$ | electrical signal frequency in dual-wavelength frequency generator |
| $f_{clock}$ | clock frequency of digital data modulation |
| $\Delta t$ | time interval between effective DGD measurements or differential time delay in CD measurement |