TECHNICAL REPORT

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Fibre optic communication system design guides –

Part 7:
Statistical calculation of chromatic dispersion

Guide de conception des systèmes de communications à fibres optiques –

Partie 7:
Calcul statistique de la dispersion chromatique

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FIBRE OPTIC COMMUNICATION SYSTEM DESIGN GUIDES –

Part 7: Statistical calculation of chromatic dispersion

FOREWORD

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IEC 61282-7, 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/429/DTR	86C/468/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 2009-12. At this date, the publication will be

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- withdrawn;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

FIBRE OPTIC COMMUNICATION SYSTEM DESIGN GUIDES –

Part 7: Statistical calculation of chromatic dispersion

1 Scope

This part of IEC 61282 is a guideline providing methods of representing the process statistics of the chromatic dispersion of optical fibres and related components that may be combined in a link.

Chromatic dispersion (ps/nm) is the derivative, with respect to wavelength, of the group delay (ps) induced by the spectral content of light propagating through an optical element or fibre. Chromatic dispersion is normally a function of wavelength and can be either positive (group delay increasing with wavelength) or negative (group delay decreasing with wavelength).

The presence of chromatic dispersion can induce distortions in signals leading to bit errors depending on

– source spectral width;
– source chirp;
– bit period;
– distance.

In addition, chromatic dispersion is interactive with the effects of non-linear optical effects and second order polarisation mode dispersion (PMD). The above system impairments are beyond the scope of this technical report.

When different components or fibres are combined, the chromatic dispersion of the combination is the total of the chromatic dispersion values of the individuals, on a wavelength-by-wavelength basis. A section with high chromatic dispersion will be balanced by sections with lower values. The variation in the total dispersion of links will therefore be dependent on the distributions of the products that are used in the link. This document provides methods to calculate the distribution statistics of concatenated links based on information on the distributions of different fibre or component populations.

NOTE In the clauses that follow, examples are given for particular fibre and component types. These examples are not necessarily broadly representative.

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

IEC 60793-2-50: *Optical fibres – Part 2-50: Product specifications – Sectional specification for class B single-mode fibres*

ITU-T Recommendation G.652: *Characteristics of a single-mode optical fibre cable*

ITU-T Recommendation G.655: *Characteristics of a non-zero dispersion shifted single-mode optical fibre cable*

ITU-T Recommendation G.671: *Transmission characteristics of optical components and subsystems*

ITU-T Recommendation G.691: *Optical interfaces for single-channel STM-64, STM-256 and other SDH systems with optical amplifiers*