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BSI Standards Publication

Fibre optic communication system design guides

Part 12: In-band optical signal-to-noise ratio (OSNR)

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National foreword

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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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Part 12: In-band optical signal-to-noise ratio (OSNR)

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FIBRE OPTIC COMMUNICATION SYSTEM DESIGN GUIDES –

Part 12: In-band optical signal-to-noise ratio (OSNR)

FOREWORD

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IEC 61282-12, 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/1341/DTR	86C/1364/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 61282 series, published under the general title *Fibre optic communication system design guides*, 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 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- withdrawn,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.

FIBRE OPTIC COMMUNICATION SYSTEM DESIGN GUIDES –

Part 12: In-band optical signal-to-noise ratio (OSNR)

1 Scope

The purpose of this part of IEC 61282, which is a Technical Report, is to provide a definition for in-band optical signal-to-noise ratio (OSNR) that is applicable to situations where the spectral noise power density is not independent of the optical frequency, as assumed in the OSNR definition of IEC 61280-2-9, but is significantly shaped across the optical bandwidth of the signal. Considering the development of multiple measurement methods for different use cases, as detailed below, it is desirable to establish a definition of in-band OSNR that is independent of the method used and, furthermore, is consistent with the OSNR definition of IEC 61280-2-9 in the case of frequency-independent noise power density.

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 61280-2-9:2009, *Fibre optic communication subsystem test procedures – Part 2-9: Digital systems – Optical signal-to-noise ratio measurement for dense wavelength-division multiplexed systems*

3 Terms and definitions

3.1
optical signal-to-noise ratio
OSNR
ratio of total signal power of an optical signal to the amplified spontaneous emission (ASE) noise power spectral density within the optical spectrum of the signal, wherein the power spectral density is normalized to a chosen reference bandwidth

Note 1 to entry: This definition is consistent with the one in subclause 3.1 of IEC 61280-2-9:2009, when the noise power spectral density is constant across the spectral range of the signal, but is used in this document as a generalized collective term for the following set of in-band OSNR definitions that have differing values when the noise power spectral density is not constant across the spectral range of the signal.

3.2
$OSNR_{int}$
spectrally integrated in-band optical signal-to-noise ratiospectrally integrated ratio of time-averaged power spectral density of a signal to the power spectral density of the amplified spontaneous emission (ASE) noise, normalized to a chosen reference bandwidth

Note 1 to entry: The spectrally-integrated in-band OSNR, R_{int}, is calculated as

$$R_{int} = \frac{1}{B_r}\int_{\lambda_1}^{\lambda_2} \frac{s(\lambda)}{\rho(\lambda)} d\lambda \qquad (1)$$

where:

$s(\lambda)$ is the time-averaged signal power spectral density, not including ASE, expressed in W/nm;

$\rho(\lambda)$ is the ASE power spectral density, independent of polarization, expressed in W/nm;