

TECHNICAL REPORT

**Fibre optic communication system design guides –
Part 12: In-band optical signal-to-noise ratio (OSNR)**



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

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CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references.....	6
3 Terms and definitions	6
4 Background	8
4.1 General.....	8
4.2 Higher spectral density of signals	9
4.3 Spectral filtering in wavelength-routing elements.....	10
4.4 Transmission of signals with multiple subcarriers	11
5 In-band OSNR measurement with spectrally shaped noise.....	12
5.1 Measurement of in-band ASE noise	12
5.2 In-band OSNR definitions	13
5.2.1 Background	13
5.2.2 Spectrally integrated in-band OSNR	13
5.2.3 In-band OSNR from averaged noise power spectral density	14
5.2.4 In-band OSNR from maximal noise power spectral density	14
5.2.5 In-band OSNR for individual optical subcarriers	15
5.3 Spectral shaping of ASE noise.....	15
5.3.1 General	15
5.3.2 Case (a): ASE noise shaped outside of the signal spectrum	15
5.3.3 Case (b): ASE noise shaped within the signal spectrum	16
5.3.4 Case (c): ASE noise shaping in a ROADM network	17
6 Guidelines for using the definitions	19
6.1 General.....	19
6.2 Wavelength integration range	20
6.3 Spectral resolution	22
7 In-band OSNR penalties of filtered signals	25
7.1 Scope of simulations	25
7.2 Results for 43 Gbit/s RZ-DQPSK	26
7.3 Results for 128 Gbit/s PM NRZ-QPSK	31
7.4 Results for 10 Gbit/s NRZ-OOK	31
7.5 Observations.....	31
Bibliography	33
Figure 1 – Optical power spectrum composed of a modulated signal and ASE noise.....	9
Figure 2 – Optical power spectrum of 50-GHz spaced 40 Gbit/s RZ-DQPSK signals with significant spectral overlap.....	10
Figure 3 – Optical power spectrum of 50-GHz spaced 10 Gbit/s NRZ-OOK signals after spectral filtering in ROADMs	11
Figure 4 – Optical power spectrum of a 400 Gbit/s optical "superchannel" comprised of four very densely spaced 100 Gbit/s PM-QPSK signals.....	11
Figure 5 – Power spectral density of a 10 Gbit/s signal with ASE noise that has been shaped by a relatively broad optical filter	16
Figure 6 – Power spectral densities of a broadband 40 Gbit/s signal and ASE noise which have been shaped by the same filter	17

Figure 7 – Variation of the in-band OSNR values R_{int} , R_{avg} and R_{max} versus filter bandwidth for the signal shown in Figure 6	17
Figure 8 – Optical power density spectra of signal and ASE noise after filtering in a ROADM network with intermediate amplification	18
Figure 9 – Variation of the in-band OSNR values R_{int} , R_{avg} and R_{max} versus number of filters for the signal shown in Figure 8	19
Figure 10 – Impact of integration range on R_{int} for 43 Gbit/s RZ-DPSK signals in a ROADM network	21
Figure 11 – Impact of instrument noise on $s(\nu)/\rho(\nu)$ for strongly filtered 10 Gbit/s NRZ-OOK signals	21
Figure 12 – Dependence of in-band OSNR on spectral resolution for 43 Gbit/s RZ-DQPSK signals	23
Figure 13 – Dependence of in-band OSNR on spectral resolution for 10 Gbit/s NRZ-OOK signals	24
Figure 14 – ROADM filter arrangements for OSNR penalty simulations	26
Figure 15 – In-band OSNR penalties for filtered 43 Gbit/s RZ-DQPSK signals	28
Figure 16 – In-band OSNR penalties for filtered 128 Gbit/s PM NRZ-QPSK signals	29
Figure 17 – In-band OSNR penalties for filtered 10 Gbit/s NRZ-OOK signals	30

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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

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- 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 ratio spectrally 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

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

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;