

Optical amplifiers — Test methods —

Part 10-1: Multichannel parameters — Pulse method using an optical switch and optical spectrum analyzer

The European Standard EN 61290-10-1:2003 has the status of a
British Standard

ICS 33.180.30

National foreword

This British Standard is the official English language version of EN 61290-10-1:2003. It is identical with IEC 61290-10-1:2003.

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, which has the responsibility to:

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 25 and a back cover.

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Amendments issued since publication

Amd. No.	Date	Comments

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 26 August 2003

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ISBN 0 580 42515 0

**Optical amplifiers -
Test methods
Part 10-1: Multichannel parameters -
Pulse method using an optical switch
and optical spectrum analyzer
(IEC 61290-10-1:2003)**

Amplificateurs optiques -
Méthodes d'essai
Partie 10-1: Paramètres à canaux
multiples -
Méthode d'impulsion utilisant
un interrupteur optique
et un analyseur de spectre optique
(CEI 61290-10-1:2003)

Prüfverfahren für Lichtwellenleiter-
Verstärker
Teil 10-1: Mehrkanalparameter -
Pulsmethode bei Verwendung
eines optischen Schalters
und optischen Spektralanalysators
(IEC 61290-10-1:2003)

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 86C/498/FDIS, future edition 1 of IEC 61290-10-1, prepared by SC 86C, Fibre optic systems and active devices, of IEC TC 86, Fibre optics, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61290-10-1 on 2003-05-01.

This standard shall be read in conjunction with EN 61291-1:1998 and EN 61290-3:2000

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2004-02-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2006-05-01

The International Electrotechnical Commission (IEC) and CENELEC draw attention to the fact that it is claimed that compliance with this International Standard/European Standard may involve the use of two patents.

One patent concerns a technique for determining the amplified spontaneous emission noise of an optical amplifier in the presence of an optical signal given in clause 3 and clause 5.

The IEC and CENELEC take 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 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 the IEC. Information may be obtained from:

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Another patent concerns a measurement system and noise measurement apparatus for an optical amplifier given in clause 3 and clause 5.

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Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annex ZA is normative and annexes A, B, and C are informative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61290-10-1:2003 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60793-1	NOTE	Harmonized in EN 60793-1 series (modified).
IEC 60825-1	NOTE	Harmonized as EN 60825-1:1994 (not modified).
IEC 60825-2	NOTE	Harmonized as EN 60825-2:2000 (not modified).
IEC 60874-1	NOTE	Harmonized as EN 60874-1:1999 (not modified).
IEC 61290-1-1	NOTE	Harmonized as EN 61290-1-1:1998 (not modified).

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INTRODUCTION

As far as can be determined, this part of IEC 61290 is the first International Standard on this subject. The technology of optical fibre amplifiers is quite new and still emerging, hence amendments and new editions to this document can be expected.

Each abbreviation introduced in this standard is explained in the text at least the first time it appears. However, for an easier understanding of the whole text, a list of abbreviations used in this International Standard is given in Annex A.

OPTICAL AMPLIFIERS – TEST METHODS –

Part 10-1: Multichannel parameters – Pulse method using an optical switch and optical spectrum analyzer

1 Scope and object

This part of IEC 61290 applies to optical fibre amplifiers (OFAs) using active fibres, containing rare-earth dopants, currently commercially available. It establishes uniform requirements for accurate and reliable measurements of the signal-spontaneous noise figure as defined in 3.1.18 of IEC 61291-1.

The test method independently detects amplified signal power and amplified spontaneous emission (ASE) power by launching optical pulses into the OFA under test and synchronously detecting “on” and “off” levels of the output pulses by using an optical sampling switch and an optical spectrum analyzer (OSA).

Such a measurement is possible because the gain response of the rare-earth doped OFA is relatively slow, particularly in Er-doped OFAs. However, since the OFA gain dynamics vary with amplifier types, operating conditions and control scheme, the amplifier type should be considered when applying the present test method.

The test method is described basically for multichannel applications, which includes single channel applications as a special case of multichannel (wavelength-division multiplexed) applications.

NOTE All numerical values followed by (‡) are intended to be currently under study.

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 61290-3, *Optical fibre amplifiers – Basic specification – Part 3: Test methods for noise figure parameters*

IEC 61291-1, *Optical fibre amplifiers – Part 1: Generic specification*

3 Apparatus

The basic measurement set-up is given in Figure 1.

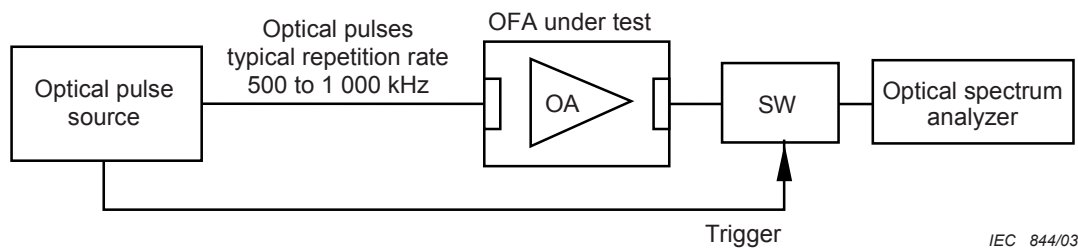


Figure 1 – Typical arrangement of the optical pulse test method

The test equipment needed, with the required characteristics, is listed below.

- a) *Optical pulse source*: Two arrangements of the optical pulse source are possible as shown in Figure 2. Optical pulse source *a* (Figure 2a) consists of CW optical sources with an external optical switch and attenuator(s). Optical pulse source *b* (Figure 2b) consists of directly modulated optical sources and attenuator(s).

Optical pulse source *a*

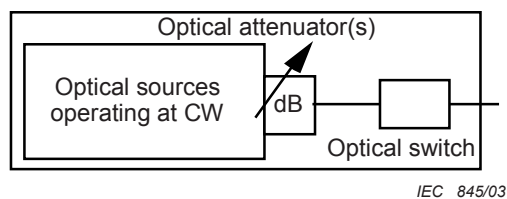


Figure 2a – Pulse source consisting of CW optical sources with an external optical switch and attenuator(s)

Optical pulse source *b*

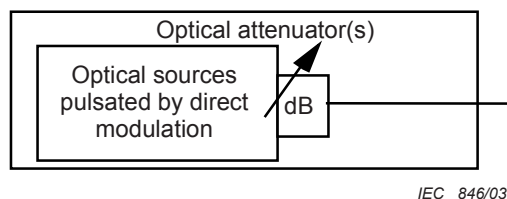


Figure 2b – Pulse source consisting of directly modulated optical sources and attenuator(s)

Figure 2 – Two arrangements of the optical pulse source

Unless otherwise specified, the full width at half maximum (FWHM) of the output spectrum of optical pulse source *a* or *b* shall be narrower than 0,1 nm(±)¹ so as not to cause any interference to adjacent channels. In the case of a single-channel source, it shall be narrower than 1 nm (±). Distributed feedback (DFB) lasers, distributed Bragg reflection (DBR) lasers, and external cavity lasers (ECLs), for example, are applicable. The suppression ratio of the side modes of these DFB lasers shall be higher than 30 dB(±). The output power fluctuation shall be less than 0,05 dB(±), which may be more easily attainable with an optical isolator placed at the output port of each source.

¹ See note in Clause 1.