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DRAFT TANZANIA STANDARD

(Draft for comments only)

Optical amplifiers - Test methods - Part 1: Power and gain parameters

TANZANIA BUREAU OF STANDARDS

1 National Foreword

This draft Tanzania Standard is being prepared by the Telecommunications and Information Technology Technical Committee, under the supervision of the Electrotechnical divisional standards committee (EDC)

This draft Tanzania Standard is an adoption of the International Standard **IEC61290-1** Optical amplifiers - Test methods - Part 1: Power and gain parameters, Which has been prepared by the International Organization for Standardization together with International Electrotechnical Commission

2 Terminology and conventions

Some terminologies and certain conventions are not identical with those used in Tanzania standards; attention is drawn especially to the following: -

- 1) The comma has been used as a decimal marker for metric dimensions. In Tanzania Standards, it is current practice to use “full point” on the baseline as the decimal marker.
- 2) Where the words “International Standard(s)” appear, referring to this standard they should read “Tanzania Standard(s)”.

INTERNATIONAL STANDARD



**Optical amplifiers – Test methods –
Part 1: Power and gain parameters**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPTICAL AMPLIFIERS – TEST METHODS – Part

1: Power and gain parameters FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
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- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 61290-1:2014. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 61290-1 has been prepared by subcommittee 86C: Fibre optic systems and active devices, of IEC technical committee 86: Fibre optics. It is an International Standard.

This second edition cancels and replaces the first edition published in 2014. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) specification of gain ripple as a new parameter;
- b) specification of test method and test report for gain ripple measurements;
- c) use of the term “measurement uncertainty” instead of “measurement accuracy”.

The text of this International Standard is based on the following documents:

Draft	Report on voting
86C/1746/FDIS	86C/1783/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 61290 series, published under the general title *Optical amplifiers – Test methods*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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

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OPTICAL AMPLIFIERS – TEST METHODS –

Part 1: Power and gain parameters

1 Scope

This part of IEC 61290 applies to all commercially available optical amplifiers (OAs) and optically amplified subsystems. It applies to OAs using optically pumped fibres (optical fibre amplifiers (OFAs) based on either rare-earth doped fibres or on the Raman effect), semiconductors (semiconductor optical amplifiers (SOAs)), and waveguides (planar optical waveguide amplifiers (POWAs)). It is specifically directed to single -channel amplifiers. Test methods for multichannel amplifiers are defined in the IEC 61290-10 series.

This document establishes uniform requirements for accurate and reliable measurements of the following OA parameters, as defined in IEC 61291-1:2018, Clause 3:

- a) nominal output signal power;
- b) gain;
- c) reverse gain;
- d) maximum gain;
- e) maximum gain wavelength;
- f) maximum gain variation with temperature;
- g) gain wavelength band;
- h) gain wavelength variation;
- i) gain stability;
- j) polarization-dependent gain;
- k) gain ripple (SOA only);
- l) large-signal output stability;
- m) saturation output power;
- n) maximum output signal power;
- o) maximum total output power.

NOTE 1 The applicability of the test methods described in this document to distributed Raman amplifiers is still under study.

NOTE 2 All numerical values followed by (±) are suggested values for which the measurement is assured. Other values are acceptable if verified.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 61290-1-1, *Optical amplifiers – Test methods – Part 1-1: Power and gain parameters – Optical spectrum analyzer method*

IEC 61290-1-2, *Optical amplifiers – Test methods – Part 1-2: Power and gain parameters – Electrical spectrum analyzer method*

IEC 61290-1-3, *Optical amplifiers – Test methods – Part 1-3: Power and gain parameters – Optical power meter method*

IEC 61291-1: 2018, *Optical amplifiers – Part 1: Generic specification*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61291-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.2 Abbreviated terms

ASE	amplified spontaneous emission
FWHM	full width at half maximum
OA	optical amplifier
OFA	optical fibre amplifier
OSA	optical spectrum analyzer
POWA	planar optical waveguide amplifier
SOA	semiconductor optical amplifier

4 Optical power and gain test method

One of the three test methods described in IEC 61290-1-1, IEC 61290-1-2, and IEC 61290-1-3 for quantifying the optical power and gain of an OA shall be followed in this document.

The test method described in IEC 61290-1-1 determines the optical power and gain by means of an optical spectrum analyzer

The test method described in IEC 61290-1-2 determines the optical power and gain by means of an optical detector and an electrical spectrum analyzer.

The test method described in IEC 61290-1-3 determines the optical power and gain by means of an optical power meter and an optical bandpass filter.

5 Optical power and gain parameters

The parameters listed below are required for gain and power:

INTERNATIONAL STANDARD

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**Optical amplifiers – Test methods –
Part 1: Power and gain parameters**

**Amplificateurs optiques – Méthodes d'essai –
Partie 1: Paramètres de puissance et de gain**

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The test method described in IEC 61290-1-3 determines the optical power and gain by means of an optical power meter and an optical bandpass filter.

4 Optical power and gain parameters

5

The parameters listed below are required for gain and power:

- a) Nominal output signal power: The nominal output signal power is given by the minimum output signal optical power for an input signal optical power specified in the relevant detail specification and under nominal operating conditions given in the relevant detail specification. To find this minimum value, input and output signal power levels shall be continuously monitored for a given duration of time and in the presence of changes in the state of polarization and other instabilities, as specified in the relevant detail specification. The measurement procedures and calculations are described in each test method.
- b) Gain: The measurement procedures and calculations are described in each test method.