



SLOVENSKI STANDARD SIST EN 62522:2015

01-julij-2015

Umerjanje nastavljivih laserskih virov (IEC 62522:2014)

Calibration of tuneable laser sources (IEC 62522:2014)

Kalibrierung von abstimmbaren Laserquellen (IEC 62522:2014)

Étalonnage des sources laser accordables (CEI 62522:2014)

Ta slovenski standard je istoveten z: **EN 62522:2014**

[SIST EN 62522:2015](https://standards.iteh.ai/catalog/standards/sist/ea578897-174a-4682-90da-f0fed469342e/sist-en-62522-2015)

<https://standards.iteh.ai/catalog/standards/sist/ea578897-174a-4682-90da-f0fed469342e/sist-en-62522-2015>

ICS:

17.180.01	Optika in optična merjenja na splošno	Optics and optical measurements in general
31.260	Optoelektronika, laserska oprema	Optoelectronics. Laser equipment

SIST EN 62522:2015

en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 62522:2015](#)

<https://standards.iteh.ai/catalog/standards/sist/ea578897-174a-4682-90da-f0fed469342e/sist-en-62522-2015>

EUROPEAN STANDARD

EN 62522

NORME EUROPÉENNE

EUROPÄISCHE NORM

July 2014

ICS 31.260; 33.180.01

English Version

**Calibration of tuneable laser sources
(IEC 62522:2014)**Étalonnage des sources laser accordables
(CEI 62522:2014)Kalibrierung von abstimmbaren Laserquellen
(IEC 62522:2014)

This European Standard was approved by CENELEC on 2014-03-21. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

<https://standards.iteh.ai/catalog/standards/sist/ea578897-174a-4682-90da-f0fed469342e/sist-en-62522-2015>



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Foreword

The text of document 86/443/CDV, future edition 1 of IEC 62522, prepared by IEC TC 86 "Fibre optics" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62522:2014.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2014-10-18
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2017-03-21

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

iTeh **STANDARD PREVIEW** Endorsement notice (standards.iteh.ai)

The text of the International Standard IEC 62522:2014 was approved by CENELEC as a European Standard without any modification.

<https://standards.iteh.ai/catalog/standards/sist/ea578897-174a-4682-90da-f0fd469342e/sist-en-62522-2015>

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

IEC 60027-3	NOTE	Harmonised as EN 60027-3.
IEC 60359	NOTE	Harmonised as EN 60359.
IEC 60793-1 (Series)	NOTE	Harmonised in EN 60793-1 (Series)
IEC 60793-2 (Series)	NOTE	Harmonised in EN 60793-2 (Series)
IEC 61280-1-3:2010	NOTE	Harmonised as EN 61280-1-3:2010.
IEC 61300-3-2	NOTE	Harmonised as EN 61300-3-2
IEC 61315	NOTE	Harmonised as EN 61315

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here:

www.cenelec.eu

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60793-2-50	-	Optical fibres -- Part 2-50: Product specifications - Sectional specification for class B single-mode fibres	EN 60793-2-50	-
IEC 60825-1	-	Safety of laser products -- Part 1: Equipment classification and requirements	EN 60825-1	-
IEC 60825-2	-	Safety of laser products -- Part 2: Safety of optical fibre communication systems (OFCS)	EN 60825-2	-
IEC 62129-2	-	Calibration of wavelength/optical frequency measurement instruments -- Part 2: Michelson interferometer single wavelength meters	EN 62129-2	-
ISO/IEC 17025	-	General requirements for the competence of testing and calibration laboratories	EN ISO/IEC 17025	-
ISO/IEC Guide 98-3 2008	-	Uncertainty of measurement -- Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)	EN ISO/IEC 98-3:2008	-
ISO/IEC Guide 99 2007	-	International vocabulary of metrology - Basic and general concepts and associated terms (VIM)	EN ISO/IEC 99:2007	-

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 62522:2015](#)

<https://standards.iteh.ai/catalog/standards/sist/ea578897-174a-4682-90da-f0fed469342e/sist-en-62522-2015>



IEC 62522

Edition 1.0 2014-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Calibration of tuneable laser sources

Étalonnage des sources laser accordables

ITh STANDARD PREVIEW
(standards.iteh.ai)
<https://standards.iteh.ai/catalog/standards/sist/ea578897-174a-4682-90daf0fed469342e/sist-en-62522-2015>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX

W

ICS 31.260; 33.180.01

ISBN 978-2-8322-1411-4

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references.....	7
3 Terms, definitions and abbreviations.....	7
3.1 Terms and definitions.....	7
3.2 Abbreviations.....	10
4 Preparation for calibration.....	10
4.1 Organization.....	10
4.2 Traceability.....	10
4.3 Preparation.....	10
4.4 Reference calibration conditions.....	11
5 Wavelength calibration.....	11
5.1 Overview.....	11
5.2 Wavelength calibration at reference conditions.....	11
5.2.1 Set-up.....	11
5.2.2 Calibration equipment.....	11
5.2.3 Procedure for wavelength calibration.....	12
5.2.4 Dependence on conditions.....	12
5.2.5 Uncertainty at reference conditions.....	14
5.3 Wavelength calibration at operating conditions.....	15
5.3.1 General.....	15
5.3.2 Optical power dependence.....	15
5.3.3 Uncertainty at operating conditions.....	16
6 Optical power calibration.....	16
6.1 Overview.....	16
6.2 Optical power calibration at reference conditions.....	17
6.2.1 Set-up.....	17
6.2.2 Calibration equipment.....	17
6.2.3 Procedure for power calibration at reference conditions.....	17
6.2.4 Dependence on conditions.....	18
6.2.5 Uncertainty at reference conditions.....	21
6.3 Optical power calibration at operating conditions.....	22
6.3.1 General.....	22
6.3.2 Wavelength dependence.....	22
6.3.3 Uncertainty at operating conditions.....	23
7 Documentation.....	23
7.1 Calibration data and uncertainty.....	23
7.2 Calibration conditions.....	23
Annex A (normative) Mathematical basis.....	25
A.1 General.....	25
A.2 Type A evaluation of uncertainty.....	25
A.3 Type B evaluation of uncertainty.....	26
A.4 Determining the combined standard uncertainty.....	26
A.5 Reporting.....	27
Annex B (informative) Averaged wavelength (or power) deviation over a certain range.....	28

Annex C (informative) Other testing	30
C.1 General	30
C.2 Wavelength resolution	30
C.2.1 Set-up	30
C.2.2 Testing equipment	30
C.2.3 Testing procedure for determining wavelength resolution	30
C.3 Optical power resolution	31
C.3.1 Set-up	31
C.3.2 Testing equipment	31
C.3.3 Testing procedure for optical power resolution	31
C.4 Signal to source spontaneous emission ratio	32
C.4.1 Set-up	32
C.4.2 Testing equipment	32
C.4.3 Testing procedure for determining signal to source spontaneous emission ratio	32
C.5 Side mode suppression ratio	33
C.5.1 General	33
C.5.2 Set-up	33
C.5.3 Testing equipment	34
C.5.4 Testing procedure	34
Bibliography	37
Figure 1 – Measurement set-up for wavelength calibration	11
Figure 2 – Measurement set-up for temperature dependence	13
Figure 3 – Measurement set-up for wavelength stability	14
Figure 4 – Measurement set-up for optical power dependence	15
Figure 5 – Measurement set-up for intrinsic optical power calibration	17
Figure 6 – Measurement set-up for temperature dependence	18
Figure 7 – Measurement set-up for optical power stability	20
Figure 8 – Measurement set-up for connection repeatability/reproducibility	21
Figure 9 – Measurement set-up for wavelength dependence	22
Figure C.1 – Measurement set-up for wavelength resolution	30
Figure C.2 – Measurement set-up for optical power resolution setting test	31
Figure C.3 – Measurement set-up for signal to total source spontaneous emission ratio	32
Figure C.4 – Measurement of the signal to spontaneous emission ratio	33
Figure C.5 – Measurement set-up for the side mode suppression ratio test	33
Figure C.6 – Optical spectrum of tuneable laser source	35
Figure C.7 – Measurement set-up for SMSR	35

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 62522:2015

https://standards.iteh.ai/catalog/standards/sist/578897-174a-4682-90da-

#0fed469742e/sist-en-62522-2015

INTERNATIONAL ELECTROTECHNICAL COMMISSION

CALIBRATION OF TUNEABLE LASER SOURCES

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.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 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.

International Standard IEC 62522 has been prepared by IEC technical committee 86: Fibre optics.

The text of this standard is based on the following documents:

CDV	Report on voting
86/443/CDV	86/459/RVC

Full information on the voting for the approval of this standard 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 the stability date indicated on the IEC web site 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.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 62522:2015](#)

<https://standards.iteh.ai/catalog/standards/sist/ea578897-174a-4682-90da-f0fed469342e/sist-en-62522-2015>

INTRODUCTION

Wavelength-division multiplexing (WDM) transmission systems have been deployed in optical trunk lines. ITU-T Recommendations in the G.694 series describe the frequency and wavelength grids for WDM applications. For example, the frequency grid of G.694.1 supports a variety of channel spacing ranging from 12,5 GHz to 100 GHz and wider. WDM devices, such as arrayed waveguide grating (AWG), thin film filter or grating based multiplexers (MUX) and demultiplexers (DMUX) with narrow channel spacing are incorporated in the WDM transmission systems. When measuring the characteristics of such devices, wavelength tuneable laser sources are commonly used and are required to have well-calibrated performances; wavelength uncertainty, wavelength tuning repeatability, wavelength stability and output optical power stability are important parameters.

The tuneable laser source (TLS) is generally equipped with the following features:

- a) the output wavelength is continuously tuneable in a wavelength range starting at 1 260 nm or higher and ending at less than 1 675 nm (the output should excite only the fundamental LP01 fibre mode);
- b) an output port for optical fibre connectors.

The envelope of the spectrum is a single longitudinal mode with a FWHM of at most 0,1 nm. Any adjacent modes are at least 20 dB lower than the main spectral mode (for example, a distributed feedback laser diode (DFB-LD), external cavity laser, etc.)

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 62522:2015](https://standards.iteh.ai/catalog/standards/sist/ea578897-174a-4682-90daf0fed469342e/sist-en-62522-2015)

<https://standards.iteh.ai/catalog/standards/sist/ea578897-174a-4682-90daf0fed469342e/sist-en-62522-2015>

CALIBRATION OF TUNEABLE LASER SOURCES

1 Scope

This International Standard provides a stable and reproducible procedure to calibrate the wavelength and power output of a tuneable laser against reference instrumentation such as optical power meters and optical wavelength meters (including optical frequency meters) that have been previously traceably calibrated.

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

IEC 60825-1, *Safety of laser products – Part 1: Equipment classification and requirements*

IEC 60825-2, *Safety of laser products – Part 2: Safety of optical fibre communication systems (OFCS)*

IEC 62129-2, *Calibration of wavelength/optical frequency measurement instruments – Part 2: Michelson interferometer single wavelength meters*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

ISO/IEC Guide 98-3:2008, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

ISO/IEC Guide 99:2007, *International vocabulary of metrology – Basic and general concepts and associated terms (VIM)*

3 Terms, definitions and abbreviations

For the purposes of this document, the following terms, definitions and abbreviations apply.

3.1 Terms and definitions

3.1.1

accredited calibration laboratory

calibration laboratory authorized by an appropriate national organization to issue calibration certificates that demonstrates traceability to national standards

3.1.2

adjustment

set of operations carried out on an instrument in order that it provides given indications corresponding to given values of the measurand