SLOVENSKI STANDARD

SIST EN 61300-3-29:2006

julij 2006

Naprave za medsebojno povezovanje optičnih vlaken in pasivne komponente – Osnovni preskusni in merilni postopki – 3-29. del: Preiskave in meritve – Merilne tehnike za ugotavljanje lastnosti amplitude spektralne prenosne funkcije komponent DWDM (IEC 61300-3-29:2005)

Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-29: Examinations and measurements – Measurement techniques for characterizing the amplitude of the spectral transfer function of DWDM components (IEC 61300-3-29:2005)

ICS 33.180.20

Referenčna številka
SIST EN 61300-3-29:2006(en)

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61300-3-29

March 2006

ICS 33.180.20

English version

Fibre optic interconnecting devices and passive components - Basic test and measurement procedures Part 3-29: Examinations and measurements - Measurement techniques for characterizing the amplitude of the spectral transfer function of DWDM components

(IEC 61300-3-29:2005)

Dispositifs d'interconnexion et composants passifs à fibres optiques - Méthodes fondamentales d'essais et de mesures Partie 3-29: Examens et mesures - Techniques de mesure pour caractériser l'amplitude de la fonction de transfert spectrale des composants DWDM (CEI 61300-3-29:2005)

Lichtwellenleiter - Verbindungselemente und passive Bauteile - Grundlegende Prüf- und Messverfahren Teil 3-29: Untersuchungen und Messungen - Messverfahren zur Charakterisierung der spektralen Übertragungsfunktion von DWDM-Bauteilen (IEC 61300-3-29:2005)

This European Standard was approved by CENELEC on 2006-03-01. 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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

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

CENELEC

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

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

Ref. No. EN 61300-3-29:2006 E

Foreword

The text of document 86B/2216/FDIS, future edition 1 of IEC 61300-3-29, prepared by SC 86B, Fibre optic interconnecting devices and passive components, of IEC TC 86, Fibre optics, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61300-3-29 on 2006-03-01.

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)	2006-12-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2009-03-01

This European Standard makes reference to International Standards. Where the International Standard referred to has been endorsed as a European Standard or a home-grown European Standard exists, this European Standard shall be applied instead. Pertinent information can be found on the CENELEC web site.

Endorsement notice

The text of the International Standard IEC 61300-3-29:2005 was approved by CENELEC as a European Standard without any modification.

NORME INTERNATIONALE
INTERNATIONAL STANDARD

CEI IEC 61300-3-29

Première édition
First edition
2005-12

Dispositifs d'interconnexion et composants passifs à fibres optiques – Méthodes fondamentales d'essais et de mesures –

Partie 3-29: Examens et mesures – Techniques de mesure pour caractériser l'amplitude de la fonction de transfert spectrale des composants DWDM

Fibre optic interconnecting devices and passive components – Basic test and measurement procedures –

Part 3-29: Examinations and measurements – Measurement techniques for characterizing the amplitude of the spectral transfer function of DWDM components

International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch

Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

CODE PRIX
PRICE CODE **V**

Pour prix, voir catalogue en vigueur
For price, see current catalogue

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – BASIC TEST AND MEASUREMENT PROCEDURES –

Part 3-29: Examinations and measurements – Measurement techniques for characterising the amplitude of the spectral transfer function of DWDM components

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 provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.

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 61300-3-29 has been prepared by sub-committee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics.

This standard cancels and replaces IEC/PAS 61300-3-29 published in 2002.

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

FDIS	Report on voting
86B/2216/DIS	86B/2253/RVD

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.

IEC 61300 consists of the following parts, under the general title *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures*:

Part 1: General and guidance

Part 2: Tests

Part 3: Examinations and measurements.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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.

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – BASIC TEST AND MEASUREMENT PROCEDURES –

Part 3-29: Examinations and measurements – Measurement techniques for characterising the amplitude of the spectral transfer function of DWDM components

1 Scope

This part of IEC 61300 identifies two basic measurement methods for characterising the spectral transfer functions of DWDM filter components.

The transfer functions can be used to produce measurements of attenuation (A), polarisation dependent loss (PDL), isolation, centre wavelength and bandwidth (BW).

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 60050-731: *International Electrotechnical Vocabulary – Chapter 731: Optical fibre communication*

IEC 61300-3-2: *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-2: Examinations and measurements – Polarisation dependence of attenuation in a single mode fibre optic device*

IEC 61300-3-7: *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-7:– Examinations and measurements – Wavelength dependence of attenuation and return loss*

IEC 61300-3-12: *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-12: Examinations and measurements – Polarisation dependence of attenuation of a single-mode fibre optic component: Matrix calculation method*

3 General description

3.1 Overview

This document is complementary to the wavelength dependence of attenuation and return loss (IEC 61300-3-7), polarisation dependence of attenuation (IEC 61300-3-2), and the polarisation dependence of attenuation using matrix methods (IEC 61300-3-12) test procedures. In general, these DWDM devices have channel bandwidths less than 1 nm, filter response slopes greater than 100 dB/nm, and out-of-band rejection extending over tens of nm.

The methods described in this standard will show how to obtain the transfer function from a single input to a single output port (single conducting path). For an m x n device, it will be required to repeat this procedure using all possible combinations of input and output ports.

The methods described in this standard are intended to be applicable to any wavelength band (C, L, S, O, etc.) although examples may be shown in the C-band for illustrative purposes.

The two methods contained in this standard differ mainly in the way in which the wavelength resolution is obtained. Method A uses a tuneable laser source and a broad band detector, while Method B uses a broad band source and a tuneable receiver. Method A shall be considered the reference test method for DWDM devices.

This standard also includes Annexes that illustrate the following:

Annex A: Reflection spectrum measurements;

Annex B: Determination of wavelength increment parameter;

Annex C: Determination of a mean value using the shorth function;

Annex D Precautions in using IEC 61300-3-7 for DWDM devices.

3.2 Terms and abbreviations

Many of the terms and abbreviations in this document are described in the generic standard IEC 60050-731. Some terms and abbreviations specific to this measurement technique are included below.

ASE: Amplified spontaneous emission.

BW: Bandwidth: The spectral width of a signal or filter. In the case of a laser signal such as a tuneable laser source, the term linewidth is commonly preferred. Often defined by the width at a set power distance from the peak power level of the device (i.e. 3 dB BW or 1 dB BW). Must be defined as the distance between the closest crossings on either side of the centre wavelength in the cases where the spectral shape has more than 2 such points. The distance between the outermost crossings can be considered the full spectral width.

δ: Wavelength sampling increment during the measurement.

λ_h: Centre channel or nominal operating wavelength for a component

OWR: Operating wavelength range. The specified range of wavelengths from λ_{hmin} to λ_{hmax} centred about the nominal operating wavelength, within which a WDM device operates.

SOP: State of polarisation. The distribution of light energy among the two linearly independent solutions of the wave equations for the electric field.

SSE: Source spontaneous emission: Broad band emissions from a laser cavity that bear no phase relation to the cavity field. These emissions can be seen as the baseline noise on an optical spectrum analyzer.

TLS: Tuneable laser source.

4 Apparatus

The basic measurement set-up for the characterisation of DWDM components is shown in Figure 1 below.

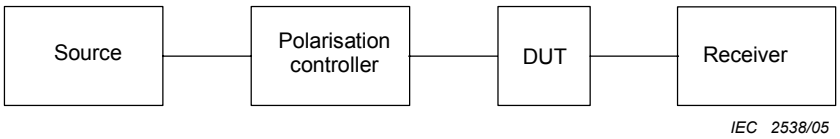

Figure 1 – Basic measurement apparatus

As mentioned in the general discussion, this procedure contains two distinct methods that differ fundamentally in the way in which the wavelength resolution is achieved. There are three key influences on the wavelength resolution: the linewidth of the source or bandwidth of the tuneable receiver, the analogue bandwidth of the detection system, and the rate of change of wavelength.

Having determined the wavelength resolution of the measurement, the wavelength sampling increment (δ) should be less than half the bandwidth of the system in order to accurately measure the average value of the attenuation.

The bandwidth of the system is determined by the convolution of the effective source bandwidth with the rate of change of wavelength over the time constant of the receiver. Practical constraints may result in smaller or larger bandwidths than recommended. Two cautions with smaller bandwidths: first, coherent interference effects can lead to additional measurement errors, and second, undersampling of the device could lead to misrepresentations of the reconstructed transfer function. If larger bandwidths are used, the reconstructed transfer function could smear out fine structures and distort response slopes. As the response slopes may exceed 100 nm/ dB, small uncertainties in wavelength may result in large amplitude response errors. In general, the resolution bandwidth of the system needs to be chosen based on the device characteristics and noted in the details to be specified.

A detailed explanation of the various components of this system and their functions is contained below. Apparatuses for both the Tuneable Laser and the Tuneable Receiver procedures are shown in Figures 2 and 3.

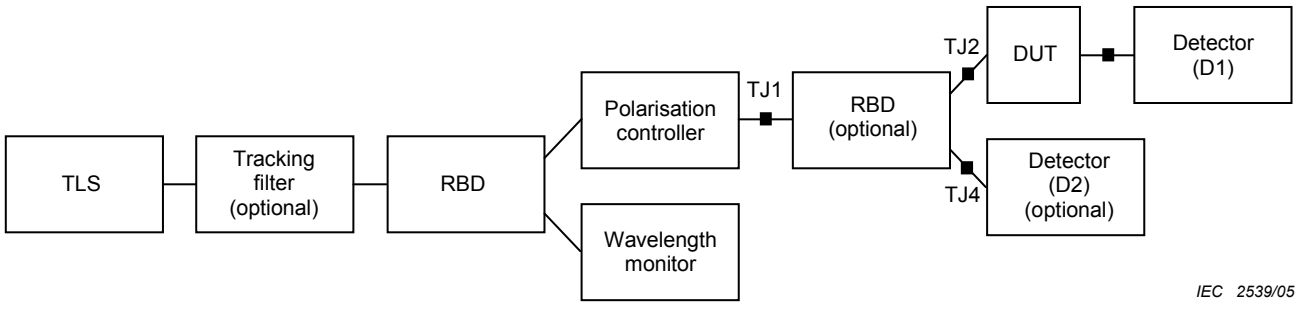

Figure 2 – Measurement apparatus for tuneable laser system