PD IEC/TR 62343-6-9:2015

BSI Standards Publication

Dynamic modules

Part 6-9: Design guide — Study of mechanisms and measurements of crosstalk in wavelength-selective switches

bsi.

...making excellence a habit.™

Document Sharing Hub

National foreword

This Published Document is the UK implementation of IEC/TR 62343-6-9:2015.

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.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2015.
Published by BSI Standards Limited 2015

ISBN 978 0 580 86722 4
ICS 33.180.01; 33.180.99

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 July 2015.

Amendments/corrigenda issued since publication

Date	Text affected

Documents
Document Sharing Hub

Full document details: PD IEC/TR 62343-6-9:2015

IEC TR 62343-6-9

Edition 1.0 2015-06

TECHNICAL REPORT

colour inside

Dynamic modules –
Part 6-9: Design guide – Study of mechanisms and measurements of crosstalk in wavelength-selective switches

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.180.01; 33.180.99

ISBN 978-2-8322-2769-5

Warning! Make sure that you obtained this publication from an authorized distributor.

® Registered trademark of the International Electrotechnical Commission

Documents
Document Sharing Hub

Full document details: PD IEC/TR 62343-6-9:2015

CONTENTS

FOREWORD 4
INTRODUCTION 6
1 Scope 7
2 Normative references 7
3 Abbreviations 7
4 Study of dynamic crosstalk for WSS 8
4.1 Static crosstalk and dynamic crosstalk 8
4.2 Generation mechanism of dynamic crosstalk 8
4.2.1 Configuration example of optical switching functionality 8
4.2.2 Generation mechanism 9
5 Measurement methods of dynamic crosstalk 11
5.1 Study of measurement methods of dynamic crosstalk 11
5.1.1 Referenced standard documents 11
5.1.2 Test configuration of tuneable laser source (TLS) and optical power meter 12
5.1.3 Test configuration of tuneable laser source, OE converter and oscilloscope 12
5.1.4 Comparison of the measurement methods 13
5.2 Evaluation of the measurement methods 13
6 Measurement result of dynamic crosstalk 14
6.1 MEMS type WSS 14
6.1.1 Measurement conditions 14
6.1.2 Measurement of different-channel crosstalk 14
6.1.3 Measurement of same-channel crosstalk 15
6.2 LCOS type WSS 16
6.2.1 Measurement conditions 16
6.2.2 Measurement of different-channel crosstalk 17
6.2.3 Measurement of same-channel crosstalk 17
6.3 DLP type WSS 18
6.3.1 Measurement conditions 18
6.3.2 Measurement procedure and result 18
6.4 Summary 20
7 Conclusion 21
Bibliography 22

Figure 1 – Block diagram of optical switching function 9
Figure 2 – Dynamic crosstalk at WSS 10
Figure 3 – Dynamic crosstalk at optical coupler for multiplexing 11
Figure 4 – Dynamic crosstalk at receiver (Rx) 11
Figure 5 – Test configuration of tuneable laser source (TLS) and optical power meter 12
Figure 6 – Test configuration of tuneable laser source and oscilloscope 13
Figure 7 – Experimental set-up 14
Figure 8 – Measurement set-up of different-channel crosstalk 15

AVA Documents
Document Sharing Hub
Full document details: PD IEC/TR 62343-6-9:2015

Figure 9 – Measurement result of different-channel crosstalk for MEMS type WSS 15
Figure 10 – Measurement result of same-channel crosstalk for MEMS type WSS 16
Figure 11 – Measurement result of different-channel crosstalk for LCOS type WSS 17
Figure 12 – Measurement result of same-channel crosstalk for LCOS type WSS 18
Figure 13 – Switching characteristics for 1 × 2 DLP type WSS 19
Figure 14 – Crosstalk measurement result of case a) for DLP type WSS 19
Figure 15 – Crosstalk measurement result of case b) for DLP type WSS 20
Figure 16 – Crosstalk measurement result of case c) for DLP type WSS 20

Table 1 – Static crosstalk and dynamic crosstalk 8
Table 2 – Same-channel crosstalk and different-channel crosstalk 8
Table 3 – Generating mechanism of same-channel crosstalk and different-channel crosstalk 10

Documents
Document Sharing Hub
Full document details: PD IEC/TR 62343-6-9:2015

INTERNATIONAL ELECTROTECHNICAL COMMISSION

DYNAMIC MODULES –

Part 6-9: Design guide – Study of mechanisms and measurements of crosstalk in wavelength-selective switches

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.

The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a Technical Report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

IEC TR 62343-6-9, which is a Technical Report, has been prepared by subcommittee SC86C: Fibre optic systems and active devices, of IEC technical committee TC 86: Fibre optics.

The text of this Technical Report is based on the following documents:

Enquiry draft	Report on voting
86C/1300/DTR	86C/1321/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.

Documents
Document Sharing Hub

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62343 series, published under the general title *Dynamic modules*, 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

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

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

Documents
Document Sharing Hub

Full document details: PD IEC/TR 62343-6-9:2015

INTRODUCTION

A dense wavelength division multiplexing (DWDM) system for fibre optic communication was developed in the late 1990's. The first generation DWDM systems were point-to-point optical networks. In the mid-2000's, second generation DWDM systems, typically ring networks, were developed. One of the key optical components for DWDM systems is a wavelength division multiplexing device. An AWG (arrayed waveguide grating) module has been mainly deployed for first and second generation DWDM systems.

Due to the increasing demand for communication capacity, more flexible optical communication systems, such as mesh networks, have been required. In the past several years, the third generation of DWDM systems, the optical cross-connect system, has been developed and deployed by some communication network carriers and is expected to be deployed worldwide. A wavelength-selective switch (WSS) module plays a key role in realizing the optical switch function in the optical cross-connect system, so that the performance of the WSS directly impacts on the performance of the optical cross-connect systems, such as the capacity, transmission distance, etc.

For AWG modules, only static performance, such as insertion loss, bandwidth, pass-band ripple, polarization dependent loss (PDL), polarization mode dispersion (PMD), coherent crosstalk, etc., has been evaluated. In addition to static performance, dynamic performance during switching or changing attenuation should be taken into consideration for the WSS as a key module of optical cross-connect systems.

For dynamic performance parameters, the influence not only on the controlled channel but also on other channels should be considered.

Considering this background, the influence of WSS dynamic crosstalk on cross-connect system performance and the measurements of dynamic crosstalk has been demonstrated.

This Technical Report is based on Optoelectronic Industry and Technology Development Association (OITDA) – Technical Paper (TP), TP15/TP-2013, "Dynamic crosstalk measurement for wavelength selective switches".

Documents
Document Sharing Hub
Full document details: PD IEC/TR 62343-6-9:2015