

TECHNICAL REPORT



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





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INTERNATIONAL ELECTROTECHNICAL COMMISSION

DYNAMIC MODULES –

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

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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.

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- withdrawn,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.

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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".

DYNAMIC MODULES –

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

1 Scope

This part of IEC 62343, which is a Technical Report, describes a study of the impact of WSS dynamic crosstalk on the optical network and includes dynamic crosstalk measurement examples for three types of WSS. The generating mechanism and the generation factor of dynamic crosstalk in WSS are clarified, and the evaluation of same-channel crosstalk and different-channel crosstalk is shown to be necessary.

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 61300-3-21, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-21: Examinations and measurements – Switching time*

IEC 61300-3-29, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-29: Examinations and measurements – Spectral transfer characteristics of DWDM devices*

3 Abbreviations

ADD	add port
AWG	arrayed waveguide grating
COM	common port
CW	continuous wave
DLP	digital light processor
DRP	drop port
DUT	device under test
DWDM	dense wavelength division multiplexing
EXP	express port
LCOS	liquid crystal on silicon
MEMS	micro electro mechanical system
OE	optical-to-electrical
PDL	polarization dependent loss
PMD	polarization mode dispersion
TLS	tuneable laser source
Tx	transmitter
Rx	receiver
WSS	wavelength selective switch