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TECHNICAL REPORT

colour inside

Fibre optic interconnecting devices and passive components – Part 08: Study of optical power blocking measurement methods for adaptors with an optical power blocking shutter

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FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS –

Part 08: Study of optical power blocking measurement methods for adaptors with an optical power blocking shutter

FOREWORD

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IEC TR 62627-08, which is a Technical Report, has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics.

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

Enquiry draft	Report on voting
86B/3931/DTR	86B/3945/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 62627 series, published under the general title *Fibre optic interconnecting devices and passive components*, 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- withdrawn,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

In recent years, optical communication networks have made greater use of optical fibre amplifiers and distributed Raman amplifiers. Optical communication equipment usually has an adaptor on the front of the board as an optical input/output terminal. These adaptors sometimes emit 100 mW or higher optical power. For the purpose of blocking such optical power, an adaptor with an optical power blocking shutter is sometimes used.

This Technical Report details the proposed methods to evaluate the efficacy of these adaptor shutters.

This Technical Report is based on Optoelectronic Industry and Technology Development Association (OITDA) – Technical Paper (TP), TP19/CN-2014, *Investigation of examinations and measurements – Light-blocking performance of optical adaptor with shutter*.

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS –

Part 08: Study of optical power blocking measurement methods for adaptors with an optical power blocking shutter

1 Scope

This part of IEC 62627, which is a Technical Report, describes two methods used to measure the blocking characteristics of adaptors with an optical power blocking shutter. This document focuses on singlemode fibre (SMF) and two wavelengths, 1 310 nm and 1 550 nm.

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.

Void.

3 Terms and definitions

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

3.1
adaptor with an optical power blocking shutter
adaptor defined in IEC 61274-1 that has a shutter to block optical power emitted from its aperture

Note 1 to entry: An adaptor with a shutter may have a structure such that the shutter automatically moves to block the aperture when the outer plug is removed. There are two commercially available types of optical adaptors with shutters: one type blocks optical power and the other type blocks dust ingress. Products that focus on optical power blocking may have a metal shutter.

3.2
optical power blocking
attenuation a_b calculated by measuring the maximum emitted optical power when the shutter is fully open (or the shutter is removed) (P_{0max}) and the maximum emitted optical power when the shutter is closed (P_{1max})

$$a_b = -10 \log_{10}\left(\frac{P_{1max}}{P_{0max}}\right) (dB) \quad (1)$$

4 Background to the measurement method of blocking characteristics for adaptors with an optical power blocking shutter

4.1 Laser safety requirement for optical fibre communication systems

The safety of laser products are defined in IEC 60825-1 which prescribes the acceptable optical power as the laser safety class. IEC 60825-2, a subdivision standard, provides the safety standards for optical fibre communication systems. Optical communication equipment

manufacturers sometimes use an adaptor with an optical power blocking shutter to comply with these laser safety standards.

4.2 Required performance of the power blocking shutter

IEC 60825-2, hazard level 3B, limits optical power at 1 550 nm to 500 mW. However, hazard level 1, the optical power allowed to be seen by the naked eye or with a magnifying scope, is limited to 10,2 mW. If equipment manufacturers ensure laser safety only by using an adaptor with an optical power blocking shutter, the required level of optical power blocking for the shutter is 17 dB, i.e. the ratio of 500 mW to 10,2 mW.

4.3 Standard measurement conditions used to determine laser safety for optical fibre communication systems

IEC 60825-2 defines the measurement conditions used to determine the hazard level of optical fibre communication systems. For wavelengths greater than 1 400 nm, an aperture diameter of 7 mm is used at a measurement distance of 28 mm from the radiating end of the optical fibre. For wavelengths less than or equal to 1 400 nm, the aperture diameter is also 7 mm, but the measurement distance is 70 mm from the radiating end of the optical fibre.

5 Measurement methods used in this Technical Report

5.1 Background

The following two methods have been studied.

Method 1: measuring with an aperture diameter of 7 mm, an integrating sphere and an optical detector.

Method 2: measuring with an optical detector only, having an aperture diameter of less than 7 mm.

In this Technical Report only the 1 310 nm and 1 550 nm wavelengths have been focused upon as these are the ones most commonly used for optical fibre communication systems.

5.2 Test

5.2.1 Measurement set-up

The measurement set-up for Method 1 and Method 2 is as follows.

a) Method 1

Figure 1 shows an example of measurement set-up for Method 1. Light emitted from an adaptor with an optical power blocking shutter arrives at the aperture plate, diameter d, in front of the integrating sphere, and passes through into the integrating sphere. Distance, l, and aperture diameter, d, are as follows:

– distance, l: 70 mm (at the wavelength of 1 310 nm);

28 mm (at the wavelength of 1 550 nm);

– aperture diameter, d: 7mm.

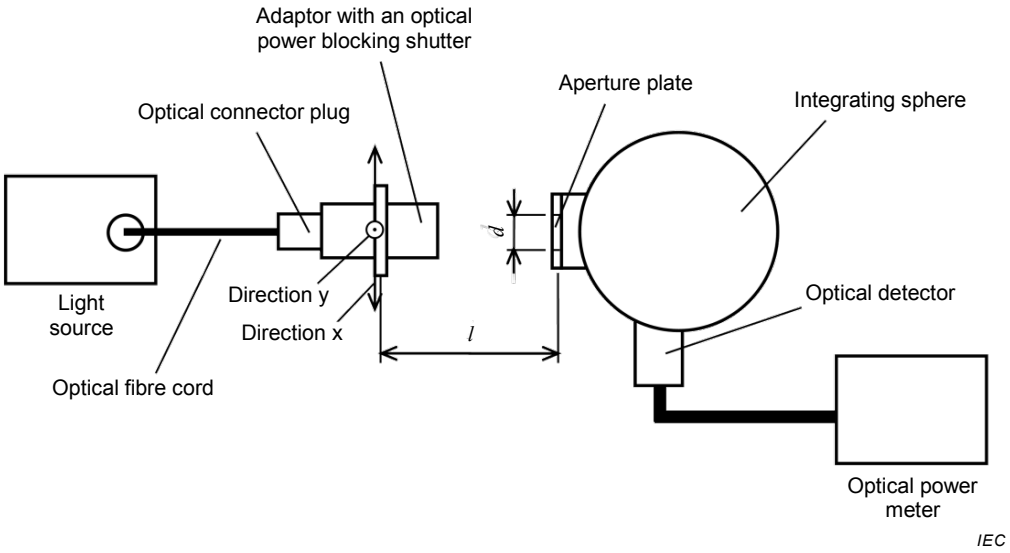

Figure 1 – Example of measurement set-up for Method 1

b) Method 2

Figure 2 shows an example of the measurement set-up for Method 2. Light emitted from the adaptor with an optical power blocking shutter arrives at the aperture plate attached directly to the optical detector. The size of the aperture diameter is different for each of the two chosen wavelengths, and in each case is calculated in order to maintain the same ratio of distance l to the aperture diameter d as is used in Method 1.

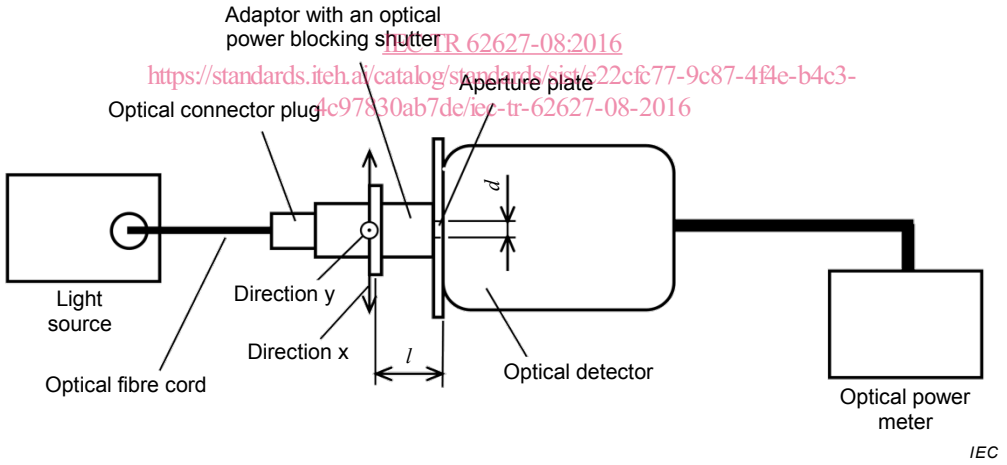

Figure 2 – Example of measurement set-up for Method 2

5.2.2 Study of dynamic range

The optical power of the light source, the sensitivity of the optical detector and any background noise should all be taken into account to achieve an adequate dynamic range for the measurement of optical power blocking greater than 17 dB with a small measurement uncertainty. A dynamic range greater than 30 dB is therefore recommended.

5.2.3 Light source and optical detector

In the case of Method 1, a typical integrating sphere has an attenuation of approximately 40 dB. Therefore, it is recommended that the sensitivity of the optical detector used together with the integrating sphere is −80 dBm or better, and the optical output from the light source is −10 dBm or more in order to achieve the suggested dynamic range of 30 dB minimum.