

TECHNICAL REPORT

**Optical amplifiers –
Part 4: Maximum permissible optical power for the damage-free and safe use of
optical amplifiers, including Raman amplifiers**



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CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope and object.....	7
2 Normative references	7
3 Abbreviated terms	8
4 Maximum transmissible optical power to keep fibres damage-free	8
4.1 General.....	8
4.2 Fibre fuse and its propagation.....	9
4.3 Loss-induced heating at connectors or splices	10
4.4 Connector end-face damage induced by dust/contamination	11
4.5 Fibre-coat burn/melt induced by tight fibre bending	13
4.6 Summary of the fibre damage	14
5 Maximum transmissible optical power to keep eyes and skin safe	15
5.1 Maximum transmissible exposure (MPE) on the surface of eye and skin	15
5.2 Maximum permissible optical power in the fibre for the safety of eye and skin.....	15
5.2.1 General	15
5.2.2 Need for APR	17
5.2.3 Wavelengths.....	17
5.2.4 Locations.....	17
5.2.5 Nominal ocular hazard distance (NOHD).....	17
5.2.6 Power reduction times	17
5.2.7 Medical aspects of the safety of eyes and skin in existing standards	18
6 Maximum optical power permissible for optical amplifiers from the viewpoint of fibre damage as well as eye and skin safety	19
7 Conclusion	19
Annex A (informative). General information for optical fibre fuse	20
A.1 Introduction.....	20
A.2 Generating mechanism	20
A.3 Figure A.3 – Calculated fibre fuse propagation behaviour simulated with the SiO absorption model/Void formation mechanism	23
A.4 Propagation characteristic of a fibre fuse	24
A.5 Prevention and termination	26
A.5.1 General	26
A.5.2 Prevention methods	26
A.5.3 Termination methods	26
A.6 Conclusion.....	29
Bibliography.....	30
Figure 1 – Experimental set-up for fibre fuse propagation	9
Figure 2 – Connection loss versus temperature increase	11
Figure 3 – Test set-up.....	11
Figure 4 – Surface condition contaminated with metal filings, before the test	12
Figure 5 – Variation of the power attenuation during the test at several power input values for plugs contaminated with metal filings.....	13
Figure 6 – Polishing surface condition contaminated with metal filing, after the test	13

Figure 7 – Thermo-viewer image of tightly-bent SMF with optical power of 3 W at 1 480 nm	14
Figure 8 – Temperature of the coating surface of SMFs against bending with optical power of 3 W at 1 480 nm	14
Figure 9 – Maximum permissible power in the fibre against APR power reduction time	18
Figure A.1 – Front part of the fibre fuse damage generated in the optical fibre	20
Figure A.2 – SiO absorption model	22
Figure A.3 – Calculated fibre fuse propagation behaviour simulated with the SiO absorption model/Void formation mechanism	23
Figure A.4 – Series of optical micrographs showing damage generated by 9,0 W 1 480 nm laser light suggesting a mechanism of periodic void formation	24
Figure A.5 – Images of fibre fuse ignition taken with an ultra-high speed camera and an optical micrograph of the damaged fibre	25
Figure A.6 – Power density dependence of the fibre-fuse propagation velocity	25
Figure A.7 – Optical micrographs showing front part of the fibre fuse damage generated in SMF-28 fibres with various laser intensities (1 480 nm)	26
Figure A.8 – Principle of the optical fibre fuse passive termination method and photograph of the fibre fuse terminator which adopted TEC structure	27
Figure A.9 – Photograph of hole-assistant fibre and fibre fuse termination using a hole-assistant fibre	28
Figure A.10 – Example of fibre fuse active termination scheme	29
Figure A.11 – Transformation of electric signal by optical fibre fuse	29
Table 1 – Threshold power of fibre fuse propagation for various fibres	9
Table 2 – Measurement conditions	10
Table 3 – Examples of power limits for optical fibre communication systems having automatic power reduction to reduce emissions to a lower hazard level	16
Table 4 – Location types within an optical fibre communication system and their typical installations	17

INTERNATIONAL ELECTROTECHNICAL COMMISSION

OPTICAL AMPLIFIERS –

Part 4: Maximum permissible optical power for the damage-free and safe use of optical amplifiers, including Raman amplifiers

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IEC TR 61292-4, which is a technical report, has been prepared by subcommittee 86C: Fibre optic systems and active devices, of IEC technical committee 86: Fibre optics.

This third edition cancels and replaces the second edition, published in 2010, and constitutes a technical revision with updates reflecting new research in the subject area.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
86C/1158/DTR	86C/1200/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 61292 series, published under the general title, *Optical amplifiers*, 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 web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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INTRODUCTION

This technical report is dedicated to the subject of maximum permissible optical power for damage-free and safe use of optical amplifiers, including Raman amplifiers. Since the technology is quite new and still evolving, amendments and new editions to this report can be expected.

Many new types of optical amplifiers are entering the marketplace and research is also stimulating many new types of fibre and non-fibre based optical amplifier research. With the introduction of such technologies as long-haul, over 40 Gb/s, WDM transmission and Raman amplification, some optical amplifiers may involve optical pump sources with extremely high optical power – up to, possibly, several watts.

Excessively high optical power may cause physical damage to the fibres/optical components/equipment as well as present medical danger to the human eye and skin.

The possibility of fibre damage caused by high optical intensity has recently been discussed at some technical conferences. The use of high intensity optical amplifiers may cause problems in the fibre such as a fibre fuse, a heating in the splice point (connection point), and the fibre end-face damage due to dust and the fibre coat burning due to tight fibre bending. IEC SC 86A (Fibres and cables) has published IEC TR 62547, and SC 86B (Fibre optic interconnecting devices and passive components) has published IEC TR 62627-01. IEC TC 31 (Equipment for explosive atmospheres) is also discussing the risk of ignition of hazardous environments by radiation from optical equipment.

Medical aspects have long been discussed at standards groups. IEC TC 76 (Optical radiation safety and laser equipment) precisely describes in IEC 60825-2 the concept of hazard level and labelling and addresses the safety aspects of lasers specifically in relation to tissue damage.

ITU-T Study Group 15 (Optical and other transport networks) has published Recommendation G.664, which primarily discusses the automatic laser power reduction functionality for safety.

With the recent growth of interest in fibre Raman amplifiers, however, some difficulties have been identified among optical amplifier users and manufacturers in fully understanding the technical details and requirements across all such standards and agreements.

This technical report provides a simple informative guideline on the maximum optical power permissible for optical amplifiers for optical amplifier users and manufacturers.