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TECHNICAL REPORT

colour inside

Optical amplifiers –
Part 6: Distributed Raman amplification

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CONTENTS

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IEC TR 61292-6 has been prepared by subcommittee 86C: Fibre optic systems and active devices, of IEC technical committee 86: Fibre optics. It is a Technical Report.

This second edition cancels and replaces the first edition published in 2010. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) correction of the formula for noise figure;
b) correction of errors in Figure 10.

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

Draft	Report on voting
86C/1822/DTR	86C/1831/RVDTR

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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INTRODUCTION

Distributed Raman amplification (DRA) describes the process whereby Raman pump power is introduced into the transmission fibre, leading to signal amplification within the transmission fibre though stimulated Raman scattering. This technology has become increasingly widespread in recent years due to many advantages that it offers to optical system designers, including improved system optical signal-to-noise ratio (OSNR) and the ability to tailor the gain spectrum to cover any or several transmission bands.

A fundamental difference between distributed Raman amplification and amplification using discrete amplifiers, such as erbium-doped fibre amplifiers (EDFAs), is that the latter can be described using a black box approach, while the former is an inherent part of the transmission system in which it is deployed. Thus, a discrete amplifier is a unique and separate element with well-defined input and output ports, allowing rigorous specifications of the amplifier performance characteristics and the methods used to test these characteristics. On the other hand, a distributed Raman amplifier is basically a pump module, with the actual amplification process taking place along the transmission fibre. This means that many of the performance characteristics of distributed Raman amplification are inherently coupled to the transmission system in which a Raman amplifier is deployed.

This document provides an overview of DRA and its applications. It also provides a detailed discussion of the various performance characteristics related to DRA, as well as some of the methods that can be used to test these characteristics. Information is also provided on some of the operational issues related to the distributed nature of the amplification process, such as the sensitivity to transmission line quality and eye-safety.

The material provided is intended to provide a basis for future development of specifications and test method standards related to DRA.