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Semiconductor devices –
Part 5-4: Optoelectronic devices – Semiconductor lasers

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SEMICONDUCTOR DEVICES –

Part 5-4: Optoelectronic devices – Semiconductor lasers

FOREWORD

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IEC 60747-5-4 has been prepared by subcommittee 47E: Discrete semiconductor devices, of IEC technical committee 47: Semiconductor devices. It is an International Standard.

This second edition cancels and replaces the first edition published in 2006. This edition constitutes a technical revision.

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

a) References for the terms and definitions related to the lighting area, IEC 60050-845, are revised based on IEC 60050-845:2020;
b) Emission angle is changed to radiation angle in 3.3.2;
c) Definitions of rise time and fall time in 3.4.1 are revised based on the publication IEC 60050-521:2002;
d) Spectral linewidth is added to Table 1 in Clause 4;
e) Conditions for carrier-to-noise ratio of Table 1 in Clause 4 is amended.

f) Error in the equation for carrier-to-noise ratio in 5.2.2 is corrected;

g) Precaution against the equipment used for carrier-to-noise ratio measurement is added in 5.2.2;

h) Explanation for the measurement method of the small signal cut-off frequency in 5.3.2 of the first edition is deleted because it has been defined in the latest version of ISO 11554;

i) Reference document for the lifetime in 5.4 is amended;

j) Precaution against the measuring arrangement used for the half-intensity width and $1/e^2$-intensity is added in 5.5.3;

k) Reference tables in Annex A, Annex B and Annex C are revised by following the latest version of ISO publications.

The text of this International Standard is based on the following documents:

Draft	Report on voting
47E/783/FDIS	47E/785/RVD

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 International Standard 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.

A list of all parts in the IEC 60747 series, published under the general title *Semiconductor devices*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

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- withdrawn,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

INTRODUCTION

The first edition of this part of IEC 60747 was published in 2006 under close collaboration between IEC TC 47 SC 47E (IEC TC 47 SC 47C at that moment) and ISO TC 172 SC 9. The scope of IEC/TC47/SC47E includes laser diodes as one of the discrete semiconductor devices while that of ISO/TC172/SC9 includes laser diodes as one of the laser and laser-related equipment. Consequently, technical contents in this publication extend over IEC and ISO.

In order to harmonize the IEC and ISO laser-related standards in 1997, a joint working group (JWG) consisted of the experts from both IEC SC 47E and ISO TC 172 SC 9 was established. As a result of discussion, items based on the electrical and electronic technologies are dealt with by subcommittee 47E of IEC technical committee 47, while optical characteristics of the output beam are under the responsibility of subcommittee 9 of ISO technical committee 172. This was agreed, after long discussion, in 2002 between subcommittee 47E of IEC technical committee 47 and subcommittee 9 of ISO technical committee 172. Based on this agreement, terms and definitions, and test and measurement methods for the optical beam parameters in this part of IEC 60747-5-4 are referenced to the ISO standards that specify the topics.

The joint working group was disbanded in 2017. However, close co-operation and contact between two groups is indispensable in order to avoid any conflicts and to keep harmonization of IEC and ISO laser standards.

This second edition of IEC 60747-5-4 has been updated by following the revision and amendments in the latest versions of laser standards of both IEC and ISO.

SEMICONDUCTOR DEVICES –

Part 5-4: Optoelectronic devices – Semiconductor lasers

1 Scope

This part of IEC 60747 specifies the terminology, the essential ratings and characteristics as well as the measuring methods of semiconductor lasers.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC TR 62572-2, *Fibre optic active components and devices – Reliability standards – Part 2: Laser module degradation*

ISO 11146-1, *Lasers and laser-related equipment – Test methods for laser beam widths, divergence angles and beam propagation ratios – Part 1: Stigmatic and simple astigmatic beams*

ISO 11554, *Optics and photonics – Lasers and laser-related equipment – Test methods for laser beam power, energy and temporal characteristics*

ISO 12005, *Lasers and laser-related equipment – Test methods for laser beam parameters – Polarization*

ISO 17526, *Optics and optical instruments – Lasers and laser-related equipment – Lifetime of lasers*