TC 76/Publication IEC 60825-1 (2007), second edition/I-SH 02

SAFETY OF LASER PRODUCTS –

Part 1: Equipment classification and requirements

INTERPRETATION SHEET 2

This interpretation sheet has been prepared by technical committee 76: Optical radiation safety and laser equipment.

The text of this interpretation sheet is based on the following documents:

ISH	Report on voting
76/437/ISH	76/440/RVD

Full information on the voting for the approval of this interpretation sheet can be found in the report on voting indicated in the above table.

Subclause 8.3 f 3)

This subclause is clarified by the following:

Introduction

For pulse durations shorter than 1 ns, the application of the criterion given in 8.3 f 3) a) (the „$N^{-0,25}$ criterion“) produces overly-restrictive results when compared to the TOTP criterion 8.3 f 3) b).

NOTE This Interpretation Sheet also applies to MPE analyses (subclause A.3 c)).

Interpretation

In the wavelength range of 400 nm to 1 400 nm, the TOTP criterion (8.3 f 3) b)) can be applied for the case of pulse trains with pulses of the same energy and duration.

NOTE 1 If the “$N^{-0,25}$ criterion” is applied, it would have to be adopted as follows so that it results in equivalent evaluations as the TOTP criterion:

Pulses with durations less than T_i are assigned pulse durations of T_i. If two or more pulses occur within a duration of T_i, these pulse groups are assigned a pulse duration of T_i. The reduction factor C_5 is applied to the AEL that is applicable for T_i (i.e. $C_5 \cdot AEL(T_i)$). If one pulse occurs within T_i, the energy of that pulse is compared with the reduced AEL, i.e. with $C_5 \cdot AEL(T_i)$). If more than one pulse occurs within T_i, the sum of the energies of these pulses is compared with the reduced AEL.

NOTE 2 For the heading of 8.3 f 3) b)), instead of “for varying pulse widths or varying pulse durations” the intended wording was “for varying pulse widths or varying pulse intervals“ as corrected in Corrigendum 1”.

Rationale

For constant pulse durations and energies, the two criteria (the $N^{-0,25}$ and the TOTP criterion) should be, as a general principle, equivalent for all pulse durations, as both reflect the same

thermal additivity of multiple pulse exposures and constant pulse trains are a special case of non-constant pulse trains.

For pulse durations longer than T_i, the TOTP and the $N^{-0,25}$ criteria, as given in IEC 60825-1:2077, do produce mathematically identical evaluations. For pulse trains where individual pulse durations are shorter than 1 ns, because the $N^{-0,25}$ criterion is applied in IEC 60825-1 to the AEL for the single pulse (which for pulse durations less than 1 ns is smaller than the AEL for T_i of 18 μs or 50 μs), the $N^{-0,25}$ criterion and the TOTP criterion produce different results. Since both rules are intended to reflect thermal additivity of pulses, the TOTP is the more general criterion. Criteria that would make the current $N^{-0,25}$ criterion equivalent with the TOTP criterion are outlined in NOTE 1 above.

This instruction will remain valid until a new version of IEC 60825-1 is published.