

Problems and open questions with limit values in directive 2006/25/EC in daily use

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Introduction

The limit values for protection of workers from hazards caused by incoherent optical radiation are described in annex I of the directive 2006/25/EC [1]. Historically, these values are mainly based on limit values proposed by ICNIRP, which have been published years ago.

The German ordinance on artificial optical radiation (OStrV) [2] came into force in July 2010. It transposes the directive 2006/25/EC into German law unchanged. Therefore, the OStrV does not define any exposure limits in detail, but refers instead to the limit values in the EU directive. Hence, any modifications in the limit values in the directive are automatically adopted to German law.

Unfortunately, gaps and open questions in the limit values still remain. However, ICNIRP is not in charge for solving these problems, but one of the most influential and qualified institution at all.

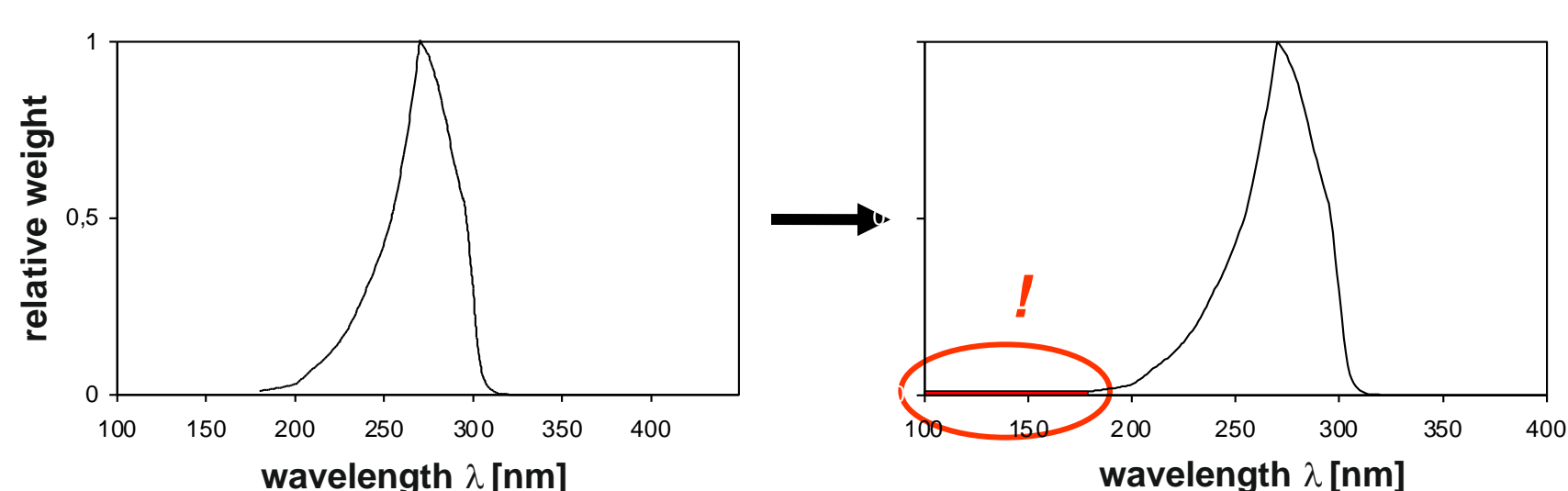
Here we depict gaps and open questions arising from the usage of the limit values in daily practical use, and suggest solutions.

Gaps, Questions and Solutions

Absence of limit values in the wavelength range from 100 nm to 180 nm

Situation: The OStrV applies to radiant exposure in the wavelength range from 100 nm to 1 mm. However, its exposure limit values fail to cover the entire wavelength regime to which it applies. Limit values are missing from 100 nm to 180 nm.

Solution: Even though UV radiation at wavelengths below 180 nm is strongly absorbed in the atmosphere, cases of exposition of individuals occur. The value of 0.012 should be employed for $S(\lambda)$ for all wavelengths from 100 nm to 179 nm, and the effective radiant exposure H_{eff} (100 nm to 400 nm) should be compared to the exposure limit value of 30 J/m².



Absence of limit values for fluctuating exposure

Situation: The limit values apply to continual exposure. Suitable limit values or provisions governing how the existing limit values are to be applied are not provided for interrupted or fluctuating radiation exposure.

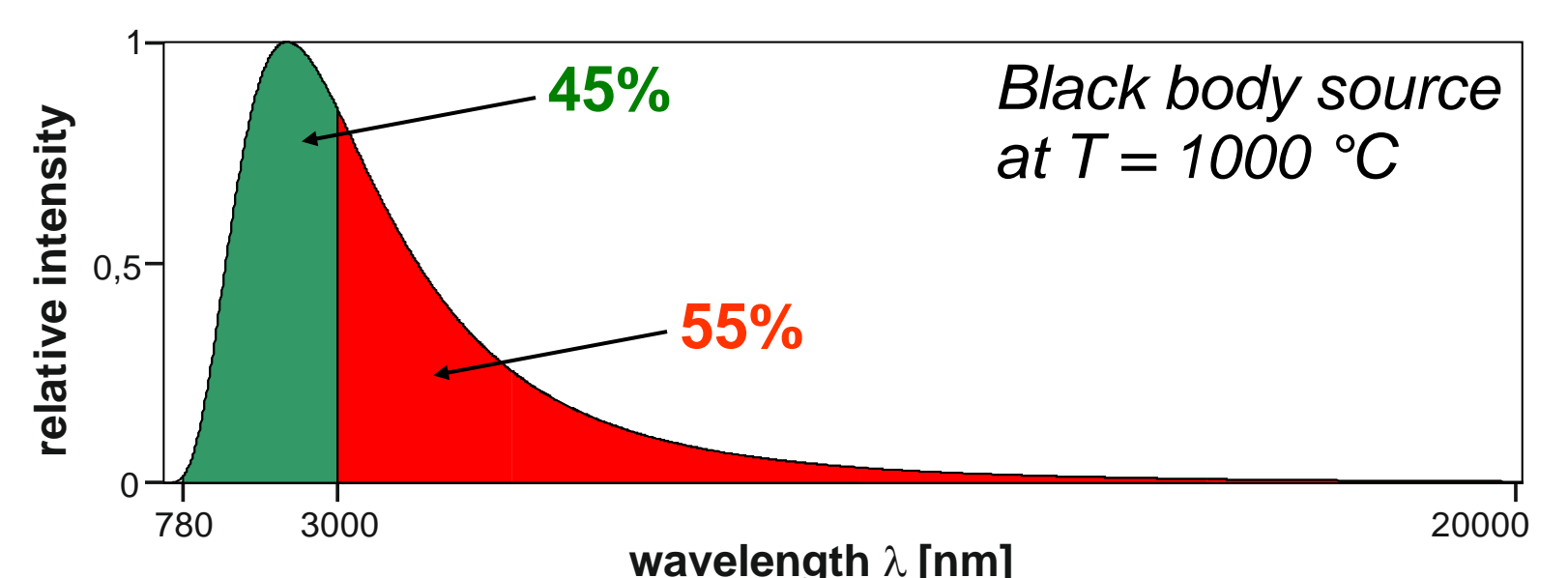
Requirement for minimization of exposure

Situation: The limit value $H_{\text{eff}} = 30 \text{ J/m}^2$ is not sufficient on its own to provide protection against long-term harm, as it has been introduced by ICNIRP for protection of the eyes and skin against short-term harm.

Absence of limit values in the wavelength range from 3000 nm to 1 mm

Situation: The lack of the limit value is a serious deficit, since optical radiation in at wavelengths above 3000 nm may be harmful to skin and eye. For example, a black body radiation source at a temperature of 1000 °C (e. g. molten glass), only 45% of the emitted radiation is in the wavelength range from 780 nm to 3000 nm, 55% is in the range from 3000 nm to 20 μm.

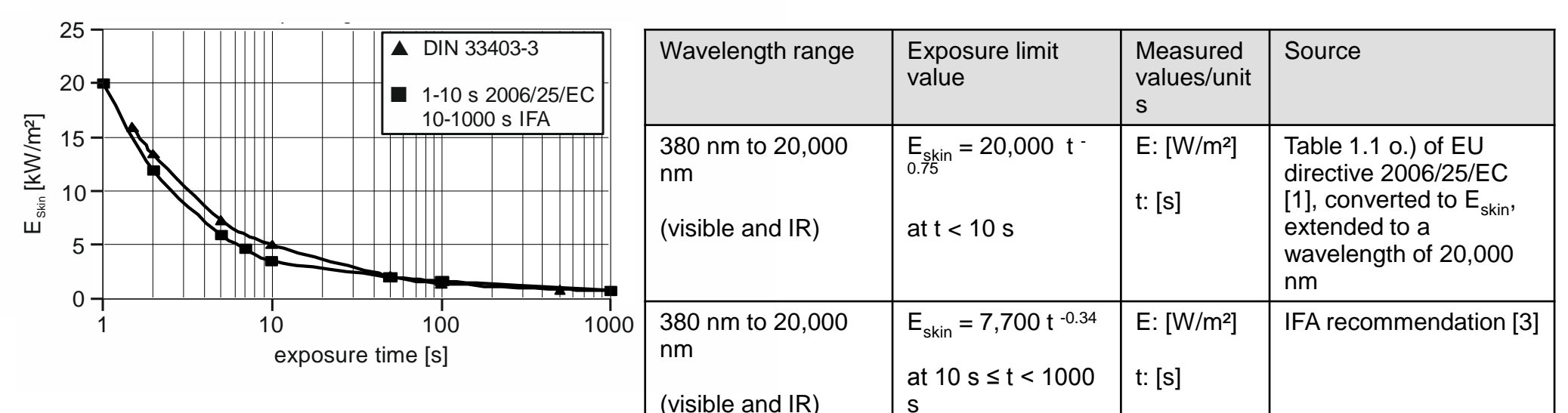
Solution: The irradiance E_{IR} considered for comparison with the limit values should extend to the greater wavelength range from 780 nm to 20 μm.



Absence of limit values for protection against skin burns at exposure times over 10 s

Situation: We experienced many workplaces with exposure times above 10 s for skin and eye. Unfortunately, no limit values exist. Once again, the exposure limit value applies only to radiation at wavelengths between 380 nm and 3000 nm.

Solution: An IFA recommendation [3] firstly adopts the limit values of the EU directive, whilst at the same time being oriented to the values of DIN 33043-3 [4] for the pain thresholds associated with the action of thermal radiation upon the skin. The IFA proposal includes exposure limit values for exposure durations of up to 1000 s and for wavelength range between 380 nm and 20 μm.



Future implementation

Currently, technical rules for more detailed explanation of the OStrV are formulated. We hope to include instructions on dealing with the gaps and questions. In future, we would appreciate to work together or within ICNIRP to optimize the limit values in directive 2006/25/EC.

References

- [1] 2006/25/EC: Directive of the European Parliament and of the Council of 5 April 2006 on the minimum health and safety requirements regarding the exposure of workers to risks arising from physical agents (artificial optical radiation), OJ EU, L 114/38 of 27 April 2006
- [2] OStrV: Verordnung zur Umsetzung der Richtlinie 2006/25/EG zum Schutz der Arbeitnehmer vor Gefährdungen durch künstliche optische Strahlung vom 19. Juli 2010, BGBl. I (2010) No. 38, 26. Juli 2010
- [3] Expositionsgrenzwerte zum Schutz der Haut vor Verbrennungen durch Wärmestrahlung – Empfehlungen des IFA, Januar 2011, <http://publikationen.dguv.de/dguv/pdf/10002/empfehlungen-ir-expgrenzwerte.pdf>
- [4] DIN 33043-3: Climate at the workplace and its environments – Part 3: Assessment of the climate in the warm and hot working areas based on selected climate indices, 2011