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## Photocarcinogenesis action spectrum (non-melanoma skin cancers)

*Spectre d'action de la photocarcinogénèse (cancers de la peau hors  
mélanome)*

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

ISO/CIE 28077 was prepared by CIE Technical Committee 6-32, *Action Spectrum for Photocarcinogenesis*, as CIE S 019. The committee responsible for this document is ISO/TC 274, *Light and lighting*.

This second edition cancels and replaces the first edition (ISO 28077:2006), of which it constitutes a minor revision.

## Introduction

Solar ultraviolet radiation (UVR) is recognized as a major cause of non-melanoma skin cancer in human beings. Skin cancer occurs most frequently in the most heavily exposed areas and correlates with degree of outdoor exposure. Describing the relationship of exposure (dose) to risk (skin cancer) requires the availability of a biological hazard function or *action spectrum* for photocarcinogenesis. This document proposes the adoption of an action spectrum (weighting function) derived from experimental laboratory data and modified to estimate the non-melanoma tumour response in human skin. The experimental data are sufficient for estimating effectiveness down to about 250 nm, but experimental data are not sufficient for specifying effectiveness above 400 nm.



# Photocarcinogenesis action spectrum (non-melanoma skin cancers)

## 1 Scope

This document specifies the action spectrum for photocarcinogenesis of non-melanoma skin cancers.

## 2 Normative references

There are no normative references in this document.

## 3 Terms, definitions, symbols and abbreviations

For the purposes of this document, the terms and definitions given in CIE S 017/E:2011 and the following terms and definitions, symbols and abbreviations apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

### 3.1 Terms and definitions

#### 3.1.1

#### ultraviolet radiation

#### UVR

radiation for which the wavelengths are shorter than those for visible radiation

Note 1 to entry: The range between 100 nm and 400 nm is commonly subdivided into: UV-A: 315 nm to 400 nm; UV-B: 280 nm to 315 nm; UV-C: 100 nm to 280 nm.

[SOURCE: CIE S 017/E:2011, Term 17-1367, modified — Notes 2 and 3 have been omitted.]

### 3.2 Symbols and abbreviations

|        |                                                                                                                                      |
|--------|--------------------------------------------------------------------------------------------------------------------------------------|
| SCUP   | Skin Cancer Utrecht-Philadelphia (an action spectrum proposed in Reference [1])                                                      |
| SCUP-m | designates the original SCUP action spectrum, based entirely on mouse data                                                           |
| SCUP-h | designates a proposed action spectrum estimated by correcting for differences in UV transmissions between human and murine epidermis |
| UV-A1  | wavelength range from 340 nm to 400 nm                                                                                               |
| UV-A2  | wavelength range from 315 nm to 340 nm                                                                                               |

## 4 The action spectrum for photocarcinogenesis of non-melanoma skin cancers

The effectiveness of ultraviolet radiation in causing photocarcinogenesis of non-melanoma skin cancers has been studied for many years[1-16]. The action spectrum defined in this document was first published by the CIE as the product of research by CIE Technical Committee 6-32, as CIE 138/2.[16] The document stated the following recognized limitations to this action spectrum: