
Ophthalmic optics — Spectacle lenses — Short wavelength visible solar radiation and the eye

*Optique ophtalmique — Verre de lunettes — L'œil et les radiations
solaires visibles de courtes longueurs d'onde*

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[ISO/TR 20772:2018](https://standards.iteh.ai/catalog/standards/iso/e7321ba5-4fef-48ad-8912-ca6d4cbc240e/iso-tr-20772-2018)

<https://standards.iteh.ai/catalog/standards/iso/e7321ba5-4fef-48ad-8912-ca6d4cbc240e/iso-tr-20772-2018>



iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[ISO/TR 20772:2018](https://standards.iteh.ai/catalog/standards/iso/e7321ba5-4fef-48ad-8912-ca6d4cbc240e/iso-tr-20772-2018)

<https://standards.iteh.ai/catalog/standards/iso/e7321ba5-4fef-48ad-8912-ca6d4cbc240e/iso-tr-20772-2018>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2018

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Preliminaries: UV400 and alpha-blocking wavelength in standardization	1
5 Solar radiation and exposure of the eye	3
5.1 Solar radiation and the earth's atmosphere	3
5.2 Geometrical factors	5
5.2.1 General	5
5.2.2 Exposure and solar altitude	5
5.2.3 Reflection from surfaces	6
5.2.4 Exposure of the eye and its response to bright light	6
5.2.5 Peripheral light focusing effects	7
5.2.6 Irradiation of the retina	8
6 Physiological effects on the eye	9
6.1 Hazards to the eye	9
6.2 Retinas of children's eyes	9
6.3 Retinal blue phototoxicity	10
6.3.1 General	10
6.3.2 Blue light in solar radiation	11
6.3.3 Eye media transmittance	11
6.3.4 Sunlight irradiance reaching the retina	11
6.4 Retinal studies	11
6.4.1 General	11
6.4.2 Phototoxic effect near 405 nm	12
6.5 The mechanisms of retinal damage	12
6.6 Blue light & non-visual functions	13
6.7 Blue light transmittance of spectacle and sunglass lenses	13
6.7.1 Existing standards requirements for claims regarding blue light transmittance	13
6.7.2 Relevant spectral bandwidth and transmittance characteristics	14
6.7.3 Effects of blue light filtering on clear lenses	14
6.7.4 Effects of blue light filtering on tinted lenses	14
7 Spectral weighting functions	14
7.1 General	14
7.2 ICNIRP 2013	15
7.3 Application of ICNIRP specifications to standards for spectacle lenses and sunglasses	16
8 Filtering materials and measurement	17
8.1 General	17
8.2 Materials for lenses and filters, including special treatments for filter properties	17
8.3 How the physical properties of lenses/filters affect transmission, reflection, and absorption of solar radiation	18
8.4 Measuring spectral transmittances	19
8.4.1 Principles of the measurements	19
8.4.2 Factors important to the accuracy of measurement	20
9 Summary	20
Bibliography	21

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).

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).

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

For an explanation of the voluntary nature of standards, 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 172, *Optics and photonics*, Subcommittee SC 7, *Ophthalmic optics and instruments*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

<https://standards.iteh.ai/catalog/standards/iso/e7321ba5-4fef-48ad-8912-ca6d4cbc240e/iso-tr-20772-2018>

Introduction

Ongoing concern about unverifiable spectacle lens and sunglass marketing claims for blocking of wavelengths near to and greater than 380 nm (such as UV400 claims) was the main motivation for creating the present Technical Report.

The intention is to explain the specifications related to the filtering effects of lenses and filters that are given in the available International Standards — for the purposes of standardization in the fields of spectacle lenses and sunglasses, 380 nm is generally chosen as both the upper limit of the solar UV range and the lower limit of the visible range — and to provide information about the supporting science as it is best understood today.

The effects of UV radiation on the eye are well known, and have been considered in the technical requirements of the standards relating to tinted spectacle lenses (ISO 8980-3) and sunglasses (ISO 12312-1).

The commitment to create this document came from a resolution of the plenary meeting of ISO/TC 172/SC 7, *Ophthalmic optics and instruments* (responsible for spectacle lens standards) in 2009, and was jointly supported by ISO/TC 94/SC 6, *Eye and face protection* (responsible for sunglass standards). The related standards activity in these two committees is summarized in [Clause 4](#), with more detail on the background and technical context leading up to the decision to create this document.

iTeh Standards (<https://standards.iteh.ai>) Document Preview

[ISO/TR 20772:2018](#)

<https://standards.iteh.ai/catalog/standards/iso/e7321ba5-4fef-48ad-8912-ca6d4cbc240e/iso-tr-20772-2018>