

ISO/TR 20772:2018-10 (E)

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

| 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 |