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01-februar-2022

Merilne metode značilnosti modre svetlobe in s tem povezanih optičnih zmogljivosti za slikovno zaslonsko opremo (TA 2)

Measuring methods of blue-light characteristics and related optical performances for visual display terminal (TA 2)

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Ta slovenski standard je istoveten z: **prEN IEC 63207:2021**

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ICS:

17.180.20	Barve in merjenje svetlobe	Colours and measurement of light
31.120	Elektronske prikazovalne naprave	Electronic display devices

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100/3685/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER:	
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DATE OF CIRCULATION:	CLOSING DATE FOR VOTING:
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IEC TA 2 : COLOUR MEASUREMENT AND MANAGEMENT	
SECRETARIAT: United States of America	SECRETARY: Mr Michael Dolan
OF INTEREST TO THE FOLLOWING COMMITTEES: TC 110	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.
FUNCTIONS CONCERNED: ☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☐ SAFETY	
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TITLE:

Measuring methods of blue-light characteristics and related optical performances for visual display terminal (TA 2)

PROPOSED STABILITY DATE: 2024

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Measuring methods of blue light characteristics and related optical performance for visual display terminal

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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- withdrawn,
- replaced by a revised edition, or
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INTRODUCTION

In nowadays, visual display terminals (VDTs) are everywhere in daily life, such as TVs, monitors, tablets, mobile phones, etc. Almost people will watch VDTs for a long time per day for varies reasons. However, there are three undesirable effects that will be caused by the blue light from VDTs.

The first one is a possibility of injury to human retina [1]. The energy of blue light emitting from VDTs is weak. However, the effects of long-termexposure (30 years or more) to weak energy from blue light of VDTs are unknown.

The 2nd one is an effect of disturbance of biological clock (circadian) [2,3]. The blue light emitting from VDTs at nighttime can also cause the disturbance of biological clock.

The 3rd one is an effect of eye strain [4,5].

To reduce these three issues, the demand of blue light reduced VDTs by market is dramatically increasing. In consequence, the industry of VDTs is enthusiastic in promoting blue light reduced VDTs, including well-known companies. On the other hand, the reduction of blue light will certainly have drawbacks on visual experience.

To address the defects above under the scope of IEC TC100, this project contributes to develop a set of novel measurement methods for VDTs that the methods integrate both the considerations of luminance independent indicators of blue light characteristics (BLCs).

NOTICE: this project will only provide objective measurement methods for measuring BLCs of VDTs, the action of defining threshold values or assessment methods are out of the scope of this project. If necessary, manufactures can define their own threshold values and/or assessment methods according to this project.

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Measuring methods of blue light characteristics and related optical performance for visual display terminal

1 Scope

This document specifies measuring methods for optical performance (luminance) and blue light characteristics (BLCs) of visual display terminals (VDTs)，excluding displays only for outdoor use.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/CIE 19476:2014 *Characterization of the performance of illuminance meters and luminance meters*

ISO 23539/CIE S010 *Photometry – The CIE system of physical photometry*

IEC 61747-30-1:2012 *Liquid crystal display devices – Part 30-1: Measuring methods for liquid crystal display modules – Transmissive type*

IEC 61966-4:2000 *Multimedia systems and equipment-Colour measurement and management - Part 4*: *Equipment using the liquid crystal display panels*

CIE S 017:2014 *International lighting vocabulary*

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3 Terms, definitions, symbols and units

For the purposes of this document, the following terms and definitions apply.

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

• ISO Online browsing platform: available at https://www.iso.org/obp

• IEC Electropedia: available at http://www.electropedia.org/

3.1 Terms and definitions

3.1.1

spectral radiance (L_λ)

for a wavelength interval dl, in a given direction at a given point, quotient of the spectral radiant power, $d\Phi_\lambda(\lambda)$, passing through an infinitely small area enclosing that point and propagating within the solid angle, $d\Omega$, in the given direction, to the product of the wavelength interval, $d\lambda$, and the area of a section of that beam on a plane perpendicular to this direction ($dA\cos\Theta$) containing the given point and to the solid angle, $d\Omega$.

unit: $W \cdot m^{-2} \cdot nm^{-1} \cdot sr^{-1}$

[SOURCE: CIE S 017:2014, 17-1228]

3.1.2

blue light

a portion of visible light spectrum, the wavelength range is specified between 400nm - 500nm.

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3.1.3

blue light radiance (L_{Blue})

radiance in which integrated spectral radiance in the blue light range.

$$L_{Blue} = \int_{400}^{500} L_{e,\lambda}\, d\lambda$$

Unit: W·m^{-2}·sr^{-1}

where:

$L_{e,\lambda}$ is spectral radiance.

3.1.4

radiance of the full white signal (L_W)

radiance in which integrated spectral radiance in the visible radiation range.

$$L_W = \int_{380}^{780} L_{e,\lambda}\, d\lambda$$

Unit: W·m^{-2}·sr^{-1}

where:

$L_{e,\lambda}$ is spectral radiance.

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3.1.5

blue light radiance per luminance (R_{BlueV})

a ratio of blue light radiance L_{Blue} to luminance L_V.

$$R_{BlueV} = \frac{L_{Blue}}{L_V}$$

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Unit: W·lm^{-1}

3.1.6

blue light radiance per radiance of the full white signal (R_{Blue})

a ratio of blue light radiance L_{Blue} to luminance L_V.

$$R_{Blue} = \frac{L_{Blue}}{L_W} \times 100$$

Unit: %

3.1.7

narrow band blue light

a wavelength range of such blue light portion is specified between 415 nm - 455 nm.

3.1.8

narrow band blue light radiance (L_{nBlue})

radiance in which integrated spectral radiance in the narrow band blue light range.

$$L_{nBlue} = \int_{415}^{455} L_{e,\lambda}\, d\lambda$$

Unit: W·m^{-2}·sr^{-1}

where:

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182 $L_{e,\lambda}$ is spectral radiance.

183 **3.1.9**

184 **narrow band blue light radiance per blue light radiance (R_{nBlue})**

185 a ratio of narrow blue light radiance L_{nBlue} to blue light radiance L_{Blue}.

186 $$R_{nBlue} = \frac{L_{nBlue}}{L_{Blue}} \times 100$$

187 Unit: %

188

189 **3.2 Abbreviations**

190 LMD light measurement device

191 MF measurement field

192 VDT visual display terminal

193 **4 Measuring conditions**

194 **4.1 Environmental conditions**

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195 The measurement shall be performed in a dark room and not be affected by electromagnetic
196 interference. If the electromagnetic interference affects results, the measurement shall be
197 carried out in a dark and shielding room.

198 The illuminance of stray light on the VDT's screen shall be ≤1 lx. It means the illuminance on
199 the VDT's screen shall be ≤1 lx when VDT has been shut down in a dark room.

200 Measurements shall be carried out under the following temperature, humidity and atmospheric
201 pressure.

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202 Temperature: 25°C ± 3 °C;

203 Humidity: 20 %RH to 80 %RH;

204 Atmospheric pressure: 86 kPa to 106 kPa.

205 When different environmental conditions are applied, they shall be noted in the measurement
206 report.

207 **4.2 Power supply**

208 The measurement of VDT shall be performed under rated power supply. The fluctuation of the
209 power supply voltage shall be no more than ±2%. When using built-in batteries, the remaining
210 battery power shall be no less than 80%; when using AC power supply, the fluctuation of power
211 frequency shall be no more than ±2%, the fluctuation of harmonic components shall be no more
212 than ±5%.

213 **4.3 Stabilized condition of VDT**

214 To stabilize the performance of VDT before measurement, the VDT shall be turned on for at
215 least 30 minutes (under standard environmental conditions) until repeated measurements of
216 the display show a variation in luminance of no more than 2% per minute for short-term stability
217 and 5% per hour for long-term stability.