

INTERNATIONAL STANDARD



Electronic displays –
Part 2-11: Measurement of optical characteristics – Local luminance and
uniformity

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IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRONIC DISPLAYS –

Part 2-11: Measurements of optical characteristics –
Local luminance and uniformity

FOREWORD

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IEC 62977-2-11 has been prepared by of IEC technical committee 110: Electronic displays. It is an International Standard.

The text of this International Standard is based on the following documents:

| Draft | Report on voting |
|---------------|------------------|
| 110/1566/FDIS | 110/1591/RVD |

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 62977 series, published under the general title *Electronic displays*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

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INTRODUCTION

Emissive displays are emerging as the most advanced displays featuring a high dynamic range from black to white luminance, as well as vivid colour for each pixel.

Various methods, which measure optical characteristics standardized in IEC TC 110, so far consider only a specified measurement area that covers more than 500 pixels. It is likely that optical performances reporting the spatially integrated data will have difficulty to represent the optical characteristics of each pixel.

For that to be possible, standardization related to the method of measuring luminance and uniformity from each pixel-to-pixel cluster within the specified local block which will cover at least 500 emission pixels regularly placed, will be identified.

This document assesses the consistent luminance and uniformity in the local block (for example, within a 4 % window box pattern and regularly scattered emission pixels) by comparing the changes in luminance variation and emissive ratio, where an emissive sequence of each pixel is controlled.

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ELECTRONIC DISPLAYS –

Part 2-11: Measurements of optical characteristics – Local luminance and uniformity

1 Scope

This part of IEC 62977 specifies the local luminance and uniformity measurement methods of emissive displays. The light measuring device's (LMD) measurement field will cover more than 500 pixels of TVs, monitors or signage displays. The local luminance and uniformity measurement methods identify optical variations within the local block where over 500 emission pixels are regularly placed.

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.

IEC 60050-845, *International Electrotechnical Vocabulary – Part 845: Lighting* (available at www.electropedia.org)

IEC 62341-1-2, *Organic light emitting diode (OLED) displays – Part 1-2: Terminology and letter symbols*

CIE 70-1987, *The Measurement of Absolute Luminous Intensity Distributions*

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3 Terms, definitions, abbreviated terms, symbols and units

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-845, IEC 62341-1-2, and the following apply.

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

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

3.1.1

local block

area where at least 500 emission pixels are regularly arranged

3.1.2

local luminance

luminance not in the whole area but in a specified or designated local block, where regularly arranged pixels are gathered, of the emissive display panel

3.1.3

local luminance consistency

luminance variation range within the local block

3.1.4

local luminance uniformity

luminance variation among adjacent pixels in the local block of the emissive display panel

3.2 Abbreviated terms

- APL average picture level
- CCT correlated colour temperature
- CIE Commission Internationale de l'Eclairage (International Commission on Illumination)
- DUT device under test
- iLMD imaging light measuring device
- LMD light measuring device

3.3 Symbols and units

Table 1 describes the symbols and quantity units.

Table 1 – Letter symbols

| No | Name of quantity | Symbol | Unit | Remark |
|---|---|-------------|-------------------|-----------------------------|
| 01 | Measuring distance between display and LMD | d | mm | Formula (1) |
| 02 | Measurement-field angle | a | degree | Formula (1) |
| 03 | Horizontal pixel pitch | p_h | mm | Formula (1) |
| 04 | Vertical pixel pitch | p_v | mm | Formula (1) |
| 05 | Number of pixels in the measured area | n | - | Formula (1) |
| 06 | Average of local luminance ($L_i = i 1, 2, \dots, m$) | L_{avg} | cd/m ² | Formula (2), Formula (3) |
| 07 | Luminance of arranged-pixels test pattern | L_i | cd/m ² | Formula (2) |
| 08 | Number of arranged-pixels test patterns | m | - | Formula (2) |
| 09 | Local luminance consistency | LLC | % | Formula (3) |
| 10 | Emissive ratio | P | % | Formula (3) |
| 11 | Luminance of reference (4 % white box) | L_{ref} | cd/m ² | Formula (3) |
| 12 | Luminance of 100 % black box | L_K | cd/m ² | Formula (3) |
| 13 | Local contrast of reference | CR_{Ref} | - | Formula (4) |
| 14 | Local contrast consistency | LCC | % | Formula (6) |
| 15 | Correct measurement distance between iLMD and display | D | mm | Formula (7) |
| 16 | Image luminance | L_{image} | cd/m ² | Formula (8) |
| 17 | Local luminance uniformity | LLU | % | Formula (9) |
| 18 | Minimum luminance of ($L_i = i 1, 2, \dots, m$) | L_{min} | cd/m ² | Formula (9) |
| 19 | Maximum luminance of ($L_i = i 1, 2, \dots, m$) | L_{max} | cd/m ² | Formula (9) |
| NOTE The pixel pitch is defined in ISO 9241-302:2008, 3.4.36 [9] ¹ . | | | | |

¹ Numbers in square brackets refer to the Bibliography.