

# REDLINE VERSION



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## Organic light emitting diode (OLED) displays – Part 5-3: Measuring methods of image sticking and lifetime

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ORGANIC LIGHT EMITTING DIODE (OLED) DISPLAYS –****Part 5-3: Measuring methods of image sticking and lifetime**

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**This Redline version provides you with a quick and easy way to compare all the changes between this standard and its previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.**

International Standard IEC 62341-5-3 has been prepared by IEC technical committee 110: Electronic displays.

This second edition replaces the first edition published in 2013. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) the measurement vehicle for lifetime is only for the module;
- b) the measurement method for monitor or TV devices is modified;
- c) the digital signage display is included as an example of OLED devices;
- d) the measurement method with HDR (high dynamic range) for image sticking is added;
- e) the analysis method with CIEDE 2000 is added for image sticking;
- f) the information method for evaluating image sticking is modified.

The text of this standard is based on the following documents:

FDIS	Report on voting
110/1134/FDIS	110/1154/RVD

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.

A list of all the parts in the IEC 62341 series, under the general title *Organic light emitting diode (OLED) displays*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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- amended.

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## ORGANIC LIGHT EMITTING DIODE (OLED) DISPLAYS –

### Part 5-3: Measuring methods of image sticking and lifetime

#### 1 Scope

This part of IEC 62341 specifies the standard ~~measurement conditions and measurement~~ measuring methods for determining the image sticking and lifetime of organic light emitting diode (OLED) display panels and modules, ~~except finalized display products for end customers, such as TV sets, monitor sets and mobile phones.~~ The measuring method for the lifetime mainly applies to modules.

#### 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 (all parts), International Electrotechnical Vocabulary (available at <<http://www.electropedia.org>>)~~

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

~~IEC 62087:2011, Methods of measurement for the power consumption of audio, video and related equipment~~

IEC 62341-1-2:~~2007~~, *Organic light emitting diode (OLED) displays – Part 1-2: Terminology and letter symbols*

IEC 62341-6-1:~~2009~~2017, *Organic light emitting diode (OLED) displays – Part 6-1: Measuring methods of optical and electro-optical parameters*

~~IEC 61966-2-1:1999, Multimedia systems and equipment – Colour measurement and management – Part 2-1: Colour management – Default RGB colour space – sRGB~~

ISO 11664-1, *Colorimetry – Part 1: CIE standard colorimetric observers*

CIE 15:~~2004~~, *Colorimetry*

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

### 3.1.1

#### equivalent current density

average current density of a certain pixel calculated from a varying luminance per frame image in a moving picture so that luminance degradation becomes similar at the same time

Note 1 to entry: See Annex A.

### 3.1.2

#### equivalent signal level

digital code value from 0 to 255 (in the case of 8 bits) transformed from the normalized luminance of a certain pixel by a  $\gamma$  specified opto-electronic transfer function (OETF)

Note 1 to entry: See Annex A.

## 3.2 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply.

APL	average picture level
CIELAB	CIE 1976(L*a*b*) colour space
DUT	devices under test
EOTF	electro-optical transfer function
FWHM	full-width-at-half-maximum
HDR	high dynamic range
LMD	light measuring device
OETF	opto-electronic transfer function
OLED	organic light emitting diode
PQ	perceptual quantizer
SDR	standard dynamic range

## 4 Measuring configuration

### 4.1 General

The system diagrams and/or operating conditions of the measuring equipment shall comply with the structure specified in each item. The measuring system and its arrangement are shown in Figure 1. The details are given in Clause 5.

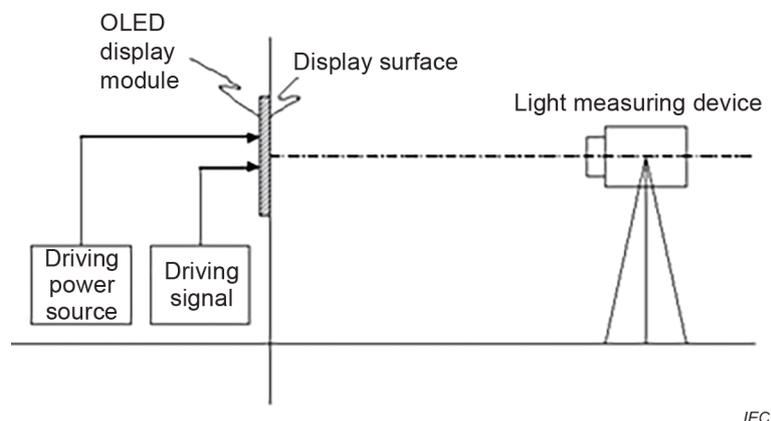


Figure 1 – Measuring system and arrangement

## 4.2 Light measuring device ~~(LMD)~~

~~The LMD as defined in IEC 62341-6-1:2009 shall be used. Specifically, the accuracy of the LMD at 1 degree of the measurement field angle is recommended as being  $\leq \pm 3\%$ , and with a repeatability  $\leq \pm 0,5\%$ .~~

The optical properties of displays shall generally be expressed in photometric or colorimetric units using the CIE 1931 standard colorimetric two-degree observer (see ISO 11664-1). Luminance can be measured by a photometer, and the CIE tristimulus values ( $X$ ,  $Y$ ,  $Z$ ) or CIE chromaticity coordinates by a colorimeter. A spectroradiometer can also obtain photometric and colorimetric values through a numerical conversion of the measured spectral radiance data (see, for example, [1]<sup>1</sup>). The following requirements are given for these instruments:

The LMD shall be a luminance meter, colorimeter, or a spectroradiometer. For DUTs that have sharp spectral peak full-width-at-half-maximums (FWHMs) smaller than 20 nm, a spectroradiometer should be used. A filter colorimeter should generally not be used for light sources with sharp spectral peaks. If they are used, the colorimeter shall be calibrated with a narrow bandwidth spectroradiometer to give the same results for the specific spectrum. Report the characteristics of the spectroradiometer which is used for calibration. For light sources with sharp spectral peaks, the maximum bandwidth of the spectroradiometer shall be  $\leq 5$  nm. The higher resolution spectroradiometer produces a more accurate colour measurement. In those cases, the wavelength accuracy shall be within  $\pm 0,5$  nm. The spectroradiometer shall be capable of measuring spectral radiance over at least the 380 nm to 780 nm wavelength range, with a maximum bandwidth of 10 nm for smooth broadband spectra (i.e. broad spectrum with no sharp spikes).

Care shall be taken to ensure that the LMD has enough sensitivity and dynamic range to perform the required task. Before measuring the DUT, the LMD specification shall be checked.

## 5 Standard measuring conditions

### 5.1 Standard measuring environmental conditions

The standard measuring environmental conditions specified in IEC 62341-6-1:2009/2017, 5.1, shall be applied. For image sticking measurements, the environmental temperature shall be controlled at  $25\text{ °C} \pm 2\text{ °C}$ , otherwise a temperature-controlled detector shall be used. (The stability of the LMD shall be less than 1/5 of the intended detecting difference levels of luminance and colour.)

### 5.2 Standard measuring darkroom conditions

The standard measuring darkroom conditions specified in IEC 62341-6-1:2009/2017, 5.2, shall be applied.

### 5.3 Standard setup conditions

#### 5.3.1 General

~~For the measurement area, the minimum radius for measurement with the distance and aperture angle is explained in Table 1.~~

<sup>1</sup> Numbers in square brackets refer to the Bibliography.

# INTERNATIONAL STANDARD



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**Organic light emitting diode (OLED) displays –  
Part 5-3: Measuring methods of image sticking and lifetime**

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ISO 11664-1, *Colorimetry – Part 1: CIE standard colorimetric observers*

CIE 15, *Colorimetry*