

PRE-RELEASE VERSION (FDIS)



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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 31.120; 31.260

Warning! Make sure that you obtained this publication from an authorized distributor.



FINAL DRAFT INTERNATIONAL STANDARD (FDIS)

PROJECT NUMBER:
IEC 62341-5-3 ED2

DATE OF CIRCULATION:
2019-08-02

CLOSING DATE FOR VOTING:
2019-09-13

SUPERSEDES DOCUMENTS:
110/1068/CDV,110/1098A/RVC

IEC TC 110 : ELECTRONIC DISPLAYS	
SECRETARIAT: Japan	SECRETARY: Mr Yoshi SHIBAHARA
OF INTEREST TO THE FOLLOWING COMMITTEES:	HORIZONTAL STANDARD: <input type="checkbox"/>
FUNCTIONS CONCERNED: <input type="checkbox"/> EMC <input type="checkbox"/> ENVIRONMENT <input type="checkbox"/> QUALITY ASSURANCE <input type="checkbox"/> SAFETY	
<input type="checkbox"/> SUBMITTED FOR CENELEC PARALLEL VOTING	<input checked="" type="checkbox"/> NOT SUBMITTED FOR CENELEC PARALLEL VOTING

This document is a draft distributed for approval. It may not be referred to as an International Standard until published as such.

In addition to their evaluation as being acceptable for industrial, technological, commercial and user purposes, Final Draft International Standards may on occasion have to be considered in the light of their potential to become standards to which reference may be made in national regulations.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

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

PROPOSED STABILITY DATE: 2024

NOTE FROM TC/SC OFFICERS:

CONTENTS

FOREWORD	4
1 Scope	6
2 Normative references	6
3 Terms, definitions and abbreviated terms	6
3.1 Terms and definitions.....	6
3.2 Abbreviated terms.....	7
4 Measuring configuration	7
4.1 General.....	7
4.2 Light measuring device	8
5 Standard measuring conditions.....	8
5.1 Standard measuring environmental conditions	8
5.2 Standard measuring darkroom conditions	8
5.3 Standard setup conditions.....	8
5.3.1 General	8
5.3.2 Adjustment of OLED display	8
5.3.3 Starting conditions of measurements	9
5.3.4 Test patterns	9
5.3.5 Conditions of measuring equipment	11
6 Measuring methods of image sticking	11
6.1 Purpose	11
6.2 Measuring method	11
6.2.1 Measuring equipment	11
6.2.2 Measuring procedure	11
6.3 Analysis and report.....	12
6.3.1 Analysis.....	12
6.3.2 Report	14
7 Measuring methods of the luminance lifetime	16
7.1 Purpose	16
7.2 Measuring method	16
7.2.1 Measuring equipment	16
7.2.2 Measuring procedure	16
7.2.3 Estimation of luminance lifetime	17
Annex A (informative) Calculating method for equivalent signal level to reflect the characteristics of the OLED display	19
A.1 Purpose	19
A.2 Determining the equivalent signal level	19
A.2.1 General	19
A.2.2 Calculation of the normalized luminance intensity.....	19
A.2.3 Examples of extracted equivalent signal level.....	22
Annex B (informative) Colour difference with CIEDE2000	25
B.1 Purpose	25
B.2 Calculation of colour difference	25
Bibliography.....	26
Figure 1 – Measuring system and arrangement.....	7

Figure 2 – Test pattern for SDR displays.....	9
Figure 3 – Image sticking measuring area.....	10
Figure 4 – Test pattern for HDR displays	11
Figure 5 – Example of the resulting image after image stress	12
Figure 6 – Example of luminance behavior in operation for an OLED display module	16
Figure 7 – Example of lifetime estimation with the extrapolation method	17
Figure 8 – Examples of estimated lifetime depending on the time elapsed	18
Figure A.1 – Measured 10 mA/cm ² to 80 mA/cm ² OLED degradation values and corresponding modelled functions with $m = 1 / 1,7$	20
Figure A.2 – Example of accumulated colour intensity of IEC 62087:2011 10-min video loop in RGB subpixel format with equivalent signal distribution chart based on the left images.....	23
Figure A.3 – Example of accumulated colour intensity of the IEC 62087:2011 10-min video loop in W, R, G, and B format, with equivalent signal distribution chart based on the left images	24
Table 1 – Examples of maximum and average code value extracted from video samples	10
Table 2 – Information on test pattern	14
Table 3 – Example of typical value.....	15
Table 4 – Reporting format of the image sticking data at target time	15
Table 5 – Reporting format of the image sticking time with threshold	15
Table A.1 – Examples of the maximum and the average equivalent signal levels (8 bits)	22

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ORGANIC LIGHT EMITTING DIODE (OLED) DISPLAYS –

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

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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/XX/FDIS	110/XX/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

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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

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

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

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

CIE 15, *Colorimetry*