

INTERNATIONAL STANDARD

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

<https://standards.iteh.ai>
Document Preview

[IEC 62341-6-1:2025](https://standards.iteh.ai/catalog/standards/iec/880a0e0a-ca0a-4450-8362-7cbdac0339a/iec-62341-6-1-2025)

<https://standards.iteh.ai/catalog/standards/iec/880a0e0a-ca0a-4450-8362-7cbdac0339a/iec-62341-6-1-2025>



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2025 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

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

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

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search -

webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

[IEC 62341-6-1:2025](https://standards.iteh.ai/catalog/standards/iec/880a0e0a-ca0a-4450-8362-7cbedac0339a/iec-62341-6-1-2025)

<https://standards.iteh.ai/catalog/standards/iec/880a0e0a-ca0a-4450-8362-7cbedac0339a/iec-62341-6-1-2025>

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

CONTENTS

FOREWORD.....	6
1 Scope.....	8
2 Normative references	8
3 Terms, definitions and abbreviated terms.....	8
3.1 Terms and definitions.....	8
3.2 Abbreviated terms.....	9
4 Structure of measuring equipment	9
5 Standard measuring conditions.....	9
5.1 Standard measuring environmental conditions	9
5.2 Standard measuring dark room conditions	10
5.3 Standard setup conditions.....	10
5.3.1 General	10
5.3.2 Adjustment of OLED displays	10
5.3.3 Starting conditions of measurements	10
5.3.4 Measuring equipment requirements	10
5.4 Standard locations of measurement field.....	12
5.5 Standard test patterns.....	13
6 Measuring methods for optical parameters	17
6.1 Primary luminance, colour, and uniformity of full-colour high-resolution displays	17
6.1.1 Purpose.....	17
6.1.2 Measuring conditions.....	18
6.1.3 Measuring methods for high-resolution full colours	18
6.1.4 Maximum luminance of white and RGB primaries.....	19
6.1.5 Average colour of maximum white and RGB primaries	19
6.1.6 Luminance uniformity of white and RGB primaries	20
6.1.7 Chromaticity non-uniformity of maximum white and RGB primaries	21
6.1.8 Colour additivity of maximum white and RGB primaries	21
6.1.9 White correlated colour temperature	21
6.2 Primary luminance, chromaticity and uniformity of low-resolution displays	22
6.2.1 Purpose.....	22
6.2.2 Measuring conditions.....	22
6.2.3 Measuring methods for low-resolution displays and segmented displays.....	22
6.3 Signal loading	23
6.3.1 Purpose.....	23
6.3.2 Measuring conditions.....	23
6.3.3 Measuring methods	23
6.4 Dark room contrast ratio	24
6.4.1 Purpose.....	24
6.4.2 Measuring conditions.....	24
6.4.3 Measuring method	24
6.5 Chromaticity gamut area	25
6.5.1 Purpose.....	25
6.5.2 Measuring conditions.....	25
6.5.3 Measuring methods	25
6.5.4 Chromaticity gamut area in CIE 1931 chromaticity diagram	25
6.6 Colour gamut volume	26

6.6.1	Purpose	26
6.6.2	Measuring conditions	27
6.6.3	Measuring methods	27
7	Measuring methods for power consumption	30
7.1	Purpose	30
7.2	Measuring conditions	30
7.3	Measuring methods	30
7.3.1	Measuring the power consumption relevant to luminance of the OLED display module without signal decoding process	30
7.3.2	Measuring the power consumption of the OLED display module's embedded video connection terminal with a signal decoding process	31
Annex A (normative)	Response time of passive matrix display panels	34
A.1	Purpose	34
A.2	Measuring conditions	34
A.3	Measuring methods	34
Annex B (normative)	Luminance current efficiency	36
B.1	Purpose	36
B.2	Measuring conditions	36
B.3	Measuring methods	36
Annex C (informative)	Veiling glare frustum	38
Annex D (informative)	Methods to obtain the correlated colour temperature (CCT) from chromaticity coordinates	39
D.1	Method 1: Use of McCamy's approximate formula	39
D.2	Method 2: Use of Javier Hernandez-Andres's approximate formula	39
D.3	Method 3: Graphical determination of correlated colour temperature	40
Annex E (informative)	Measuring performance of modern colour-managed displays and panels	43
E.1	Legacy displays	43
E.2	Modern displays	43
E.3	Results	45
E.4	Conclusion	48
Annex F (informative)	Simple window luminance and colour measurements	49
F.1	Background	49
F.2	Measuring conditions	49
F.3	Maximum full screen luminance	49
F.4	4 % window luminance	49
F.5	Sampled luminance non-uniformity	50
F.6	4 % window centre colour	50
F.7	Sampled colour non-uniformity	51
Bibliography	52
Figure 1	– Layout diagram of measurement setup	11
Figure 2	– Standard measurement positions in the display active area	12
Figure 3	– Test pattern scaling used to define the area size of the coloured rectangles in the active area of the display	13
Figure 4	– Medium APL loading series of red, green, blue, and white test patterns used for basic luminance, colour, and uniformity measurements	14
Figure 5	– Low and high APL loading versions of CTR pattern	15

Figure 6 – Standard medium APL RGBCMY test pattern used for centre luminance and colour measurements with 25 % APL	16
Figure 7 – Examples of variable signal loading RGBCMY test patterns used for centre luminance and colour measurements	17
Figure 8 – Sequence for measuring luminance and colour at the nine standard display positions for all coloured tile patterns	18
Figure 9 – Chromaticity of blackbody source at various temperatures as represented on the CIE 1931 chromaticity diagram	22
Figure 10 – Example representation of the primary colours in the CIE 1931 chromaticity diagram	26
Figure 11 – Example of range in colours produced by an sRGB display as represented by the CIELAB colour space and by visualization using gamut rings	29
Figure 12 – Example of measurement setup of power consumption	31
Figure 13 – Example of measurement setup of power consumption with embedded video terminal	32
Figure A.1 – Relationship between driving signal and optical response times	35
Figure B.1 – Example of a measurement configuration for measuring luminance current efficiency	37
Figure C.1 – Pattern for veiling glare frustum	38
Figure D.1 – CIE 1931 XYZ chromaticity diagram	41
Figure D.2 – Blackbody locus (Planckian locus) and isothermperature lines in CIE 1931 chromaticity diagram	42
Figure E.1 – Legacy model where the independent drive electronics provide a direct correlation between the input RGB signals and the display's colour primaries	43
Figure E.2 – Examples of modern drive models using multi-dimensional LUTs for RGB (top) and multi-chromatic (bottom) displays	44
Figure E.3 – Example of signal loading behaviour for an RGBW display (top) and RGB (bottom) OLED display	46
Figure E.4 – Low APL loading test pattern with small box size (1/9 of the screen size dimensions)	47
Figure E.5 – Signal loading profiles for several input colours measured at the centre of the test pattern using Figure 8	48
Figure F.1 – Example of simple 4 % white window pattern at the centre of the screen	50
Table 1 –Standard digital-equivalent input signals for rendering the white, primary and secondary colours in test patterns	17
Table 2 – Example of luminance measured for the same colour patch at the standard nine screen positions and the resulting luminance non-uniformity	19
Table 3 – Example of the chromaticity measured for the same colour patch at the nine standard screen positions and the resulting chromaticity non-uniformity	19
Table 4 – Scaling the size of the colour boxes in the APL loading pattern relative to the screen dimensions	24
Table 5 – Example of report format for CIELAB gamut volume	30
Table 6 – Example of a module power consumption measurements summary sheet	31
Table 7 – Example of module power consumption measurements with contents	33
Table 8 – Example of module power consumption measurements with images	33
Table D.1 – x_e , y_e , A_i and t_i for Formula (D.3) and Formula (D.4)	40

Table E.1 – Example of luminance data for an RGB display and an RGBW OLED display	45
---	----

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[IEC 62341-6-1:2025](https://standards.iteh.ai/catalog/standards/iec/880a0e0a-ca0a-4450-8362-7cbedac0339a/iec-62341-6-1-2025)

<https://standards.iteh.ai/catalog/standards/iec/880a0e0a-ca0a-4450-8362-7cbedac0339a/iec-62341-6-1-2025>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ORGANIC LIGHT EMITTING DIODE (OLED) DISPLAYS –

Part 6-1: Measuring methods of optical and electro-optical parameters

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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 62341-6-1 has been prepared by IEC technical committee 110: Electronic displays. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2022. This edition constitutes a technical revision.

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

- a) The standard average picture level (APL) RGBCMY test pattern is modified, and the variable signal loading RGBCMY test pattern is added.
- b) Chromaticity gamut area and colour gamut volume are modified.