

Edition 2.0 2016-10

INTERNATIONAL STANDARD

3D display devices -

Part 22-1: Measuring methods for autostereoscopic displays - Optical

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 31.120; 31.260 ISBN 978-2-8322-3688-8

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

CONTENTS

F	DREWORD		5
1	Scope		7
2	Normativ	/e references	7
3	Terms. o	definitions and abbreviated terms	7
		rms and definitions	
		breviated terms	
4	Standard measuring conditions		
•	4.1 Standard environmental conditions		
	4.1.1	Temperature, humidity and pressure conditions	
	4.1.2	Illumination conditions	
		ht measuring device	
	4.2.1	General	
	4.2.2	Aperture size	
		easuring setup	
	4.3.1	Designed viewing distance	
	4.3.2	Measurement area	
	4.3.3	Measuring layout	
		st signal	
		andard measuring points	
5		ng method for two-view and multi-view displays	
		ximum luminance direction	
	5.1.1	General	
	5.1.2	Measuring equipment	
	5.1.3	Measuring conditions	
	5.1.4	Measuring procedure	
	5.1.5	Measurement report	
	5.2 Lobe angle and lobe angle variation on screen		
	5.2.1	General	16
	5.2.2	Measuring equipment	16
	5.2.3	Measuring conditions	16
	5.2.4	Measuring procedure	17
	5.2.5	Measurement report	17
	5.3 Luminance, screen luminance uniformity, and angular luminance variation		18
	5.3.1	Luminance and screen luminance uniformity	18
	5.3.2	Angular luminance variation	19
		nite chromaticity, white chromaticity uniformity on screen, and white romaticity variation in angle	20
	5.4.1	White chromaticity and white chromaticity uniformity on screen	20
	5.4.2	White chromaticity angular variation	22
6	Standard	d measuring method for integral imaging displays (1D/2D)	
	6.1 Ge	neral	23
	6.2 Lo	be angle and lobe angle variation on screen	24
		minance, screen luminance uniformity, and angular luminance variation	
	6.3.1	Luminance and screen luminance uniformity	
	6.3.2	Angular luminance variation	24

6.4 White chromaticity, white chromaticity uniformity on screen, and white chromaticity variation in angle	24
6.4.1 White chromaticity and white chromaticity uniformity on screen	
6.4.2 White chromaticity variation in angle	
7 Measuring method for 3D crosstalk related property	
7.1 3D crosstalk (luminance components ratio), 3D crosstalk variation on scree and 3D crosstalk variation in angle for two-view and multi-view displays	n,
7.1.1 3D crosstalk (luminance components ratio) and 3D crosstalk variation on screen	
7.1.2 3D crosstalk angular variation	
7.2 3D crosstalk related property for multi-view display	
7.2.1 General	
7.2.2 Offset crosstalk	28
7.2.3 3D pixel crosstalk	30
Annex A (informative) Principle of autostereoscopic display	35
A.1 General	35
A.2 Two-view display	35
A.3 Multi-view display	36
A.4 Integral imaging display	37
Annex B (informative) Angular profile of luminance	39
Annex C (informative) 3D crosstalk based on one inter-pupil distance	40
C.1 General	40
C.2 Measuring equipment	41
C.3 Measuring conditions	41
C.4 Measuring procedure	41
C.5 Measuring report	41
Annex D (informative) View density for motion parallax smoothness	44
D.1 General	44
D.2 Measuring equipment	44
D.3 Measuring conditions	
D.4 Measuring procedure	
D.5 Measuring report	
Bibliography	46
Figure 1 – Measuring system	
Figure 2 – Measuring layout for centre point measurement	
Figure 3 – Measuring layout for multi-point measurement (side view)	11
Figure 4 – Other measuring layout for multi-point measurement (side view)	11
Figure 5 – Measuring layout for horizontal viewing direction dependency	12
Figure 6 – Measuring layout for vertical viewing direction dependency	12
Figure 7 – Two examples of the relation between pixel and lenslet in multi-view displa	y13
Figure 8 – Measuring points for the centre and multi-point measurement	•
Figure 9 – Example of n by m measuring points	
Figure 10 – Example of measurement results for angular luminance profile	
Figure 11 – Example of lobe angle measurement	
Figure 12 – Example of 3D crosstalk variation on screen	
Figure 13 Example of acquired images in multi-view display	25

Figure 14 – Spatial luminance data acquisition (left) and example of calculated spatial crosstalk graph (right)	26
Figure 15 – Example of minimum luminance and maximum luminance for offset crosstalk	29
Figure 16 – Example of adjacent overlap	30
Figure 17 – Example of slanted lens configuration where 4,688 sub-pixels in a row are covered in one lens pitch	31
Figure 18 – Measuring layout example for 3D pixel crosstalk for multi-view displays having dozens of perspective output images	32
Figure 19 – Example of luminance angular profile for a multi-view display having 28 views (perspective images)	33
Figure A.1 – Structure of two-view display	35
Figure A.2 – Basic principle of two-view display	36
Figure A.3 – Structure of multi-view display	36
Figure A.4 – Basic principle of multi-view display	37
Figure A.5 – Basic principle of integral imaging display	37
Figure B.1 – Example of angular profile of luminance	39
Figure C.1 – Example image of a traditional multi-view display	40
Figure C.2 – Example image of the multi-view display having at least one view within one IPD	40
Figure C.3 – Example of luminance angular profile for a multi-view display having at least one view within one IPD (at designed viewing distance = 3,878 m)	42
Table 1 – Example of reported specification of two-dimensional LMD	9
Table 2 – Example of measurement results for maximum luminance direction	16
Table 3 – Example of measurement results for lobe angle variation on screen	18
Table 4 – Example of measurement results for luminance and screen luminance non- uniformity	19
Table 5 – Example of measurement results for angular luminance variation	20
Table 6 – Example of measurement results for white chromaticity and white chromaticity uniformity on screen	22
Table 7 – Example of measurement results for white chromaticity variation in angle	23
Table 8 – Example of measurement results for 3D crosstalk variation on screen	27
Table 9 – Example of measurement results for 3D crosstalk angular variation	28
Table 10 – Example of measurement results for offset crosstalk	30
Table 11 – Example of 3D pixel crosstalk calculation results	34
Table B.1 – Example of measurement results	39
Table C.1 – Example of measurement results for 3D crosstalk based on one IPD	43
Table D.1 – Example of measurement results for motion parallax smoothness	45

INTERNATIONAL ELECTROTECHNICAL COMMISSION

3D DISPLAY DEVICES -

Part 22-1: Measuring methods for autostereoscopic displays - Optical

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 62629-22-1 has been prepared by IEC technical committee 110: Electronic display devices.

This second edition cancels and 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) addition of offset crosstalk and 3D pixel crosstalk as 3D crosstalk related property.

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

FDIS	Report on voting
110/784/FDIS	110/797/RVD

Full information on the voting for the approval of 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 62629 series, under the general title 3D display devices, 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 website 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.

3D DISPLAY DEVICES -

Part 22-1: Measuring methods for autostereoscopic displays - Optical

1 Scope

This part of IEC 62629-22 specifies optical measuring methods for autostereoscopic display devices. It defines general measuring procedures for optical characteristics of two-view and multi-view displays and integral imaging displays.

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 62629-1-2, 3D display devices – Part 1-2: Generic – Terminology and letter symbols

ISO/CIE 19476, Characterization of the performance of illuminance meters and luminance meters

CIE 15:2004, Colorimetry