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INTERNATIONAL STANDARD

colour inside

3D displays –
Part 52-1: Fundamental measurement methods of aerial display – Optical

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IEC 62629-52-1 has been prepared by 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
110/1593/FDIS	110/1616/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 62629 series, published under the general title *3D 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- withdrawn, or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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3D DISPLAYS –

Part 52-1: Fundamental measurement methods of aerial display – Optical

1 Scope

This part of IEC 62629 specifies the standard measurement methods and measurement conditions for determining the optical properties of aerial displays. This document excludes image quality of aerial displays, such as modulation transfer function (MTF) and resolution measurements.

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 62629-1-2:2021, *3D display devices – Part 1-2: Generic – Terminology and letter symbols*

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

3 Terms, definitions, abbreviated terms and letter symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in 62629-1-2 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
aerial display
display that forms a real image in mid-air by use of an incoherent light-source and a passive optical component to converge diverging light from the light-source

Note 1 to entry: Details of aerial display, including the principles and typical optical components to form a real image, are given in IEC TR 62629-51-1 [1].

[SOURCE: IEC 62629-1-2:2021, 3.1.20, modified – in the definition, the term "display" is removed from the light source description because the light source is not limited to display, and Note 1 has been expanded.]

3.1.2
aerial image area
two-dimensional area in mid-air where the aerial display exhibits information via electrically generated images

3.1.3
design viewing space
three-dimensional space within which the user places both eyes and can see the entire aerial image area

Note 1 to entry: Unlike the eye box of the eyewear display, the design viewing space of the aerial display usually has no upper limit in the viewing distance; the width and height are quite larger than the interpupillary distance. Both eyes of the viewer in the design viewing space will see the entire aerial image area meet a specified performance metric.

3.1.4
design viewing position
design location at which the midpoint of both eyes is placed to achieve the optimal performance when using an aerial display

Note 1 to entry: The design viewing position is not limited to the front centre of the aerial image area.

3.1.5
hardware reference point
design location on the aerial display hardware that is used for the origin of the coordinates

Note 1 to entry: The hardware reference point serves as the origin location of the measurement.

Note 2 to entry: The design viewing position is located along the line from the hardware reference point to the centre of the aerial image area.

3.1.6
floating distance
distance from the centre of the aerial image area to the hardware reference point

3.1.7
design viewing distance
<aerial display> distance from the design viewing position to the centre of the aerial image area

Note 1 to entry: The summation of the design viewing distance and the floating distance becomes the distance between the hardware reference point and the design viewing position.

3.2 Abbreviated terms

AIA aerial image area
CCD charge-coupled device
DUT device under test
DVP design viewing position
DVS design viewing space
HRP hardware reference point
LMD light measuring device
MTF modulation transfer function

3.3 Letter symbols (quantity symbols and units)

The letter symbols for aerial displays are shown in Table 1.

Table 1 – Letter symbols (quantity symbols and units)

Quantities	Symbols	Units
Measuring point (i = 0: centre)	P_i	
Luminance	L_v	cd/m^2
Maximum luminance	L_{max}	cd/m^2
Minimum luminance	L_{min}	cd/m^2
Average luminance (spatial)	L_{va}	cd/m^2
Luminance non-uniformity	NU	
Contrast ratio	CR	

4 Standard measurement conditions

4.1 Standard environmental conditions

Unless otherwise specified, all tests and measurements for aerial displays shall be carried out after sufficient warm-up time for the illumination sources and DUT (see 4.3), under the standard environmental conditions as follows:

– temperature 25 °C ± 3 °C,
– relative humidity 25 % to 85 %, and
– atmospheric pressure 86 kPa to 106 kPa.

When different environmental conditions are used, they shall be noted in the report.

4.2 Power supply

In order to stabilize the performances of the DUT, the power supply for driving the DUT shall be adjusted in accordance with the specification of the DUT.

NOTE When the DUT is driven by the battery, it is less susceptible to power supply fluctuations.

4.3 Warm-up time

The optical performances of the DUT can be affected by the temperature. It takes a certain time for the luminance output of the DUT to achieve a steady state. If the luminance output is not within ±3 % variation, it shall be reported. All measuring conditions shall be kept constant during the measurements.

NOTE If the measuring result does not become steady state, it might be influenced by the output fluctuation of the DUT or fluctuation of the LMD such as noise, or both.

4.4 Darkroom condition

The luminance contribution from the background in the test room reflected off the measurement space shall be less than 1/20 of minimum luminance output from the DUT. If the condition is not satisfied, then background subtraction is required, and it shall be noted in the report.