
**Technical requirements and
test methods for digital cinema
stereoscopic projection**

*Exigences techniques et méthodes d'essai pour la projection cinéma
numérique stéréoscopique*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 36, *Cinematography*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document was developed in response to worldwide demand for minimum specifications for the digital cinema stereoscopic projection distributed internationally.

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Technical requirements and test methods for digital cinema stereoscopic projection

1 Scope

This document specifies the technical requirements and corresponding measurement methods for the parameters of images generated by digital cinema stereoscopic projection optical systems.

This document is applicable to the measurement of digital cinema stereoscopic projection systems.

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.

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

ISO 26431-1:2008, *Digital cinema (D-cinema) quality — Part 1: Screen luminance level, chromaticity and uniformity*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

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

3.1

centre luminance

luminance value of the centre point of the white screen expressed as the arithmetic mean of the luminance values of the left and right eye white screen centres

3.2

luminance difference ratio

ratio of the absolute value of luminance difference between the left and right eye white screen centres and the centre luminance

3.3

side luminance uniformity

consistency of luminance of the top, bottom, left and right sides of the left (right) eye white screen with the luminance of the centre of left (right) eye white screen

3.4

centre white chromaticity

chromaticity of the centre point of the left (right) eye white screen, expressed in colour coordinates

4 Technical requirements

The technical requirements for the parameters of images generated by digital cinema stereoscopic projection optical systems are given in [Table 1](#). Target A shall be preferred for theatres, followed by B and C.

Table 1 — Technical requirements for the parameters of images generated by digital cinema stereoscopic projection optical systems

Number	Parameter	Requirements				Test methods
		Target ^a	Nominal	Review rooms range	Theatres range	
1	Centre luminance (cd/m ²)	A	48,0	±3,5	±10,2	refer to 5.4.1
		B	24,0	±1,8	±5,1	
		C	15,5	±1,1	±3,3	
2	luminance difference ratio	shall not be more than 5 %				refer to 5.4.2
3	side luminance uniformity	(should be): 75 % to 90 % of centre luminance				refer to 5.4.3
4	centre white chromaticity	(should be): $x = 0,314 \pm 0,006, y = 0,351 \pm 0,006$				refer to 5.4.4

^a Filmmakers can prepare content that is optimized for any or each of the targets, and such content should always be clearly identified as to the intended playback luminance.

5 Test methods

5.1 Measurement equipment

5.1.1 Spectroradiometer

The spectroradiometer shall comply with the requirements specified in ISO 26431-1:2008, 4.5.

5.1.2 Photometer

Screen luminance shall be measured with a spot photometer having the spectral luminance response of the standard observer (photopic vision), as defined in ISO/CIE 11664-1. The acceptance angle of the photometer shall be 2° or less. The lower limit of the measuring range shall be 0,01 cd/m² or better. The photometer response to luminance variation over time shall be to properly integrate any such variation occurring at frequencies at or above 24 Hz and display the arithmetic mean value.

5.2 Signal of measurement

The digital code values of the white field signal is ($X'=3\ 794, Y'=3\ 960, Z'=3\ 890$).

5.3 Measurement conditions and measurement requirements

Measurement conditions shall meet the following requirements:

- All equipment shall be in normal operating status;
- Measurement shall be carried out after the light output of the digital projector stabilizes. Digital projector shall project white field signal through the stereoscopic equipment for 15 min;
- The light of the digital projector shall pass through the stereoscopic projection equipment;

- d) When measuring through the stereoscopic glasses they shall be placed in a horizontal state, as a viewer would wear them. No tilt from the horizontal axis is allowed;
- e) All signals shall be output to the digital projector by Media Block. The measurement shall cover all valid screen images;
- f) Measurement location in the auditorium shall comply with the requirements specified in ISO 26431-1:2008, 4.3;
- g) Measurement locations on the screen of Luminance, difference shall comply with the requirements specified in ISO 26431-1:2008, 4.2;
- h) For using dual stereoscopic cinema screenings, both of the digital projectors shall also be turned on and working normally;
- i) The measurement of the optical system of stereoscopic projection should be carried out within the range of the white colour chromaticity coordinates of the centre of the screen.

5.4 The measurement of the optical system of stereoscopic projection

5.4.1 Centre luminance

Measurement procedures:

- a) Open the photometer and make it work normally;
- b) Set the digital projector as the stereoscopic projection mode and use the stereoscopic projection equipment;
- c) The white field signal is simultaneously displayed in the left and right eyes;
- d) Using the photometer to measure and record the left-eye white field centre luminance, L_{lw} , and the right-eye white field centre luminance, L_{rw} , through the left-eye lens and the right-eye lens of the stereo glasses;
- e) Calculate and record the centre luminance, L , according to [Formula \(1\)](#);

$$L = \frac{L_{lw} + L_{rw}}{2} \quad (1)$$

where

L is the centre luminance;

L_{lw} is the centre luminance of the white field of the left-eye when the left and right eyes simultaneously display the white field signal;

L_{rw} is the centre luminance of the white field of the right-eye when the left and right eyes simultaneously display the white field signal.

5.4.2 Luminance difference ratio

Measurement procedures:

- a) Refer to the measurement method of centre luminance, record the left-eye white field centre luminance L_{lw} and the right-eye white field centre luminance L_{rw} ;
- b) Calculate and record the luminance difference ratio L_d according to [Formula \(2\)](#);

$$L_d = \frac{|L_{lw} - L_{rw}|}{\left(\frac{1}{2}\right)(L_{lw} + L_{rw})} \times 100 \% \quad (2)$$

where

L_d is the luminance difference ratio;

L_{lw} is the centre luminance of the white field of the left-eye when the left and right eyes simultaneously display the white field signal;

L_{rw} is the centre luminance of the white field of the right-eye when the left and right eyes simultaneously display the white field signal.

5.4.3 Side luminance uniformity

Measurement procedures:

- a) Open the photometer and make it work normally;
- b) Set the digital projector as the stereoscopic projection mode and use the stereoscopic projection equipment;
- c) The white field signal is simultaneously displayed in the left and right eyes;
- d) Measure the luminance, L_{lw} , of white field in the centre of screen and the luminance, L_{ls} , of white field of four sides by using photometer through stereoscopic glasses of left-eye;
- e) Measure the luminance, L_{rw} , of white field in the centre of screen and the luminance, L_{rs} , of white field of four sides by using photometer through stereoscopic glasses of right-eye;
- f) Calculate and record the side luminance uniformity, U_l of the upper, lower, left and right edges of the white field of the left-eye according to [Formula \(3\)](#):

$$U_l = \frac{L_{ls}}{L_{lw}} \times 100 \% \quad (3)$$

where

U_l is the left-eye side luminance uniformity;

L_{lw} is the centre luminance of the white field of the left-eye when the left and right eyes simultaneously display the white field signal;

L_{ls} is the left-eye luminance of white field of four sides when the left and right eyes simultaneously display the white field signal.

- g) Calculate and record the side luminance uniformity U_r of the upper, lower, left and right sides of the white field of the right-eye according to [Formula \(4\)](#).

$$U_r = \frac{L_{rs}}{L_{rw}} \times 100 \% \quad (4)$$

where

U_r is the right-eye side luminance uniformity;

L_{rw} is the centre luminance of the white field of the right-eye when the left and right eyes simultaneously display the white field signal;