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Plasma display panels – Part 2-6: Measuring methods – APL dependent gamma and colour characteristics

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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PLASMA DISPLAY PANELS –

Part 2-6: Measuring methods – APL dependent gamma and colour characteristics

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International Standard IEC 61988-2-6 has been prepared by IEC technical committee 110: Electronic display devices.

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

FDIS	Report on voting
110/636/FDIS	110/652/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 61988 series, under the general title *Plasma display panels*, 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- withdrawn,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.

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PLASMA DISPLAY PANELS –

Part 2-6: Measuring methods – APL dependent gamma and colour characteristics

1 Scope

This part of IEC 61988 defines the measuring methods for gamma and colour gamut characteristics as a function of the APL for a PDP module (plasma display module). Generally, the luminance level of a PDP module is dependent on the APL (average picture level) of input images. Varying the input levels causes a change of the chromaticity of RGB primary colours. This standard also defines the measuring methods of tone characteristics and chromaticity characteristics with varying APLs. This standard is based on the assumption that the inverse-gamma circuit is inside the module.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068-1, *Environmental testing – Part 1: General and guidance*

IEC 60107-1, *Methods of measurement on receivers for television broadcast transmissions – Part 1: General considerations – Measurements at radio and video frequencies*

IEC 61966-5, *Multimedia system and equipment – Colour measurement and management – Part 5: Equipment using plasma display panels*

IEC 61988-1, *Plasma display panels – Part 1: Terminology and letter symbols*

IEC 61988-2-1, *Plasma display panels – Part 2-1: Measuring methods – Optical and optoelectrical*

CIE 15:2004, *Colorimetry*

ITU-R Rec. BT.709-5, *Parameter values for the HDTV standards for production and international programme exchange*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60068-1, IEC 60107-1 and IEC 61988-1, as well as the following apply.

3.1.1
tone
characteristics of the relationship between input signal level and output luminance

3.1.2
colour difference
difference between two colour stimuli, defined as the Euclidean distance between the points representing them in a specific colour space such as CIE 1976 $u'v'$ colour space.

3.1.3
colour gamut area
two-dimensional maximum area of reproducible colours expressed in the CIE 1976 colour space defined in CIE 15

3.2 Abbreviations

For the purposes of this document, the following abbreviations apply.

APL Average picture level

CCT Correlated colour temperature

LMD Light measuring device

PDP Plasma display

4 Measurement equipment

4.1 Video signal generator

An analogue video signal generator or a digital video signal generator is used. The signal characteristics shall match with the measured PDP module. Input signal, in this document, means a pre-gamma signal and APL means a post-gamma APL.

4.2 Non-contact LMD (light measurement device)

When using a non-contact LMD, the non-contact LMD incorporates a spectroradiometer or a non-contact colorimeter as shown in Figure 1. The detail conditions are defined in IEC 61988-2-1, where a non-contact LMD is described as an LMD.

NOTE: See IEC 61966-5.

4.3 Contact LMD

When using a contact LMD, the measurement probe shall be placed perpendicular to the display surface and include at least 500 pixels in the measurement aperture. It shall be confirmed that the results measured by the contact LMD are the same as the results measured by the non-contact LMD.

5 Measurement conditions

5.1 General

The following standard setup conditions shall be used. Each condition shall be noted on the relevant specification whenever any different conditions other than the standard setup conditions are applied. (See the measuring conditions in IEC 61966-5 and IEC 61988-2-1.)

5.2 Setup conditions

All measurements shall be carried out in a dark room. Illuminance shall be less than 1 lx anywhere on the screen of the PDP module. When this illuminance significantly affects the measurement of the black level, the background subtraction method shall be used. When a

different illuminance or the background subtraction method is used, this shall be noted on the report.

The warm-up time shall be longer than 30 minutes with a signal input set at 15 % grey level on full screen without gamma correction, unless other specified measuring methods are used. When different warm-up conditions are used, they shall be noted on the report.

For the measurement of tone characteristics, the conditions of contrast and colour enhancement functions to preserve the tone characteristics of the panel itself shall be applied and noted on the report. The image sticking preventing function (for a still image) shall be turned off, or some procedures in which the function is kept inactive can be applied.

5.3 Measuring layout

The measuring equipment shall be set as shown in Figure 1 for a non-contact LMD and in Figure 2 for a contact LMD. The optical axis of the non-contact LMD should be normal to the centre of the display surface. It is recommended that the measuring distance ℓ_0 of LMD is 2,5V, where V is the effective screen height of the display.

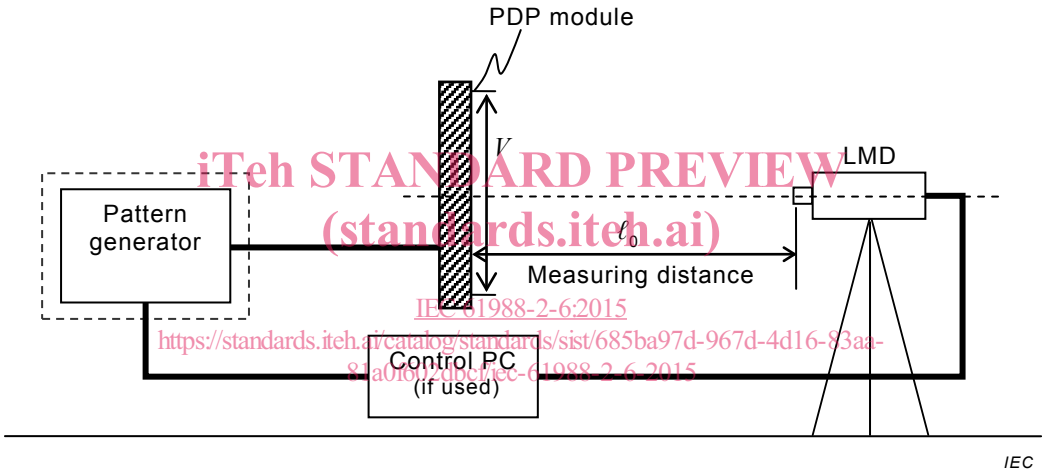


Figure 1 – Measuring layout for non-contact measurement

The measuring layout for a contact LMD is shown in Figure 2. A measurement probe shall be set to the surface of the display.

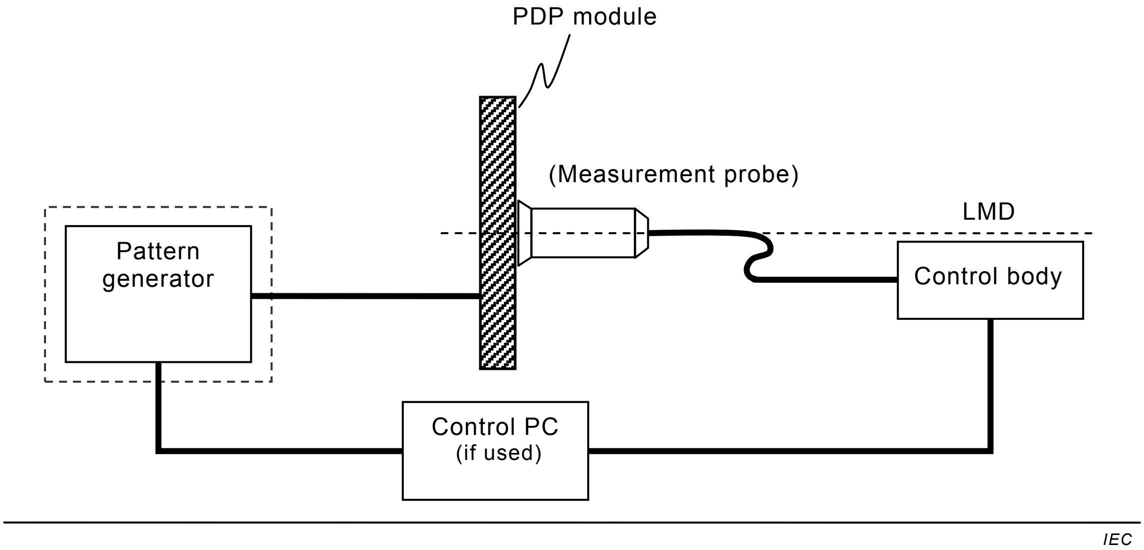
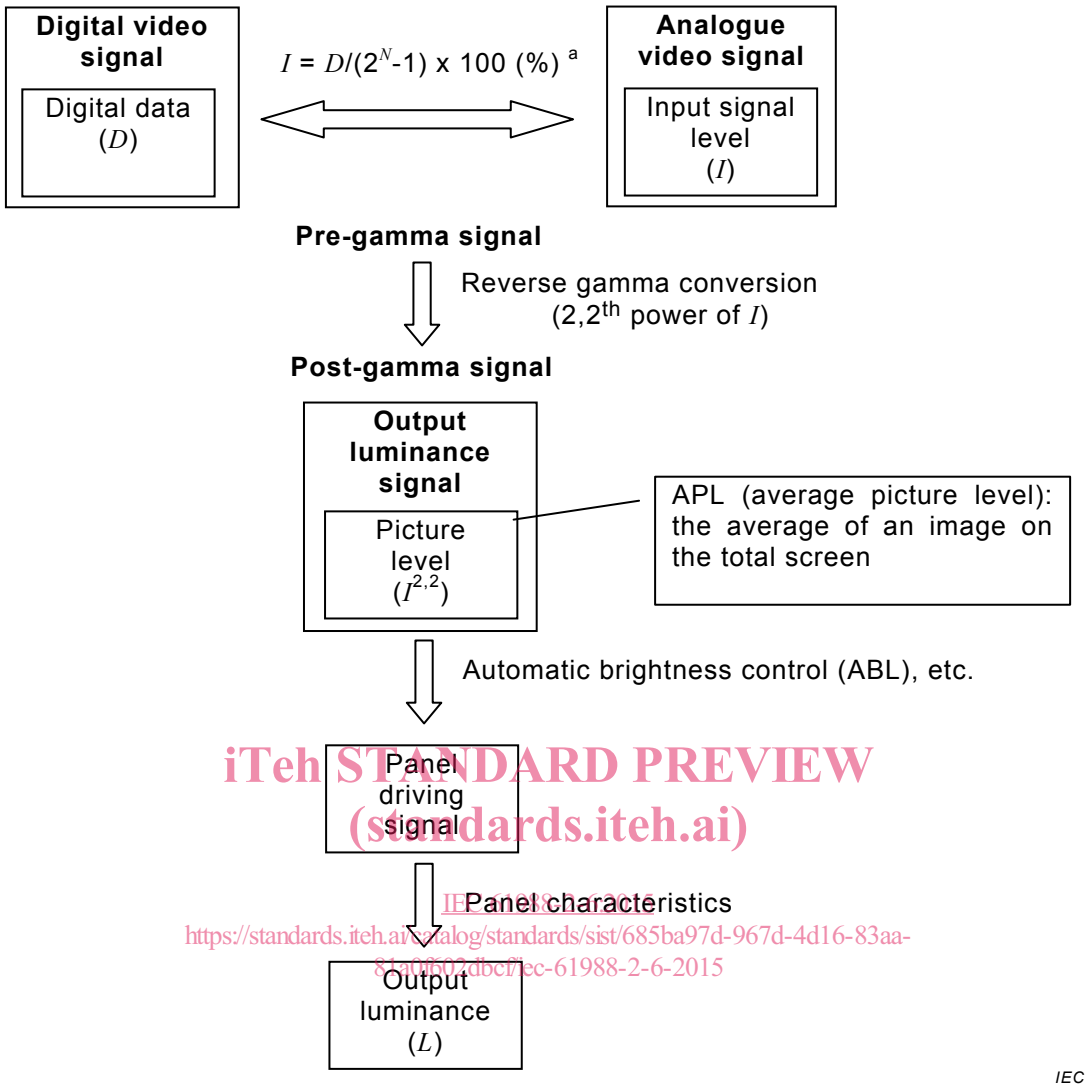


Figure 2 – Measuring layout for contact measurement

5.4 Input signal level and picture level

For the measurement, analogue video signals or digital video signals are used as input signals. The input signal level is the level of the analogue video signal and is indicated in percent (0 % to 100 %, $I_{0\ \%}$ to $I_{100\ \%}$ respectively), while the conventional digital input data is the level of the digital input video signal having a value from 0 to 2^N-1, where N is the number of the bits for the digital video signal. When N is 8, 256 grey steps are used. Basically these input video signals are pre-gamma signals having an applied gamma correction of 2,2. The output luminance level is related to 2,2[th] power of the input signal level. The term picture level, which relates to luminance, is used for the output luminance level of the post-gamma signal. Figure 3 shows these relationships.

NOTE In the ITU-R Rec. BT.709-5 8-bit digital video signal, the digital data is compressed to 16 to 235 from 0 to 255. The input signal at level 0 % is the digital data of 16 and the input signal at level 100 % is the digital data of 235. The input digital data is modified to this relationship as shown in Annex A. In this document the procedure of the conventional digital signal is mainly mentioned.



a For the use of the ITU-R Rec. BT.709-5 8-bit digital signal, the relationship between the input signal level and the digital data is as follows:

$$I = (D\text{-}16)/(235\text{-}16) \times 100\ (\%)$$

Figure 3 – Input signals and signal processing in a PDP module

6 Measuring methods of tone characteristics

6.1 Purpose

The purpose of this method is to measure the tone characteristics of a PDP as a function of the APL. The following items are then measured:

a) APL dependent gamma characteristics,

b) signal level and APL dependent CCT (correlated colour temperature), and

c) signal level and APL dependent chromaticity coordinates ($u'v'$).

NOTE u' and v' are CIE 1976 UCS diagram coordinates defined in CIE 15.