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INTERNATIONAL STANDARD

Multimedia systems and equipment – Colour measurement and management – Part 12-2: Simple metadata format for identification of colour gamut

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FOREWORD

IEC 61966-12-2 has been prepared by technical area 2: Colour measurement and management, of IEC technical committee 100: Audio, video and multimedia systems and equipment. It is an International Standard.

This second edition cancels and replaces the first edition published in 2014. This edition constitutes a technical revision.

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

a) the number of bits of metadata format has been extended in Clause 4;

b) Annex C has been added for handling HDR content.

The text of this International Standard is based on the following documents:

Draft	Report on voting
100/3847/CDV	100/4109/RVC

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 of the IEC 61966 series, published under the general title *Multimedia systems and equipment – Colour measurement and management*, 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- withdrawn, or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.

INTRODUCTION

New technologies in capturing and displaying wide-gamut colour images enable a new market of wide-gamut video colour content creation. Recent video standards for wide gamut colour space encoding such as ITU-R BT.2100 (HDR), ITU-R BT.2020 (UHDTV) and IEC 61966-2-4 (xvYCC) were developed in order to be able to distribute content with a colour gamut that is extended with respect to classical colour gamuts such as those defined by standards ITU-R BT.601 (standard-definition television) and ITU-R BT.709 (high-definition television). With the increasing popularity of wide gamut and high dynamic range content and displays, the variety of colour gamuts of displays is expected to increase. This issue can be an obstacle to adoption of wide-gamut video colour content in professional content creation since the compatibility of the content to the employed displays, as well as the compatibility among different displays, is not ensured. The term "display" includes here any video colour reproduction equipment, such as direct view displays and projectors. Thanks to improvements in technology, the variety of colour gamuts and colour reproduction capacities of displays are increasing while the colour gamut and the colour encoding rules of existing colour space encoding standards are fixed.

To address this issue, IEC 61966-12-1 (*Metadata for identification of colour gamut (Gamut ID)*) specifies a colour gamut metadata scheme for video systems including information for colour reproduction. This metadata can apply to video content or displays. More specifically, improvements can be achieved if the wide-gamut colour content is created with the knowledge of the display colour gamut and if the colour reproduction in the display is done with the knowledge of the colour gamut of the pictorial content.

IEC 61966-12-1 has the capability to describe arbitrary 3D colour gamuts in a given colour space and include the full/medium profile for professional use and the simple profile for consumer use with easier product implementation. This approach is effective, but some ambiguities can occur in practical use, for example if typical CE devices are able to decode the simple profile only owing to CPU and software limitations.

In this case, even if a sender device and a receiver device are based on IEC 61966-12-1:

a) the receiver device cannot handle the Gamut ID of incoming content, if the sender device sends only a full or a medium profile;

b) the sender device should convert a full profile to a simple one for CE devices if the receiver can receive the simple profile only, but the conversion is not possible for all the cases.

Therefore, a simple Gamut ID profile standard based on this document has been developed to address this problem.

This second edition extends the number of bits of "back level ratio" in the metadata format to accommodate the wider dynamic range content and displays.

MULTIMEDIA SYSTEMS AND EQUIPMENT – COLOUR MEASUREMENT AND MANAGEMENT –

Part 12-2: Simple metadata format for identification of colour gamut

1 Scope

This part of IEC 61966-12 specifies the colour gamut metadata format for video systems intended for use in CE (consumer electronics) devices. The metadata specified in this part of IEC 61966-12 is limited to the gamut description for display types comprising the three primary additive colours, whose white and black points have the same chromaticity. It is fundamentally based on the conventional VESA-EDID format.

When associated with content, the simple metadata format defines the gamut for which the content was created. It can be used by the display for controlled colour reproduction even if the display's colour gamut is different from that of the content.

When associated with a display, the simple metadata format defines the display colour gamut. It can be used during content creation to enable improved colour reproduction.

This document provides the simplest, but unambiguous solution for typical CE devices that are based on colour gamut information communication.

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 60050-845, *International Electrotechnical Vocabulary – Part 845: Lighting*

IEC 61966-12-1, *Multimedia systems and equipment – Colour measurement and management – Part 12-1: Metadata for identification of colour gamut (Gamut ID)*

ISO 15076-1, *Image technology colour management – Architecture, profile format and data structure – Part 1: Based on ICC.2010*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-845 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
content
set of video signals in production, post-production or consumption

3.2
colour gamut
range of colours achievable on a given colour reproduction medium (or present in an image of that medium) under a given set of viewing conditions

Note 1 to entry: It is a volume in colour space.

3.3
gamut mapping
mapping of the colour-space coordinates of the elements of a source image to colour-space coordinates of the elements of a reproduction to compensate for differences in the source and output medium colour gamut capability

4 Simple description of gamut

The three primary additive colours gamut can be specified by four combinations of CIE-xy chromaticity values of red, green, blue and white. The gamut is assumed to have the characteristic that combining equal amounts of the three primaries (red, green, blue) produces the chromaticity of white. These values can be encoded according to the gamut CIE-xy chromaticity values used in Vesa Enhanced Extended Display Identification Data Standard (Defines EDID Structure Version 1, Revision 4). The description includes eight values (CIE-xy chromaticity values for each red, green, blue and white) with 10-bit fixed point form in the range of 0,0 to 1,0. These display primary and the white point CIE-xy chromaticity values should be measured in such a way as to minimize the contribution from the display black. In addition to VESA-EDID format, the information of White Absolute Luminance (WAL) and Black Level Ratio (BLR) are included. WAL value is defined in cd/m^2 and denoted as Y_W, and encoded into 16-bit unsigned integer form. BLR is defined as Equation (1), and encoded into 32-bit fixed point form in the range of 0,0 to 1,0.

$$BLR = (Y_K / Y_W) \quad (1)$$

where

Y_K is the luminance of black shown in Figure 1;

Y_W is the luminance of white shown in Figure 1.

Table 1 shows the total metadata which includes the VESA–EDID compatible CIE-xy chromaticity values of red, green, blue and white and BLR and WAL value. The total size of this format is 16 B.

Refer to Annex C for information about handling HDR content.

Table 1 – Simple metadata format for identification of colour gamut

Byte# hex	**Size** B	**Colour characteristic**	**Description**							
			7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
00	1	Red_x, Red_y, Green_x, Green_y Bits1 & bits0	Rx1	Rx0	Ry1	Ry0	Gx1	Gx0	Gy1	Gy0
01	1	Blue_x, Blue_y, White_x, White_y bits1 & bits0	Bx1	Bx0	By1	By0	Wx1	Wx0	Wy1	Wy1
02	1	Red_x bit9 – bit2	Rx9	Rx8	Rx7	Rx6	Rx5	Rx4	Rx3	Rx2
03	1	Red_y bit9 – bit2	Ry9	Ry8	Ry7	Ry6	Ry5	Ry4	Ry3	Ry2
04	1	Green_x bit9 – bit2	Gx9	Gx8	Gx7	Gx6	Gx5	Gx4	Gx3	Gx2
05	1	Green_y bit9 – bit2	Gy9	Gy8	Gy7	Gy6	Gy5	Gy4	Gy3	Gy2
06	1	Blue_x bit9 – bit2	Bx9	Bx8	Bx7	Bx6	Bx5	Bx4	Bx3	Bx2
07	1	Blue_y bit9 – bit2	By9	By8	By7	By6	By5	By4	By3	By2
08	1	White_x bit9 – bit2	Wx9	Wx8	Wx7	Wx6	Wx5	Wx4	Wx3	Wx2
09	1	White_y bit9 – bit2	Wy9	Wy8	Wy7	Wy6	Wy5	Wy4	Wy3	Wy2
0A	1	White absolute luminance Bit15 – bit8 (16 bit unsigned Integer)	WAL15	WAL14	WAL13	WAL12	WAL11	WAL10	WAL9	WAL8
0B	1	White absolute luminance Bit7 – bit0 (16 bit unsigned Integer)	WAL7	WAL6	WAL5	WAL4	WAL3	WAL2	WAL1	WAL0
0C	1	Black level ratio Bit31 – bit24 (32-bit fixed point)	BLR31	BLR30	BLR29	BLR28	BLR27	BLR26	BLR25	BLR24
0D	1	Black level ratio Bit23 – bit16 (32-bit fixed point)	BLR23	BLR22	BLR21	BLR20	BLR19	BLR18	BLR17	BLR16
0E	1	Black level ratio Bit15 – bit8 (32-bit fixed point)	BLR15	BLR14	BLR13	BLR12	BLR11	BLR10	BLR9	BLR8
0F	1	Black level ratio Bit7 – bit0 (32-bit fixed point)	BLR7	BLR6	BLR5	BLR4	BLR3	BLR2	BLR1	BLR0

NOTE The metadata format in this document has backward compatibility with IEC 61966-12-2:2014 because addresses "0C" and "0D" indicate same bits.