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Information technology — Multimedia application format (MPEG-A) — Part 19: Common media application format (CMAF) for segmented media, AMENDMENT 3: 8K HEVC, 4K HFR HEVC and Chroma Location for CMAF

CD stage

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The committee responsible for this document is ISO/IEC JTC1 SC29.

# Introduction to Amendment 2

This amendment adds support for

* Media Profile for 8K HEVC,
* Media Profile for 4K HFR HEVC,
* HEVC Clarifications on Chroma Sample Location

This amendment also addresses several clarifcations and improvements.

Information technology — Multimedia application format (MPEG-A) — Part 19: Common media application format (CMAF) for segmented media, AMENDMENT 3: 8K HEVC, 4K HFR HEVC and Chroma Location for CMAF

# Change 1: 8K HEVC Media Profile definition

Add 2. 4K-HFR HEVC Media Profile definition

Table B.1 — HEVC video CMAF media profiles

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Media Profile** | **Codec** | **Profile** | **Level** | **colour\_ primaries in VUI** | **transfer\_ characteristics in VUI** | **matrix\_ coefficients in VUI** | **Max Frame Height** | **Max Frame Width** | **Max Frame Rate** | **CMAF**  **File Brand** |
| **8K10** | HEVC | Main10 MainTier 10-bit | 6.1 | 9 (BT.2100) [Note 5] | 16 (BT.2100 Table 4 PQ EOTF) [Note 3, 6]  18 (BT.2100 Table 5 HLG OETF) [Note 8]  14 (BT.2020 OETF) [Note2] | 9 (BT.2100 Table 6 Y′C′BC′R) [Note 7] | 4320 | 7680 | 60 | 'c8k0' |

Editor’s Note: NBs are asked to comment on the decision to reduce the amount of media profiles for 8K and not generating a separate media profile for SDR, HLG and PQ10 as done for example for UHD/4K. It may be instead be suitable to provide informative information on how signaling on transfer characteristics may be supported for example in manifest. See discussion also here: https://github.com/MPEGGroup/CMAF/issues/30

Add an extra entry for the UHDTV2 resolution definition to Table C.1 (marked in red)

Table C.1 — Resolution operating point sets

|  | **Vertical Size (lines)** | **Horizontal Size (pixels)** | **aspect\_ ratio\_idc (see ISO/IEC 23008-2, Table E.1)** | **Display Aspect Ratio** | **Production Format** |
| --- | --- | --- | --- | --- | --- |
|  | 4320 | 7680 | 1 | 16:9 | UHDTV2 |
|  | 2160 | 3840 | 1 | 16:9 | UHDTV1 |
|  | 1080 | 1920 | 1 | 16:9 | HDTV |

# Change 2: 4K-HFR HEVC Media Profile definition

## Replace clause B.6

B.6 High frame rate HD

HEVC Levels 5.0 and 5.1 support greater than 60 Hz, e.g. when the resolution is not at the maximum. These profiles relax the frame rate constraints of Table B.1 profiles “UHD8”, UHD10”, “HDR10”, and “HLG10” to allow what Levels 5.0 and 5.1 permit. The profiles defined in Table B.2 are identical to the corresponding Table B.1 CMAF media profiles, except for the “Max Frame Rate” column in Table B.1. These new profiles can support the maximum resolution or maximum frame rate but not both concurrently due to HEVC level constraints.

Table B.2 — HEVC video CMAF media profiles – High frame rate

| **Media Profile** | **Corresponding Table B.1 Media Profile** | **Max Frame Rate** | **CMAF File Brand** |
| --- | --- | --- | --- |
| UHD8H | UHD8 | 120 | 'cud9' |
| UHD10H | UHD10 | 120 | 'cud2' |
| HDR10H | HDR10 | 120 | 'chd2' |
| HLG10H | HLG10 | 120 | 'clg2' |
| HLG10H | HLG10 | 120 | 'clg2' |

## With

B.6 High frame rate

HEVC Levels 5.0, 5.1 and 6.1 support greater than 60 Hz, e.g. when the resolution is not at the maximum. These profiles relax the frame rate constraints of Table B.1 profiles “UHD8”, UHD10”, “HDR10”, “HLG10” and “8K10” to allow what Levels 5.0, 5.1 and 6.1 permit. The profiles defined in Table B.2 are identical to the corresponding Table B.1 CMAF media profiles, except for the “Max Frame Rate” column in Table B.1. These new profiles can support the maximum resolution or maximum frame rate but not both concurrently due to HEVC level constraints.

For a CMAF track to comply with one of the CMAF media profiles in Table B.2, it:

— shall conform to the profile in column “Corresponding Table B.1 Media Profile” except for the Max Frame Rate indicated in Table B.1.

— shall not exceed the frame rate listed in Table B.2 “Max Frame Rate” column, even if the HEVC level would permit higher values.

— should include the CMAF File Brand listed in its CMAF header

NOTE CMAF tracks conforming to the Media Profile listed in the Second column of Table B.2 automatically conform to the associated media profile listed in the same row in the first column.

Table B.2 — HEVC video CMAF media profiles – High frame rate

| **Media Profile** | **Corresponding Table B.1 Media Profile** | **Max Frame Rate** | **CMAF File Brand** |
| --- | --- | --- | --- |
| UHD8H | UHD8 | 120 | 'cud9' |
| UHD10H | UHD10 | 120 | 'cud2' |
| HDR10H | HDR10 | 120 | 'chd2' |
| HLG10H | HLG10 | 120 | 'clg2' |
| 8K10H | 8K10 | 120 | 'c8k1' |

# Change 3: Chroma location info in HEVC CMAF Media profiles

## Replace clause B.3.3.4.2

B.3.3.4.2 Visual Usability Information (VUI) parameters

VUI parameters that occur within a CMAF HEVC track shall conform to ISO/IEC 23008-2 with the following additional constraints.

— The following fields shall have pre-determined values as follows.

— aspect\_ratio\_info\_present\_flag shall be set to 1.

— video\_full\_range\_flag shall be set to 0.

— The following fields have the following values.

— colour\_description\_present\_flag should be set to 1.

NOTE As defined in ISO/IEC 23008-2, if the colour\_description\_present\_flag is set to 1, the colour\_primaries, transfer\_characteristics and matrix\_coefficients fields are present in the VUI.

— If colour\_description\_present\_flag is set to 1, then colour\_primaries, transfer\_characteristics and matrix\_coefficients shall be set to one of the values permitted for the media profile (see Table B.1).

— If colour\_description\_present\_flag is set to 0, this shall indicate the following values are to be assumed:

— colour\_primaries = 1;

— transfer\_characteristics = 1;

— matrix\_coefficients = 1.

— overscan\_info\_present\_flag shall be set to 0, therefore overscan\_appropriate shall not be present.

— The values of the following fields shall not change throughout a CMAF track and CMAF switching set.

— low\_delay\_hrd\_flag

— colour\_description\_present\_flag

— colour\_primaries, when present

— transfer\_characteristics, when present

— matrix\_coeffs, when present

— The values of the following fields should not change throughout a CMAF track.

— vui\_time\_scale

— vui\_num\_units\_in\_tick

— If BT.2020 or BT.2100 is signalled by colour\_primaries = 9,

— chroma\_loc\_info\_present\_flag shall be set to 1, indicating the presence of chroma location types.

— chroma\_sample\_loc\_type\_top\_field shall be set to 2

— chroma\_sample\_loc\_type\_bottom\_field shall be set to 2

## With

B.3.3.4.2 Visual Usability Information (VUI) parameters

VUI parameters that occur within a CMAF HEVC track shall conform to ISO/IEC 23008-2 with the following additional constraints.

— The following fields shall have pre-determined values as follows.

— aspect\_ratio\_info\_present\_flag shall be set to 1.

— video\_full\_range\_flag shall be set to 0.

— The following fields have the following values.

— colour\_description\_present\_flag should be set to 1.

NOTE As defined in ISO/IEC 23008-2, if the colour\_description\_present\_flag is set to 1, the colour\_primaries, transfer\_characteristics and matrix\_coefficients fields are present in the VUI.

— If colour\_description\_present\_flag is set to 1, then colour\_primaries, transfer\_characteristics and matrix\_coefficients shall be set to one of the values permitted for the media profile (see Table B.1).

— If colour\_description\_present\_flag is set to 0, this shall indicate the following values are to be assumed:

— colour\_primaries = 1;

— transfer\_characteristics = 1;

— matrix\_coefficients = 1.

— overscan\_info\_present\_flag shall be set to 0, therefore overscan\_appropriate shall not be present.

— The values of the following fields shall not change throughout a CMAF track and CMAF switching set.

— low\_delay\_hrd\_flag

— colour\_description\_present\_flag

— colour\_primaries, when present

— transfer\_characteristics, when present

— matrix\_coeffs, when present

— The values of the following fields should not change throughout a CMAF track.

— vui\_time\_scale

— vui\_num\_units\_in\_tick

— If BT.2020 or BT.2100 is signalled by colour\_primaries = 9,

— chroma\_loc\_info\_present\_flag should be set to 1, indicating the presence of chroma location types.

— If chroma\_loc\_info\_present\_flag is set to 1 then,

— chroma\_sample\_loc\_type\_top\_field shall be set to 2

— chroma\_sample\_loc\_type\_bottom\_field shall be set to 2

NOTE If BT.2020 or BT.2100 is signalled by colour\_primaries = 9 and the chroma\_loc\_info\_present\_flag is set to 0 then receivers are expected to rely on the BT.2020 and BT.2100 definitions. For more information, refer to the HEVC specification, Annex E.