**3GPP TSG-S4 Meeting #114-e *S4-210712***

**Online, , 19th–28th May 2021** revision of S4-210607

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| *CR-Form-v12.0* | | | | | | | | |
| **DRAFT CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network |  |

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| ***Title:*** |  | | | | | | | | | |
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| ***Source to WG:*** |  | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
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| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** |  |  | | | | | ***Release:*** | | |  |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | |  | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Add support for Hybrid Log–Gamma (HLG) opto-electronic transfer function as part of the existing provision for High Dynamic Range colour encoding. HLG is expected to be especially useful in the production and distribution of live Virtual Reality experiences, as described in the agreed discussion paper S4-210434. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | * Addition of “BT.2100 HLG” to Operation Point summary table. * Specification of VUI parameters to support HLG HDR for the Flexible H.265/HEVC and Main 8K H.265/HEVC Operation Points. | | | | | | | | |
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| ***Consequences if not approved:*** | | It will not be possible to convey video with HLG transfer characteristics across Release 17 3GPP networks. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5.1.3, 5.1.6.5, 5.1.7.5 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  |  | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  |  | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | S4-210435 -> S4-210607 | | | | | | | | |

FIRST CHANGE

### 5.1.3 Operation Point Summary

The present document defines several operation points for different target applications and scenarios. In particular, two legacy operation points are defined that use existing video codecs H.264/AVC and H.265/HEVC to enable distribution of up to 4K full 360 mono video signals up to 60 Hz by using simple equirectangular projection.

In addition, one operation for each codec is defined that enables enhanced features, in particular stereo video, up to 8K mono, higher frame rates and HDR.

Furthermore, one additional operation point is defined that uses H.265/HEVC to enable distribution of up to 8K full 360 mono video signals up to 60 Hz and with HDR using equirectangular projection.

Table 5.1-1 summarizes the Operation Points, the detailed definitions are defined in the remainder of clause 5.1 where 3k refers to 2880 × 1440 pixels, 4k to 4096 × 2048 pixels, 6k to 6144 × 3072 pixels and 8k to 8192 × 4096 pixels (expressed in luminance pixel width × luminance pixel height).

Note: The Table only provides an informative high-level summary and is not considered to be complete. The specification text in the remainder of clause 5.1 refines the table and takes precedence over any information documented in the table.

Restrictions on source formats such as resolution and frame rates, content generation and encoding guidelines are provided in Annex A.

Table 5.1-1: High-level Summary of Operation Points

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Operation Point name | Decoder | Bit depth | Typical  Original Spatial Resolution | Frame Rate | Colour space format | Transfer  Characteristics | Projection | Rotation | RWP | Stereo |
| Basic H.264/AVC | H.264/AVC HP@L5.1 | 8 | Up to 4k | Up to 60 Hz | BT.709 | BT.709 | ERP w/o padding | No | No | No |
| Main H.265/HEVC | H.265/HEVC MP10@L5.1 | 8, 10 | Up to 6k in mono and 3k in stereo | Up to 60 Hz | BT.709  BT.2020 | BT.709 | ERP w/o padding | No | Yes | Yes |
| Flexible H.265/HEVC | H.265/HEVC MP10@L5.1 | 8, 10 | Up to 8k in mono and 3k in stereo | Up to 120 Hz | BT.709  BT.2020 | BT.709,  BT.2100 PQ, BT.2100 HLG | ERP w/o padding CMP | No | Yes | Yes |
| Main 8K H.265/HEVC | H.265/HEVC MP10@L6.1 | 10 | Up to 8k in mono and 6k in stereo | Up to 60 60 Hz for 8K and 120 Hz for 4k | BT.709  BT.2020 | BT.709, BT.2100 PQ, BT.2100 HLG | ERP w/o padding | No | Yes, but restricted to coverage | Yes |

VR Rendering metadata in the Operation Points is carried in SEI messages. Receivers are expected to be able to process the VR metadata carried in SEI messages. However, the same VR metadata may be duplicated on system-level. In this case, the Receiver may rely on the system level processing to extract the relevant VR Rendering metadata rather than extracting this from the SEI message.

NEXT CHANGE

#### 5.1.6.5 Colour information and Transfer Characteristics

A Bitstream conforming to the 3GPP VR Flexible H.265/HEVC Operation Point shall use either Recommendation ITU-R BT.709 [3] colorimetry or Recommendation ITU-R BT.2020 [4] colorimetry in non-constant luminance for standard dynamic range (SDR).

For Perceptual Quantization (PQ) High Dynamic Range (HDR), BT.2020 [4] colorimetry in non-constant luminance and the PQ electro-optical transfer function (EOTF) as defined in Recommendation ITU-R BT.2100 [11] are used.

For Hybrid Log–Gamma (HLG) High Dynamic Range (HDR), BT.2020 [4] colorimetry in non-constant luminance and the HLG opto-electronic transfer function (OETF) as defined in Recommendation ITU-R BT.2100 [11] are used.

Specifically, in the VUI, the colour parameter information shall be present, i.e.:

- video\_signal\_type\_present\_flag value and colour\_description\_present\_flag value shall be set to 1.

- If BT.709 [3] is used, it shall be signalled by setting colour\_primaries to the value 1, transfer\_characteristics to the value 1 and matrix\_coeffs to the value 1.

- If BT.2020 [4] and SDR is used, it shall be signalled by setting colour\_primaries to the value 9, transfer\_characteristics to the value 14 and matrix\_coeffs to the value 9.

- If BT.2020 [4] and ITU-R BT.2100 [11] are used in HDR, it shall be signalled by setting colour\_primaries to the value 9 and matrix\_coeffs to the value 9.

- If the PQ EOTF is used, transfer\_characteristics shall be set to the value 16.

- If the HLG OETF is used, transfer\_characteristics shall be set to the value 14. The Bitstream shall also contain the alternative\_transfer\_characteristics SEI message. The alternative\_transfer\_characteristics SEI message shall be inserted at each RAP, and its parameter preferred\_transfer\_characteristics shall be set to the value 18.

NOTE: HLG is specified using the alternative\_transfer\_characteristics method only to ensure backwards compatibility with earlier releases at this Operation Point.

If the content is provided to a receiver that is not able to process to the SEI message, the content provider should be aware that the receiver uses the backward-compatibility mode of HLG to present the SDR version.

A Receiver conforming to the 3GPP VR Flexible H.265/HEVC Operation Point shall be capable of decoding and rendering according to any of the above configurations.

SEI messages for HDR metadata signalling may be used. The requirements and recommendations for Bitstreams and Receivers as documented in TS 26.116 [12], clause 4.5.5.7 also apply for the 3GPP VR Flexible H.265/HEVC Operation Point.

NEXT CHANGE

#### 5.1.6.15 Receiver Compatibility

Receivers conforming to the 3GPP VR Flexible H.265/HEVC Operation Point shall support decoding and displaying3GPP VR Main H.265/HEVC Operation Point Bitstreams and 3GPP VR Flexible H.265/HEVC Operation Point Bitstreams.

Receivers conforming to the 3GPP VR Flexible H.265/HEVC Operation Point shall support all Receiver requirements in clause 5.1.6. Specifically, receivers conforming to the 3GPP VR Flexible H.265/HEVC Operation Point shall support decoding and rendering Bitstreams that include the following display or VR rendering metadata:

- the region-wise packing SEI message (for details see clauses 5.1.6.11 and 5.1.6.12),

- the equirectangular projection SEI message (for details see clause 5.1.6.10),

- the cubemap projection SEI message (for details see clause 5.1.6.10),

- the frame-packing arrangement SEI message (for details see clause 5.1.6.13),

- the alternative\_transfer\_characteristics SEI message with preferred\_transfer\_characteristics set to the value 18 (for details see clause 5.1.6.5).

- any combinations of those.

NEXT CHANGE

#### 5.1.7.5 Colour information and Transfer Characteristics

A Bitstream conforming to the 3GPP VR Main 8K H.265/HEVC Operation Point shall use either Recommendation ITU-R BT.709 [3] colorimetry or Recommendation ITU-R BT.2020 [4] colorimetry in non-constant luminance for standard dynamic range (SDR).

For Perceptual Quantization (PQ) High Dynamic Range (HDR), BT.2020 [4] colorimetry in non-constant luminance and the PQ electro-optical transfer function (EOTF) as defined in Recommendation ITU-R BT.2100 [11] are used.

For Hybrid Log–Gamma (HLG) High Dynamic Range (HDR), BT.2020 [4] colorimetry in non-constant luminance and the HLG opto-electronic transfer function (OETF) as defined in Recommendation ITU-R BT.2100 [11] are used.

Specifically, in the VUI, the colour parameter information shall be present, i.e.:

- video\_signal\_type\_present\_flag value and colour\_description\_present\_flag value shall be set to 1.

- If BT.709 [3] is used, it shall be signalled by setting colour\_primaries to the value 1, transfer\_characteristics to the value 1 and matrix\_coeffs to the value 1.

- If BT.2020 [4] and SDR is used, it shall be signalled by setting colour\_primaries to the value 9, transfer\_characteristics to the value 14 and matrix\_coeffs to the value 9.

- If BT.2020 [4] and ITU-R BT.2100 [11] are used in HDR, it shall be signalled by setting colour\_primaries to the value 9 and matrix\_coeffs to the value 9. The chroma\_sample\_loc\_type\_top\_field shall be set to 2.

- If the PQ EOTF is used, transfer\_characteristics shall be set to the value 16.

- If the HLG OETF is used, transfer\_characteristics shall be set to either the value 18 or 14. In the latter case, the Bitstream shall also contain the alternative\_transfer\_characteristics SEI message. The alternative\_transfer\_characteristics SEI message shall be inserted at each RAP, and its parameter preferred\_transfer\_characteristics shall be set to the value 18.

A Receiver conforming to the 3GPP VR Main 8K H.265/HEVC Operation Point shall be capable of decoding and rendering according to any of the above configurations.

SEI messages for HDR metadata signalling may be used. The requirements and recommendations for Bitstreams and Receivers as documented in TS 26.116 [12], clause 4.5.5.7 also apply for the 3GPP VR Main 8K H.265/HEVC Operation Point.

NEXT CHANGE

END OF CHANGES