**3GPP TSG-S4 Meeting#133-e*****S4-251336***

**Online, 18th–25th July 2025**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.2* | | | | | | | | |
| **PSEUDO CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  |  | **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)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network | **X** |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Apple Inc. | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***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). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | There are remaining EN’s on missing features like 3D reference info SEI which needs to be implemented. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Add recommendation for 3D reference info SEI. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Several key features will remain missing. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.3.6 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

\* \* \* First Change \* \* \* \*

6.3.6 3GPP MV-HEVC Stereo

6.3.6.1 Introduction

The MV-HEVC Stereo Operation Point permits consistent distribution of stereoscopic content using MV-HEVC. The remainder of this clause 6.3.6 defines the Bitstream and Receiver requirements for the 3GPP-MV-HEVC-Stereo receiver.

6.3.6.2 Bitstream Requirements

A 3GPP-MV-HEVC-Stereo Bitstream shall conform to the following requirements

- the Representation Format included in the Bitstream shall conform to the 3GPP Stereoscopic format as defined in clause 4.4.3.4.

- The bitstream shall conform to the constraints specified in the **MV-HEVC-UHD** decoding capabilities as defined in clause 5.3.2.

- the Bitstream shall be decodable by

- a decoder with **HEVC-UHD-Dec** decoding capabilities as defined in clause 5.3.2 for a single output layer.

- a decoder with **MV-HEVC-UHD** decoding capabilities as defined in clause 5.3.2 for two output layers.

- The chroma sub-sampling shall be 4:2:0 and the value of chroma\_format\_idc shall be set to 1.

[

- The vps\_numlayers\_minus1 value shall be set to 2.

]

[

- vps\_auxiliary[lId] shall be equal to 0 in the VPS extension for the sub-bitstream with nuh\_layer\_id != 0.

- scalability\_mask\_flag[ 3 ][ nuh\_layer\_id ] (ScalabilityId mapping: AuxId) shall be equal to 0 in the VPS extension for the sub-bitstream with nuh\_layer\_id != 0.

Or

scalability\_mask\_flag[ 1 ][ nuh\_layer\_id ] shall be equal to 1 in the VPS extension for the sub-bitstream with nuh\_layer\_id != 0, while for i not equal to 1, scalability\_mask\_flag[ i][ nuh\_layer\_id ] shall be equal to 0

Or

dimension\_id[i][j], if present, shall be 0, where layer\_id\_in\_nuh[ i ] identifies an output layer, and j is sum of scalability\_mask\_flag[k], k = 0,1,2.

Or

- The derived value of AuxId[ lId ] shall be equal to 0 in the VPS extension for an output layer.

Or

]

If

NOTE: This implies that the second also carries primary video.

- The vps\_num\_direct\_ref\_layers[1] may be present, and if present,

- it shall be set to 1.

- the vps\_direct\_ref\_layer\_id[1][0] shall be set to 0.

NOTE: This implies, that layer-dependency is possible, but not needed. The two layers may be independent, or the second layer depend on the base layer. - The aspect\_ratio\_idc value shall be set to 1, indicating a square pixel format.

- In the VUI, either

- the values of colour\_primaries, transfer\_characteristics and matrix\_coeffs each shall be set to 1.

- The value of chroma\_sample\_loc\_type\_top\_field shall be set to 0.

- or

- the values of colour\_primaries and matrix\_coeffs each shall be set to 9, and the value of transfer\_characteristics shall be set to one of the following values: 14 (for SDR with WCG), 16 (for PQ) and 18 (for HLG).

- The value of the chroma\_sample\_loc\_type\_top\_field shall be set to 2.

The timing information may be present.

- If the timing information is present, i.e. the value of vui\_timing\_info\_present\_flag is set to 1, then the values of vui\_num\_units\_in\_tick and vui\_time\_scale shall be set according to the frame rates allowed for each operation point. The timing information present in the video Bitstream should be consistent with the timing information signalled at the system level.

- The frame rate shall not change between two RAPs. fixed\_pic\_rate\_general\_flag value, if present, shall be set to 1.

Bitstreams not required to be associated with frame packing information for all coded video sequences. It is also possible that such information, when present, may differ from one coded video sequence to another.

The bitstream shall include the three\_dimensional\_reference\_displays\_info SEI message as specified in Recommendation ITU-T H.265 / ISO/IEC 23008-2 [h265].

| **SEI Message Name** | **Purpose** | **Key Fields / Parameters** |
| --- | --- | --- |
| three\_dimensional\_reference\_displays\_info | Describes reference display geometry for 3D rendering | Display width/height, aspect ratio, viewing distance, screen center, baseline, depth range |
| depth\_representation\_info | Specifies depth value representation | Depth range (near/far), quantization, linearity |
| multiview\_scene\_info | Describes scene structure across multiple views | Number of views, view IDs, camera parameters |
| multiview\_acquisition\_info | Provides camera acquisition details | Intrinsic/extrinsic camera parameters, baseline distances |
| depth\_timing | Synchronizes depth and texture layers | Timing offsets, synchronization flags |
| view\_position | Specifies spatial position of each view | View index, 3D coordinates |
| view\_dependency\_structure | Describes inter-view dependencies | View hierarchy, reference relationships |

6.3.6.3 Receiver Requirements

Receivers conforming to this Operation Point 3GPP-MV-HEVC-Stereo shall support decoding and rendering Bitstreams with the restrictions defined in clause 6.3.6.2.

NOTE 1: Rendering includes adherence to the parameters signalled in the bitstream to characterize the distributed Representation format.

There are no requirements on output timing conformance for H.265/HEVC decoding (Annex C of [6]). The Hypothetical Reference Decoder (HRD) parameters, if present, should be ignored by the Receiver.

Also checked how the SEI messages interact with rendering

**How 3D SEI Messages Interact in Rendering**

**1. Scene and Acquisition Understanding**

* **multiview\_scene\_info** and **multiview\_acquisition\_info** provide the **camera setup** and **scene structure**:
  + Number of views
  + Camera positions and orientations
  + Baseline distances
* These are used to **reconstruct the 3D geometry** of the scene and determine how views relate spatially.

**2. Depth Interpretation**

* **depth\_representation\_info** tells the renderer how to **map depth values** (e.g., from 0–255) to **real-world distances**.
* This is essential for **accurate depth-based rendering** and **view synthesis**.

**3. Display Calibration**

* **three\_dimensional\_reference\_displays\_info** defines the **target display geometry**:
  + Screen size, viewing distance, eye separation
* This ensures that the **rendered 3D effect** appears correctly on the intended display.

**4. View Positioning and Dependencies**

* **view\_position** specifies where each view is located in 3D space.
* **view\_dependency\_structure** tells the decoder which views depend on others, guiding **decoding order** and **prediction structure**.

**5. Temporal Synchronization**

* **depth\_timing** ensures that **depth maps and texture video** are **synchronized** in time.
* This prevents visual artifacts due to misaligned frames.

**Rendering Pipeline Overview**

Here’s a simplified flow of how these SEI messages are used:

1. **Decode SEI messages** → extract scene, depth, and display info.
2. **Reconstruct 3D scene** using camera and depth data.
3. **Map depth to screen space** using display parameters.
4. **Synthesize intermediate views** or render stereo pairs.
5. **Display on 3D screen** with correct parallax and depth cues.

**A diagram of a software development

AI-generated content may be incorrect.**

\* \* \* End of Changes \* \* \* \*