3GPP TSG-SA WG4 Meeting #132S4-250940

Japan, Fukuoka, 19 – 23 May 2025 revision of S4aV250042

**Source: Xiaomi**

**Title: [VOPS] pCR On multi-component video signals**

**Spec: 3GPP TS 26.265 1.1.0**

**Agenda item: 9.5**

**Document for: Agreement**

**1. Introduction**

This contribution proposes text changes to consistently address the case of multiple components per video signal.

**2. Reason for Change**

The concept of multi-component video signals is defined in Clause 4.2:

“The video signal can be composed of one or more video signal components, for example a video signal can include multiple views.”

In addition, the changes accommodate both frame-packing or multi signal representations for such multi-component video signal, e, g. stereoscopic.

Those changes derives from discussion on S4aV250042 and before S4-250601.

**4. Proposal**

It is proposed to agree the following changes to 3GPP TS 26.265 1.1.0. Note that it was previously raised that using the term component may collide with the terms luma components and chroma components used in Clause 4.4.2. If deemed problematic, the proposed changes here can be adapted by replacing the term “component” by another term.

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

## 4.4 Video representation formats

### 4.4.1 Overview

This clause defines video representation formats in the context of media delivery in 3GPP. For this purpose, a set of video signal parameters are defined in clause 4.4.2, with the restriction on what is defined in 3GPP media delivery. Based on the defined video signal parameters, clause 4.4.3 defines a set of video representation formats.

NOTE: These clause does not specify whether these parameters and formats are required, recommended or suggested to be supported. This aspect is left to specific service specifications or external specifications to refer to the parameters and formats defined in this clause.

### 4.4.2 Video signal parameters

Video signals considered in this specification are represented by a sequence of pictures, where a *picture* can represent either an array of *luma* samples in a monochrome format or an array of luma samples and two corresponding arrays of *chroma* samples in a 4:2:0, 4:2:2, or 4:4:4 colour format. Only *progressive* signals are considered. A component refers to an array or single sample from one of the three arrays (luma and two chroma) that compose a picture. The Luma component represents a sample array or single sample representing the monochrome signal related to the primary colours (denoted with the symbol *Y*), and a chroma component represents a sample array or single sample representing one of the two colour difference signals related to the primary colours, represented by the symbols *Cb* and *Cr*.

Video signals are typically described by a set of parameters that are required for the proper rendering of the decoded signal. Table 4.4.2-1 documents typical video signal parameters and provides a definition and/or reference.

Table 4.4.2-1 Video Signal Parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Definition | 3GPP restrictions | Service or Application restrictions |
| Spatial Resolution width | The number of active samples per line for the luma component.Example values are 1280 or 1920 for HD, and 3840 for UHD.NOTE: The width does not restrict the encoding resolution to fixed values. Cropping parameters can be indicated that prescribe decoders the need to remove spatial video samples in a partially filled coding block that are not intended for presentation. | No restrictions | Restrictions possible |
| Spatial Resolution height | The number of active lines per picture for the luma component.Example values are 720 or 1080 for HD, and 2160 for UHD.NOTE: The height does not restrict the encoding resolution to fixed values. Cropping parameters can be indicated that prescribe decoders the need to remove spatial video samples in a partially filled coding block that are not intended for presentation. | No restrictions | Restrictions possible |
| Scan Type | Indicates the source scan type of the pictures as defined in clause 7.3 of Rec. ITU-T H.273.Typical value is progressive | Progressive only |  |
| Chroma format indicator | Indicates whether the picture has only a luma component or that the picture has three colour components that consist of a luma component and two associated chroma components, such that the width and height of each chroma component are the width and height of the luma component divided by a factor defined by the chroma format as defined in Rec. ITU-T H.274, clause 7.3.  | 4:2:0 |  |
| Bit depth | Indicates the bit depth for the samples of the luma component and the samples of the two associated chroma components.Note that in general, the bit depth of the luma component and of the two associated chroma components may differ.Typical values are 8 or 10 bits. | 8 or 10 bitsLuma and chroma components shall not differ |  |
| Colour primaries  | Indicates the chromaticity coordinates of the source colour primaries as specified in clause 8.1 of Rec. ITU-T H.273.Typical values are 1 to refer to Rec. ITU-R BT.709-6 [bt709] or 9 to refer to Rec. ITU-R BT.2020-2 and Rec. ITU-R BT.2100-2.  | BT.709 or BT.2020/BT.2100 |  |
| Transfer Characteristics | Either indicates the reference opto-electronic transfer characteristic function of the source picture as a function of a source input linear optical intensity input or indicates the inverse of the reference electro-optical transfer characteristic function as a function of an output linear optical intensity as defined in clause 8.2 of Rec. ITU-T H.273.Typical values are 1 to refer to Rec. ITU-R BT.709-6, 14 to refer to Rec. ITU-R BT.2020-2 (10 bit), 16 to refer to the Rec. ITU-R BT.2100-2 perceptual quantization (PQ) system, or 18 to refer to the Rec. ITU-R BT.2100-2 hybrid log-gamma (HLG) system | BT.709, BT.2020 SDR, BT.2100 PQ, or BT.2100 HLG |  |
| Matrix Coefficients | Describes the matrix coefficients used in deriving the luma and chroma signals from the green, blue, and red primaries. A video full range flag may be supplied with this parameter specifying the scaling and offset values applied in association with the Matrix coefficients. For detailed definition refer to clause 8.2 of Rec. ITU-T H.273.Typical values are 1 to refer to the non constant luminance YCbCr representation in Rec. ITU-R BT.709-6 or 9 to refer to the non constant luminance YCbCr representations in Rec. ITU-R BT.2020-2 and Rec. ITU-R BT.2100-2. | YCbCr BT.709, YCbCr BT.2020, orYCbCr BT.2100 |  |
| Frame rate | Typical values, using frames per second, are: 120, 120/1.001, 100, 60, 60/1.001, 50, 30, 30/1.001, 25, 24, 24/1.001 | No restrictions | services may only permit a restricted subset |
| Frame packing | Indicates a frame packing arrangement, if present, as defined in clause 8.4 of Rec. ITU-T H.273. | Typically restricted to no frame packing. | Some applications may use frame packing. |
| Projection | Indicates a projection, if present, as defined in Rec. ITU-T H.274, clause 7.3, and typically refers to packing arrangements in clause 8.6 of Rec. ITU-T H.274. | Typically restricted to no projection. | Some applications may use projections. |
| Sample aspect ratio | Indicates width-to-height aspect ratio of the luma samples of the associated pictures as defined in clause 7.3 of Rec. ITU-T H.273.Typical value is 1 | No specific restrictions, but 1 is expected. |  |
| Chroma sample location type | Specifies the location of the chroma samples relative to the luma samples for frames as defined in Rec. ITU-T H.273, clause 8.7.Typical values are 0 (chroma samples are horizontally co-sited with and vertically centered between the first luma sample at the top-left corner and the first two luma samples at the top-left corner, respectively) or 2 (chroma samples are co-sited with the luma sample at the top-left corner). Note that a value of 1 is common for still images. | No specific restrictions, but 0 is expected if not present. For HDR the value is typically set to 2. |  |
| Range | Specifies how luma and chroma samples are represented in digital video as defined in Rec. ITU‑T H.273, clause 8.3 using the parameter VideoFullRangeFlag. For video applications only the value set to 0 is used, i.e. the video range or restricted range is applied where the luma values range from 16 to 235 in an 8-bit system, and chroma values range from 16 to 240. For 10-bit systems, the values are multiplied by 4. Note that for still images full range (value set to 1) is commonly used. | No specific restrictions, but 0 is expected if not present. |  |
|  |  |  |  |

Certain video experiences are concurrently displaying video signals composed of multiple components. In this case, the video representation format describes each video signal component individually with the parameters defined in Table 4.4.2-1. Additionally, the components of the same video signal are typically jointly described and constrained for properly rendering the video representation.

The video signals made of multiple components can be represented in either of the following forms:

* As a single video signal using frame packing as defined in Table 4.4.2-1.
* As multiple separate video signals

Table 4.4.3-1 lists the multi-component video signal parameters.

Table 4.4.3-1 Multi-component Video Signal Parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Definition | 3GPP restrictions | Service or Application restrictions |
| Stereoscopic Video | Visual media may be stereoscopic, in which case the video signal is composed of two signal components: a view is available to be presented to the left eye and another view is available to be presented simultaneously to the right eye. The presentation of both the left and right views allows for an effect known as stereopsis, which can be defined as "the perception of depth produced by the reception in the brain of visual stimuli from both eyes in combination; binocular vision." For signal representations, [3dtv] recommends that the Left and Right eyes comply to regular image formats such as Rec. ITU-R BT.709 and any necessary 3D-specific metadata is incorporated with the data. Hence, for stereoscopic video, two synchronized video signals are available, each with identical format parameters (such as the ones defined in this table). NOTE: When distributing the signal, some systems may use different resolutions for one of the views.Additional metadata that may be added with stereoscopic video:- “Hero eye” is the default eye in a stereo (stereoscopic) video pair, often determined by tags set by the cameras used to capture the video. If so signaled, this indicates that the other stereo eye view is derived from the specified stereo eye and may be useful when choosing which eye to use in a monoscopic viewing environment. There is no requirement that either of the two eyes (or views) is tagged as the hero eye, in which case no hero eye tagging may be present.  |  |  |

\* \* \* Second Change \* \* \* \*

#### 4.4.3.4 Stereoscopic format

The 3GPP Stereoscopic format uses a two-component video signal, one component for the left eye and another component for the right eye as defined in Table 4.4.3-1. The components for each eye closely follow the specifications of the 3GPP HDR format, but there are some restrictions and extensions, namely:

- Only 4:2:0 colour subsampling is considered.

- Frame rates include high frame rate for movies, namely 48 fps.

- the spatial resolution for each component is restricted to a maximum value of 4K (3840 × 2160).

- Only the Non-Constant Luminance YCbCr signal format is considered.

- Square picture aspect ratios are supported for different screen sizes.

An informative summary of the parameters of a 3GPP Stereoscopic format based on the parameters defined in Table 4.4.2-1 is provided in Table 4.4.3.4-1.

Table 4.4.3.4-1 Video Signal Parameters for 3GPP Stereoscopic format for each component

|  |  |
| --- | --- |
| Parameter | Restrictions |
| Picture aspect ratio | 16:9, 1:1.  |
| Spatial Resolution width x height | 3840 × 2160, 1920 × 1080, 2048 × 2048, 1024 × 1024. NOTE 1: Down-sampled resolutions may be created for distribution, for example in case of adaptive streaming.NOTE 2: To accommodate the block coding structure of a given specification, quite often the encoded signal may be padded. In such cases, normative cropping is typically applied to remove spatial samples that are not intended to be presented. |
| Scan Type | The source scan type of the pictures as defined in clause 7.3 of Rec. ITU-T H.273 is progressive |
| Chroma format indicator | The chroma format indicator is 4:2:0.  |
| Bit depth | The permitted values are 8 or 10 bit. 8 bit is only permitted for SDR. |

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