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**Information technology — Coded  
representation of immersive media —**

**Part 20:**

**Conformance testing for visual  
volumetric video-based coding  
(V3C) with video-based point cloud  
compression (V-PCC)**

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## Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives) or [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs)).

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This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

A list of all parts in the ISO 23090 series can be found on the ISO and IEC websites.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html) and [www.iec.ch/national-committees](http://www.iec.ch/national-committees).

## Introduction

This document outlines the conformance testing specification for ISO/IEC 23090-5.

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# Information technology — Coded representation of immersive media —

## Part 20:

## Conformance testing for visual volumetric video-based coding (V3C) with video-based point cloud compression (V-PCC)

### 1 Scope

This document specifies a set of tests and procedures designed to indicate whether encoders or decoders meet the requirements specified in ISO/IEC 23090-5.

### 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.

ISO/IEC 23090-5:2023, *Information technology — Coded representation of immersive media — Part 5: Visual volumetric video-based coding (V3C) and video-based point cloud compression (V-PCC)*

ISO/IEC 23090-19, *Information technology — Coded representation of immersive media — Part 19: Reference Software for V-PCC*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 23090-5 apply, and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

#### 3.1

##### **bitstream**

sequence of bits that conforms to specified syntax requirements or sequence of bits to be tested for conformance to such syntax requirements

#### 3.2

##### **decoder**

embodiment of the decoding process to be tested for conformance to such a decoding process specification

Note 1 to entry: The decoder does not include the rendering and display process, which are outside the scope of this document.

### 3.3

#### **encoder**

embodiment of a process, not specified in this document (except in respect to identification of the reference software encoder), that produces a *bitstream* (3.1)

### 3.4

#### **reference software decoder**

particular *decoder* (3.2) provided as a software package for use as an example available for study, as a potential starting basis for the development of other decoders, as a way of testing *bitstreams* (3.1) for conformance to a decoding process specification, or as a reference for comparison with the behaviour of other decoders

### 3.5

#### **reference software encoder**

particular *encoder* (3.3) provided as a software package for use as an example available for study, as a potential starting basis for the development of other encoders, or as a reference for comparison with the behaviour of other encoders

### 3.6

#### **V3C output unit**

particular structure containing decoded and normalized V3C components that correspond to a specific composition time

### 3.7

#### **V-PCC reconstruction**

particular recommendation of the reconstruction process to be tested for conformance to such a reconstruction process specification

## 4 Abbreviated terms and acronyms

The relevant abbreviated terms and acronyms are specified in Clause 4 of ISO/IEC 23090-5:2023.

## 5 Conventions

The relevant conventions are specified in Clause 5 of ISO/IEC 23090-5:2023.

## 6 Conformance for ISO/IEC 23090-5

### 6.1 General

The following clauses specify normative tests for verifying the conformance of V3C bitstreams as well as decoders. Those normative tests make use of test data (bitstream test suites) provided at <https://standards.iso.org/iso-iec/23090/-20/ed-1/en/> and the reference software decoder specified in ISO/IEC 23090-5.

### 6.2 Bitstream conformance

The bitstream conformance is specified by Clause E.4 of ISO/IEC 23090-5:2023.

### 6.3 Decoder conformance

The decoder conformance is specified by Clause E.5 of ISO/IEC 23090-5:2023.

## 6.4 Reconstruction conformance

The reconstruction conformance of ISO/IEC 23090-5 is specified by Annex B and H.10, H.11, and H.12 according to the chosen reconstruction profile indicated in ISO/IEC 23090-5:2023, H.15. The voxelized representation of the decoded point cloud shall be used for conformance testing. Therefore, the adaptation process specified in the ISO/IEC 23090-5:2023, H.13 shall be ignored.

Decoders conforming to a V-PCC profile with a reconstruction profile component shall perform reconstruction operations required by this reconstruction profile component. Conformance is assessed at conformance point A, as shown in Figure 1, examining the decoded attribute, geometry, and occupancy bitstreams together with the decoded atlas and appropriate information that can associate the decoded patch metadata with the decoded video signal (e.g., patch to block map information). For conformance point A, conformance is exact.

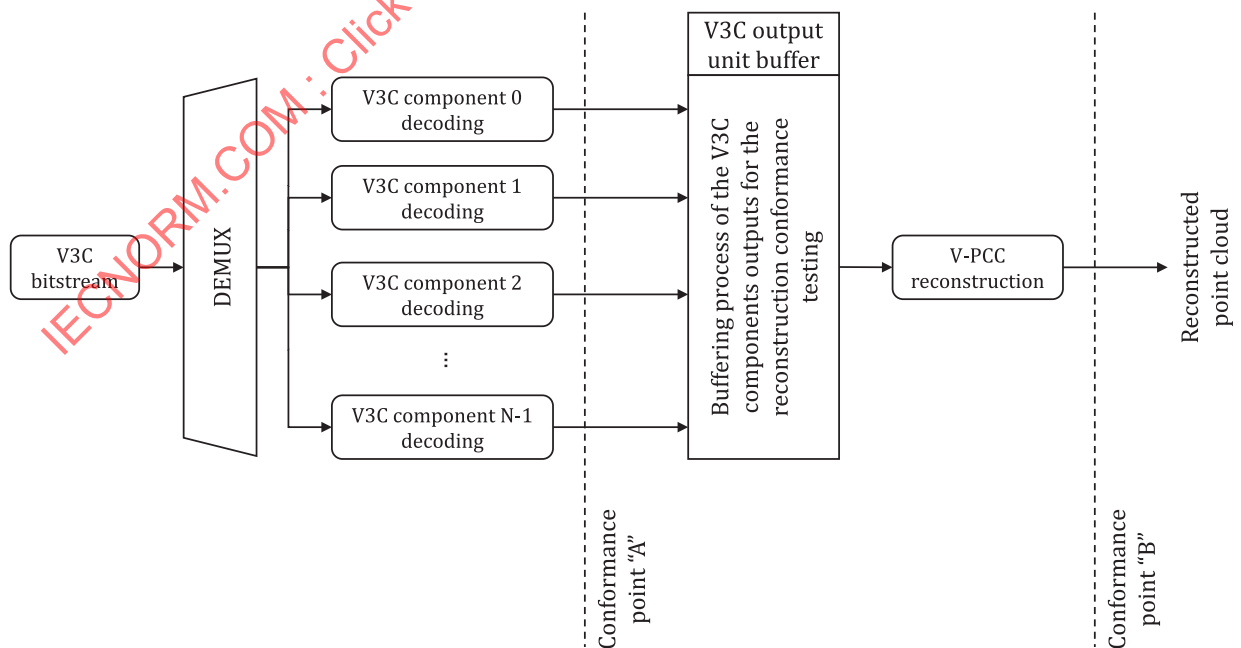
Conformance is assessed at conformance point B, as shown in Figure 1, when the decoder selects to operate in a particular reconstruction profile. Associated reconstruction information to a specific reconstruction profile is provided as reference only. A conformant V-PCC decoder to a particular reconstruction profile may implement alternative processes that produce similar or better visual quality. The definition of similar or better visual quality is outside the scope of this document.

For conformance testing, post-decoding conversion of the decoded V3C video components to a nominal video format is performed.

The process specified in Annex B of ISO/IEC 23090-5 is recommended to be used for the decoded to the nominal video format conversion. The reconstruction process follows a specified order of operations for reconstruction conformance. It is suggested to follow the implementation in ISO/IEC 23090-19.

The process of synchronizing the V3C components is specified in Annex B of ISO/IEC 23090-5. An example containing a detailed description of the V3C component synchronization process can be found in Reference [1].

It is a recommendation of this document that the decoded V3C output units are stored in an intermediate buffer for reconstruction purposes. The decoded V3C output units may be placed into the intermediate buffer at the output time of the corresponding V3C output unit processing. The reconstruction process can start when all required V3C units are available for processing.



**Figure 1 — V3C bitstream conformance evaluation for V-PCC content**

## 6.5 Procedure to test bitstreams

A bitstream that claims conformance with ISO/IEC 23090-5 shall pass the following normative tests:

The bitstream shall be decoded by processing it with the reference software decoder. When processed by the reference software decoder, the bitstream shall not cause any error or non-conformance messages to be reported by the reference software decoder. This test should not be applied to bitstreams that are known to contain errors introduced by transmission, as such errors are likely to result in bitstreams that lack conformance to ISO/IEC 23090-5. The decoding process is performed at best effort to decode atlas, occupancy, geometry, and attribute components of the V3C bitstream. It is a minimum requirement that the atlas component of the V3C bitstream is present for conformance testing.

Additional tests may be required to thoroughly check that the bitstream appropriately meets all the requirements specified in ISO/IEC 23090-5, including the hypothetical reference decoder (HRD) conformance (based on Annexes E, F, and G). These complementary tests may be performed using other point cloud bitstream verification solutions or decoders that perform additional tests compared to checks implemented by the reference software decoder.

ISO/IEC 23090-5 contains several informative recommendations that are not an integral part of that document. When testing a bitstream for conformance, it may also be helpful to test whether the bitstream follows those recommendations.

To check the correctness of a bitstream, it is necessary to parse the entire bitstream and extract all the syntax elements and other values derived from those syntax elements and used by the decoding process specified in ISO/IEC 23090-5.

The verification process shall not necessarily perform all stages of the decoding process specified in ISO/IEC 23090-5 to verify bitstream correctness. Some tests can be performed on syntax elements in a state before their use in corresponding processing stages.

## 6.6 Procedure to test decoder conformance

### 6.6.1 Conformance bitstreams

A bitstream has values of `ptl_profile_codec_group_idc`, `ptl_profile_toolset_idc`, `ptl_profile_reconstruction_idc`, and `ptl_level_idc` corresponding to a set of specified constraints on a bitstream for which a decoder conforming to a specified profile and level is required in Annex A of ISO/IEC 23090-5 to perform the decoding process properly.

### 6.6.2 Contents of the bitstream file

The conformance bitstreams are available at <https://standards.iso.org/iso-iec/23090/-20/ed-1/en/>. The information indicated in Table 1 is included in a single zipped file for each such bitstream.

In cases where the decoded pictures or hashes of decoded pictures are not available, the reference software decoder shall be used to generate the necessary reference decoded pictures from the bitstream.

**Table 1 — List of the files for conformance testing**

| Item | Extension             | Description                                                                                                                                        | Requirement                              |
|------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| 1    | *.bin                 | coded bitstream                                                                                                                                    | mandatory                                |
| 2    | *_dscr_bitstr.txt     | a short description of the bitstream                                                                                                               | mandatory                                |
| 3    | *.cfg                 | the configuration files used to generate bitstream with a software encoder provided in ISO/IEC 23090-20.                                           | optional, if reference software is used. |
| 4    | *_bitstream_md5.txt   | the MD5 checksum of the entire coded V3C bitstream file                                                                                            | mandatory                                |
| 5    | *_hls_md5.txt         | the MD5 checksum of the HLS and SEI units, if present, of the coded V3C bitstream file                                                             | mandatory for HLS<br>optional for SEI    |
| 6    | *_picture_log.txt     | Contains the logs for occupancy, geometry, and attribute components                                                                                | optional                                 |
| 7    | *_atlas_log.txt       | output atlas log                                                                                                                                   | optional*                                |
| 8    | *_tile_log.txt        | output tile log                                                                                                                                    | optional*                                |
| 9    | *_pcframe_log.txt     | output point cloud frame log before post-reconstruction                                                                                            | optional                                 |
| 10   | *_rec_pcframe_log.txt | the output of post-reconstruction point cloud frame log                                                                                            | optional                                 |
| 11   | *_dec_[frm_no].ply    | A collection of decoded point cloud frames per indicated reconstruction profile containing the unordered reconstructed decoded point cloud frames. | optional                                 |

### 6.6.3 Requirements on the output of the decoding process, reconstruction process, and timing

The output of the decoding process is specified in Clauses 8, 9, and Annexes E, F, G, and H of ISO/IEC 23090-5:2023. The output of the decoding process is used as the input of the reconstruction process and timing, as defined in Annex B of ISO/IEC 23090-5:2023.

For output order conformance, it is a requirement that all the decoded V3C component frames (point cloud frames) specified for output in Annex E of ISO/IEC 23090-5:2023 shall be output by a conforming decoder in the specified order and that the values of the decoded samples in all the V3C component frames that are output shall be equal to the values specified in Clause 8 of ISO/IEC 23090-5:2023.

For output timing conformance, it is a requirement that a conforming decoder shall also output the decoded samples at the rates and times specified in Annex E of ISO/IEC 23090-5:2023.

For the reconstruction conformance, it is a requirement that all the decoded components are normalized to the nominal frame rate. An example is provided in Annex B of ISO/IEC 23090-5:2023.

The visualization and display processes, which ordinarily follow the output of the reconstruction process, are outside the scope of this document.

### 6.6.4 Bitstream validation

The uploaded bitstreams should be validated, and the following aspects should be verified.

- Confirm that the decoded V3C components are identical at conformance point A,
- Confirm that all intended features are included in the bitstream.

The outputs for conformance point A, comprised of the V3C components representing a point cloud frame at a given time instance, are used as an input for the decoder reconstruction process that specifies soft conformance check for conformance point B.

### 6.6.5 Recommendations (informative)

This clause does not form an integral part of this document.

In addition to the requirements, conforming decoders should implement various informative recommendations specified in ISO/IEC 23090-5 that are not an integral part of that document. This clause lists some of these recommendations.

It is recommended that a conforming decoder can resume the decoding process as soon as possible after the loss or corruption of part of a bitstream. In most cases, it is possible to continue decoding at the following V3C tile unit header. It is recommended that a conforming decoder can perform concealment for the patches or V3C packets for which all the coded data of the V3C components has not been received.

## 6.7 Test bitstreams

### 6.7.1 General

The test bitstreams<sup>1)</sup> are part of the mechanism to verify decoder conformance according to ISO/IEC 23090-5.

The zipped log files are stored at <https://standards.iso.org/iso-iec/23090/-20/ed-1/en/> for the V3C conformance bitstreams test.

Subclause 6.7.2 lists test bitstreams coded with basic toolset and reconstructed with Rec0 profiles, as indicated in Table 2.

**Table 2 — Basic toolset bitstreams list**

| No | Bitstream name                                             | MD5 Sum for decoded bitstream (BITSTRMD5) |
|----|------------------------------------------------------------|-------------------------------------------|
| 1  | HEVCMaIn10_Basic_Rec0_STLINTRA_SONY                        | 5fb-5d5e2434168c07330527f23e14095         |
| 2  | HEVCMaIn10_Basic_Rec0_STLINTRA_MC1_INTERDIGITAL            | 0937d8615746da43ac-c0dee5fb927520         |
| 3  | HEVCMaIn10_Basic_Rec0_STLINTRA_MC2_INTERDIGITAL            | b16a41e5b11160b9a20efed-860a6253b         |
| 4  | HEVCMaIn10_Basic_Rec0_MTLINTRA_tileT2M2P21MC1_INTERDIGITAL | 9989f3757815dab0459a2c3464275327          |
| 5  | HEVCMaIn10_Basic_Rec0_MTLINTRA_tileT2M2P21MC2_INTERDIGITAL | 4d16e79e58750329e3a6462d-49d39df5         |
| 6  | HEVCMaIn10_Basic_Rec0_MTLINTRA_tileT2M3P11MC1_INTERDIGITAL | 0e6e2f2742d49b-b1462976024a442b7b         |
| 7  | HEVCMaIn10_Basic_Rec0_MTLINTRA_tileT2M3P11MC2_INTERDIGITAL | b7ecfb5bd-c78476968331661918d1d42         |
| 8  | HEVCMaIn10_Basic_Rec0_MTLINTRA_tileT2M3P21MC1_INTERDIGITAL | 9989f3757815dab0459a2c3464275327          |
| 9  | HEVCMaIn10_Basic_Rec0_MTLINTRA_tileT2M3P21MC2_INTERDIGITAL | 4d16e79e58750329e3a6462d-49d39df5         |
| 10 | HEVCMaIn10_Basic_Rec0_STLLRA_MC1_INTERDIGITAL              | 9955e89a55b-35832785f9630ed1655f5         |
| 11 | HEVCMaIn10_Basic_Rec0_STLLRA_MC2_INTERDIGITAL              | 511e459e5797fb179285a79f04293fb6          |
| 12 | HEVCMaIn10_Basic_Rec0_MTLIRA_tileT2M2P21MC1_INTERDIGITAL   | 5c91cd236b5ed9c-99d542a78c0691fdf         |

1) Sony®, Interdigital™, Samsung in the bitstream names are given for the convenience of users of this document and do not constitute an endorsement by ISO or IEC.

**Table 2 (continued)**

| No | Bitstream name                                           | MD5 Sum for decoded bitstream (BITSTRMD5) |
|----|----------------------------------------------------------|-------------------------------------------|
| 13 | HEVCMaIn10_Basic_Rec0_MTLRA_tileT2M2P21MC2_INTERDIG-ITAL | a17fbe41da9412a87174b0ae3f7ecfb5          |
| 14 | HEVCMaIn10_Basic_Rec0_MTLRA_tileT2M3P21MC1_INTERDIG-ITAL | 5c91cd236b5ed9c-99d542a78c0691fdf         |
| 15 | HEVCMaIn10_Basic_Rec0_MTLRA_tileT2M3P21MC2_INTERDIG-ITAL | a17fbe41da9412a87174b0ae3f7ecfb5          |
| 16 | MP4RA_Basic_Rec0_SEICCM_MC1_INTERDIGITAL                 | acf33444354598a11e2f-59c08e99e549         |
| 17 | MP4RA_Basic_Rec0_SEICCM_MC2_INTERDIGITAL                 | 49db25179023cab3c1d3802e75e-a24ed         |
| 18 | HEVCMaIn10_Basic_Rec0_LOSSYOM_SAMSUNG_v1                 | 39941d7b2c920f-86309305661b388aa5         |
| 19 | HEVCMaIn10BASIC_MTL_1MAP_SS_basketball_player            | ad92fdd94cb15e-b585099e1c3b280832         |
| 20 | HEVCMaIn10BASIC_MTL_1MAP_SS_longdress                    | 8b7b97448e18556b5fdce217a0f-9d80a         |
| 21 | HEVCMaIn10BASIC_MTL_2MAP_MS_basketball_player            | 1cfddc7fa93a1f43535c7e99819feb11          |
| 22 | HEVCMaIn10BASIC_MTL_2MAP_MS_longdress                    | 37409b9ef2002febe941d-820c1a0681d         |
| 23 | HEVCMaIn10BASIC_MTLNONUNI_1MAP_SS_basketball_player      | 71296ea0e77cb5f0d0b2ca9ad-5b444f5         |
| 24 | HEVCMaIn10BASIC_MTLNONUNI_1MAP_SS_longdress              | 8235b0f5a5a6d-72098233c53be895527         |
| 25 | HEVCMaIn10BASIC_MTLNONUNI_2MAP_MS_basketball_player      | 54ecbb384241483f5cc12adeffdd5185          |
| 26 | HEVCMaIn10BASIC_MTLNONUNI_2MAP_MS_longdress              | c3130f-b1741a1a432f9b26d189797362         |
| 27 | HEVCMaIn10BASIC_STL_1MAP_SS_basketball_player            | a8129a79da1af42e13cbd54005bf-cbd3         |
| 28 | HEVCMaIn10BASIC_STL_1MAP_SS_longdress                    | 051bd5b55ff3a0d76ad1d-7a7206d1d11         |
| 29 | HEVCMaIn10BASIC_STL_2MAP_MS_basketball_player            | 3e2e4bb8c66ccf78620709d-e43cd80d7         |
| 30 | HEVCMaIn10BASIC_STL_2MAP_MS_longdress                    | 68559cb8d38735336ca934d-302c2ff57         |

Subclause 6.7.2 lists test bitstreams coded with basic toolset still and reconstructed with Rec0 profiles, as indicated in Table 3.

**Table 3 — Basic toolset still bitstreams list**

| No | Bitstream name                                       | MD5 Sum for decoded bitstream (BITSTRMD5) |
|----|------------------------------------------------------|-------------------------------------------|
| 1  | HEVCMaIn10_BASIC_STILL_MTL_2MAP_MS_basketball_player | a64b90433ac6fdb1c126d0b64bfa8ef           |
| 2  | HEVCMaIn10_BASIC_STILL_MTL_2MAP_MS_longdress         | a7258d5d6f1ac601aa4bcb0854a497f8          |
| 3  | HEVCMaIn10_BASIC_STILL_STL_1MAP_SS_basketball_player | df4be9bd01ad7dcb9f94d071fbe20a51          |
| 4  | HEVCMaIn10_BASIC_STILL_STL_1MAP_SS_longdress         | 2bb57067a0891209f0b122ced437c77e          |

Subclause 6.7.4 lists test bitstreams coded with extended toolset and reconstructed with Rec0 profiles, as indicated in Table 4.

**Table 4 — Extended toolset bitstreams list**

| No | Bitstream name                           | MD5 Sum for decoded bitstream (BITSTRMD5) |
|----|------------------------------------------|-------------------------------------------|
| 1  | HEVCMaIn10_Extended_Rec0_PEXT_SONY       | daa83e77634c7b01b371ffe74a895bed          |
| 2  | HEVCMaIn10_Extended_Rec0_POEIGHT_SONY_v1 | 8e8925a83f6ac99978ecce0c76deef98          |

Subclause 6.7.5 lists test bitstreams with soft conformance reconstructed with Rec 1 profiles, as indicated in Table 5.

**Table 5 — Soft conformance REC1 bitstreams list**

| No | Bitstream name                                    | MD5 Sum for decoded bitstream (BITSTRMD5) |
|----|---------------------------------------------------|-------------------------------------------|
| 1  | HEVCMaIn10_Basic_Rec1_GEOSM_SONY                  | ac94dbcf4f48457af3ee72b1a0b7cffe          |
| 2  | HEVCMaIn10_Basic_Rec1_ATTRSM_SAMSUNG_v1           | eadd2d534fb3e40f5d3416a552e54ad7          |
| 3  | HEVCMaIn10_Basic_Rec1_PDI_INTERDIGITAL            | 011c280fae20ad2412d9790861499326          |
| 4  | HEVCMaIn10_Extended_Rec1_PLR_MC1PLR1_INTERDIGITAL | efec2b6b09168f4f68060ca1aa18aa21          |
| 5  | HEVC444_Extended_Rec1_PTEOM_LOSGEO_INTERDIGITAL   | 27e230ed30f2ba00f9818ce9f453a41b          |
| 6  | HEVC444_Extended_Rec1_PTRAX_LOSGEO_INTERDIGITAL   | 67d97cf5fa42313d13393e9ff7892966          |

Subclause 6.7.6 lists test bitstreams with soft conformance reconstructed with Rec 2 profiles, as indicated in Table 6.

**Table 6 — Soft conformance REC2 bitstreams list**

| No | Bitstream name                                              | MD5 Sum for decoded bitstream (BITSTRMD5) |
|----|-------------------------------------------------------------|-------------------------------------------|
| 1  | HEVCMaIn10_Basic_Rec2_OCCSY_PBF_INTERDIGITAL                | 49e6ac465e1689dc0da4b-2712641cd77         |
| 2  | HEVCMaIn10_Extended_Rec2_PLR_MC1PLR1_OCCSY_PBF_INTERDIGITAL | 2388e9534b9c2be8f-8389cdead804877         |
| 3  | HEVC444_Basic_Rec2_PTRAW_INTERDIGITAL                       | 04a7a4d4982bb9aa5c8b840c3f-fa42b7         |
| 4  | HEVCMaIn10_Basic_Rec2_ATTRSM_SAMSUNG_v1                     | bdf8da8707220dab41585953b-dd2f2f7         |

## 6.7.2 Bitstreams coded with basic toolset coding profile and reconstructed with Rec 0 profiles

### 6.7.2.1 General

This subclause contains bitstreams coded with basic toolset and reconstructed with Rec 0 profiles.

#### 6.7.2.2 HEVCMaIn10\_Basic\_Rec0\_STLINTRA\_SONY

**Specification:** V3C coded bitstream is a single bitstream composed of 32 coded atlas frames together with the corresponding occupancy, geometry, and attribute V3C components coded using HEVC main 10 profile. Each atlas frame contains a single tile, coded as intra tile (I\_TILE). Two maps are used to code each of the geometry and texture attribute V3C video components. Texture attribute consists of 3 channels: r, g, and b. The V3C profile for coding the V3C bitstream is HEVC Main10 Basic Rec0.

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode atlas bitstreams comprised of a single atlas tile, with one or two maps. The patches are coded in intra mode only.

### 6.7.2.3 HEVCMaIn10\_Basic\_Rec0\_STLINTRA\_MC1\_INTERDIGITAL

**Specification:** V3C coded bitstream is processed with All Intra and multiple map streams configuration, 32 frames are coded.

- The bitstream contains one map.
- The bitstream allows testing conformance point A.
- The bitstream profile is HEVC Main10 V-PCC Basic Rec0.

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode atlas bitstreams comprised of a single atlas tile with one map. The patches are coded in intra mode only.

### 6.7.2.4 HEVCMaIn10\_Basic\_Rec0\_STLINTRA\_MC2\_INTERDIGITAL

**Specification:** V3C coded bitstream is processed with All Intra and multiple map streams configuration, 32 frames are coded.

- The bitstream contains two maps.
- The bitstream allows testing conformance point A.
- The bitstream profile is HEVC Main10 V-PCC Basic Rec0.

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode atlas bitstreams comprised of a single atlas tile with two maps. The patches are coded in intra mode only.

### 6.7.2.5 HEVCMaIn10\_Basic\_Rec0\_MTLINTRA\_tileT2M2P21MC1\_INTERDIGITAL

**Specification:** V3C coded bitstream is processed with All Intra and multiple streams configuration, 32 frames are coded.

- It contains multiple I\_TILE. The maximum number of tiles per frame is set to 2.
- The bitstream contains one map.
- The tile segmentation method is 2D Patch size based.
- The uniform partition width in the unit of 64 pixels is set to 2.
- The uniform partition height in the unit of 64 pixels is set to 1.
- The bitstream allows testing conformance point A.
- The bitstream profile is HEVC Main10 V-PCC Basic Rec0.

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode atlas bitstreams comprised of multiple uniform atlas tiles with one map. The patches are coded in intra mode only.

### 6.7.2.6 HEVCMaIn10\_Basic\_Rec0\_MTLINTRA\_tileT2M2P21MC2\_INTERDIGITAL

**Specification:** V3C coded bitstream is processed with All Intra and multiple streams configuration, 32 frames are coded.

- It contains multiple I\_TILE. The maximum number of tiles per frame is set to 2.

- The bitstream contains two maps.
- The tile segmentation method is 2D Patch size based.
- The uniform partition width in the unit of 64 pixels is set to 2.
- The uniform partition height in the unit of 64 pixels is set to 1.
- The bitstream allows testing conformance point A.
- The bitstream profile is HEVC Main10 V-PCC Basic Rec0.

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode atlas bitstreams comprised of multiple uniform atlas tiles with two maps. The patches are coded in intra mode only.

#### 6.7.2.7 HEVCMain10\_Basic\_Rec0\_MTLINTRA\_tileT2M3P11MC1\_INTERDIGITAL

**Specification:** V3C coded bitstream is processed with All Intra and multiple streams configuration, 32 frames are coded.

- It contains multiple I\_TILE. The maximum number of tiles per frame is set to 3.
- The bitstream contains one map.
- The tile segmentation method is 2D Patch size based.
- The uniform partition width in the unit of 64 pixels is set to 1.
- The uniform partition height in the unit of 64 pixels is set to 1.
- The bitstream allows testing conformance point A.
- The bitstream profile is HEVC Main10 V-PCC Basic Rec0.

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode atlas bitstreams comprised of multiple uniform atlas tiles with one map. The patches are coded in intra mode only.

#### 6.7.2.8 HEVCMain10\_Basic\_Rec0\_MTLINTRA\_tileT2M3P11MC2\_INTERDIGITAL

**Specification:** V3C coded bitstream is processed with All Intra and multiple streams configuration, 32 frames are coded.

- It contains multiple I\_TILE. The maximum number of tiles per frame is set to 3.
- The bitstream contains two maps.
- The tile segmentation method is 2D Patch size based.
- The uniform partition width in the unit of 64 pixels is set to 1.
- The uniform partition height in the unit of 64 pixels is set to 1.
- The bitstream allows testing conformance point A.
- The bitstream profile is HEVC Main10 V-PCC Basic Rec0.

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode atlas bitstreams comprised of multiple uniform atlas tiles with two maps. The patches are coded in intra mode only.

#### 6.7.2.9 HEVCMaIn10\_Basic\_Rec0\_MTLINTRA\_tileT2M3P21MC1\_INTERDIGITAL

**Specification:** V3C coded bitstream is processed with All Intra and multiple streams configuration, 32 frames are coded.

- It contains multiple I\_TILE. The maximum number of tiles per frame is set to 3.
- The bitstream contains one map.
- The tile segmentation method is 2D Patch size based.
- The uniform partition width in the unit of 64 pixels is set to 2.
- The uniform partition height in the unit of 64 pixels is set to 1.
- The bitstream allows testing conformance point A.
- The bitstream profile is HEVC Main10 V-PCC Basic Rec0.

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode atlas bitstreams comprised of multiple uniform atlas tiles with one map. The patches are coded in intra mode only.

#### 6.7.2.10 HEVCMaIn10\_Basic\_Rec0\_MTLINTRA\_tileT2M3P21MC2\_INTERDIGITAL

**Specification:** V3C coded bitstream is processed with All Intra and multiple streams configuration, 32 frames are coded.

- It contains multiple I\_TILE. The maximum number of tiles per frame is set to 3.
- The bitstream contains two maps.
- The tile segmentation method is 2D Patch size based.
- The uniform partition width in the unit of 64 pixels is set to 2.
- The uniform partition height in the unit of 64 pixels is set to 1.
- The bitstream allows testing conformance point A.
- The bitstream profile is HEVC Main10 V-PCC Basic Rec0.

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode atlas bitstreams comprised of multiple uniform atlas tiles with two maps. The patches are coded in intra mode only.

#### 6.7.2.11 HEVCMaIn10\_Basic\_Rec0\_STLLRA\_MC1\_INTERDIGITAL

**Specification:** V3C coded bitstream is processed with Inter Random Access, Merge, Skip, and multiple map streams configuration, 32 frames are coded.

- The bitstream contains one map.
- The bitstream allows testing conformance point A.
- The bitstream profile is HEVC Main10 V-PCC Basic Rec0.

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode atlas bitstreams comprised of multiple uniform atlas tiles with one map. The patches are coded in inter, skip, and merge modes.

#### 6.7.2.12 HEVCMaIn10\_Basic\_Rec0\_STLLRA\_MC2\_INTERDIGITAL

**Specification:** V3C coded bitstream is processed with Inter Random Access, Merge, Skip, and multiple map streams configuration, 32 frames are coded.

- The bitstream contains two maps.
- The bitstream allows testing conformance point A.
- The bitstream profile is HEVC Main10 V-PCC Basic Rec0.

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode atlas bitstreams comprised of multiple uniform atlas tiles with two maps. The patches are coded in inter, skip, and merge modes.

#### 6.7.2.13 HEVCMaIn10\_Basic\_Rec0\_MTLRA\_tileT2M2P21MC1\_INTERDIGITAL

**Specification:** V3C coded bitstream is processed with Inter Random Access, Merge, Skip, and multiple map streams configuration, 32 frames are coded.

- It contains multiple I\_TILE. The maximum number of tiles per frame is set to 2.
- The bitstream contains 1 map.
- The tile segmentation method is 2D Patch size based.
- The uniform partition width in the unit of 64 pixels is set to 2.
- The uniform partition height in the unit of 64 pixels is set to 1.
- The bitstream allows testing conformance point A.
- The bitstream profile is HEVC Main10 V-PCC Basic Rec0.

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode atlas bitstreams comprised of multiple uniform atlas tiles, with two maps. The patches are coded in inter, skip, and merge modes.

#### 6.7.2.14 HEVCMaIn10\_Basic\_Rec0\_MTLRA\_tileT2M2P21MC2\_INTERDIGITAL

**Specification:** V3C coded bitstream is processed with Inter Random Access, Merge, Skip, and multiple map streams configuration, 32 frames are coded.

- It contains multiple I\_TILE. The maximum number of tiles per frame is set to 2.
- The bitstream contains 2 maps.
- The tile segmentation method is 2D Patch size based.
- The uniform partition width in the unit of 64 pixels is set to 2.
- The uniform partition height in the unit of 64 pixels is set to 1.
- The bitstream allows testing conformance point A.
- The bitstream profile is HEVC Main10 V-PCC Basic Rec0.

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode atlas bitstreams comprised of multiple uniform atlas tiles, with two maps. The patches are coded in inter, skip, and merge modes.

**6.7.2.15 HEVCMaIn10\_Basic\_Rec0\_MTLRA\_tileT2M3P21MC1\_INTERDIGITAL**

**Specification:** V3C coded bitstream is processed with Inter Random Access, Merge, Skip, and multiple map streams configuration, 32 frames are coded.

- It contains multiple I\_TILE. The maximum number of tiles per frame is set to 3.
- The bitstream contains 1 map.
- The tile segmentation method is 2D Patch size based.
- The uniform partition width in the unit of 64 pixels is set to 2.
- The uniform partition height in the unit of 64 pixels is set to 1.
- The bitstream allows testing conformance point A.
- The bitstream profile is HEVC Main10 V-PCC Basic Rec0.

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode atlas bitstreams comprised of multiple uniform atlas tiles, with two maps. The patches are coded in inter, skip, and merge modes.

**6.7.2.16 HEVCMaIn10\_Basic\_Rec0\_MTLRA\_tileT2M3P21MC2\_INTERDIGITAL**

**Specification:** V3C coded bitstream is processed with Inter Random Access, Merge, Skip, and multiple map streams configuration, 32 frames are coded.

- It contains multiple I\_TILE. The maximum number of tiles per frame is set to 3.
- The bitstream contains 2 maps.
- The tile segmentation method is 2D Patch size based.
- The uniform partition width in the unit of 64 pixels is set to 2.
- The uniform partition height in the unit of 64 pixels is set to 1.
- The bitstream allows testing conformance point A.
- The bitstream profile is HEVC Main10 V-PCC Basic Rec0.

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode atlas bitstreams comprised of multiple uniform atlas tiles, with two maps. The patches are coded in inter, skip, and merge modes.

**6.7.2.17 MP4RA\_Basic\_Rec0\_SEICCM\_MC1\_INTERDIGITAL**

**Specification:** V3C coded bitstream is processed with Inter Random Access, Merge, Skip, and multiple map streams configuration, 32 frames are coded.

- The bitstream contains 1 map.
- The Component Codec Mapping SEI message is used (pointing to HEVC codec).
- The bitstream allows testing conformance point A.
- The bitstream profile is HEVC Main10 V-PCC Basic Rec0.

**Functional stage:** Component codec mapping (CCM) SEI message.

**Purpose:** Check that the decoder can properly parse and decode information contained in CCM SEI message.

#### 6.7.2.18 MP4RA\_Basic\_Rec0\_SEICCM\_MC2\_INTERDIGITAL

**Specification:** V3C coded bitstream is processed with Inter Random Access, Merge, Skip, and multiple map streams configuration, 32 frames are coded.

- The bitstream contains 2 maps
- The Component Codec Mapping SEI message is used (pointing to HEVC codec).
- The bitstream allows testing conformance point A.
- The bitstream profile is HEVC Main10 V-PCC Basic Rec0.

**Functional stage:** Component codec mapping (CCM) SEI message.

**Purpose:** Check that the decoder can properly parse and decode information contained in CCM SEI message.

#### 6.7.2.19 HEVCMaIn10\_Basic\_Rec0\_LOSSYOM\_SAMSUNG\_v1

**Specification:** V3C coded bitstream is a single bitstream composed of a single coded atlas frame together with the corresponding occupancy, geometry, and attribute V3C components coded using the HEVC main 10 profile. The V3C profile for coding the V3C bitstream is HEVC Main10 Basic Rec0.

**Functional stage:** Derivation of binary occupancy map values for point cloud reconstruction.

**Purpose:** Check that the reconstruction is performed correctly when the bitstream includes a positive value for `oi_lossy_occupancy_compression_threshold`.

#### 6.7.2.20 HEVCMaIn10BaSiC\_MTL\_1MaP\_SS\_basketball\_player

**Specification:** HEVCMaIn10BaSiC\_MTL\_1MaP\_SS\_basketball\_player.bit is a V-PCC elementary bitstream of the sequence `basketball_player_vox11`.

The bitstream has 32 point cloud frames that consist of multiple I\_TILEs. The frame has one map. One geometry video bitstream and one attribute video bitstream are present in the bitstream. Auxiliary video is not present in the bitstream.

Occupancy, geometry, and attribute videos are compressed only with intra prediction.

It conforms HEVCMaIn10 and BaSiC profile, `ptl_profile_toolset_idc` is 0 and `ptl_profile_reconstruction_idc` is 0.

None of the post-processing, such as geometry smoothing, attribute transfer or color smoothing is applied.

The tile partition is uniform ( `afti_uniform_partition_spacing_flag` = 1 ).

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode a bitstream has multiple intra tiles with uniformly partitioned in one map.

#### 6.7.2.21 HEVCMaIn10BaSiC\_MTL\_1MaP\_SS\_longdress

**Specification:** HEVCMaIn10BaSiC\_MTL\_1MaP\_SS\_longdress.bit is a V-PCC elementary bitstream of the sequence `longdress_vox10`.

The bitstream has 32 point cloud frames that consist of multiple I\_TILES. The frame has one map. One geometry video bitstream and One attribute video bitstream are present in the bitstream. Auxiliary video is not present in the bitstream.

Occupancy, geometry, and attribute videos are compressed only with intra prediction.

It conforms HEVCMAIN10 and BASIC profile, `ptl_profile_toolset_idc` is 0 and `ptl_profile_reconstruction_idc` is 0.

None of the post-processing, such as geometry smoothing, attribute transfer or color smoothing is applied.

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode a bitstream has multiple intra tiles with uniformly partitioned in one map.

#### 6.7.2.22 HEVCMAIN10BASIC\_MTL\_2MAP\_MS\_basketball\_player

**Specification:** HEVCMAIN10BASIC\_MTL\_2MAP\_MS\_basketball\_player.bit is a V-PCC elementary bitstream of the sequence basketball\_player\_vox11.

The bitstream has 32 point cloud frames that consist of multiple I\_TILES. The frame has two maps. Two geometry video bitstreams and two attribute video bitstreams are present in the bitstream. Auxiliary video is not present in the bitstream.

Occupancy, geometry, and attribute videos are compressed only with intra prediction.

It conforms HEVCMAIN10 and BASIC profile, `ptl_profile_toolset_idc` is 0 and `ptl_profile_reconstruction_idc` is 0.

None of the post-processing, such as geometry smoothing, attribute transfer or color smoothing is applied.

The tile partition is uniform ( `afti_uniform_partition_spacing_flag` = 1 ).

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode a bitstream has multiple intra tiles with two maps in two bitstreams.

#### 6.7.2.23 HEVCMAIN10BASIC\_MTL\_2MAP\_MS\_longdress

**Specification:** HEVCMAIN10BASIC\_MTL\_2MAP\_MS\_longdress.bit is a V-PCC elementary bitstream of the sequence longdress\_vox10.

The bitstream has 32 point cloud frames that consist of multiple I\_TILES. The frame has two maps. Two geometry video bitstreams and two attribute video bitstreams are present in the bitstream. Auxiliary video is not present in the bitstream.

Occupancy, geometry, and attribute videos are compressed only with intra prediction.

It conforms HEVCMAIN10 and BASIC profile, `ptl_profile_toolset_idc` is 0 and `ptl_profile_reconstruction_idc` is 0.

None of the post-processing, such as geometry smoothing, attribute transfer or color smoothing is applied.

The tile partition is uniform ( `afti_uniform_partition_spacing_flag` = 1 ).

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode a bitstream has multiple intra tiles with two maps in two bitstreams.

#### 6.7.2.24 HEVCMAIN10BASIC\_MTLNONUNI\_1MAP\_SS\_longdress

**Specification:** HEVCMAIN10BASIC\_MTLNONUNI\_1MAP\_SS\_longdress.bit is a V-PCC elementary bitstream of the sequence longdress\_vox10.

The bitstream has 32 point cloud frames that consist of multiple I\_TILES. The frame has one map. One geometry video bitstream and One attribute video bitstream are present in the bitstream. Auxiliary video is not present in the bitstream.

Occupancy, geometry, and attribute videos are compressed only with intra prediction.

It conforms HEVCMAIN10 and BASIC profile, ptl\_profile\_toolset\_idc is 0 and ptl\_profile\_reconstruction\_idc is 0.

None of the post-processing, such as geometry smoothing, attribute transfer or color smoothing is applied.

The tile partition is non-uniform ( afti\_uniform\_partition\_spacing\_flag = 0 ).

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode a bitstream has multiple intra tiles with one map in one bitstream.

#### 6.7.2.25 HEVCMAIN10BASIC\_MTLNONUNI\_1MAP\_SS\_basketball\_player

**Specification:** HEVCMAIN10BASIC\_MTLNONUNI\_1MAP\_SS\_basketball\_player.bit is a V-PCC elementary bitstream of the sequence basketball\_player\_vox11.

The bitstream has 32 point cloud frames that consist of multiple I\_TILES. The frame has one map. One geometry video bitstream and One attribute video bitstream are present in the bitstream. Auxiliary video is not present in the bitstream.

Occupancy, geometry, and attribute videos are compressed only with intra prediction.

It conforms HEVCMAIN10 and BASIC profile, ptl\_profile\_toolset\_idc is 0 and ptl\_profile\_reconstruction\_idc is 0.

None of the post-processing, such as geometry smoothing, attribute transfer or color smoothing is applied.

The tile partition is non-uniform ( afti\_uniform\_partition\_spacing\_flag = 0 ).

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode a bitstream has multiple intra tiles with one map in one bitstream.

#### 6.7.2.26 HEVCMAIN10BASIC\_MTLNONUNI\_2MAP\_MS\_basketball\_player

**Specification:** HEVCMAIN10BASIC\_MTLNONUNI\_2MAP\_MS\_basketball\_player.bit is a V-PCC elementary bitstream of the sequence basketball\_player\_vox11.

The bitstream has 32 point cloud frames that consist of multiple I\_TILES. The frame has two maps. Two geometry video bitstreams and two attribute video bitstreams are present in the bitstream. Auxiliary video is not present in the bitstream.

Occupancy, geometry, and attribute videos are compressed only with intra prediction.

It conforms HEVCMAIN10 and BASIC profile, `ptl_profile_toolset_idc` is 0 and `ptl_profile_reconstruction_idc` is 0.

None of the post-processing, such as geometry smoothing, attribute transfer or color smoothing is applied.

The tile partition is non-uniform ( `afti_uniform_partition_spacing_flag` = 0 ).

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode a bitstream has multiple intra tiles with two maps in two bitstreams.

#### 6.7.2.27 HEVCMAIN10BASIC\_MTLNONUNI\_2MAP\_MS\_longdress

**Specification:** HEVCMAIN10BASIC\_MTLNONUNI\_2MAP\_MS\_longdress.bit is a V-PCC elementary bitstream of the sequence longdress\_vox10.

The bitstream has 32 point cloud frames that consist of multiple I\_TILEs. The frame has two maps. Two geometry video bitstreams and two attribute video bitstreams are present in the bitstream. Auxiliary video is not present in the bitstream.

Occupancy, geometry, and attribute videos are compressed only with intra prediction.

It conforms HEVCMAIN10 and BASIC profile, `ptl_profile_toolset_idc` is 0 and `ptl_profile_reconstruction_idc` is 0.

None of the post-processing, such as geometry smoothing, attribute transfer or color smoothing is applied.

The tile partition is non-uniform ( `afti_uniform_partition_spacing_flag` = 0 ).

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode a bitstream has multiple intra tiles with one map in one bitstream.

#### 6.7.2.28 HEVCMAIN10BASIC\_STL\_1MAP\_SS\_basketball\_player

**Specification:** HEVCMAIN10BASIC\_STL\_1MAP\_SS\_basketball\_player.bit is a V-PCC elementary bitstream of the sequence basketball\_player\_vox11.

The bitstream has 32 point cloud frames that consist of a single I\_TILE. The frame has one map. One geometry video bitstream and One attribute video bitstream are present in the bitstream. Auxiliary video is not present in the bitstream.

Occupancy, geometry, and attribute videos are compressed only with intra prediction.

It conforms HEVCMAIN10 and BASIC profile, `ptl_profile_toolset_idc` is 0 and `ptl_profile_reconstruction_idc` is 0.

None of the post-processing, such as geometry smoothing, attribute transfer or color smoothing is applied.

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode a bitstream has a single intra tile in one map.

#### 6.7.2.29 HEVCMAIN10BASIC\_STL\_1MAP\_SS\_longdress

**Specification:** HEVCMAIN10BASIC\_STL\_1MAP\_SS\_longdress.bit is a V-PCC elementary bitstream of the sequence longdress\_vox10.

The bitstream has 32 point cloud frames that consist of a single I\_TILE. The frame has one map. One geometry video bitstream and One attribute video bitstream are present in the bitstream. Auxiliary video is not present in the bitstream.

Occupancy, geometry, and attribute videos are compressed only with intra prediction.

It conforms HEVCMAIN10 and BASIC profile, `ptl_profile_toolset_idc` is 0 and `ptl_profile_reconstruction_idc` is 0.

None of the post-processing, such as geometry smoothing, attribute transfer or color smoothing is applied.

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode a bitstream has a single intra tile in one map.

#### 6.7.2.30 HEVCMAIN10BASIC\_STL\_2MAP\_MS\_basketball\_player

**Specification:** HEVCMAIN10BASIC\_STL\_2MAP\_MS\_basketball\_player.bit is a V-PCC elementary bitstream of the sequence `basketball_player_vox11`.

The bitstream has 32 point cloud frames that consist of a single I\_TILE. The frame has two maps. Two geometry video bitstreams and two attribute video bitstreams are present in the bitstream. Auxiliary video is not present in the bitstream.

Occupancy, geometry, and attribute videos are compressed only with intra prediction.

It conforms HEVCMAIN10 and BASIC profile, `ptl_profile_toolset_idc` is 0 and `ptl_profile_reconstruction_idc` is 0.

None of the post-processing, such as geometry smoothing, attribute transfer or color smoothing is applied.

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode a bitstream has a single intra tile in two maps.

#### 6.7.2.31 HEVCMAIN10BASIC\_STL\_2MAP\_MS\_longdress

**Specification:** HEVCMAIN10BASIC\_STL\_2MAP\_MS\_longdress.bit is a V-PCC elementary bitstream of the sequence `longdress_vox10`.

The bitstream has 32 point cloud frames that consist of a single I\_TILE. The frame has two maps. Two geometry video bitstreams and two attribute video bitstreams are present in the bitstream. Auxiliary video is not present in the bitstream.

Occupancy, geometry, and attribute videos are compressed only with intra prediction.

It conforms HEVCMAIN10 and BASIC profile, `ptl_profile_toolset_idc` is 0 and `ptl_profile_reconstruction_idc` is 0.

None of the post-processing, such as geometry smoothing, attribute transfer or color smoothing is applied.

**Functional stage:** Atlas coding in Basic Toolset profile.

**Purpose:** Check that the decoder can properly decode a bitstream has a single intra tile in two maps.

### 6.7.3 Bitstreams coded with basic toolset still coding profile and reconstructed with Rec 0 profiles

#### 6.7.3.1 General

This subclause contains bitstreams coded with basic toolset still and reconstructed with Rec 0 profiles.

#### 6.7.3.2 HEVCMAIN10\_BASIC\_STILL\_MTL\_2MAP\_MS\_basketball\_player

**Specification:** HEVCMAIN10\_BASIC\_STILL\_MTL\_2MAP\_MS\_basketball\_player.bit is a V-PCC elementary bitstream of the sequence, basketball\_player\_vox11.

The bitstream has a single point cloud frame. The frame has one map. Two geometry video bitstreams and two attribute video bitstreams are present in the bitstream. Auxiliary video is not present in the bitstream.

Occupancy, geometry, and attribute videos are compressed only with intra prediction.

It conforms HEVCMAIN10 and BASIC STILL profile, `ptl_profile_toolset_idc` is 0, `ptl_profile_reconstruction_idc` is 0 and `ptc_one_v3c_frame_only_flag` = 1.

None of the post-processing, such as geometry smoothing, attribute transfer or color smoothing is applied.

The tile partition is non-uniform ( `afti_uniform_partition_spacing_flag` = 0 ).

**Functional stage:** Atlas coding in Basic Toolset Still profile.

**Purpose:** Check that the decoder can properly decode a bitstream in Basic Still profile with multiple tiles. The patches are coded in intra mode only.

#### 6.7.3.3 HEVCMAIN10\_BASIC\_STILL\_MTL\_2MAP\_MS\_longdress

**Specification:** HEVCMAIN10\_BASIC\_STILL\_MTL\_2MAP\_MS\_longdress.bit is a V-PCC elementary bitstream of the sequence, longdress\_vox10.

The bitstream has a single point cloud frame. The frame has one map. Two geometry video bitstreams and two attribute video bitstreams are present in the bitstream. Auxiliary video is not present in the bitstream.

Occupancy, geometry, and attribute videos are compressed only with intra prediction.

It conforms HEVCMAIN10 and BASIC STILL profile, `ptl_profile_toolset_idc` is 0, `ptl_profile_reconstruction_idc` is 0 and `ptc_one_v3c_frame_only_flag` = 1.

None of the post-processing, such as geometry smoothing, attribute transfer or color smoothing is applied.

The tile partition is non-uniform ( `afti_uniform_partition_spacing_flag` = 0 ).

**Functional stage:** Atlas coding in Basic Toolset Still profile.

**Purpose:** Check that the decoder can properly decode a bitstream in Basic Still profile with multiple tiles. The patches are coded in intra mode only.

#### 6.7.3.4 HEVCMAIN10\_BASIC\_STILL\_STL\_1MAP\_SS\_basketball\_player

**Specification:** HEVCMAIN10\_BASIC\_STILL\_STL\_1MAP\_SS\_basketball\_player.bit is a V-PCC elementary bitstream of the sequence, basketball\_player\_vox11.

The bitstream has a single point cloud frame. The frame has one map. An attribute video bitstream is present in the bitstream. Auxiliary video is not present in the bitstream.

Occupancy, geometry, and attribute videos are compressed only with intra prediction.

It conforms HEVCMAIN10 and BASIC STILL profile, `ptl_profile_toolset_idc` is 0, `ptl_profile_reconstruction_idc` is 0 and `ptc_one_v3c_frame_only_flag` =1.

None of the post-processing, such as geometry smoothing, attribute transfer or color smoothing is applied.

**Functional stage:** Atlas coding in Basic Toolset Still profile.

**Purpose:** Check that the decoder can properly decode a bitstream in Basic Still profile with single tile. The patches are coded in intra mode only.

#### 6.7.3.5 HEVCMAIN10\_BASIC\_STILL\_STL\_1MAP\_SS\_longdress

**Specification:** HEVCMAIN10\_BASIC\_STILL\_STL\_1MAP\_SS\_longdress.bit is a V-PCC elementary bitstream of the sequence, longdress\_vox10.

The bitstream has a single point cloud frame. The frame has one map. An attribute video bitstream is present in the bitstream. Auxiliary video is not present in the bitstream.

Occupancy, geometry, and attribute videos are compressed only with intra prediction.

It conforms HEVCMAIN10 and BASIC STILL profile, `ptl_profile_toolset_idc` is 0, `ptl_profile_reconstruction_idc` is 0 and `ptc_one_v3c_frame_only_flag` =1.

None of the post-processing, such as geometry smoothing, attribute transfer or color smoothing is applied.

**Functional stage:** Atlas coding in Basic Toolset Still profile.

**Purpose:** Check that the decoder can properly decode a bitstream in Basic Still profile with single tile. The patches are coded in intra mode only.

#### 6.7.4 Bitstreams coded with extended toolset coding profile and reconstructed with Rec 0 profiles

##### 6.7.4.1 General

This subclause contains bitstreams coded with extended toolset and reconstructed with Rec 0 profiles.

##### 6.7.4.2 HEVCMaIn10\_Extended\_Rec0\_PEXT\_SONY

**Specification:** V3C coded bitstream is a single bitstream composed of 32 coded atlas frames together with the corresponding occupancy, geometry, and attribute V3C components coded using HEVC main 10 profile. Each atlas frame contains a single tile, coded as intra tile (I\_TILE). Two maps are used to code each of the geometry and texture attribute V3C video components. Texture attribute consists of 3 channels: r, g, and b. The V3C profile for coding the V3C bitstream is HEVC Main10 extended Rec0.

**Functional stage:** Atlas coding in Extended Toolset profile.

**Purpose:** Check that the decoder can properly decode atlas bitstreams comprised of multiple uniform atlas tiles with one or two maps. The patches are projected using a 45-degree extended projection.

##### 6.7.4.3 HEVCMaIn10\_Extended\_Rec0\_POEIGHT\_SONY\_v1

**Specification:** V3C coded bitstream is a single bitstream composed of 32 coded atlas frames together with the corresponding occupancy, geometry, and attribute V3C components coded using HEVC main

10 profile. Each atlas frame contains a single tile, coded as intra tile (I\_TILE). Two maps are used to code each of the geometry and texture attribute V3C video components. Texture attribute consists of 3 channels: r, g, and b. The V3C profile for coding the V3C bitstream is HEVC Main10 extended Rec0.

**Functional stage:** Atlas coding in Extended Toolset profile.

**Purpose:** Check that the decoder can properly decode atlas bitstreams comprised of multiple uniform atlas tiles with one or two maps. The patches are packed using up to eight different orientations.

## 6.7.5 Bitstreams with soft conformance reconstructed with Rec 1 profile

### 6.7.5.1 General

This subclause contains bitstreams coded with basic toolset, extended toolset, and reconstructed with Rec 1 profiles

#### 6.7.5.2 HEVCMaIn10\_Basic\_Rec1\_GEOSM\_SONY

**Specification:** V3C coded bitstream is a single bitstream composed of 32 coded atlas frames together with the corresponding occupancy, geometry, and attribute V3C components coded using HEVC main 10 profile. The V3C profile for coding the V3C bitstream is HEVC Main10 Basic Rec1.

**Functional stage:** Geometry Smoothing in Rec 1 profile.

**Purpose:** Check that the reconstruction can properly process geometry smoothing.

#### 6.7.5.3 HEVCMaIn10\_Basic\_Rec1\_ATTRSM\_SAMSUNG\_v1

**Specification:** V3C coded bitstream is a single bitstream composed of a single coded atlas frame together with the corresponding occupancy, geometry, and attribute V3C components coded using HEVC main 10 profile. The V3C profile for coding the V3C bitstream is HEVC Main10 Basic Rec1.

**Functional stage:** Attribute Smoothing in Rec 1 profile.

**Purpose:** Check that the reconstruction can properly process attribute smoothing in conjunction with geometry smoothing.

#### 6.7.5.4 HEVCMaIn10\_Basic\_Rec1\_PDI\_INTERDIGITAL

**Specification:** V3C coded bitstream is processed with All Intra and single-stream configuration, 32 frames are coded.

- The bitstream contains one map.
- The pixel deinterleaving tool is enabled.
- The bitstream allows testing conformance points A and B.
- The bitstream profile is HEVC MAIN10 V-PCC Basic Rec1.

**Functional stage:** Pixel deinterleaving reconstruction.

**Purpose:** Check that the decoder can properly decode and reconstruct points carried in interleaved maps, with one map.

#### 6.7.5.5 HEVCMaIn10\_Extended\_Rec1\_PLR\_MC1PLR1\_INTERDIGITAL

**Specification:** V3C coded bitstream is processed with All Intra and single-stream configuration, 32 frames are coded.

- The bitstream contains one map.

- The point local reconstruction (PLR) tool is enabled.
- The bitstream allows testing conformance point A and B.
- The bitstream profile is HEVC Main10 V-PCC Extended Rec1.

**Functional stage:** Point local reconstruction.

**Purpose:** Check that the decoder can properly decode and reconstruct points carried with point local reconstruction (PLR) method, with one map.

#### 6.7.5.6 HEVC444\_Extended\_Rec1\_PTEOM\_LOSGEO\_INTERDIGITAL

**Specification:** V3C coded bitstream is processed with All Intra lossless and single-stream configuration, 32 frames are coded.

- The Enhanced Occupancy Map tool is enabled.
- The geometry map is losslessly coded.
- The bitstream allows testing conformance points A and B.
- The bitstream profile is HEVC444 V-PCC Extended Rec1.

**Functional stage:** EOM patch decoding and EOM points reconstruction in Rec 1 profile.

**Purpose:** Check that the decoder can properly decode the EOM patch type, and reconstruction can properly process points associated with decoded EOM patch.

#### 6.7.5.7 HEVC444\_Extended\_Rec1\_PTRAX\_LOSGEO\_INTERDIGITAL

**Specification:** V3C coded bitstream is processed with All Intra lossless and single-stream configuration, 32 frames are coded.

- The RAW points are enabled and coded in an auxiliary video.
- The EOM points are enabled and coded in an auxiliary video.
- The geometry map is coded losslessly.
- The bitstream allows testing conformance points A and B.
- The bitstream profile is HEVC444 V-PCC Extended Rec1.

**Functional stage:** RAW and EOM patch decoding in the auxiliary video.

**Purpose:** Check that the decoder can adequately decode RAW and EOM patches carried in the auxiliary video and reconstruction can properly process points associated with the decoded RAW patch and EOM patch.

### 6.7.6 Bitstreams with soft conformance reconstructed with Rec 2 profile

#### 6.7.6.1 General

This subclause contains bitstreams coded with basic toolset and reconstructed with Rec 2 profiles.

#### 6.7.6.2 HEVC444\_Basic\_Rec2\_PTRAX\_INTERDIGITAL

**Specification:** V3C coded bitstream is processed with All Intra lossless and multiple stream configuration, 32 frames are coded.

- The Enhanced Occupancy Map tool is set to 0 (disabled).

- The RAW tool is set to 1 (enabled).
- The bitstream allows testing conformance points A and B.

The bitstream profile is HEVC444 V-PCC Basic Rec2.

**Functional stage:** RAW patch decoding and RAW points reconstruction in Rec 2 profile.

**Purpose:** Check that the decoder can properly decode RAW patch type and reconstruction can properly process points associated with the decoded RAW patch.

#### 6.7.6.3 HEVCMain10\_Basic\_Rec2\_OCCSY\_PBF\_INTERDIGITAL

**Specification:** V3C coded bitstream is processed with All Intra and multiple streams configuration, 32 frames are coded.

- The occupancy synthesis method 1: Patch Border Filtering (PBF) is enabled.
- The bitstream allows testing conformance points A and B.
- The bitstream profile is HEVC Main10 V-PCC Basic Rec2.

**Functional stage:** Patch Border Filtering in Rec 2 profile.

**Purpose:** Check that the reconstruction can properly process occupancy map filtering using patch border filtering, with two maps.

#### 6.7.6.4 HEVCMain10\_Extended\_Rec2\_PLR\_MC1PLR1\_OCCSY\_PBF\_INTERDIGITAL

**Specification:** V3C coded bitstream is processed with All Intra and single-stream configuration, 32 frames are coded.

- The bitstream contains one map.
- The occupancy synthesis method 1: Patch Border Filtering (PBF) is enabled.
- The point local reconstruction (PLR) tool is enabled.
- The bitstream allows testing conformance points A and B.
- The bitstream profile is HEVC Main10 V-PCC Extended Rec2.

**Functional stage:** Point local reconstruction and Patch Border Filtering.

**Purpose:** Check that the decoder can properly decode and reconstruct points carried with point local reconstruction (PLR) method and process occupancy map filtering using patch border filtering, with one map.

#### 6.7.6.5 HEVCMain10\_Basic\_Rec2\_ATTRSM\_SAMSUNG\_v1

**Specification:** V3C coded bitstream is a single bitstream composed of a single coded atlas frame together with the corresponding occupancy, geometry, and attribute V3C components coded using HEVC main 10 profile. The V3C profile for coding the V3C bitstream is HEVC Main10 Basic Rec2.

**Functional stage:** Attribute Smoothing in Rec 2 profile.

**Purpose:** Check that the reconstruction can properly process attribute smoothing in conjunction with occupancy synthesis.

## 6.8 Conformance test suites ISO/IEC 23090-5

### 6.8.1 Bitstreams for basic toolset

In [Table 7](#), the bitstreams use the following naming convention to describe the coding tools for basic toolset profile.

**Table 7 — Coding tool bitstreams for basic toolset profile**

| Categories           | Tool description                  | Feature Name | Bitstream features                                            |
|----------------------|-----------------------------------|--------------|---------------------------------------------------------------|
| Atlas coding         | Patch packing in single tile      | STL          | Test single atlas tile                                        |
| Atlas coding         | Patch packing in multiple tiles   | MTL          | Test multiple atlas tiles                                     |
| Atlas coding         | Patch packing in multiple tiles   | MTLNONUNI    | Test non-uniform tile partitions                              |
| Atlas coding         | Patch packing in multiple tiles   | SS           | Test atlas map carriage in single sub-bitstream               |
| Atlas coding         | Patch packing in multiple tiles   | MS           | Test atlas map carriage in multiple individual sub-bitstreams |
| SEI                  | Video coding component mapping    | CCM          | Test reconstruction with different component codec mapping    |
| Occupancy map coding | Reconstruction of lossy coded map | LOSSYOM      | Test lossy occupancy map                                      |

### 6.8.2 Bitstreams for basic toolset still profile

In [Table 8](#), the bitstreams use the following naming convention to describe the coding tools for extended toolset profile.

**Table 8 — Coding tools for extended toolset profile**

| Categories   | Tool description                | Feature Name | Bitstream features                     |
|--------------|---------------------------------|--------------|----------------------------------------|
| Atlas coding | Patch packing in multiple tiles | MTL          | Test still profile with multiple tiles |
| Atlas coding | Patch packing in single tile    | STL          | Test still profile with single tile    |

### 6.8.3 Bitstreams for extended toolset profile

In [Table 9](#), the bitstreams use the following naming convention to describe the coding tools for extended toolset profile.

**Table 9 — Coding tools for extended toolset profile**

| Categories       | Tool description                                                                                     | Feature Name | Bitstream features                                |
|------------------|------------------------------------------------------------------------------------------------------|--------------|---------------------------------------------------|
| Patch projection | Patch projection to additional projection plane and point cloud reconstruction from additional plane | PEXT         | Test additional 45 degree patch projection planes |
| Patch projection | Flexible patch orientation in projection map                                                         | POEIGHT      | Test eight patch orientation modes                |