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| **Joint Collaborative Team on 3D Video Coding Extension**  **of ITU-T SG 16 WP 3 and ISO/IEC JTC 1/SC 29/WG 11**  12th Meeting: Warsaw, PL, 20–26 June 2015 | Document: JCT3V-L0002 |

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| *Title:* | **JCT-3V AHG Report: 3D-HEVC Draft and MV-HEVC / 3D-HEVC Test Model editing (AHG2)** | | |
| *Status:* | AHG report input to JCT-3V | | |
| *Purpose:* | AHG report | | |
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| *Source:* | AHG | | |

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# Abstract

This document reports on the work of the JCT-3V ad hoc group on 3D-HEVC Draft and MV-HEVC / 3D-HEVC Test Model editing (AHG2) between the 11th JCT-3V meeting in Geneva and the 12th meeting in Warsaw.

# Mandates

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| **Title and Email Reflector** | **Chairs** | **Mtg** |
| **3D-HEVC Draft and MV-HEVC / 3D-HEVC Test Model editing (AHG2)**   * Produce and finalize JCT3V-K1001 3D-HEVC Draft Text 7. * Produce and finalize JCT3V-K1003 3D-HEVC and MV-HEVC Test Model 11. * Gather and address comments for refinement of these documents. * Coordinate with the HTM software Integration AHG to address issues relating to mismatches between software and text. * Coordinate with AHG6 w.r.t. text improvements in 3D-HEVC specific HLS. | G. Tech, K. Wegner (co-chairs),  J. Boyce,  Y. Chen,  M. Hannuksela,  T. Suzuki,  S. Yea,  J.-R. Ohm,  G. Sullivan (vice chairs) | N |

# Introduction

The seventh 3D-HEVC draft, the ninth Test Model of 3D-HEVC and MV-HEVC were developed from the sixth 3D-HEVC draft, the eighth 3D-HEVC Test Model, respectively, following the decisions taken at the 11th JCT-3V meeting in Geneva.

Two editorial teams were formed to work on the two documents that were to be produced:

* JCT3V-K1001 3D-HEVC Draft Text 7
* G. Tech, Y. Chen, J.-R. Ohm, S. Yea
* JCT3V-K1003 Test Model 11 of 3D-HEVC and MV-HEVC
* Y. Chen, G. Tech

# Status

## 3D-HEVC Draft 7 (JCT3V-K1001)

One version including all adoptions has been finalized at the meeting and submitted for ITU consent. After the meeting eight versions with further editorial improvements have been released. The last version has been submitted for FDAM ballot to the MPEG secretariat. The text of the last version of JCT3V-K1001 has been integrated to the HEVC version 2 text and submitted to ITU.

### Incorporated changes

All, adoptions of the last meeting have been incorporated. Moreover numerous editorial fixes and clean-ups have been applied. Changes (70) of JCT3V-K1001 relative to JCT3V-J1001 are:

SEI (1)

* (3DN-20/JCT3V-K0029) Alternative depth representation SEI

HLS (4)

* (3DN-19/direct dependency type)
* (3DN-12/[JCT3V-K0050](http://phenix.it-sudparis.eu/jct3v/doc_end_user/current_document.php?id=2462)) Proposed HLS Cleanup for 3D-HEVC, Availability ARP
* (3DN-13/[JCT3V-K0050](http://phenix.it-sudparis.eu/jct3v/doc_end_user/current_document.php?id=2462)) Proposed HLS Cleanup for 3D-HEVC, Availability Inter component pred.
* (3DN-11/[JCT3V-K0050](http://phenix.it-sudparis.eu/jct3v/doc_end_user/current_document.php?id=2462)) Proposed HLS Cleanup for 3D-HEVC, Flexible camera parameter

Depth Intra (3)

* (3DN-14/[JCT3V-K0042](http://phenix.it-sudparis.eu/jct3v/doc_end_user/current_document.php?id=2454)) Simplification of DMM table derivation.
* (3DN-10/[JCT3V-K0033](http://phenix.it-sudparis.eu/jct3v/doc_end_user/current_document.php?id=2445)) 3D-CE1: Depth intra skip (DIS) mode Decision: Adopt K0033 test 1
* (3DN-03/[JCT3V-K0044](http://phenix.it-sudparis.eu/jct3v/doc_end_user/current_document.php?id=2456)) Clean up of 3D-HEVC specification Decision: Adopt items 3

Profiles (1)

* (3DN-17/[JCT3V-K0065](http://phenix.it-sudparis.eu/jct3v/doc_end_user/current_document.php?id=2478)) On maximum number of direct and indirect reference layers in the 3D main profile.

Merge (2)

* (3DN-09/[JCT3V-K0036](http://phenix.it-sudparis.eu/jct3v/doc_end_user/current_document.php?id=2448)) Position Derivation for Shifted-IVMC
* (3DN-08/[JCT3V-K0053](http://phenix.it-sudparis.eu/jct3v/doc_end_user/current_document.php?id=2465)) Bug fix of the 3D-HEVC specification text on the scaling of TMVP

QTL (1)

* (3DN-06/[JCT3V-K0045](http://phenix.it-sudparis.eu/jct3v/doc_end_user/current_document.php?id=2457)) Bug Fix for Texture-dependent Depth Partitioning

Various clean-ups and fixes (4)

* (3DN-07/[JCT3V-K0052](http://phenix.it-sudparis.eu/jct3v/doc_end_user/current_document.php?id=2464)) CU syntax cleanup for 3D-HEVC
* (3DN-04/[JCT3V-K0044](http://phenix.it-sudparis.eu/jct3v/doc_end_user/current_document.php?id=2456)) Clean up of 3D-HEVC specification Decision: Adopt items 2
* (3DN-02/[JCT3V-K0044](http://phenix.it-sudparis.eu/jct3v/doc_end_user/current_document.php?id=2456)) Clean up of 3D-HEVC specification Decision: Adopt items 1
* (3DN-01/[JCT3V-K0035](http://phenix.it-sudparis.eu/jct3v/doc_end_user/current_document.php?id=2447)) Removal of Encoder Restriction of ARP

Editorial improvements/Fixes (54)

* (3DE-76) Updated references.
* (3DE-75) Fixes and cleanups.
* (3DE-74) Removed unused paragraphs.
* (3DE-73) Fix chroma mv precision in ARP.
* (3DE-72) Aligned shifts illumination compensation
* (3DE-71) Fix and simplification full sample accuracy for depth.
* (3DE-70) Fix access to num\_ref\_idx\_l1\_active\_minus1 in P slices.
* (3DE-69) Fixes and cleanups
* (3DE-68) Update References (not marked)
* (3DE-67) Restructured TMVP for merge.
* (3DE-66) Fix Locations GVD.
* (3DE-65) Removed derivation process for an inter-layer predicted contour partition pattern and further improvements.
* (3DE-64) Split and merge derivation processes for Iv and di candidates and further improvements
* (3DE-63) Renaming MvDisp
* (3DE-62) Further reorderings.
* (3DE-61) Reordered SEI
* (3DE-60) Removal Editors notes
* (3DE-59) Fixes and simplifications.
* (3DE-58) Fix intraSkip mode constrained\_intra\_pred\_flag.
* (3DE-57) Added missing condition on depth flag for the iv merging candidate.
* (3DE-56) Fix camera parameter derivation
* (3DE-55) Fixes related to change of sps\_extension\_6bits and pps\_extension\_6bits.
* (3DE-54) Fix inter-view reference picture.
* (3DE-53) Removed Derivation process for a depth predicted contour partition pattern.
* (3DE-52) Removed unnecessary availableFlagT.
* (3DE-51) Removed unnecessary inputs of RefViewIdx and MvRefinedDisp.
* (3DE-50) Fix num\_ref\_idx\_lX\_default\_active\_minus1 and NumRefPicsLX.
* (3DE-49) Renaming qt\_pred\_flag
* (3DE-48) Moved depth DCs to own syntax structure and related clean ups.
* (3DE-47) Removal DepthIntraMode variable, and related clean ups
* (3DE-46) Fixes and simplifications.
* (3DE-45) Modifications Alternative depth information SEI.
* (3DE-44) Simplified derivation of tool enabling variables.
* (3DE-43) Removed editor's notes.
* (3DE-42) Moved merge candidate list related processes.
* (3DE-41) Move semantics of direct\_dependency\_type
* (3DE-40) Incorporated "Derivation process for a texture predicted contour partition pattern" to "Specification of intra prediction mode INTRA\_CONTOUR".
* (3DE-39) Minor fixes.
* (3DE-38) Reordered slice level processes.
* (3DE-37) Moved derivation of WedgePatternTable to clause 6.1
* (3DE-36) Fix heading clause 6.1
* (3DE-38a) Fixes wedge pattern
* (3DE-36a) Removal enhance intra slice. Extended definition of intra prediction.
* (3DE-35) Renaming illumination compensation.
* (3DE-34) Renamed SDC to DC only.
* (3DE-33) Definitions and substitution of undefined terms.
* (3DE-32) Unification Pb accesses.
* (3DE-31) Fix QTL, Replaced derivation of global variables, since these variables are not defined for the e.g. the base layer or MV-HEVC conforming layers.
* (3DE-30) Cleanup otherDimsEqual
* (3DE-29) Cleanup VPS extension semantics Annex I.
* (3DE-28) Moved depth scalability id to base spec.
* (3DE-27) Moved SPS and PPS extension flags to base spec.
* (3DE-26) SEI cleanup
* (3DE-21) Improvement semantics direct\_dependency\_type.

## Test Model 11 of 3D-HEVC and MV-HEVC

One version of JCT3V-K1003 has been published by the editing AHG following the 11th JCT-3V meeting in Geneva. The last version corresponds to the text submitted to MPEG secretariat.

### Incorporated changes

All adoptions of the last meeting have been incorporated. Moreover existing text has been revised and improved and missing text from previous meeting has been added.

Changes (4) of JCT3V-K1003 relative to JCT3V-J1003 are:

* (3DN-01/[JCT3V-K0028](http://phenix.it-sudparis.eu/jct3v/doc_end_user/current_document.php?id=2440)) Encoder optimization: Motion estimation for DBBP with masked SAD instead of SATD.
* (3DN-02/[JCT3V-K0033](http://phenix.it-sudparis.eu/jct3v/doc_end_user/current_document.php?id=2445)) Depth intra skip (DIS) mode.
* (3DN-03/[JCT3V-K0042](http://phenix.it-sudparis.eu/jct3v/doc_end_user/current_document.php?id=2454)) Simplification of DMM table derivation.
* (3DN-04) Editorial improvements and bug fixes.

## 3D-HEVC specification defects

Two minor defects related to JCT3V-K1001 have been reported:

* In I.8.4.4.2.1 General intra sample prediction "skip\_intra\_flag[ xTbCmp ][ yTbCmp ]" should be replaced by "skip\_intra\_mode\_idx[ xTbCmp ][ yTbCmp ]".
* The derivation process for a disparity vector for depth layers (I.8.3.2) requires camera parameters. However, it might be invoked also when camera parameters are not present.

# Recommendations

The recommendations of the 3D-HEVC Draft and MV-HEVC / 3D-HEVC Test Model editing AHG are to:

* Approve the edited documents JCT3V-K1001, JCT3V-K1003 as JCT-3V outputs.
* Continue to edit document JCT3V-K1003 to ensure that all agreed elements of 3D-HEVC are fully described.
* Compare the documents JCT3V-K1001 and JCT3V-K1003 with the HTM-software and resolve any discrepancies that may exist, in collaboration with the Software AHG.
* Discuss reported open issues and defects.