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| **Joint Collaborative Team on Video Coding (JCT-VC)**  **of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11**  8th Meeting: San José, CA, USA, 1–10 February, 2012 | Document: JCTVC-H0015 |

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| *Title:* | **JCT-VC AHG report: High-level syntax (AHG 15)** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Report | | |
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| *Source:* | High-level syntax AHG | | |

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# Abstract

This report summarizes the activities of the high-level syntax ad hoc group between the 7th JCT-VC meeting and the 8th JCT-VC meeting, and lists the related input documents submitted to this meeting according to their topics.

One recommendation this AHG is making is on signaling of picture size, as concluded through mailing list discussions. The recommendation is to leave the signaling of decoded picture width and height as they are in the SPS in the latest HEVC WD, in units of luma samples, but to add a cropping process before a decoded picture is stored into the DPB, to make sure that the decoded picture size is exactly the same as signalled in the SPS.

# Mandates

1. Study NAL unit header, sequence parameter set, picture parameter set, adaptation parameter set, and slice header syntax designs
2. Study the partial update issue associated with adaptation parameter set
3. Study and identify needs for SEI messages and VUI
4. Study the hypothetical reference decoder (HRD) behaviour, including the need and feasibility of sub-picture based HRD operations
5. Assist in software development and text drafting for the high-level syntax in the HEVC design

# Reflector activities

There were some discussions on picture size signaling and the LCU concept.

On picture size signaling, it was concluded to leave the signaling of decoded picture width and height as they are in the SPS in the latest HEVC WD, in units of luma samples, but to add a cropping process before a decoded picture is stored into the DPB, to make sure that the decoded picture size is exactly the same as signalled in the SPS.

On the LCU concept, there was no clear conclusion. Among those who were involved in the discussion, more were inclined to add some clarification to the draft HEVC specification, such that an LCU can be incomplete, in terms that some pixels in the LCU may be outside the boundary of the decoded picture. This way, even when the picture width or height is not an integer number of LCU sizes, tiles, which are defined as consisting of an integer number of LCUs, may still be applied.

# Related contributions

High-level syntax related contributions submitted to this JCT-VC meeting are listed below, according to the topics. Documents that are obviously more belonging to other high-level syntax closely related AHGs (than AHG 15), namely the following, are not listed herein:

* AHG 4: Picture partitioning and LCU scan order
* AHG 8: Profiles and levels
* AHG 14: Loss robustness
* AHG 17: Hooks for scalable coding
* AHG 21: Reference picture buffering and list construction

The related documents are listed below, categorized according to the topics.

**Documents related to APS:**

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| [JCTVC-H0069](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4370) | APS partial update through Referencing | [Stephan Wenger](mailto:stewe@stewe.org), [Jill Boyce](mailto:jill@vidyo.com), [Ming Li](mailto:li.ming42@zte.com.cn), [Ping Wu](mailto:ping.we@zte.com.cn) |
| [JCTVC-H0070](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4371) | APS partial update through conditional replacement | [Stephan Wenger](mailto:stewe@stewe.org), [Jill Boyce](mailto:jill@vidyo.com) |
| [JCTVC-H0071](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4372) | On the need for an Adaptation Parameter Set | [Stephan Wenger](mailto:stewe@stewe.org), [Jill Boyce](mailto:jill@vidyo.com), [Won Kap Jang](mailto:wonkap@vidyo.com) |
| [JCTVC-H0119](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4420) | Non-CE4 Subtest2 : Extension of Adaptation Parameter Sets syntax for scaling list matrix | [J. Tanaka](mailto:Tanaka.Junichi@jp.sony.com), [Y. Morigami](mailto:Yoshitaka.Morigami@jp.sony.com), [T. Suzuki (Sony)](mailto:teruhikos@jp.sony.com) |
| [JCTVC-H0132](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4433) | On Adaptation Paremeter Signalling | [Y. Ye](mailto:yan.ye@interdigial.com), [E. S. Ryu (InterDigital)](mailto:eun.ryu@interdigital.com) |
| [JCTVC-H0255](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4558) | On partial updating of APS parameters | A. Minezawa, K. Sugimoto, S. Sekiguchi (Mitsubishi) |
| [JCTVC-H0376](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4679) | Non-CE8: Low-delay support for APS | [S. Esenlik](mailto:Semih.Esenlik@eu.panasonic.com), [M. Narroschke](mailto:Matthias.Narroschke@eu.panasonic.com), [V. Drugeon](mailto:Virginie.Drugeon@eu.panasonic.com), [T. Wedi (Panasonic)](mailto:Thomas.Wedi@eu.panasonic.com) |
| [JCTVC-H0381](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4684) | AHG15: Partial APS update | [V. Drugeon](mailto:virginie.drugeon@eu.panasonic.com), [S. Esenlik](mailto:semih.esenlik@eu.panasonic.com), [M. Narroschke](mailto:matthias.narroschke@eu.panasonic.com), [T. Wedi](mailto:thomas.wedi@eu.panasonic.com), [V. Wahadaniah (Panasonic)](mailto:Viktor%20Wahadaniah) |
| [JCTVC-H0505](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4814) | On APS partial update | [Y. -K. Wang](mailto:yekuiw@qualcomm.com), [Y. Chen](mailto:cheny@qualcomm.com), [G. Van der Auwera (Qualcomm)](mailto:geertv@qualcomm) |
| [JCTVC-H0507](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4816) | Referencing different APS’s in the same picture | [S. Wenger (Vidyo)](mailto:stewe@stewe.org), [Y. -K. Wang](mailto:yekuiw@qualcomm.com), [I. S. Chong (Qualcomm)](mailto:ichong@qualcomm.com) |
| [JCTVC-H0512](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4821) | APS fragmentation | [Y. Chen](mailto:cheny@qualcomm.com), [Y. -K. Wang](mailto:yekuiw@qualcomm.com%20%28Qualcomm%29), [R. Joshi](mailto:rajanj@qualcomm.com), [M. Karczewicz (Qualcomm)](mailto:martak@qualcomm.com) |

**Documents related to SPS and PPS:**

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| [JCTVC-H0198](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4500) | Comments on Slice-independent Loop Filtering | [M. LI](mailto:li.ming42@zte.com.cn), [P. WU(ZTE)](mailto:ping.wu@zte.com.cn) |
| [JCTVC-H0288](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4591) | Syntax on picture size signaling | Y. Park, C. Kim, J. H. Kim, J. H. Park (Samsung) |
| [JCTVC-H0313](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4616) | AHG15: On Signaling of Several Syntax Elements in SPS | X. Li, J. An, X. Guo, S. Lei (MediaTek) |
| [JCTVC-H0380](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4683) | AHG15: SPS and PPS syntax modifications | [V. Drugeon](mailto:virginie.drugeon@eu.panasonic.com), [T. Wedi](mailto:thomas.wedi@eu.panasonic.com), [M. Narroschke](mailto:matthias.narroschke@eu.panasonic.com), V. Wahadaniah (Panasonic) |
| [JCTVC-H0392](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4695) | AHG15: Enable picture-level CU/TU size signaling in HEVC | [N. Srinivasamurthy](mailto:snaveen@ti.com), [K. Prasad](mailto:prasadk@ti.com), [Y. Dutt](mailto:yashwant.dutt@ti.com), [M. Zhou (TI)](mailto:zhou@ti.com) |
| [JCTVC-H0423](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4727) | Indication of the temporal structure of coded video sequences | M. M. Hannuksela, S. M. Gopalakrishna (Nokia) |
| [JCTVC-H0485](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4791) | Picture size signaling and cropping operation | [K. Suehring](mailto:Karsten.Suehring@hhi.fraunhofer.de), B. Bross (Fraunhofer HHI) |
| [JCTVC-H0654](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4974) | Modifications on sequence parameter set RBSP syntax, picture parameter set RBSP syntax and slice header syntax | [J. Lou](mailto:lou@motorola.com), [Y. Yu](mailto:yyu@motorola.com), [L. Wang (Motorola Mobility)](mailto:limin.wang@motorola.com) |

**Documents related to CRA pictures:**

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| [JCTVC-H0291](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4594) | Information for video editing at CRA pictures | C. Kim, Y. Park, J. H. Kim, J. H. Park (Samsung) |
| [JCTVC-H0496](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4805) | On bitstreams starting with CRA pictures | [Y. -K. Wang](mailto:yekuiw@qualcomm.com), [Y. Chen](mailto:cheny@qualcomm.com), [Marta Karczewicz (Qualcomm)](mailto:martak@qualcomm.com) |
| [JCTVC-H0566](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4875) | AHG15: Temporal layer access pictures | [J. Samuelsson](mailto:jonatan.samuelsson@ericsson.com), [R. Sjöberg (Ericsson)](mailto:rickard.sjoberg@ericsson.com) |

**Documents related to POC coding and derivation:**

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| [JCTVC-H0257](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4560) | Cyclic POC | [J. Koyama](mailto:koyama.junpei@jp.fujitsu.com), [K. Kazui](mailto:kazui.kimihiko@jp.fujitsu.com), S. Shimada, A. Nakagawa (Fujitsu) |
| [JCTVC-H0425](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4729) | POC granularity for reference picture sets and slice header | M. M. Hannuksela, S. M. Gopalakrishna (Nokia) |
| [JCTVC-H0449](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4753) | AHG21: A constraint to simplify and improve the robustness of POC computation | [G. J. Sullivan (Microsoft)](mailto:garysull@microsoft.com) |
| [JCTVC-H0501](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4810) | Efficient POC signaling for temporal scalability | [Y. Chen](mailto:cheny@qualcomm.com), [Y. -K. Wang (Qualcomm)](mailto:yekuiw@qualcomm.com) |

**Documents related to ultra-low delay and HRD:**

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| [JCTVC-H0215](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4518) | Market needs and practicality of sub-picture based CPB operation | [K. Kazui](mailto:kazui.kimihiko@jp.fujitsu.com), S.Shimada, J.Koyama, A.Nakagawa (Fujitsu), [A.Duenas (CAVIUM)](mailto:alberto@cavium.com) |
| [JCTVC-H0471](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4776) | Proposed Mechanism for Improving Ultra Low Delay Coding Efficiency |  |
| [JCTVC-H0487](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4796) | Importance of very high bit rate and ultra-low latency applications | [Alberto Duenas](mailto:alberto@cavium.com), [Francisco Javier Roncero (Cavium)](mailto:kroncero@cavium.com) |
| [JCTVC-H0567](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4876) | AHG15: Syntax controlled output process | [J. Samuelsson](mailto:jonatan.samuelsson@ericsson.com), [R. Sjöberg (Ericsson)](mailto:rickard.sjoberg@ericsson.com) |

**Documents related to other high-level syntax topics:**

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| [JCTVC-H0267](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4570) | AHG15:Constraint the number of motion vector for memory bandwidth reduction | [C.S.Park](mailto:chansik.park@samsung.com), [T. Kosuge](mailto:kosuge@samsung.com), [J.H. Kim](mailto:jhgim@samsung.com), [K.H. Lee](mailto:kyohyuk.lee@samsung.com), [J.H.Park](mailto:jeonghoon@samsung.com), [C. Kim (Samsung)](mailto:dionism@samsung.com) |
| [JCTVC-H0269](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4572) | AHG15 : Independent control of Max CU and LCU size for small LCU | [J.B.Choi](mailto:jb79.choi@samsung.com), [J.H. Kim](mailto:jhgim@samsung.com), [K.H. Lee](mailto:kyohyuk.lee@samsung.com), [J.H. Park](mailto:jeonghoon@samsung.com), [C. Kim (Samsung)](mailto:dionism@samsung.com) |
| [JCTVC-H0293](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4596) | Syntax on parallel processing information signaling | S. S. Jeong, Y. Park, C. Kim, J. H. Kim, J. H. Park (Samsung), |
| [JCTVC-H0343](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4646) | Redundancy removal of syntax | [T. Lee](mailto:tammy.lee@samsung.com), [J. Park (Samsung)](mailto:jeonghoon@samsung.com) |
| [JCTVC-H0391](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4694) | AHG15: Slice-Level Control of In-Loop Filter | [R. Srinivasan](mailto:ramanujam@ti.com), [C. Ghone (TI)](mailto:csghone@ti.com) |
| [JCTVC-H0424](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4728) | Non-CE10 Subtest 4: On Deblocking Parameter Signalling | [G. Van der Auwera](mailto:geertv@qualcomm.com), [Y.-K. Wang](mailto:yekuiw@qualcomm.com), [X. Wang](mailto:xianglin@qualcomm.com), [M. Karczewicz (Qualcomm)](mailto:martak@qualcomm.com) |
| [JCTVC-H0500](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4809) | Bit depth of output pictures | [Y. Chen](mailto:cheny@qualcomm.com), [Y. -K. Wang](mailto:yekuiw@qualcomm.com), [X. Wang](mailto:xianglin@qualcomm.com), [I. S. Chong](mailto:ichong@qualcomm.com), [M. Karczewicz (Qualcomm)](mailto:martak@qualcomm.com) |
| [JCTVC-H0548](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4857) | Signaling of collocated picture for HEVC | [Y. Yu](mailto:yyu@motorola.com), [K. Panusopone](mailto:krit@motorola.com), [L. Wang (Motorola Mobility)](mailto:limin.wang@motorola.com) |
| [JCTVC-H0568](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4877) | AHG15: Specification of bitstream subsets | [J. Samuelsson](mailto:jonatan.samuelsson@ericsson.com), [R. Sjöberg (Ericsson)](mailto:rickard.sjoberg@ericsson.com) |
| [JCTVC-H0570](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4879) | AHG14/AHG15/non-CE9: Loss robustness issue in TMVP disabling | [V. Wahadaniah](mailto:viktor.wahadaniah@sg.panasonic.com), C. S. Lim (Panasonic) |
| [JCTVC-H0623](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=4942) | HG15: Crosscheck of JCTVC-H0269 on independent control of Max CU and LCU size for small LCU | [Y. Jeon](mailto:yongjoon.jeon@lge.com), [B. Jeon (LG)](mailto:bm.jeon@lge.com) |

# Recommendations

The high-level syntax ad hoc group recommends:

* To discuss and try to make a decision on picture size signaling, taking into consideration the AHG conclusion achieved through mailing discussions
* To review all related input contributions
* To coordinate with other closely related AHGs on commonly related contributions, including
  + AHG 4: Picture partitioning and LCU scan order
  + AHG 8: Profiles and levels
  + AHG 14: Loss robustness
  + AHG 17: Hooks for scalable coding
  + AHG 21: Reference picture buffering and list construction