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| **Joint Collaborative Team on Video Coding (JCT-VC)**  **of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11**  9th Meeting: Geneva, CH, 27 April – 7 May 2012 | Document: JCTVC-I0011 |

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| *Title:* | **JCT-VC AHG report: High-level syntax (AHG11)** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Report | | |
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| *Source:* | High-level syntax AHG (AHG11) | | |

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# Abstract

This report summarizes the activities of the high-level syntax ad hoc group (AHG11) between the 8th JCT-VC meeting and the 9th JCT-VC meeting, and lists the related input documents submitted to this meeting according to their topics.

The AHG recommends that the JCT-VC discusses the issue of NAL unit allocation and seeks a cleanup.

# 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, discuss and provide a draft text of sub-picture based HRD operations.
5. Work towards simplification and general minor cleanup of the high-level syntax.
6. Assist in software development and text drafting for the high-level syntax in the HEVC design.

# Reflector discussions

There were some discussions on the following topics:

1. Slice address signaling (related to slice header parsing);
2. PPS/SPS parsing dependency on tiles\_or\_entropy\_coding\_sync\_idc;
3. APS NAL unit type (why use 14 instead of 13); and
4. Sub-picture level CPB behavior for reduced codec delay.

There are input documents to this meeting addressing the issues related to topics 1, 2 and 4.

There is no input on topic 3. One reason mentioned during the discussion for using 14 instead of 13 for APS was that, 14 is clearly specified as one of those types of NAL unit that may start a new access unit, while 13 does not belong to that category (though it is possible to add 13 to that category). It seems generally agreeable that the NAL unit type allocation should be cleaned up, for the following reasons:

1. Reserved NAL unit type values are fragmented (e.g., 10-11, 13, 15-23). Since the NAL unit types are not compatible to H.264/AVC anyway, a general renumbering to consecutive numbers and grouping of similar units (slices, parameter sets, etc.) would be desirable.
2. Too many NAL unit types are "unspecified" (0, 24-63), which cannot be used for future extensions in a backward compatible way.

JCTVC-G331 was mentioned as a reference that includes more detailed discussion on NAL unit type allocation.

# 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 AHG11), namely the following, are not listed herein:

* AHG4: High-level parallelism
* AHG8: Profile and level definitions
* AHG10: Loss robustness
* AHG12: Hooks for scalable coding
* AHG15: Reference picture buffering and list construction

There are totally 47 AHG11 non-crosscheck non-AHG-report documents submitted to this meeting (by Tuesday April 24, 2012), including 8 on APS, 4 on CRA, 2 on HRD, 3 on POC, 3 on slices, 8 on SEI, 5 on syntax cleanups, 4 on WP signaling, 10 on other topics. These documents are listed below, ordered according to the topic category (and for documents of the same category, order in document number).

Note that document JCTVC-I0499 may not intended for a submission to JCT-VC. But since the /proposal is relevant, it is tentatively included in this report.

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| **JCT-VC number** | **JCT-VC number** | **Authors** | **Category** |
| [JCTVC-I0046](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5301) | APS partial update through conditional replacement | [S. Wenger](mailto:stewe@stewe.org), [J. Boyce (Vidyo)](mailto:jill@vidyo.com) | AHG11 - APS - partial update |
| [JCTVC-I0061](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5317) | Simplified APS partial update through referencing | [M. Li](mailto:li.ming42@zte.com.cn), [P. Wu (ZTE)](mailto:ping.wu@zte.com.cn), [S. Wenger](mailto:stephan@vidyo.com), [J. Boyce (Vidyo)](mailto:jill@vidyo.com), [D. Flynn (BBC)](mailto:davidf@rd.bbc.co.uk) | AHG11 - APS - partial update |
| [JCTVC-I0081](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5337) | APS partial update â€“ APS update with one or multiple references | [Hendry](mailto:hendry.hendry@lge.com), [B. Jeon (LG)](mailto:bm.jeon@lge.com) | AHG11 - APS - partial update |
| [JCTVC-I0082](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5338) | APS partial update â€“ APS buffer management | [Hendry](mailto:hendry.hendry@lge.com), [B. Jeon (LG)](mailto:bm.jeon@lge.com) | AHG11 - APS - partial update |
| [JCTVC-I0069](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5325) | APS error resilience and partial updating | [M. M. Hannuksela](mailto:miska.hannuksela@nokia.com), S. M. Gopalakrishna (Nokia) | AHG11 - APS - partial update & error resilience |
| [JCTVC-I0189](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5445) | On APS referring and updating | N. Ouedraogo, E. Francois (Canon) | AHG11 - APS - partial update & more |
| [JCTVC-I0338](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5596) | AHG11: On parameter sets referencing and partial update | [Y.-K. Wang](mailto:yekuiw@qualcomm.com), [Y. Chen](mailto:cheny@qualcomm.com), [G. Van der Auwera (Qualcomm)](mailto:geertv@qualcomm.com), [P. Wu (ZTE)](mailto:ping.wu@zte.com.cn) | AHG11 - APS - partial update & PS referencing |
| [JCTVC-I0083](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5339) | Error resilience improvements for APS partial updates | [Hendry](mailto:hendry.hendry@lge.com), [B. Jeon (LG)](mailto:bm.jeon@lge.com) | AHG11 - APS - partial update error resilience |
| [JCTVC-I0275](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5533) | On Leading Pictures | [S. Deshpande](mailto:sdeshpande@sharplabs.com), A. Segall (Sharp) | AHG11 - CRA |
| [JCTVC-I0278](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5536) | Signaling of CRA Pictures | [S. Deshpande](mailto:sdeshpande@sharplabs.com), L. Kerofsky, A. Segall (Sharp) | AHG11 - CRA |
| [JCTVC-I0404](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5662) | CRA pictures with broken links | [G. J. Sullivan (Microsoft)](mailto:garysull@microsoft.com) | AHG11 - CRA |
| [JCTVC-I0277](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5535) | HRD Buffering for Bitstreams Starting with CRA Picture | [S. Deshpande](mailto:sdeshpande@sharplabs.com), A. Segall (Sharp) | AHG11 - CRA - HRD |
| [JCTVC-I0333](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=5591) | AHG11: Proposed text for sub-picture based CPB operation | [K. Kazui](mailto:kazui.kimihiko@jp.fujitsu.com), J. Koyama, S. Shimada, A. Nakagawa (Fujitsu) | AHG11 - HRD |
| [JCTVC-I0349](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5607) | AHG11: Sub-picture-level low-delay CPB behavior | [Y. -K. Wang](mailto:yekuiw@qualcomm.com), [Y. Chen (Qualcomm)](mailto:cheny@qualcomm.com) | AHG11 - HRD |
| [JCTVC-I0499](file:///C:\Users\yekuiw\2012\JCT-VC\JCT-VC%239\0011%20-%20HLS%20AHG%20report\current_document.php%3fid=5761) | HEVC Profile Signalling | [D. Singer (Apple)](mailto:singer@apple.com) | AHG11 - others - profile signaling |
| [JCTVC-I0420](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5678) | High-level Syntax: Proposed fix on signaling of TMVP disabling flag | [C. S. Lim](mailto:ChongSoon.Lim@sg.panasonic.com), [S. Mon Thet Naing (Panasonic)](mailto:sue.naing@sg.panasonic.com) | AHG11 - others - motion related |
| [JCTVC-I0422](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5680) | High-level Syntax: MVP scaling issue for LTRPs | [Chong Soon Lim](mailto:chongsoon.lim@sg.panasonic.com), [Sue Mon Thet Naing](mailto:sue.naing@sg.panasonic.com) | AHG11 - others - motion related |
| [JCTVC-I0143](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5399) | High level syntax modifications | B. Li, H. Li (USTC), H. Yang (Huawei) | AHG11 - others - multiple topics |
| [JCTVC-I0330](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5588) | AHG11: Comments on HEVC text spec draft 6 | [Y.-K. Wang](mailto:yekuiw@qualcomm.com), [M. Coban](mailto:mcoban@qualcomm.com), [Y. Chen](mailto:cheny@qualcomm.com), [R. L. Joshi](mailto:rajanj@qualcomm.com), [J. Chon](mailto:jchon@qualcomm.com), [A. K. Ramasubramonian (Qualcomm)](mailto:aramasub@qualcomm.com) | AHG11 - others - multiple topics |
| [JCTVC-I0113](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5369) | AHG11: High level syntax parsing issues | [K. Suehring (HHI)](mailto:Karsten.Suehring@hhi.fraunhofer.de) | AHG11 - others - parsing |
| [JCTVC-I0170](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5426) | Parsing robustness issue for deblocking filter syntax | [S. Esenlik](mailto:Semih.Esenlik@eu.panasonic.com), [M. Narroschke](mailto:Matthias.Narroschke@eu.panasonic.com), [T. Wedi (Panasonic)](mailto:Thomas.Wedi@eu.panasonic.com) | AHG11 - others - parsing |
| [JCTVC-I0144](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5400) | Removal of input picture size constraint and picture cropping offset parameters in sequence parameter set | I.-K Kim, Y. Park, J. H. Kim, J. H. Park (Samsung) | AHG11 - others - picture size |
| [JCTVC-I0465](http://phenix.int-evry.fr/jct/doc_end_user/current_document.php?id=5725) | Signaling of quantization matrices in SPS and PPS | [M. Zhou (TI)](mailto:zhou@ti.com) | AHG11 - others - QM signaling - PPS partial update |
| [JCTVC-I0236](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5494) | TLA picture restriction | R. SjÃ¶berg, J. Samuelsson (Ericsson) | AHG11 - others - TLA |
| [JCTVC-I0045](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5300) | Cyclic POC | J. Koyama, [K. Kazui](mailto:kazui.kimihiko@jp.fujitsu.com), S. Shimada, A. Nakagawa (Fujitsu) | AHG11 - POC |
| [JCTVC-I0133](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5389) | POC signalling for CRA picture | [B. Choi](mailto:b.d.choi@samsung.com), [J. Kim](mailto:jhgim@samsung.com), [J. Park (Samsung)](mailto:jeonghoon@samsung.com) | AHG11 - POC |
| [JCTVC-I0345](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5603) | AHG11: Temporally adaptive POC coding | [R. L. Joshi](mailto:rajanj@qualcomm.com), [Y. Chen](mailto:cheny@qualcomm.com), [Y.-K. Wang](mailto:yekuiw@qualcomm.com), [A. K. Ramasubramonian (Qualcomm)](mailto:aramasub@qualcomm.com) | AHG11 - POC |
| [JCTVC-I0044](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5299) | Modification of recovery point SEI message | [K. Kazui](mailto:kazui.kimihiko@jp.fujitsu.com), J. Koyama, S. Shimada, A. Nakagawa (Fujitsu) | AHG11 - SEI |
| [JCTVC-I0062](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5318) | Comments on field indication SEI message | [M. Li](mailto:li.ming42@zte.com.cn), [P. Wu (ZTE)](mailto:ping.wu@zte.com.cn), [C. Fogg (Harmonic)](mailto:chadfogg@gmail.com) | AHG11 - SEI |
| [JCTVC-I0218](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5476) | Changes to the Hash SEI calculation for improved usability | [T. Hellman](mailto:timhellman@broadcom.com), [W. Wan (Broadcom)](mailto:wwan@broadcom.com) | AHG11 - SEI |
| [JCTVC-I0245](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5503) | LCU based Input order scanning for HASH SEI Message | [R. R. Srinivasan](mailto:ramanujam@ti.com), [M. Mody](mailto:mihir@ti.com%20), [C. Ghone (TI)](mailto:csghone@ti.com) | AHG11 - SEI |
| [JCTVC-I0393](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5651) | How to use the field sequence SEI | [C. Fogg (Harmonic)](mailto:chadfogg@gmail.com), [A. Wells (Ambarella)](mailto:awells@ambarella.com) | AHG11 - SEI |
| [JCTVC-I0057](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5313) | Frame packing arrangement SEI extension for HEVC | [O. Nakagami](mailto:ohji.nakagami@jp.sony.com), [T. Suzuki (Sony)](mailto:teruhikos@jp.sony.com) | AHG11 - SEI - 3D |
| [JCTVC-I0058](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5314) | On stereo 3D coding using frame packing arrangement SEI | [O. Nakagami](mailto:ohji.nakagami@jp.sony.com), [T. Suzuki (Sony)](mailto:teruhikos@jp.sony.com) | AHG11 - SEI - 3D |
| [JCTVC-I0072](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5328) | Usage of cropping rectangle and sample aspect ratio to support 2D-compatible services in "Frame compatible Plano-Stereoscopic 3DTV" within the HEVC specification. | [M. Arena](mailto:marco.arena@rai.it), [P. Sunna (RAI)](mailto:p.sunna@rai.it) | AHG11 - SEI - 3D |
| [JCTVC-I0313](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5571) | Restricting Slice Boundaries to LCU Granularity | [T. Hellman](mailto:timhellman@broadcom.com), [W. Wan (Broadcom)](mailto:wwan@broadcom.com) | AHG11 - slices |
| [JCTVC-I0394](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5652) | Copy Slice Type | [S. Deshpande](mailto:sdeshpande@sharplabs.com), A. Segall (Sharp) | AHG11 - slices |
| [JCTVC-I0500](http://wg11.sc29.org/jct/doc_end_user/current_document.php?id=5762) | AHG11: Definition of slice types | [K. Suehring](mailto:Karsten.Suehring@hhi.fraunhofer.de) | AHG11 - slices |
| [JCTVC-I0037](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5292) | Removal of Syntax Redundancies | Y. Morigami, K. Sato (Sony) | AHG11 - syntax cleanup |
| [JCTVC-I0127](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5383) | Syntax cleanup | [T. Lee](mailto:tammy.lee@samsung.com), [J. Park (Samsung)](mailto:jeonghoon@samsung.com) | AHG11 - syntax cleanup |
| [JCTVC-I0266](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5524) | Modifications on signaling collocated picture | [Y. Yu](mailto:yyu@motorola.com), [J. Lou](mailto:lou@motorola.com), [L. Wang (Motorola Mobility)](mailto:limin.wang@motorola.com) | AHG11 - syntax cleanup |
| [JCTVC-I0390](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5648) | Restructuring high-level syntax to promote profile compliance | [C. Fogg (Harmonic)](mailto:chadfogg@gmail.com), [A. Wells (Ambarella)](mailto:awells@ambarella.com) | AHG11 - syntax cleanup |
| [JCTVC-I0165](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5421) | On Signaling of Several Syntax Elements in Slice Header | J. An, X. Guo, C.-W. Hsu, Y.-W. Huang, S. Lei (MediaTek) | AHG11 - syntax cleanup - slice header |
| [JCTVC-I0260](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5518) | On Weighted Prediction Parameter Signalling | [Yong He](mailto:yong.he@interdigital.com), [Jie Dong](mailto:jie.dong@interdigital.com), [Yan Ye](mailto:yan.ye@interdigital.com), [Eun S. Ryu (InterDigital)](mailto:eun.ryu@interdigital.com) | AHG11 - WP |
| [JCTVC-I0335](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5593) | AHG11: On weighted prediction signaling | [Y. Chen](mailto:cheny@qualcomm.com), [M. Coban](mailto:mcoban@qualcomm.com), [Y.-K. Wang](mailto:yekuiw@qualcomm.com), [W.-J. Chien (Qualcomm)](mailto:wchien@qualcomm.com) | AHG11 - WP |
| [JCTVC-I0421](file:///C:\Users\yekuiw\AppData\Local\Temp\current_document.php%3fid=5679) | High-level Syntax: Improvements to weighted prediction for B slices | [Chong Soon Lim](mailto:chongsoon.lim@sg.panasonic.com), [Sue Mon Thet Naing](mailto:sue.naing@sg.panasonic.com) | AHG11 - WP |
| [JCTVC-I0439](http://wg11.sc29.org/jct/doc_end_user/current_document.php?id=5698) | On Explicit Weighted Prediction Signalling | [Hendry](mailto:hendry.hendry@lge.com), [S. Park](mailto:seungwook.park@lge.com), [Y. Jeon](mailto:yongjoon.jeon@lge.com), [B. Jeon (LG)](mailto:bm.jeon@lge.com) | AHG11 - WP |

# Recommendations

The high-level syntax ad hoc group recommends:

* To discuss and try to make a decision on NAL unit type allocation, taking into consideration the AHG mailing discussions
* To review all related input contributions
* To coordinate with other closely-related AHGs on commonly related contributions, including
  + AHG4: High-level parallelism
  + AHG8: Profile and level definitions
  + AHG10: Loss robustness
  + AHG12: Hooks for scalable coding
  + AHG15: Reference picture buffering and list construction