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| **Joint Video Experts Team (JVET)**  **of ITU-T SG 16 WP 3 and ISO/IEC JTC 1/SC 29**  32nd Meeting, Hannover, DE, 13–20 October 2023 | Document: JVET-AF\_notes\_d0 |

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| *Title:* | **Meeting Report of the 32nd Meeting of the Joint Video Experts Team (JVET), Hannover, DE, 13–20 October 2023** | | |
| *Status:* | Report document from the chair of JVET | | |
| *Purpose:* | Report | | |
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| *Source:* | Chair of JVET | | |

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# Summary

The Joint Video Experts Team (JVET) of ITU-T WP3/16 and ISO/IEC JTC 1/‌SC 29 held its thirty-second meeting during 13–20 October 2023 at the Hannover Congress Centrum (HCC) in Hannover, Germany. The meeting was held as a face-to-face meeting, but remote participation was provided on best-effort basis for experts who were unable to travel.

For ISO/IEC purposes, JVET is alternatively designated ISO/IEC JTC 1/‌SC 29/‌WG 5, and this was the thirteenth meeting as WG 5. The JVET meeting was held under the chairmanship of Dr Jens-Rainer Ohm (RWTH Aachen/Germany). For rapid access to particular topics in this report, a subject categorization is found (with hyperlinks) in section 2.16 of this document. It is further noted that work items which had originally been conducted by the Joint Collaborative Team on Video Coding (JCT-VC) were continued in JVET as a single joint team, and explorations towards possible future need of standardization in the area of video coding are also conducted by JVET, as negotiated by the parent bodies.

The JVET meeting began at approximately 0900 CEST (UTC+2) on Friday 13 October 2023. Meeting sessions were held on all days, including the weekend days of Saturday and Sunday 14 and 15 October 2023, until the meeting was closed at approximately XXXX hours CEST on Friday 20 October 2023. Approximately XXX people attended the JVET meeting (XXX in person and XXX remotely), and approximately XXX input documents (not counting crosschecks, reports, and summary documents), 14 AHG reports, 2 EE summary reports, X BoG reports, and X incoming liaison document(s) were discussed. in coordination with a meeting of various SC29 Working Groups and Advisory Groups – where WG 5 is representing the Joint Video Coding Team(s) and their activities from the perspective of the SC 29 parent body, under whose auspices this JVET meeting was held. The subject matter of the JVET meeting activities consisted of work on further development and maintenance of the twin-text video coding technology standards *Advanced Video Coding* (AVC), *High Efficiency Video Coding* (HEVC), *Versatile Video Coding* (VVC)*, Coding-independent Code Points (Video)* (CICP), and *Versatile Supplemental Enhancement Information Messages for Coded Video Bitstreams* (VSEI), as well as related technical reports, reference software and conformance testing packages. Further important goals were reviewing the results of the Exploration Experiment (EE) on Neural Network-based Video Coding, of the EE on Enhanced Compression beyond VVC capability, of other technical input on novel aspects of video coding technology, and to plan next steps for investigation of candidate technology towards further standard development.

As a primary goal, the JVET meeting reviewed the work that had been performed in the interim period since the thirty-first JVET meeting in producing the following documents:

a) JVET documents

* [JVET-AE1004](https://jvet-experts.org/doc_end_user/current_document.php?id=12567) Errata report items for VVC, VSEI, HEVC, AVC, and Video CICP
* [JVET-AE1006](https://jvet-experts.org/doc_end_user/current_document.php?id=12568) New profiles, colour decriptors, and SEI messages for HEVC (draft 1), also issued as WG 5 CDAM N 226
* [JVET-AE1011](https://jvet-experts.org/doc_end_user/current_document.php?id=12569) HEVC multiview profiles supporting extended bit depth (draft 2)
* [JVET-AE1013](https://jvet-experts.org/doc_end_user/current_document.php?id=12569) Common test conditions of 3DV experiments
* [JVET-AE1016](https://jvet-experts.org/doc_end_user/current_document.php?id=12568) AVC with extensions and corrections (draft 1), also issued as WG 5 CD of AVC 11th edition N 218
* [JVET-AE2005](https://jvet-experts.org/doc_end_user/current_document.php?id=12574) New level and systems-related supplemental enhancement information for VVC (Draft 6)
* [JVET-AE2006](https://jvet-experts.org/doc_end_user/current_document.php?id=12574) Additional SEI messages for VSEI (Draft 5)
* [JVET-AE2016](https://jvet-experts.org/doc_end_user/current_document.php?id=12576) Common test conditions and evaluation procedures for neural network-based video coding technology
* [JVET-AE2017](https://jvet-experts.org/doc_end_user/current_document.php?id=12576) Common test conditions and evaluation procedures for enhanced compression tool testing
* [JVET-AE2019](https://jvet-experts.org/doc_end_user/current_document.php?id=12563) Description of algorithms and software in neural network-based video coding (NNVC) version 4
* [JVET-AD2020](https://jvet-experts.org/doc_end_user/current_document.php?id=12579) Film grain synthesis technology for video applications (Draft 5), also issued as WG 5 DTR N 222
* [JVET-AE2021](https://jvet-experts.org/doc_end_user/current_document.php?id=12578) Verification test plan for VVC multilayer coding (update 1)
* [JVET-AE2023](https://jvet-experts.org/doc_end_user/current_document.php?id=12560) Exploration experiment on neural network-based video coding (EE1)
* [JVET-AE2024](https://jvet-experts.org/doc_end_user/current_document.php?id=12562) Exploration experiment on enhanced compression beyond VVC capability (EE2)
* [JVET-AE2025](https://jvet-experts.org/doc_end_user/current_document.php?id=12580) Algorithm description of Enhanced Compression Model 10 (ECM 10)
* [JVET-AE2027](https://jvet-experts.org/doc_end_user/current_document.php?id=12582) SEI processing order SEI message in VVC (Draft 5), also issued as WG 5 preliminary WD N 229
* [JVET-AE2028](https://jvet-experts.org/doc_end_user/current_document.php?id=12583) Additional conformance bitstreams for VVC multilayer configurations
* [JVET-AE2030](https://jvet-experts.org/doc_end_user/current_document.php?id=12564) Optimization of encoders and receiving systems for machine analysis of coded video content (draft 3), also issued as WG 5 preliminary WD N 224
* [JVET-AE2031](https://jvet-experts.org/doc_end_user/current_document.php?id=12584) Common test conditions for optimization of encoders and receiving systems for machine analysis of coded video content
* [JVET-AE2032](https://jvet-experts.org/doc_end_user/current_document.php?id=12584) Technologies under consideration for future extensions of VSEI (draft 1)

b) documents produced as WG 5 documents only:

* WG 5 N 217 Request for ISO/IEC 14496-10 11th edition
* WG 5 N 219 Disposition of comments received on ISO/IEC 23002-7:2022 DAM 1
* WG 5 N 220 Text of ISO/IEC FDIS 23002-7:202x Versatile supplemental enhancement infor­mation messages for coded video bitstreams (3rd edition)
* WG 5 N 222 Disposition of comments received on ISO/IEC CDTR 23002-9
* WG 5 N 225 Request for ISO/IEC 23008-2:202x/Amd.1
* WG 5 N 227 Disposition of comments received on ISO/IEC 23090-3:2022 DAM 1
* WG 5 N 228 Text of ISO/IEC FDIS 23090-3:202x Versatile video coding (3rd edition)

c) draft revised ITU-T Recommendations forwarded by JVET and Q6/16 for ITU-T Consent:

* TD169/Plen ITU-T H.265 (V9) "High efficiency video coding" (Rev.)
* TD171/Plen ITU-T H.266 (V3) "Versatile video coding" (Rev.)
* TD159/Plen ITU-T H.266.1 (V2) "Conformance specification for ITU-T H.266 versatile video coding" (Rev.)
* TD172/Plen ITU-T H.273 (V3) "Coding-independent code points for video signal type identification" (Rev.)
* TD170/Plen (A.5: TD173/Plen) ITU-T H.274 (V3) "Versatile supplemental enhancement information messages for coded video bitstreams" (Rev.)

As main results, the JVET produced XX output documents from the current meeting (update):

* [JVET-AE1004](https://jvet-experts.org/doc_end_user/current_document.php?id=12567) Errata report items for VVC, VSEI, HEVC, AVC, and Video CICP
* [JVET-AE1006](https://jvet-experts.org/doc_end_user/current_document.php?id=12568) New profiles, colour decriptors, and SEI messages for HEVC (draft 1), also issued as WG 5 CDAM N 226
* [JVET-AE1011](https://jvet-experts.org/doc_end_user/current_document.php?id=12569) HEVC multiview profiles supporting extended bit depth (draft 2)
* [JVET-AE1013](https://jvet-experts.org/doc_end_user/current_document.php?id=12569) Common test conditions of 3DV experiments
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* [JVET-AE2005](https://jvet-experts.org/doc_end_user/current_document.php?id=12574) New level and systems-related supplemental enhancement information for VVC (Draft 6)
* [JVET-AE2006](https://jvet-experts.org/doc_end_user/current_document.php?id=12574) Additional SEI messages for VSEI (Draft 5)
* [JVET-AE2016](https://jvet-experts.org/doc_end_user/current_document.php?id=12576) Common test conditions and evaluation procedures for neural network-based video coding technology
* [JVET-AE2017](https://jvet-experts.org/doc_end_user/current_document.php?id=12576) Common test conditions and evaluation procedures for enhanced compression tool testing
* [JVET-AE2019](https://jvet-experts.org/doc_end_user/current_document.php?id=12563) Description of algorithms and software in neural network-based video coding (NNVC) version 4
* [JVET-AD2020](https://jvet-experts.org/doc_end_user/current_document.php?id=12579) Film grain synthesis technology for video applications (Draft 5), also issued as WG 5 DTR N 222
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* [JVET-AE2023](https://jvet-experts.org/doc_end_user/current_document.php?id=12560) Exploration experiment on neural network-based video coding (EE1)
* [JVET-AE2024](https://jvet-experts.org/doc_end_user/current_document.php?id=12562) Exploration experiment on enhanced compression beyond VVC capability (EE2)
* [JVET-AE2025](https://jvet-experts.org/doc_end_user/current_document.php?id=12580) Algorithm description of Enhanced Compression Model 10 (ECM 10)
* [JVET-AE2027](https://jvet-experts.org/doc_end_user/current_document.php?id=12582) SEI processing order SEI message in VVC (Draft 5), also issued as WG 5 preliminary WD N 229
* [JVET-AE2028](https://jvet-experts.org/doc_end_user/current_document.php?id=12583) Additional conformance bitstreams for VVC multilayer configurations
* [JVET-AE2030](https://jvet-experts.org/doc_end_user/current_document.php?id=12564) Optimization of encoders and receiving systems for machine analysis of coded video content (draft 3), also issued as WG 5 preliminary WD N 224
* [JVET-AE2031](https://jvet-experts.org/doc_end_user/current_document.php?id=12584) Common test conditions for optimization of encoders and receiving systems for machine analysis of coded video content
* [JVET-AE2032](https://jvet-experts.org/doc_end_user/current_document.php?id=12584) Technologies under consideration for future extensions of VSEI (draft 1)

The following X documents were produced as WG 5 documents only:

* …

For the organization and planning of its future work, the JVET established XX “ad hoc groups” (AHGs) to progress the work on particular subject areas. At this meeting, 2 Exploration Experiments (EE) were defined. The next eight JVET meetings were planned for 17 – 19 and 22 – 26 January 2024 under ISO/IEC JTC 1/‌SC 29 auspices, to be conducted as teleconference meeting; during 19 – 26 April 2024 under ITU-T SG16 auspices in Rennes, FR; during 12 – 19 July 2024 under ISO/IEC JTC 1/‌SC 29 auspices in Sapporo, JP; during October 2024 under ISO/IEC JTC 1/‌SC 29 auspices, date and location t.b.d.; during January 2025 under ITU-T SG16 auspices, date and location t.b.d.; during April 2025 under ISO/IEC JTC 1/‌SC 29 auspices, date and location t.b.d.; during 26 June – 4 July 2025 under ISO/IEC JTC 1/‌SC 29 auspices in Daejeon, KR; and during October 2025 under ISO/IEC JTC 1/‌SC 29 auspices, date and location t.b.d.

The document distribution site <https://jvet-experts.org/> was used for distribution of all documents. It was noted that the previous sites <http://phenix.int-evry.fr/jvet/>, <http://phenix.int-evry.fr/jct/>, and <http://phenix.int-evry.fr/jct3v/> are still accessible, but were converted to read-only.

The reflector to be used for discussions by the JVET and all its AHGs is the JVET reflector:  
[jvet@lists.rwth-aachen.de](mailto:jvet@lists.rwth-aachen.de) hosted at RWTH Aachen University. For subscription to this list, see <https://lists.rwth-aachen.de/postorius/lists/jvet.lists.rwth-aachen.de/>.

# Administrative topics

## Organization

The ITU-T/ISO/IEC Joint Video Experts Team (JVET) is a group of video coding experts from the ITU-T Study Group 16 Visual Coding Experts Group (VCEG) and ISO/IEC JTC 1/‌SC 29/‌WG 5. The parent bodies of the JVET are ITU-T WP3/16 and ISO/IEC JTC 1/‌SC 29.

The Joint Video Experts Team (JVET) of ITU-T WP3/16 and ISO/IEC JTC 1/‌SC 29 held its thirty-second meeting during 13–20 October 2023 at the Hannover Congress Centrum (HCC) in Hannover, Germany. The meeting was held as a face-to-face meeting, but remote participation was provided on best-effort basis for experts who were unable to travel. For ISO/IEC purposes, JVET is alternatively designated ISO/IEC JTC 1/‌SC 29/‌WG 5, and this was the thirteenth meeting as WG 5. The JVET meeting was held under the chairmanship of Dr Jens-Rainer Ohm (RWTH Aachen/Germany).

It is further noted that the unabbreviated name of JVET was formerly known as “Joint Video *Exploration* Team”, but the parent bodies modified it when entering the phase of formal development of the *Versatile Video Coding* (VVC) and *Versatile Supplemental Enhancement Information Messages for Coded Video Bitstreams* (VSEI) standards, as well as associated conformance test sets, reference software, verification testing, and non-normative guidance information. Furthermore, starting from the twentieth meeting, work items which had originally been conducted by the Joint Collaborative Team on Video Coding (JCT-VC) were continued to be conducted in JVET as a single joint team, as negotiated by the parent bodies. This particularly consists of work on:

* *High Efficiency Video Coding* (HEVC) and its extensions, the development of associated conformance test sets, reference software, verification testing, and non-normative guidance information,
* Specification of *Coding-independent Code Points (Video)* (CICP), and associated technical report(s),
* Maintenance and enhancement work on the *Advanced Video Coding* (AVC) standard, associated conformance test sets and reference software.

Furthermore, explorations towards possible future need of standardization in the area of video coding are also conducted by JVET. Currently, the following topics are under investigation:

* Exploration on Neural Network-based Video Coding
* Exploration on Enhanced Compression beyond VVC capability

This report contains three important annexes, as follows:

* Annex A contains a list of the documents of the JVET meeting
* Annex B contains a list of the meeting participants, consisting of two parts, (B1) in-person attendees as recorded by a sign-in sheet circulated in meeting rooms, (B2) remote attendees as recorded by the teleconferencing tool used for the meeting
* Annex C contains the meeting recommendations of ISO/IEC JTC 1/‌SC 29/‌WG 5 for purposes of results reporting to ISO/IEC.

## Meeting logistics

Information regarding logistics arrangements for the meeting had been provided via the email reflector [jvet@lists.rwth-aachen.de](mailto:jvet@lists.rwth-aachen.de) and at <http://wftp3.itu.int/av-arch/jvet-site/2023_10_AF_Hannover/>.

## Primary goals

As a primary goal, the JVET meeting reviewed the work that was performed in the interim period since the thirty-first JVET meeting in producing the following documents:

a) JVET documents

* [JVET-AE1004](https://jvet-experts.org/doc_end_user/current_document.php?id=12567) Errata report items for VVC, VSEI, HEVC, AVC, and Video CICP
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b) documents produced as WG 5 documents only:

* WG 5 N 217 Request for ISO/IEC 14496-10 11th edition
* WG 5 N 219 Disposition of comments received on ISO/IEC 23002-7:2022 DAM 1
* WG 5 N 220 Text of ISO/IEC FDIS 23002-7:202x Versatile supplemental enhancement infor­mation messages for coded video bitstreams (3rd edition)
* WG 5 N 222 Disposition of comments received on ISO/IEC CDTR 23002-9
* WG 5 N 225 Request for ISO/IEC 23008-2:202x/Amd.1
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* WG 5 N 228 Text of ISO/IEC FDIS 23090-3:202x Versatile video coding (3rd edition)

c) draft revised ITU-T Recommendations forwarded by JVET and Q6/16 for ITU-T Consent:

* TD169/Plen ITU-T H.265 (V9) "High efficiency video coding" (Rev.)
* TD171/Plen ITU-T H.266 (V3) "Versatile video coding" (Rev.)
* TD159/Plen ITU-T H.266.1 (V2) "Conformance specification for ITU-T H.266 versatile video coding" (Rev.)
* TD172/Plen ITU-T H.273 (V3) "Coding-independent code points for video signal type identification" (Rev.)
* TD170/Plen (A.5: TD173/Plen) ITU-T H.274 (V3) "Versatile supplemental enhancement information messages for coded video bitstreams" (Rev.)

Further important goals were reviewing the results of the EE on Neural Network-based Video Coding, of the EE on Enhanced Compression beyond VVC capability, of other technical input on novel aspects of video coding technology, and planning next steps for investigation of candidate technology towards further standard development.

## Documents and document handling considerations

### General

The document distribution site <https://jvet-experts.org/> was used for distribution of all documents. It was noted that the previous site <http://phenix.int-evry.fr/jvet/> was still accessible, but had been converted to read-only.

Document registration timestamps, initial upload timestamps, and final upload timestamps are listed in Annex A of this report.

The document registration and upload times and dates listed in Annex A and in headings for documents in this report are in Paris/Geneva time. Dates mentioned for purposes of describing events at the meeting follow the CEST timezone (local time in Geneva), except as otherwise noted.

Highlighting of recorded decisions in this report is practised as follows:

* Decisions made by the group that might affect the normative content of a future standard are identified in this report by prefixing the description of the decision with the string “Decision:”.
* Decisions that affect one of the various software packages but have no normative effect on text are marked by the string “Decision (SW):”.
* Decisions that fix a “bug” in one of the test model descriptions such as VTM, HM, etc. (an error, oversight, or messiness) or in the associated software package are marked by the string “Decision (BF):”.
* Decisions that are merely editorial without effect on the technical content of a draft standard are marked by the string "Decision (Ed.):". Such editorial decisions are merely suggestions to the editor, who has the discretion to determine the final action taken if their judgment differs.
* Other parenthetical comments may be used for describing the impact or motivation of a decision. Some decisions are recorded with the word “agreed” rather than “Decision:”, especially for non-normative, editorial and planning matters.

This meeting report is based primarily on notes taken by the JVET chair. The preliminary notes were also circulated publicly by ftp and http during the meeting on a daily basis. It should be understood by the reader that 1) some notes may appear in abbreviated form, 2) summaries of the content of contributions are often based on abstracts provided by contributing proponents without an intent to imply endorsement of the views expressed therein, and 3) the depth of discussion of the content of the various contributions in this report is not uniform. Generally, the report is written to include as much information about the contributions and discussions as is feasible (in the interest of aiding study), although this approach may not result in the most polished output report. Expressions such as “X.XX%” indicate that the desired results were not available at the time the information was recorded.

### Late and incomplete document considerations

The formal deadline for registering and uploading non-administrative contributions had been announced as Friday, 6 October 2023. Any documents uploaded after 1159 hours Paris/Geneva time on Saturday 7 October 2023 were considered “officially late”, with a grace period of 12 hours (to accommodate those living in different time zones of the world). The deadline does not apply to AHG reports and other such reports which can only be produced after the availability of other input documents.

All contribution documents with registration numbers higher than JVET-AF0207 were registered after the “officially late” deadline (and therefore were also uploaded late). However, some documents in the “late” range might include break-out activity reports that were generated during the meeting, or documents which were requested to be produced for the purpose of improving specification text, and are therefore better considered as report documents rather than as late contributions.

In many cases, contributions were also revised after the initial version was uploaded. The contribution document archive website retains publicly accessible prior versions in such cases. The timing of late document availability for contributions is generally noted in the section discussing each contribution in this report.

One suggestion to assist with the issue of late submissions has been to require the submitters of late contributions and late revisions to describe the characteristics of the late or revised (or missing) material at the beginning of discussion of the contribution. This has been agreed to be a helpful approach to be followed at the meeting.

The following technical design proposal contributions were registered and/or uploaded late:

* JVET-AF0XXX (a proposal on …), uploaded 10-XX,
* …

It may be observed that some of the above-listed contributions were submissions made in response to issues that arose in discussions during the meeting or from the study of other contributions, and thus could not have been submitted by the ordinary deadline.

The following other documents not proposing normative technical content, but with some need for consideration, were registered and/or uploaded late:

* JVET-AF0XXX (a document presenting …), uploaded 10-XX,
* …

All cross-verification reports at this meeting (except for JVET-AF0074, JVET-AF0124, and JVET-AF0125) were registered late, and/or uploaded late. In the interest of brevity, these are not specifically identified here. Initial upload times for each document are recorded in Annex A of this report.

The following contribution registrations were noted that were later cancelled, withdrawn, never provided, were cross-checks of a withdrawn contribution, or were registered in error: JVET-AF0046, JVET-AF0054, JVET-AF0077, JVET-AF0078, JVET-AF0123, JVET-AF0127, JVET-AF0195, JVET-AF0196.

The cross-verification reports JVET-AF0XXX, and … were still missing at the end of the meeting on Friday 20 Oct., but became available later. The following cross-verification reports were still missing three weeks after the end of the meeting: JVET-AF0XXX, and … . These were marked as withdrawn by the JVET chair, assuming their registrations had become obsolete.

“Placeholder” contribution documents that were basically empty of content, or lacking any results showing benefit for the proposed technology, and obviously uploaded with an intent to provide a more complete submission as a revision, had been agreed to be considered unacceptable and to be rejected in the document management system until a more complete version was available (which would then be counted as a late contribution if the update was after the document deadline). At the current meeting, this situation applied with documents JVET-AF0XXX and … , which were categorized as late in the list above, based on the time of the first reasonable document upload; this case did not happen at the current meeting, but the sentence is kept for future use.

Contributions that had significant problems with uploaded versions were not observed at this meeting.

It was remarked that documents that are substantially revised after the initial upload can also be a problem, as this becomes confusing, interferes with study, and puts an extra burden on synchronization of the discussion. This can especially be a problem in cases where the initial upload is clearly incomplete, and in cases where it is difficult to figure out what parts were changed in a revision. For document contributions, revision marking is very helpful to indicate what has been changed. Also, the “comments” field on the web site can be used to indicate what is different in a revision, although participants tend to seldom notice what is recorded there.

As a general policy, missing documents were not to be presented, and late documents (and substantial revisions) could only be presented when there was a consensus to consider them and there was sufficient time available for their review. Again, an exception is applied for AHG reports, CE and HLS topic summaries, and other such reports which can only be produced after the availability of other input documents. There were no objections raised by the group regarding presentation of late contributions, although there may have been some expression of annoyance and remarks on the difficulty of dealing with late contributions and late revisions.

A few contributions may have had some problems relating to IPR declarations in the initial uploaded versions (missing declarations, declarations saying they were from the wrong companies, etc.). Any such issues were corrected by later uploaded versions in a reasonably timely fashion in all cases (to the extent of the awareness of the responsible coordinators).

Some other errors may have also noticed in other initial document uploads (wrong document numbers or meeting dates or meeting locations in headers, etc.) which were generally sorted out in a reasonably timely fashion. The document web site contains an archive of each upload.

### Outputs of the preceding meeting

All output documents of the previous meeting, particularly the meeting report JVET-AE1000, the Errata report items for VVC, VSEI, HEVC, AVC, and Video CICP JVET-AE1004, the New profiles, colour descriptors, and SEI messages for HEVC (draft 1) JVET-AE1006, the HEVC multiview profiles supporting extended bit depth (draft 2) JVET-AE1011, the Common test conditions of 3DV experiments [JVET-AE1013](https://jvet-experts.org/doc_end_user/current_document.php?id=12569), the AVC specification with extensions and corrections (draft 1) JVET-AE1016, the New level and systems-related supplemental enhancement information for VVC (Draft 6) JVET-AE2005, the Additional SEI messages for VSEI (Draft 5) JVET-AE2006, the Common test conditions and evaluation procedures for neural network-based video coding technology JVET-AE2016, the Common test conditions and evaluation procedures for enhanced compression tool testing JVET-AE2017, the Description of algorithms and software in neural network-based video coding (NNVC) version 4 JVET-AE2019, the Film grain synthesis technology for video applications (Draft 5) JVET-AE2020, the Verification test plan for VVC multilayer coding (update 1) JVET-AE2021, the Description of the EE on Neural Network-based Video Coding JVET-AE2023, the Description of the EE on Enhanced Compression beyond VVC capability JVET-AE2024, the Algorithm description of Enhanced Compression Model 10 (ECM 10) JVET-AE2025, the SEI processing order SEI message in VVC (Draft 5) JVET-AE2027, the Additional conformance bitstreams for VVC multilayer configurations JVET-AE2028, the Optimization of encoders and receiving systems for machine analysis of coded video content (Draft 3) [JVET-AE2030](https://jvet-experts.org/doc_end_user/current_document.php?id=12564), the Common test conditions for optimization of encoders and receiving systems for machine analysis of coded video content [JVET-AE2031](https://jvet-experts.org/doc_end_user/current_document.php?id=12584), and the Technologies under consideration for future extensions of VSEI (draft 1) JVET-AE2032, had been completed and were approved. In a few cases, the corresponding WG 5 N-numbered documents had not yet been uploaded, and this was requested to be done as soon as possible. The software implementations of VTM version 22.0, ECM version 10.0, and NNVC (versions 6.0 and 6.1) were also approved. The latter include modifications of loop filters confirmed by post-meeting AHG recommendations which were also approved by JVET.

Only minor editorial issues were found in the meeting report JVET-AE1000; no need to produce an update was identified (see section 2.14 for details).

The available output documents of the previous meeting and the software had been made available in a reasonably timely fashion.

## Attendance

The list of participants in the JVET meeting can be found in Annexes B1 and B2 of this report.

The meeting was open to those qualified to participate either in ITU-T WP3/16 or ISO/IEC JTC 1/‌SC 29/‌WG 5 (including experts who had been personally invited as permitted by ITU-T or ISO/IEC policies).

Participants had been reminded of the need to be properly qualified to attend. Those seeking further information regarding qualifications to attend future meetings may contact the responsible coordinators.

It was further announced that it is necessary to register for the meeting through the ISO Meetings website for ISO/IEC experts or through the Q6/16 rapporteur for ITU-T experts. The password for meeting access had been sent to registered participants via these channels. Links to the Zoom sessions (without the necessary password) were available in the posted meeting logistics information and the calendar of meeting sessions in the JVET web site.

The following rules were established for those participating remotely via Zoom teleconference meeting:

* Use the “hand-raising” function to enter yourself in the queue to speak (unless otherwise instructed by the session chair). If you are dialed in by phone, request your queue position verbally. The online queue will be interleaved with the room queue, though it may not always be guaranteed that the sequence perfectly follows the sequence by which hand raising occurred.
* Stay muted unless you have something to say. People are muted by default when they join and need to unmute themselves to speak. The chair may mute anyone who is disrupting the proceedings (e.g. by forgetting they have a live microphone while chatting with their family or by causing bad noise or echo).
* Identify who you are and your affiliation when you begin speaking. The same applies for speakers in the room to let online participants know who is speaking.
* Use your full name and company/organization and country affiliation in your joining information, since the participation list of Zoom would also be used to compile the online part of attendance records.
* Turn on the chat window and watch for chair communication and side commentary there as well as by audio.
* Generally do not use video for the teleconferencing calls in order to avoid overloading internet connections; enable only voice and screen sharing.
* Extensive use of screen sharing is encouraged, to enable participants to view the presented material and the meeting notes. At times, multiple sources of screen sharing may be enabled, so it may be necessary for participants to understand that this is happening and to understand how to select which shared screen they want to see.

## Agenda

The agenda for the meeting, for the further development and maintenance of the twin-text video coding technology standards *Advanced Video Coding* (AVC), *High Efficiency Video Coding* (HEVC), *Versatile Video Coding* (VVC)*, Coding-independent Code Points (Video)* (CICP), and *Versatile Supplemental Enhancement Information Messages for Coded Video Bitstreams* (VSEI), as well as related technical reports, software and conformance packages, was as follows:

* Opening remarks and review of meeting logistics and communication practices
* Roll call of participants
* Adoption of the agenda
* Code of conduct policy reminder
* IPR policy reminder and declarations
* Contribution document allocation
* Review of results of the previous meeting
* Review of target dates
* Reports of ad hoc group (AHG) activities
* Report of exploration experiments on neural-network-based video coding
* Report of exploration experiments on enhanced compression beyond VVC capability
* Consideration of contributions on high-level syntax
* Consideration of contributions and communications on project guidance
* Consideration of video coding technology contributions
* Consideration of contributions on conformance and reference software development
* Consideration of contributions on coding-independent code points for video signal type identification
* Consideration of contributions on film grain synthesis technology
* Consideration of contributions on optimization of encoders and receiving systems for machine analysis of coded video content
* Consideration of contributions on errata relating to standards in the domain of JVET
* Consideration of contributions on technical reports relating to standards and exploration study activities in the domain of JVET
* Consideration of contributions providing non-normative guidance relating to standards and exploration study activities in the domain of JVET
* Consideration of information contributions
* Consideration of future work items
* Coordination of visual quality testing
* Liaisons, coordination activities with other organizations
* Review of project editor and liaison assignments
* Approval of output documents and associated editing periods
* Future planning: Determination of next steps, discussion of working methods, communication practices, establishment of coordinated experiments (if any), establishment of AHGs, future meeting planning, other planning issues
* Other business as appropriate for consideration
* Closing

The agenda was approved as suggested.

The times of meeting sessions followed the needs of the face-to-face meeting, with highest priority given to the aim of achieving the goals of the meeting. Typical meeting hours were expected to be 0830-1900 CEST with coffee breaks and lunch breaks as appropriate, however some early morning or late-night sessions were anticipated to be necessary. Sessions were announced in the online JVET calendar in advance as far as possible, but it was anticipated that some activities (such as breakout sessions) could be held at short notice.

## ISO and IEC Code of Conduct reminders

Participants were reminded of the ISO and IEC Codes of Conduct, found at

<https://www.iso.org/publication/PUB100011.html>.

<https://www.iecapc.jp/F/IEC_Code_of_Conduct.pdf>

These include points relating to:

* Complying with legal and statutory obligations
* Performing and acting in good faith, consistent with the purpose, policies and principles of the organization
* Behaving ethically
* Promoting and enabling all voices to be heard
* Engaging constructively in ISO and IEC activities
* Declaring actual and potential conflicts of interest and managing them appropriately
* Protecting confidential information
* Protecting ISO and IEC assets
* Avoiding and preventing any form of bribery or corruption
* Escalating and resolving disputes and upholding agreed resolutions

## IPR policy reminder

Participants were reminded of the IPR policy established by the parent organizations of the JVET and were referred to the parent body websites for further information. The IPR policy was summarized for the participants.

The ITU-T/ITU-R/ISO/IEC common patent policy shall apply. Participants were particularly reminded that contributions proposing normative technical content shall contain a non-binding informal notice of whether the submitter may have patent rights that would be necessary for implementation of the resulting standard. The notice shall indicate the category of anticipated licensing terms according to the ITU-T/ITU-R/ISO/IEC patent statement and licensing declaration form.

This obligation is supplemental to, and does not replace, any existing obligations of parties to submit formal IPR declarations to ITU-T/ITU-R/ISO/IEC.

Participants were also reminded of the need to formally report patent rights to the top-level parent bodies (using the common reporting form found on the database listed below) and to make verbal and/or document IPR reports within the JVET necessary in the event that they are aware of unreported patents that are essential to implementation of a standard or of a draft standard under development.

Some relevant links for organizational and IPR policy information are provided below:

* <http://www.itu.int/ITU-T/ipr/index.html> (common patent policy for ITU-T, ITU-R, ISO, and IEC, and guidelines and forms for formal reporting to the parent bodies)
* <http://ftp3.itu.int/av-arch/jvet-site> (JVET contribution templates)
* <http://www.itu.int/ITU-T/dbase/patent/index.html> (ITU-T IPR database)

The responsible coordinators invited participants to make any necessary verbal reports of previously-unreported IPR in technology that might be considered as prospective candidate for inclusion in future standards, and opened the floor for such reports: No such verbal reports were made.

## Software copyright disclaimer header reminder

It was noted that the VTM and ECM software implementation packages use the same software copyright license header as the HEVC reference software, where the latter had been agreed at the 5th meeting of the JCT-VC and approved by both parent bodies at their collocated meetings at that time. This license header language is based on the BSD license with a preceding sentence declaring that other contributor or third party rights, including patent rights, are not granted by the license, as recorded in [N 10791](http://phenix.it-sudparis.eu/mpeg/doc_end_user/current_document.php?id=27881&id_meeting=16) of the 89th meeting of ISO/IEC JTC 1/‌SC 29/‌WG 11 of June/July 2009. Both ITU and ISO/IEC will be identified in the <OWNER> and <ORGANIZATION> tags in the header. This software header is also used in the process of designing the VTM and ECM software, and for evaluating proposals for technology to be potentially included in these designs. This software or parts thereof might be published by ITU-T and ISO/IEC as an example implementation of a future video coding standard and for use as the basis of products to promote adoption of such technology.

Different copyright statements shall not be committed to the committee software repository (in the absence of subsequent review and approval of any such actions). As noted previously, it must be further understood that any initially-adopted such copyright header statement language could further change in response to new information and guidance on the subject in the future.

These considerations apply to the 360Lib video conversion software and HDRTools as well. The SADL and NNVC packages for neural network-based video coding use the same licensing terms.

Software packages that had been developed in prior work of the JVT, the JCT-VC and the JCT-3V have similar considerations and are maintained according to the past practice in that work.

## Communication practices

The documents for the meeting can be found at <https://jvet-experts.org/>. It was noted that the previous site <http://phenix.int-evry.fr/jvet/> is still accessible, but was converted to read-only. It was reminded to send a notice to the chairs in cases of changes to document titles, authors, etc.

JVET email lists are managed through the site <https://lists.rwth-aachen.de/postorius/lists/jvet.lists.rwth-aachen.de/>, and to send email to the reflector, the email address is [jvet@lists.rwth-aachen.de](mailto:jvet@lists.rwth-aachen.de). Only members of the reflector can send email to the list. However, membership of the reflector is not limited to qualified JVET participants.

It was emphasized that reflector subscriptions and email sent to the reflector must use real names when subscribing and sending messages and subscribers must respond to inquiries regarding the nature of their interest in the work. The current number of subscribers on the JVET email list was 1215 (as of 10 July 2023). All discussions (including those on AVC, HEVC, VVC, CICP, etc.) shall be conducted on the JVET reflector rather than any of the old reflectors (including JVT, JCT-VC, and JCT-3V) which are retained for archiving purposes.

For distribution of test sequences, a password-protected ftp site had been set up at RWTH Aachen University, with a mirror site at FhG-HHI. Accredited members of JVET may contact the responsible JVET coordinators to obtain the password information (but the site is not open for use by others).

It is further emphasized that the document JVET-AD1012 gives valuable hints about communication practices as well as other IT resources used in JVET, such as software, conformance, and test materials.

## Terminology

* **ACT**: Adaptive colour transform
* **AFF**: Adaptive frame-field
* **AI**: All-intra
* **AIF**: Adaptive interpolation filtering
* **ALF**: Adaptive loop filter
* **AMP**: Asymmetric motion partitioning – a motion prediction partitioning for which the sub-regions of a region are not equal in size (in HEVC, being N/2x2N and 3N/2x2N or 2NxN/2 and 2Nx3N/2 with 2N equal to 16 or 32 for the luma component)
* **AMVP**: Adaptive motion vector prediction
* **AMT or MTS**: Adaptive multi-core transform, or multiple transform selection
* **AMVR**: (Locally) adaptive motion vector resolution
* **APS**: Adaptation parameter set
* **ARC**: Adaptive resolution conversion (synonymous with DRC, and a form of RPR)
* **ARMC**: Adaptive re-ordering of merge candidates
* **ARSS**: Adaptive reference sample smoothing
* **ATM**: AVC-based multiview and 3D test model
* **ATMVP** or “subblock-based temporal merging candidates”: Alternative temporal motion vector prediction
* **AU**: Access unit
* **AUD**: Access unit delimiter
* **AVC**: Advanced video coding – the video coding standard formally published as ITU-T Recommendation H.264 and ISO/IEC 14496-10
* **BA**: Block adaptive
* **BC**: See CPR or IBC
* **BCW**: Biprediction with CU based weighting
* **BD**: Bjøntegaard-delta – a method for measuring percentage bit rate savings at equal PSNR or decibels of PSNR benefit at equal bit rate (e.g., as described in document VCEG-M33 of April 2001)
* **BDOF**: Bi-directional optical flow (formerly known as **BIO**)
* **BDPCM**: Block-wise DPCM
* **BL**: Base layer
* **BMS**: Benchmark set (no longer used), a former preliminary compilation of coding tools on top of VTM, which provide somewhat better compression performance, but are not deemed mature for standardzation
* **BoG**: Break-out group
* **BR**: Bit rate
* **BT**: Binary tree
* **BV**: Block vector (used for intra BC prediction)
* **CABAC**: Context-adaptive binary arithmetic coding
* **CBF**: Coded block flag(s)
* **CC**: May refer to context-coded, common (test) conditions, or cross-component
* **CCALF**: Cross-component ALF
* **CCLM**: Cross-component linear model
* **CCCM**: Cross-component convolutional model
* **CCP**: Cross-component prediction
* **CCSAO**:Cross-component SAO
* **CE**: Core Experiment – a coordinated experiment conducted toward assessment of coding technology
* **CG**: Coefficient group
* **CGS**: Colour gamut scalability (historically, coarse-grained scalability)
* **CIIP**: Combined inter/intra prediction
* **CIPF**: CABAC initialization from the previous frame
* **CL-RAS**: Cross-layer random-access skip
* **CPB**: Coded picture buffer
* **CPMV**: Control-point motion vector
* **CPMVP**: Control-point motion vector prediction (used in affine motion model)
* **CPR**: Current-picture referencing, also known as IBC – a technique by which sample values are predicted from other samples in the same picture by means of a displacement vector called a block vector, in a manner conceptually similar to motion-compensated prediction
* **CST**: Chroma separate tree
* **CTC**: Common test conditions
* **CVS**: Coded video sequence
* **DCI**: Decoder capability information
* **DCT**: Discrete cosine transform (sometimes used loosely to refer to other transforms with conceptually similar characteristics)
* **DCTIF**: DCT-derived interpolation filter
* **DF**: Deblocking filter
* **DIMD**: Decoder intra mode derivation
* **DMVR**: Decoder motion vector refinement
* **DoCR**: Disposition of comments report
* **DPB**: Decoded picture buffer
* **DPCM**: Differential pulse-code modulation
* **DPS**: Decoding parameter sets
* **DRC**: Dynamic resolution conversion (synonymous with ARC, and a form of RPR)
* **DT**: Decoding time
* **DQ**: Dependent quantization
* **ECS**: Entropy coding synchronization (typically synonymous with WPP)
* **EMT**: Explicit multiple-core transform
* **EOTF**: Electro-optical transfer function – a function that converts a representation value to a quantity of output light (e.g., light emitted by a display
* **EPB**: Emulation prevention byte (as in the emulation\_prevention\_byte syntax element)
* **ECM**: Enhanced compression model – a software codebase for future video coding exploration
* **ECV**: Extended Colour Volume (up to WCG)
* **EL**: Enhancement layer
* **EOS**: End of (coded video) sequence
* **ET**: Encoding time
* **FRUC**: Frame rate up conversion (pattern matched motion vector derivation)
* **GCI**: General constraints information
* **GDR**: Gradual decoding refresh
* **GLM**: Gradient linear model
* **GOP**: Group of pictures (somewhat ambiguous)
* **GPM**: Geometry partitioning mode
* **GRA**: Gradual random access
* **HBD**: High bit depth
* **HDR**: High dynamic range
* **HEVC**: High Efficiency Video Coding – the video coding standard developed and extended by the JCT-VC, formalized by ITU-T as Rec. ITU-T H.265 and by ISO/IEC as ISO/IEC 23008-2
* **HLS**: High-level syntax
* **HM**: HEVC Test Model – a video coding design containing selected coding tools that conforms to the HEVC standard design (possibly with under-development extensions) – now also used especially in reference to the (non-normative) encoder algorithms (see WD and TM)
* **HMVP**: History based motion vector prediction
* **HOP**: High-complexity operating point for neural network-based filter.
* **HRD**: Hypothetical reference decoder
* **HTM**: HEVC-based multiview and 3D test model (developed by JCT-3V)
* **HyGT**: Hyper-cube Givens transform (a type of NSST)
* **IBC** (also **Intra BC**): Intra block copy, also known as CPR – a technique by which sample values are predicted from other samples in the same picture by means of a displacement vector called a block vector, in a manner conceptually similar to motion-compensated prediction
* **IBDI**: Internal bit-depth increase – a technique by which lower bit-depth (8 bits per sample) source video is encoded using higher bit-depth signal processing, ordinarily including higher bit-depth reference picture storage (ordinarily 12 bits per sample)
* **IBF**: Intra boundary filtering
* **ILP**: Inter-layer prediction (in scalable coding)
* **ILRP**: Inter-layer reference picture
* **IPCM**: Intra pulse-code modulation (similar in spirit to IPCM in AVC and HEVC)
* **IRAP**: Intra random access picture
* **ISP**: Intra subblock partitioning
* **JCCR**: Joint coding of chroma residuals
* **JCT-3V**: Joint collaborative team on 3D video (for AVC and HEVC)
* **JCT-VC**: Joint collaborative team on video coding (for HEVC)
* **JEM**: Joint exploration model – a software codebase previously used for video coding exploration
* **JM**: Joint model – the primary software codebase that has been developed for the AVC standard
* **JSVM**: Joint scalable video model – another software codebase that has been developed for the AVC standard, which includes support for scalable video coding extensions
* **JVET**: Joint video experts team (initially for VVC, later expanded)
* **JVT**: Joint video team (for AVC)
* **KLT**: Karhunen-Loève transform
* **LB** or **LDB**: Low-delay B – the variant of the LD conditions that uses B pictures
* **LD**: Low delay – one of two sets of coding conditions designed to enable interactive real-time communication, with less emphasis on ease of random access (contrast with RA). Typically refers to LB, although also applies to LP
* **LFNST**: Low-frequency non-separable transform
* **LIC**: Local illumination compensation
* **LM**: Linear model
* **LMCS**: Luma mapping with chroma scaling (formerly sometimes called “in-loop reshaping”)
* **LOP**: Low-complexity operating point for neural network-based filter.
* **LP** or **LDP**: Low-delay P – the variant of the LD conditions that uses P frames
* **LUT**: Look-up table
* **LTRP**: Long-term reference picture
* **MANE**: Media-aware network element
* **MC**: Motion compensation
* **MCP**: Motion compensated prediction
* **MCTF**: Motion compensated temporal pre-filtering
* **MDNSST**: Mode dependent non-separable secondary transform
* **MIP**: Matrix-based intra prediction
* **MMLM**: Multi-model (cross component) linear mode
* **MMVD**: Merge with MVD
* **MPEG**: Moving picture experts group (an alliance of working groups and advisory groups in ISO/IEC JTC 1/‌SC 29, one of the two parent bodies of the JVET)
* **MPM**: Most probable mode (in intra prediction)
* **MRL**: Multiple reference line intra prediction
* **MV**: Motion vector
* **MVD**: Motion vector difference
* **NAL**: Network abstraction layer
* **NNVC**: Neural network-based video coding (experimental software package)
* **NSQT**: Non-square quadtree
* **NSST**: Non-separable secondary transform
* **NUH**: NAL unit header
* **NUT**: NAL unit type (as in AVC and HEVC)
* **OBMC**: Overlapped block motion compensation (e.g., as in H.263 Annex F)
* **OETF**: Opto-electronic transfer function – a function that converts to input light (e.g., light input to a camera) to a representation value
* **OLS**: Output layer set.
* **OOTF**: Optical-to-optical transfer function – a function that converts input light (e.g. l,ight input to a camera) to output light (e.g., light emitted by a display).
* **ONNX**: Open Neural Network Exchange – a format used to convert code from common neural network software packages into SADL code.
* **operation point**: A temporal subset of an OLS.
* **PDPC**: Position-dependent (intra) prediction combination.
* **PERP**: Padded equirectangular projection (a 360° projection format).
* **PH**: Picture header.
* **PHEC**: Padded hybrid equiangular cubemap (a 360° projection format).
* **PMMVD**: Pattern-matched motion vector derivation.
* **POC**: Picture order count.
* **PoR**: Plan of record.
* **PROF**: Prediction refinement with optical flow
* **PPS**: Picture parameter set (as in AVC and HEVC).
* **PTL**: Profile/tier/level combination.
* **QM**: Quantization matrix (as in AVC and HEVC).
* **QP**: Quantization parameter (as in AVC and HEVC, sometimes confused with quantization step size).
* **QT**: Quadtree.
* **RA**: Random access – a set of coding conditions designed to enable relatively-frequent random access points in the coded video data, with less emphasis on minimization of delay (contrast with LD).
* **RADL**: Random-access decodable leading (type of picture).
* **RASL**: Random-access skipped leading (type of picture).
* **R-D**: Rate-distortion.
* **RDO**: Rate-distortion optimization.
* **RDOQ**: Rate-distortion optimized quantization.
* **RDPCM**: Residual DPCM
* **ROT**: Rotation operation for low-frequency transform coefficients.
* **RPL**: Reference picture list.
* **RPLM**: Reference picture list modification.
* **RPR**: Reference picture resampling (e.g., as in H.263 Annex P), a special case of which is also known as ARC or DRC.
* **RPS**: Reference picture set.
* **RQT**: Residual quadtree.
* **RRU**: Reduced-resolution update (e.g. as in H.263 Annex Q).
* **RVM**: Rate variation measure.
* **SADL**: Small adhoc deep learning library
* **SAO**: Sample-adaptive offset.
* **SBT**: Subblock transform.
* **SbTMVP**: Subblock based temporal motion vector prediction.
* **SCIPU**: Smallest chroma intra prediction unit.
* **SD**: Slice data; alternatively, standard-definition.
* **SDH**: Sign data hiding.
* **SDT**: Signal-dependent transform.
* **SE**: Syntax element.
* **SEI**: Supplemental enhancement information (as in AVC and HEVC).
* **SH**: Slice header.
* **SHM**: Scalable HM.
* **SHVC**: Scalable high efficiency video coding.
* **SIF**: Switchable (motion) interpolation filter.
* **SIMD**: Single instruction, multiple data.
* **SMVD**: Symmetric MVD.
* **SPS**: Sequence parameter set (as in AVC and HEVC).
* **STMVP**: Spatial-temporal motion vector prediction.
* **STRP**: Short-term reference picture.
* **STSA**: Step-wise temporal sublayer access.
* **TBA/TBD/TBP**: To be announced/determined/presented.
* **TGM**: Text and graphics with motion – a category of content that primarily contains rendered text and graphics with motion, mixed with a relatively small amount of camera-captured content.
* **TIMD**: Template-based intra mode derivation
* **TM**: Template matching.
* **TMVP**: Temporal motion vector prediction.
* **TS**: Transform skip.
* **TSRC**: Transform skip residual coding.
* **TT**: Ternary tree.
* **UCBDS**: Unrestricted center-biased diamond search.
* **UGC**: User-generated content.
* **UWP**: Unequal weight prediction.
* **VCEG**: Visual coding experts group (ITU-T Q.6/16, the relevant rapporteur group in ITU-T WP3/16, which is one of the two parent bodies of the JVET).
* **VCM**: Video coding for machines.
* **VPS**: Video parameter set – a parameter set that describes the overall characteristics of a coded video sequence – conceptually sitting above the SPS in the syntax hierarchy.
* **VQA**: Visual quality assessment.
* **VT**: Verification testing.
* **VTM**: VVC Test Model.
* **VUI**: Video usability information.
* **VVC**: Versatile Video Coding, the standardization project developed by JVET.
* **WAIP**: Wide-angle intra prediction
* **WCG**: Wide colour gamut.
* **WG**: Working group, a group of technical experts (usually used to refer to WG 11, a.k.a. MPEG).
* **WPP**: Wavefront parallel processing (usually synonymous with ECS).
* Block and unit names in HEVC:
  + **CTB**: Coding tree block (luma or chroma) – unless the format is monochrome, there are three CTBs per CTU.
  + **CTU**: Coding tree unit (containing both luma and chroma, synonymous with LCU), with a size of 16x16, 32x32, or 64x64 for the luma component.
  + **CB**: Coding block (luma or chroma), a luma or chroma block in a CU.
  + **CU**: Coding unit (containing both luma and chroma), the level at which the prediction mode, such as intra versus inter, is determined in HEVC, with a size of 2Nx2N for 2N equal to 8, 16, 32, or 64 for luma.
  + **PB**: Prediction block (luma or chroma), a luma or chroma block of a PU, the level at which the prediction information is conveyed or the level at which the prediction process is performed in HEVC.
  + **PU**: Prediction unit (containing both luma and chroma), the level of the prediction control syntax within a CU, with eight shape possibilities in HEVC:
    - **2Nx2N**: Having the full width and height of the CU.
    - **2NxN (or Nx2N)**: Having two areas that each have the full width and half the height of the CU (or having two areas that each have half the width and the full height of the CU).
    - **NxN**: Having four areas that each have half the width and half the height of the CU, with N equal to 4, 8, 16, or 32 for intra-predicted luma and N equal to 8, 16, or 32 for inter-predicted luma – a case only used when 2N×2N is the minimum CU size.
    - **N/2x2N** paired with **3N/2x2N** or **2NxN/2** paired with **2Nx3N/2**: Having two areas that are different in size – cases referred to as AMP, with 2N equal to 16 or 32 for the luma component.
  + **TB**: Transform block (luma or chroma), a luma or chroma block of a TU, with a size of 4x4, 8x8, 16x16, or 32x32.
  + **TU**: Transform unit (containing both luma and chroma), the level of the residual transform (or transform skip or palette coding) segmentation within a CU (which, when using inter prediction in HEVC, may sometimes span across multiple PU regions).
* Block and unit names in VVC:
  + **CTB**: Coding tree block (luma or chroma) – there are three CTBs per CTU in a P or B slice or in an I slice that uses a single tree, and one CTB per luma CTU and two CTBs per chroma CTU in an I slice that uses separate trees.
  + **CTU**: Coding tree unit (synonymous with LCU, containing both luma and chroma in a P or B slice or in an I slice that uses a single tree, containing only luma or only chroma in an I slice that uses separate trees), with a size of 16x16, 32x32, 64x64, or 128x128 for the luma component.
  + **CB**: Coding block, a luma or chroma block in a CU.
  + **CU**: Coding unit (containing both luma and chroma in P/B slice, containing only luma or chroma in I slice), a leaf node of a QTBT. It’s the level at which the prediction process and residual transform are performed in JEM. A CU can be square or rectangle shape.
  + **PB**: Prediction block, a luma or chroma block of a PU.
  + **PU**: Prediction unit, has the same size as a CU in the VVC context.
  + **TB**: Transform block, a luma or chroma block of a TU.
  + **TU**: Transform unit, has the same size as a CU in the VVC context.

## Standards, TRs, supplements and technical papers approval and publication status

* MPEG-2 | H.262 (coding specification is common text)
  + ITU-T H.262 V3 was approved in 2012-02; Amd.1 was approved in 2013-03 and was not published separately; it was instead incorporated directly into the V3 text and published 2013-09
  + ISO/IEC 13818-2:2013 V3 FDIS ballot closed 2012-05-08; FDAM 1 ballot closed 2013-04-12 and was not published separately; it was instead incorporated directly into the V3 text and published 2013-10
  + Conformance testing (not joint with ITU-T)
    - ISO/IEC 13818-4:2004 V2 FDIS closed 2004-08-22, published 2004-12-12; it specifies conformance testing for Part 1 (Systems), Part 2 (Video), Part 3 (Audio), and Part 7 (AAC)
    - ISO/IEC 13818-4:2004/Amd 3:2009 Level for 1080@50p/60p conformance testing
    - Cor 1:2007, Cor 2:2009, Cor 3:2012, Cor 4:2011 may also have video relevance
  + Reference software (not joint with ITU-T)
    - ISO/IEC TR 13818-5:2005 V2 FDIS closed 2005-07-24, published 2005-10; it specifies reference software for Part 1 (Systems), Part 2 (Video), Part 3 (Audio), Part 7 (AAC) and Part 11 (IPMP)
* AVC (twin text)
  + ITU-T H.264 V14 was Consented at 22nd meeting on 2021-04-30 (with annotated regions, shutter interval, and miscellaneous corrections), approved 2021-08-22, published 2021-10-13
  + ISO/IEC 14496-10:2020 (Ed. 9) FDIS ballot closed 2020-11-27, published 2020-12-15
  + ISO/IEC 14496-10:2022 (Ed. 10), had been forwarded from DIS directly for publication 2022-01-21 (with annotated regions, shutter interval, and miscellaneous corrections) with an editing period, submitted to ITTF in 2022-05 after consultation with ISO staff on format of graphics files, upgraded to “DIS approved for registration” in ISO Project system 2022-07-04, published 2022-11-07
  + Preliminary draft text for YCgCo-Re and YCgCo-Ro issued at 26th meeting, second draft including SMPTE ST 2128 issued at 28th meeting 2022-10, third draft issued at 29th meeting 2023-01, fourth draft issued at 30th meeting 2023-04, formal project requested and CD of 11th edition issued at 31st meeting 2023-07, ready for progression to DIS at the current meeting.
  + Conformance testing (twin text)
    - ITU-T H.264.1 V6 Approved 2016-02-13, published 2016-06-17
    - Various amendments of ISO/IEC 14496-4:2004, including:
      * ISO/IEC 14496-4:2004/AMD 6:2005 Advanced Video Coding conformance
      * ISO/IEC 14496-4:2004/AMD 9:2006 AVC fidelity range extensions conformance
      * ISO/IEC 14496-4:2004/AMD 30:2009 Conformance testing for new profiles for professional applications
      * ISO/IEC 14496-4:2004/AMD 31:2009 Conformance testing for SVC profiles
      * ISO/IEC 14496-4:2004/AMD 38:2010 Conformance testing for Multiview Video Coding
      * ISO/IEC 14496-4:2004/AMD 41:2014 Conformance testing of MVC plus depth extension of AVC
      * ISO/IEC 14496-4:2004/AMD 42:2014 Conformance testing of Multi-Resolution Frame Compatible Stereo Coding extension of AVC
      * ISO/IEC 14496-4:2004/AMD 43:2015 3D-AVC conformance testing
      * ISO/IEC 14496-4:2004/AMD 45:2016 Conformance Testing for the Multi-resolution Frame Compatible Stereo Coding with Depth Maps Extension of AVC
  + Reference software (twin text)
    - ITU-T H.264.2 V7 Approved 2016-02-13, published 2016-05-30
    - Various amendments of ISO/IEC 14496-5:2001 have been published, including:
      * ISO/IEC 14496-5:2001/AMD 6:2005 Advanced Video Coding (AVC) and High Efficiency Advanced Audio Coding (HE AAC) reference software
      * ISO/IEC 14496-5:2001/AMD 8:2006 AVC fidelity range extensions reference software
      * ISO/IEC 14496-5:2001/AMD 15:2010 Reference software for Multiview Video Coding
      * ISO/IEC 14496-5:2001/AMD 18:2008 Reference software for new profiles for professional applications
      * ISO/IEC 14496-5:2001/AMD 19:2009 Reference software for Scalable Video Coding
      * ISO/IEC 14496-5:2001/AMD 33:2015 Reference software for MVC plus depth extension of AVC
      * ISO/IEC 14496-5:2001/AMD 34:2014 Reference software of the multi-resolution frame compatible stereo coding of AVC
      * ISO/IEC 14496-5:2001/AMD 35:2015 3D-AVC Reference software
      * ISO/IEC 14496-5:2001/AMD 39:2016 Reference software for the Multi-resolution Frame Compatible Stereo Coding with Depth Maps of AVC
      * ISO/IEC 14496-5:2001/AMD 42:2017 Reference software for the alternative depth information SEI message extension of AVC
* HEVC (twin text)
  + ITU-T H.265 V7 approved 2019-11-29, published 2020-01-10
  + ISO/IEC 23008-2:2020 (Ed. 4) FDIS ballot closed 2020-07-16, published 2020-08-27
  + ITU-T H.265 V8 Consented at the 22nd meeting (shutter interval information SEI message and miscellaneous corrections), published 2020-10-13
  + ISO/IEC 23008-2:2020/AMD 1:2021 (shutter interval information SEI message) published 2021-07-12
  + ISO/IEC 23008-2:202x (Ed. 5) began as CDAM 2 High-range levels output of 25th meeting of January 2022, CDAM ballot closed 2022-04-15, conversion to 5th edition with miscellaneous corrections planned at 26th meeting of 2022-04, text submitted for DIS ballot 2022-07-10, DIS ballot closed 2023-01-10, FDIS issued 29th meeting of 2023-01, FDIS ballot opened 2023-08-06, closed 2023-10-02, pending publication
  + ITU-T H.265 V9 Consented at 31st meeting 2023-07, approved and pre-published 2023-09.
  + Preliminary draft text for YCgCo-Re and YCgCo-Ro issued at 26th meeting 2022-04, second draft including SMPTE ST 2128 issued at 28th meeting 2022-10, third draft at 29th meeting 2023-01, fourth draft at 30th meeting 2023-04, formal work item requested and CDAM1 issued 31st meeting 2023-07.
  + Conformance testing (twin text)
    - ITU-T H.265.1 V3 approved 2018-10-14, published 2019-01-15
    - ISO/IEC 23008-8:2018 (Ed. 2) Conformance specification for HEVC, published 2018-08-06
    - ISO/IEC 23008-8:2018/AMD 1:2019 Conformance testing for HEVC screen content coding (SCC) extensions and non-intra high throughput profiles, published 2019-10-15
  + Reference software (twin text)
    - ITU-T H.265.2 V4 approved 2016-12-22, published 2017-04-10
    - ISO/IEC 23008-5:2017 (Ed. 2) Reference software for high efficiency video coding, published 2017-03-01
    - ISO/IEC 23008-5:2017/AMD 1:2017 Reference software for screen content coding extensions, published 2017-11-09
* VVC (twin text)
  + ITU-T H.266 V1 approved 2020-08-29, published 2020-11-10
  + ISO/IEC 23090-3:2021 (Ed. 1) published 2021-02-16
  + ITU-T H.266 V2 with operation range extensions, Consented 2022-01-28, Last Call began 2022-04-01, Approved 2022-04-29, pre-published 2022-06-06, published 2022-07-12
  + ISO/IEC 23090-3:2022 (Ed. 2) with operation range extensions, approval at WG level to proceed to FDIS 2022-01-21, published 2022-09-25
  + ISO/IEC 23090-3:202x (Ed. 2) / Amd.1 New level and systems-related supplemental enhancement information, CDAM 1 issued from 26th meeting, ballot closed 2022-07-14, DAM 1 issued from 27th meeting, ballot closed 2023-01-03, FDIS issued 2023-07
  + ITU-T H.266 V3 Consented 2023-07, approved and pre-published 2023-09
  + Conformance testing (twin text)
    - ITU-T H.266.1 V1 Consented 2022-01-28, Last Call began 2022-04-01, Approved 2022-04-29, pre-published 2022-05-17, published 2022-07-12
    - ISO/IEC 23090-15:2022 V1 approval at WG level to proceed to FDIS 2022-10-15, upgraded to “DIS approved for registration” in ISO Projects system 2021-10-24, upgraded to “FDIS registered for formal approval” 2022-07-11, FDIS ballot closed 2022-11-04, published 2022-11-24
    - ISO/IEC 23090-15:202x Amd.1 Operation range extensions – DAM 1 issued from 25th meeting 2022-01-21, upgraded to “CD approved for registration as DIS” status in ISO Projects system 2022-05-31, upgraded to “DIS registered” 2022-06-22, DAM ballot closed 2022-11-15, consolidated into FDIS 3rd edition issued as an output of the 29th meeting in January 2023 (awaiting ballot at the time of this meeting)
    - ITU-T H.266.1 V4 Consented 2023-07, approved and pre-published 2023-09.
  + Reference software (twin text)
    - ITU-T H.266.2 V1 Consented 2022-01-28, Last Call began 2022-04-01, Approved 2022-04-29, pre-published 2022-05-17, published 2022-07-12
    - ISO/IEC 23090-16:2022 V1 approval at WG level to proceed to FDIS 2022-01-21, upgraded to “DIS approved for registration” status in ISO Projects system 2022-04-21, upgraded to “FDIS registered for formal approval” 2022-04-22, FDIS ballot initiated 2022-07-24, FDIS ballot closed 2022-09-19, published 2022-10-23
* VSEI (twin text)
  + ITU-T H.274 V1 approved 2020-08-29, published 2020-11-10
  + ISO/IEC 23002-7:2021 (Ed. 1) published 2021-01-28
  + ITU-T H.274 V2 Consented 2022-01-28, Last Call began 2022-04-01, Approved 2022-05-22 (after 1 Last Call comment and Additional Review), pre-published 2022-06-17, published 2022-07-25
  + ISO/IEC 23002-7:2022 (Ed. 2) approval at WG level to proceed to FDIS 2022-01-21, upgraded to “DIS approved for registration” status in ISO Projects system 2022-05-05 and “FDIS registered for formal approval” 2022-05-08, FDIS ballot closed 2022-09-27, published 2022-10-30
  + ISO/IEC 23002-7:202x (2nd Ed.) Amd.1 Request for new edition and CD for additional SEI messages issued at 27th meeting, ballot closed 2022-10-10, DAM registered 2022-11-13, DAM ballot closed 2022-04-06,[m62571](https://dms.mpeg.expert/doc_end_user/current_document.php?id=86620&id_meeting=194) FDIS 3rd edition issued 2023-07 (pending ballot)
  + ITU-T H.274 V3 Consent 2023-07, approved 2023-07, pending publication.
* CICP (twin text)
  + ISO/IEC 23091-2:2021 (Ed. 2) had been forwarded from DIS directly for publication in 2021-04 and published 2021-10-18
  + ITU-T H.273 V2 (with 4:2:0 sampling alignment and corrections for range of values for sample aspect ratio, ICTCP equations for HLG, and transfer characteristics function for sYCC of IEC 61966-2-1) Consented on 2021-04-30, Last Call closed during the 23rd meeting with approval on 2021-07-14, published 2021-09-24
  + ISO/IEC 23091-2:202x (Ed. 3) Request for new edition and CD for new edition (including YCgCo-Re and YCoCg-Ro) issued at 27th meeting, ballot closed 2022-10-10, DIS registered 2022-11-13, DIS ballot closed 2023-04-06, preliminary draft text for including SMPTE ST 2128 issued at 28th meeting, incorporated into preliminary FDIS at 30th meeting 2023-04, FDIS issued 2023-07
  + ITU-T H.273 Consent 2023-07, approved 2023-09, publication waiting for publication of SMPTE ST 2128.
* Conversion and coding practices for HDR/WCG Y′CbCr 4:2:0 video with PQ transfer characteristics (twin text)
  + H.Sup15 V1, approved 2017-01-27, published 2017-04-12
  + ISO/IEC TR 23008-14:2018 published 2018-08
* Signalling, backward compatibility and display adaptation for HDR/WCG video coding (twin text)
  + H.Sup18 V1, approved 2017-10-27, published 2018-01-18
  + ISO/IEC TR 23008-15:2018 published 2018-08
* Usage of video signal type code points (twin text)
  + H.Sup19 V3 approved 2021-04-30, published 2021-06-04
  + ISO/IEC TR 23091-4 (Ed. 3) published 2021-05-23
* Working practices using objective metrics for evaluation of video coding efficiency experiments (twin text)
  + HSTP-VID-WPOM V1: approved 2020-07-03, published 2020-11
  + ISO/IEC TR 23002-8 (Ed. 1) published 2021-05-20
* Film grain synthesis technologies for video applications (twin text)
  + ISO/IEC TR 23002-9 Request for subdivision and WD 1 issued at 25th meeting 2022-01-21, WD 2 issued at 27th meeting, WD 3 issued at 28th meeting, CDTR issued at 29th meeting 2023-07, consultation period ended 2023-07-09 (ready for DTR at this meeting)
* The following freely available standards are published here in ISO/IEC:  
  <https://standards.iso.org/ittf/PubliclyAvailableStandards/index.html> as of 2023-10-09:
  + ISO/IEC 13818-4:2004 Conformance for MPEG-2
  + ISO/IEC 13818-4:2004/Amd 3:2009 Level for 1080@50p/60p conformance testing
  + ISO/IEC TR 13818-5:2005 Software simulation for MPEG-2
  + Various amendments of ISO/IEC 14496-4:2004 Conformance for AVC
  + Various amendments of ISO/IEC 14496-5:2001 Reference software for AVC
  + ISO/IEC 14496-10:2022 (Ed. 10) AVC
  + ISO/IEC 23002-7:2022 (Ed. 2) – VSEI
  + ISO/IEC 23008-2:2020 (Ed. 4) HEVC
  + ISO/IEC 23090-3:2022 (Ed. 2) VVC
  + ISO/IEC 23090-15:2022 (Ed. 1) Conformance for VVC
  + ISO/IEC 23090-16:2022 (Ed. 1) Reference software for VVC
  + ISO/IEC 23091-2:2021 (Ed. 2) Video CICP
* The following standards that have been intended by JVET to be publicly available were not available at <https://standards.iso.org/ittf/PubliclyAvailableStandards/index.html> as of 2023-05-26 and this was still the case as of 2023-10-06. (These should be checked for previously issued requests for free availability.)
  + ISO/IEC 23008-2:2020 (Ed. 4) Amd.1:2021: Shutter interval information SEI message, published 2021-07-12 (has not been requested)
  + ISO/IEC 23008-5:2017 (Ed. 2) Reference software for high efficiency video coding, published 2017-03-01
  + ISO/IEC 23008-5:2017/AMD 1:2017 Reference software for screen content coding extensions, published 2017-11-09
  + ISO/IEC 23008-8:2018 (Ed. 2) Conformance specification for HEVC, published 2018-08, published 2018-08-06
  + ISO/IEC 23008-8:2018/AMD 1:2019 Conformance testing for HEVC screen content coding (SCC) extensions and non-intra high throughput profiles, published 2019-10-15
* It appears necessary to check if all older software and conformance packages are publicly available – it might be that it was never requested, e.g. for those that were produced by JCT-3V. This topic was left TBD until the next meeting – perhaps it would be best to compile a list of all relevant software and conformance parts of AVC, HEVC, MPEG-2 aka H.262, CICP, and request these in bulk.

## Draft standards progression status

* AVC colour type indicators for YCgCo-Re, YCgCo-Ro, and SMPTE ST 2128 (IPT-PQ-C2) and XXX are in a CD of the 11th edition issued in July 2023 (WG 5 N 218).
* HEVC 23008-2:202x (5th ed.) CDAM1 New profiles, colour descriptors, and SEI messages, with colour type indicators for YCgCo-Re, YCgCo-Ro, and SMPTE ST 2128 (IPT-PQ-C2) and XXX was issued in July 2023 (WG 5 N 226)
* HEVC new levels (from JVET-Z1005) – ISO/IEC 23008-2 DIS of new edition of HEVC was issued from the April 2022 26th meeting, incorporating Amd.1 and corrigenda items (ballot closed 2023-01-10, ballot comments in the Summary of Voting document [m61834](https://dms.mpeg.expert/doc_end_user/current_document.php?id=85619&id_meeting=193)); note that Amd.1 = shutter interval SEI is already included in latest ITU-T edition of H.265. It is noted that there are potential additional items (corrigenda+tickets, YCgCo-Re and YCgCo-Ro draft, SMPTE ST 2128, multiview profiles draft) where only corrigenda items were included in the FDIS text based on ballot comments, ballot had not been started yet. ITU-T consent for a new edition is planned for July 2023. It was noted that the referencing of VSEI is also somewhat different in the ITU-T and ISO/IEC versions of HEVC and/or AVC, which might be aligned at the next convenient time (basically editorial – e.g., the ITU version of AVC specifies the annotated regions SEI message without referencing VSEI, whereas the ISO/IEC version references VSEI for the syntax and semantics of that SEI message). However, there is currently no other need for HEVC to reference the VSEI standard. An FDIS for HEVC was issued as an output of the 29th meeting in January 2023 (and it does not reference VSEI). Its ballot began 2023-08-06 and closed 2023-10-02, and it was pending publication. A new edition of H.265 (v9) was Consented in July 2023, and approved and pre-published in September 2023 (not referencing VSEI).
* VVC new level and systems-related supplemental enhancement information (from JVET-AA2005) – VVC DAM was issued from 27th meeting, ballot closed 2023-01-03, ballot comments in the Summary of Voting document [m61833](https://dms.mpeg.expert/doc_end_user/current_document.php?id=85618&id_meeting=193). This was converted into a preliminary FDIS of VVC 3rd edition ([WG 5 N 183](https://dms.mpeg.expert/doc_end_user/current_document.php?id=86365&id_meeting=193)) at the 29th meeting of January 2023, anticipating that some alignment would be necessary with the ongoing VSEI amendment. Another preliminary FDIS was issued (WG 5 N 202) from the April meeting. The FDIS was then issued (WG 5 N 228) from the 31st meeting in July 2023. A new edition of H.266 was Consented in July 2023, approved in September 2023 and currently pending publication.
* VVC Conformance testing for operation range extensions – (from JVET-Y2026) – the DAM ballot closed 2022-11-15 (ballot comments in the Summary of Voting document [m61832](https://dms.mpeg.expert/doc_end_user/current_document.php?id=85617&id_meeting=193)), and this was consolidated into an FDIS at the 29th meeting, but the ballot had not been started yet. ITU-T H.266.1 was Consented in July 2023 and approved and pre-published in September 2023.
* VSEI additional SEI messages (from JVET-AB2006) – VSEI DAM (JVET draft 3) was issued from the 28th meeting and a DAM ballot was issued, Summary of Voting document is available as [m62571](https://dms.mpeg.expert/doc_end_user/current_document.php?id=86620&id_meeting=194). The FDIS of a new edition of ISO/IEC 23002-7 was issued (WG 5 N 220) from the 31st meeting in July 2023 and also reached ITU-T Consent at that meeting. H.274 v3 was approved in September 2023 and currently pending publication.
* Film grain synthesis technology for video applications – JVET draft 4 was issued at the 29th meeting (JVET-AC2020), and the ISO/IEC 23002-9 CDTR was issued (a request to start work on the TR had been made at the 25th meeting), and the CDTR consultation period ended 2023-07-09. A DTR ballot was issued from the 31st meeting in July 2023 and results are expected prior to the 33rd meeting in January 2024. (It was noted that a second DTR could become necessary in case of comments). The publication limit date was reportedly 2023-08-09, so action to extend that date may be needed. ITU-T approval would be anticipated in April 2024.
* Video CICP new edition draft for YCgCo-Re and YCgCo-Ro (from JVET-Z1003), an ISO/IEC 23091-2 preliminary FDIS was issued from the 30th meeting and the Summary of Voting document was available as [m62572](https://dms.mpeg.expert/doc_end_user/current_document.php?id=86621&id_meeting=194) and a draft DoC had been issued as WG 5 [N 205](https://sd.iso.org/documents/ui/#!/browse/iso/iso-iec-jtc-1/iso-iec-jtc-1-sc-29/iso-iec-jtc-1-sc-29-wg-5/library/2/Draft%20disposition%20of%20comments%20received%20on%20ISO-IEC%20DIS%2023091-2%3A202X). There was a delay in the submittal of the FDIS due to dependency on the status of SMPTE ST 2128, which was tentatively included in the preliminary FDIS, based on an NB comment. The video CICP colour type indicator for SMPTE ST 2128 had been drafted and incorporated into the preliminary FDIS issued at the 30th meeting of April 2023. It had been reported that the specification was expected to become finalized in the SMPTE meeting in March 2023, but this had not yet happened, so the production of the FDIS was delayed. ITU-T Consent for H.273 v3 proceeded at the 31st meeting of July 2023 (to prevent undue delay since SG16 does not meet very frequently) and the text was approved in September 2023, but the text was on hold pending the publication of SMPTE ST 2128.
* A request for free availability in ISO/IEC has to be made for each edition, amendment and corrigendum, and the request needs to be approved in the WG 5 Recommendations. A request form also needs to be filled out (but the form does not need to be issued as a WG 5 document). A freely available URL for the ITU publication should be provided for the following parts:
  + For the ongoing work items, when they become finalized
  + ISO/IEC 23008-2:2020/Amd.1:2021 – HEVC FDAM issued 20th meeting (October 2020), public availability not yet requested but may not be necessary as it becomes included in next edition

## Opening remarks

Remarks during the opening session of the meeting Friday 13 October at 0900 CEST were as follows.

* Timing and organization of the meeting and online access, calendar posting of session plans
  + The initial number of documents was increased relative to the previous meeting (160->XXX) – parallel sessions might be necessary.
  + Scheduling of NNVC discussions – might need alignment with NNPF discussions (but no overlap with JPEG meeting this time, JPEG meets from Oct. 30)
* Plans for subsequent F2F meeting in April (Rennes), July (Sapporo), and October 2024 (??).
* The meeting logistics, agenda, working practices, policies, and document allocation considerations were reviewed.
  + Remote access to the meeting was provided using Zoom. This required discipline in the meeting room (no microphone to be switched on, podium and room microphones to be under central control). Presentations in the room are also managed via zoom – experts who present need to connect to the zoom meeting for screen sharing. Recording of the meeting notes by the session chair will also permanently be shared via zoom.
  + Having text and software available is crucial (and not just arriving at the end of the meeting).
  + There were no objections voiced in the opening plenary to the consideration of late contributions.
* The results of the previous meeting and the meeting report JVET-AE1000 were reviewed. The following small issues in the meeting report were noted and were not considered sufficient to warrant issuing a revision. These are obviously left over from a previous report, and the correct information can be found in other places of the report:
  + In section 1 (summary), JVET-AE1016 is alternatively denoted as “WG 5 DIS of AVC 11th edition N 218”, which actually was issued as WG 5 CD, not DIS.
  + In section 2.1, annex B is mentioned, but information is missing that it consists of two parts, (B1) in-person attendees as recorded by ITU-T via registration and badge pickup, (B2) remote attendees as recorded by the teleconferencing tool used for the meeting.
  + In annex B2, the remote attendees are associated with the thirtieth JVET meeting, which should have been the thirty-first meeting.
* There was a somewhat decreased number of late non-cross-check documents, compared to previous meetings. In particular, all non-cross-check documents that had been registered before the deadline were also available in time.
* There were only few documents registered where authors’ given names were not abbreviated, and/or company affiliation was missing in the authors’ list. Participants were reminded to stick to JVET’s conventions.
* Experts were asked not to pick a specific JVET number for regular documents – this function is reserved for AHG reports, summary reports, and output docs
* Experts were asked to always register JVET documents via the “jvet-experts.org” site, not via the MPEG dms site.
* Experts were asked to inform the chair when the title of a document is changed, or if authors are added. Otherwise, that might not be correct in the meeting notes.
* The primary goals of the meeting were:
  + Any action on a new version of VVC software as standards part – target April 2024, for inclusion of NNPF SEI, software from TRs, layered coding, bug fixes, etc.
  + New edition video CICP FDIS (DIS ballot response in [m62572](https://dms.mpeg.expert/doc_end_user/current_document.php?id=86621&id_meeting=194) draft DoCR in [MDS22710](https://dms.mpeg.expert/doc_end_user/current_document.php?id=87856&id_meeting=194), and preliminary FDIS text in [MDS22711](https://dms.mpeg.expert/doc_end_user/current_document.php?id=87857&id_meeting=194)) – inclusion of ST 2128 descriptor needed clarification of the status, therefore it was not yet submitted for FDIS yet; was consented and approved in ITU-T, but cannot be published as long as ST2128 is not available.
  + TR on film grain synthesis technology for video applications – DTR submitted for ballot in ISO, target ITU consent for April 2024, possibly second DTR by January or April?
  + Optimization of encoders and receiving systems for machine analysis of coded video content – new WD of TR to be issued
  + Preparation of verification tests film grain and multilayer – expert viewing?
  + Any action items on reference software JM/HM/VTM? Status of MV-HEVC software and test conditions (refer to resolution of last meeting for the latter)?
  + New edition of AVC (both ISO and ITU)
    - 11th ed. CD ballot response in [m65567](https://dms.mpeg.expert/doc_end_user/current_document.php?id=90188&id_meeting=196), DIS to be issued
    - ITU consent for new H.264 edition was targeted for April 2024
  + HEVC updates
    - CDAM includes elements that are not in the ISO 5th edition – ballot response in [m65568](https://dms.mpeg.expert/doc_end_user/current_document.php?id=90189&id_meeting=196), DAM to be issued, check/confirm registered title.
    - 5th edition not published yet, ballot results in [m65579](https://dms.mpeg.expert/doc_end_user/current_document.php?id=90200&id_meeting=196)
    - An updated H.265 edition was sent for ITU consent in the last meeting; consent for next H.265 edition was targeted for April 2024 with new elements from CDAM
  + Exploration Experiments
    - Neural network-based video coding
    - Enhanced compression beyond VVC
* Liaison communication:
  + Incoming liaison statements: JPEG [m65594](https://dms.mpeg.expert/doc_end_user/current_document.php?id=90215&id_meeting=196), One from 3GPP might be expected.
* Joint meetings were expected with AG 5 (on Monday 16 Oct.) and possibly with other groups.
* Principles of standards development were discussed.
* Lunch: Oct. 13-15 only in outside restaurants, may require 60-90 minutes break. Oct. 16-20 in the conference center, 45 minutes are enough, JVET shall use the time slot 1245-1330 to avoid congestion with other WGs.

## Scheduling of discussions

The times of meeting sessions followed the needs of the face-to-face meeting, with highest priority given to the aim of achieving the goals of the meeting. Typical meeting hours were in the range of 0830-1900 CEST with coffee breaks and lunch breaks as appropriate, however some early morning or late-night sessions were anticipated to be necessary. Sessions were announced in the JVET calendar and the ITU posting system in advance as far as possible, although it was acknowledged that some activities (such as breakout sessions) might be held at short notice.

Particular scheduling notes are shown below, although not necessarily 100% accurate or complete. Times are recorded in the local timezone of the meeting venue, except as otherwise noted:

* Fri. 13 October, 1st day
  + Morning session:
    - 0900–XXXX Opening remarks, review of practices, agenda, IPR policy reminder
    - XXXX–1300 Reports of AHGs 1–X
  + Afternoon session:
    - 1430–XXXX Reports of AHGs X–X
    - XXXX–XXXX EE summary reports
* Sat. 14 October, 2nd day
  + Morning session:
    - 0830–1300 Review of …
  + Afternoon sessions:
    - 1430–1900 Review of …
* Sun. 15 October, 3rd day
  + Morning session:
    - 0830–1300 Review of …
  + Afternoon session:
    - 1430–1900 Review of …
* Mon. 16 October, 4th day
  + 0900–1230 MPEG information sharing session
  + 1330–1900 Afternoon session t.b.d.
  + Joint Meetings t.b.d.
* Tue 17 October, 5th day
  + Morning session:
    - 0830–1245 t.b.d.
  + Afternoon session:
    - 1330–1900 t.b.d.
* Wed. 18 October, 6th day
  + 0900–1030 MPEG information sharing session
  + Morning session:
    - 1045–1245 t.b.d.
  + Afternoon session:
    - 1330–1900 t.b.d.
  + Social event starts 1930
* Thu. 19 October, 7th day
  + Morning session:
    - 0830–1245 t.b.d.
  + Afternoon session:
    - 1330–1900 t.b.d.
* Fri. 20 Oct., 8th day
  + 0830–1300 JVET wrap-up plenary:
    - Review liaison doc
    - Approval of output docs
    - Establishment of AHGs
    - Review of meeting recommendations
    - Future planning, a.o.b.
  + 1400–1600 MPEG information sharing session
  + XXXX–XXXX WG 5 approval of meeting recommendations, closing of meeting

## Contribution topic overview (update tbd)

The approximate subject categories and quantity of contributions per category for the meeting were summarized as follows (note that the noted document counts do not include crosschecks and summary reports, and may not be completely accurate; documents which are allocated to multiple sections are only counted in one of them):

* AHG reports (14) (section 3)
* Project development (section 4)
  + AHG1: Deployment and advertisement of standards (3)
  + AHG2: Text development and errata reporting (1)
  + AHG3: Test conditions (0)
  + AHG3: Software development (0)
  + AHG4: Subjective quality testing and verification testing (3)
  + AHG4: Test Material (0)
  + AHG4: Codec performance with alternative test material (2)
  + AHG5: Conformance test development (0)
  + AHG7: ECM tool assessment (1)
  + AHG8: Optimization of encoders and receiving systems for machine analysis of coded video content (2)
  + AHG10: Encoding algorithm optimization (3)
  + AHG13: Film grain synthesis (4)
  + Implementation studies (1)
  + Profile/tier/level specification (1)
  + General aspects of standards development and applications of standards (1)
* Low-level tool technology proposals (section 5) with subtopics (number counts excluding BoG and summary reports)
  + AHG11/AHG14 and EE1: Neural network-based video coding (27) (section 5.1)
  + AHG6/AHG12 and EE2: Enhanced compression beyond VVC capability (76) (section 5.2)
* AHG9: High-level syntax (HLS) proposals (section 6) with subtopics
  + SEI messages on neural-network post filter (13) (sections 6.1, 6.2, 6.3)
  + SEI messages on topics other than NNPF (29) (sections 6.4, 6.5, 6.6, 6.7, 6.8, 6.9)
  + Non-SEI HLS aspects (0) (section 6.10)
* Joint meetings, plenary discussions, BoG reports (X), liaison (1), summary of actions (section 7)
* Project planning (section 8)
* Establishment of AHGs (section 9)
* Output documents (section 10)
* Future meeting plans and concluding remarks (section 11)

The document counts above do not include cross-checks and summary reports.

# AHG reports (14)

These reports were discussed during XXXX–XXXX on Friday 13 Oct. 2023 (chaired by JRO).

[JVET-AF0001](https://jvet-experts.org/doc_end_user/current_document.php?id=13372) JVET AHG report: Project Management (AHG1) [J.-R. Ohm (chair), G. J. Sullivan (vice chair)]

[JVET-AF0002](https://jvet-experts.org/doc_end_user/current_document.php?id=13373) JVET AHG report: Draft text and test model algorithm description editing (AHG2) [B. Bross, C. Rosewarne (co-chairs), F. Bossen, A. Browne, S. Kim, S. Liu, J.-R. Ohm, G. J. Sullivan, A. Tourapis, Y.-K. Wang, Y. Ye (vice chairs)]

[JVET-AF0003](https://jvet-experts.org/doc_end_user/current_document.php?id=13374) JVET AHG report: Test model software development (AHG3) [F. Bossen, X. Li, K. Sühring (co-chairs), E. François, Y. He, K. Sharman, V. Seregin, A. Tourapis (vice chairs)]

[JVET-AF0004](https://jvet-experts.org/doc_end_user/current_document.php?id=13375) JVET AHG report: Test material and visual assessment (AHG4) [V. Baroncini, T. Suzuki, M. Wien (co-chairs), W. Husak, S. Iwamura, P. de Lagrange, S. Liu, S. Puri, A. Segall, S. Wenger (vice-chairs)]

[JVET-AF0005](https://jvet-experts.org/doc_end_user/current_document.php?id=13376) JVET AHG report: Conformance testing (AHG5) [I. Moccagatta (chair), F. Bossen, K. Kawamura, P. de Lagrange, T. Ikai, S. Iwamura, H.-J. Jhu, S. Paluri, K. Sühring, Y. Yu (vice chairs)]

[JVET-AF0006](https://jvet-experts.org/doc_end_user/current_document.php?id=13295) JVET AHG report: ECM software development (AHG6) [V. Seregin (chair), J. Chen, R. Chernyak, F. Le Léannec, K. Zhang (vice-chairs)]

[JVET-AF0007](https://jvet-experts.org/doc_end_user/current_document.php?id=13377) JVET AHG report: ECM tool assessment (AHG7) [X. Li (chair), L.-F. Chen, Z. Deng, J. Gan, E. François, H.-J. Jhu, X. Li, H. Wang (vice chairs)]

[JVET-AF0008](https://jvet-experts.org/doc_end_user/current_document.php?id=13379) JVET AHG report: Optimization of encoders and receiving systems for machine analysis of coded video content (AHG8) [C. Hollmann, S. Liu, S. Wang, M. Zhou (AHG chairs)]

[JVET-AF0009](https://jvet-experts.org/doc_end_user/current_document.php?id=13380) JVET AHG report: SEI message studies (AHG9) [S. McCarthy, Y.-K. Wang (co-chairs), T. Chujoh, S. Deshpande, C. Fogg, Hendry, P. de Lagrange, G. J. Sullivan, A. Tourapis, S. Wenger (vice-chairs)]

[JVET-AF0010](https://jvet-experts.org/doc_end_user/current_document.php?id=13381) JVET AHG report: Encoding algorithm optimization (AHG10) [P. de Lagrange, A. Duenas, R. Sjöberg, A. Tourapis (AHG chairs)]

[JVET-AF0011](https://jvet-experts.org/doc_end_user/current_document.php?id=13382) JVET AHG report: Neural network-based video coding (AHG11) [E. Alshina, F. Galpin, S. Liu, A. Segall (co chairs), J. Li, R.-L. Liao, D. Rusanovskyy, T. Shao, M. Wien, P. Wu (vice chairs)]

[JVET-AF0012](https://jvet-experts.org/doc_end_user/current_document.php?id=13383) JVET AHG report: Enhanced compression beyond VVC capability (AHG12) [M. Karczewicz, Y. Ye, L. Zhang (co-chairs), B. Bross, R. Chernyak, X. Li, K. Naser, Y. Yu (vice-chairs)]

[JVET-AF0013](https://jvet-experts.org/doc_end_user/current_document.php?id=13384) JVET AHG report: Film grain technologies (AHG13) [W. Husak, P. de Lagrange (co-chairs), A. Duenas, D. Grois, Y. He, X. Meng, M. Radosavljević, A. Segall, A. Tourapis, W. Zhang (vice-chairs)]

[JVET-AF0014](https://jvet-experts.org/doc_end_user/current_document.php?id=13385) JVET AHG report: NNVC software development (AHG14) [F. Galpin (chair), Y. Li, Y. Li, J. Shingala, L. Wang, Z. Xie (vice chairs)]

# Project development (22)

## AHG1: Deployment and advertisement of standards (3)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0020](https://jvet-experts.org/doc_end_user/current_document.php?id=13447) Deployment status of the HEVC standard [G. J. Sullivan (SC 29 chair & VCEG rapporteur)]

[JVET-AF0021](https://jvet-experts.org/doc_end_user/current_document.php?id=13448) Deployment status of the VVC standard [G. J. Sullivan (SC 29 chair & VCEG rapporteur)]

[JVET-AF0175](https://jvet-experts.org/doc_end_user/current_document.php?id=13433) MC-IF VVC technical guidelines [L. Litwic (Ericsson), S. McCarthy (Dolby), S. Wenger, J. Ridge (Nokia), B. Bross (Fraunhofer HHI), D. Rusanovskyy (Qualcomm), A. Stein (InterDigital), J. Outters (Ateme), T. Suzuki (Sony), Y.-J. Chiu (Intel), J. Lemotheux (Orange)]

## AHG2: Text development and errata reporting (1+2)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0045](https://jvet-experts.org/doc_end_user/current_document.php?id=13289) AHG2/AHG9: On the use of NNPF SEI messages in AVC [M. M. Hannuksela (Nokia)]

See section 6.3

[JVET-AF0063](https://jvet-experts.org/doc_end_user/current_document.php?id=13311) On MV-HEVC profiles [Y.-K. Wang, H. Liu, L. Zhang, S. Jiao, C. Hu, J. Cui, G. Xu (Bytedance)]

See section 4.14

[JVET-AF0064](https://jvet-experts.org/doc_end_user/current_document.php?id=13312) AHG2: Editor commentary on some editorial issues [Y.-K. Wang, G. J. Sullivan (Editors)]

## AHG3: Test conditions (0)

This section is kept as a template for future use.

## AHG3: Software development (0)

This section is kept as a template for future use.

## AHG4: Subjective quality testing and verification testing (3)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by JRO and MW, joint meeting with AG 5).

[JVET-AF0044](https://jvet-experts.org/doc_end_user/current_document.php?id=13288) AHG4: Report on AhG meeting on verification testing for VVC multilayer coding [M. Wien]

[JVET-AF0075](https://jvet-experts.org/doc_end_user/current_document.php?id=13323) Evaluation results of Low Complexity Enhancement Video Codec (LCEVC) with HM and VTM on 4K content [O. Chubach, Y.-L. Hsiao, C.-Y. Chen, C.-W. Hsu, T.-D. Chuang, Y.-W. Chen, Y.-W. Huang, S.-M. Lei (MediaTek)]

[JVET-AF0224](https://jvet-experts.org/doc_end_user/current_document.php?id=13487) Crosscheck of JVET-AF0075 (Evaluation results of LCEVC) [C. Lehmann (HHI)] [late] [miss]

[JVET-AF0228](https://jvet-experts.org/doc_end_user/current_document.php?id=13491) Crosscheck of JVET-AF0075 (Evaluation results of Low Complexity Enhancement Video Codec with HM and VTM on 4K content) [P. Chen, M. Zhou, W. Wan (Broadcom)] [late]

[JVET-AF0186](https://jvet-experts.org/doc_end_user/current_document.php?id=13444) AHG4: experiments related to VVC spatial scalability visual testing [P. de Lagrange, F. Urban (InterDigital)]

## AHG4: Test material (0+2)

This section is kept as a template for future use.

[JVET-AF0253](https://jvet-experts.org/doc_end_user/current_document.php?id=13516) [AHG-7] On the proposed gaming sequences from InterDigital and class gaming [S. Puri, T. Poirier, C. Bonnineau, I. Marzuki, R. Utida, E. Francois (InterDigital)] [late] [miss]

See section 4.9

[JVET-AF0262](https://jvet-experts.org/doc_end_user/current_document.php?id=13526) New Film Grain Material based on a Ground Truth approach [D. Ugur, D. Podborski, A. M. Tourapis (Apple Inc)] [late]

See section 4.12

## Codec performance with alternative test materials (2)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0047](https://jvet-experts.org/doc_end_user/current_document.php?id=13294) [AHG4] ECM10.0 evaluation on V3C test content [S. Schwarz, M.M. Hannuksela (Nokia)]

[JVET-AF0187](https://jvet-experts.org/doc_end_user/current_document.php?id=13445) Compression of Gaming Contents [Z. Lin, K. Cai, Y. Zhao, E. Alshina (Huawei)]

## AHG5: Conformance test development (0)

This section is kept as a template for future use.

## AHG7: ECM tool assessment (1+1)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0165](https://jvet-experts.org/doc_end_user/current_document.php?id=13423) Ahg7/Ahg12: On VTM-11ecm anchor low-delay test conditions [F. Le Léannec, S. Puri, E. François, K. Naser (InterDigital)]

See section 5.2.5

[JVET-AF0253](https://jvet-experts.org/doc_end_user/current_document.php?id=13516) [AHG-7] On the proposed gaming sequences from InterDigital and class gaming [S. Puri, T. Poirier, C. Bonnineau, I. Marzuki, R. Utida, E. Francois (InterDigital)] [late] [miss]

## AHG8: Optimization of encoders and receiving systems for machine analysis of coded video content (2+3)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

### Non-SEI contributions (2)

[JVET-AF0060](https://jvet-experts.org/doc_end_user/current_document.php?id=13308) AHG8: An exemplar software implementation for temporal resampling for VCM [S. Wang, J. Chen, Y. Ye (Alibaba), S. Wang (CityU)]

[JVET-AF0157](https://jvet-experts.org/doc_end_user/current_document.php?id=13415) AHG8: A temporal resampling algorithm [D. Ding, X. Zhao, Z. Liu, S. Liu (Tencent)]

[JVET-AF0241](https://jvet-experts.org/doc_end_user/current_document.php?id=13504) Cross-check of JVET-AF0157 (AHG8: A temporal resampling algorithm) [C. Hollmann (Ericsson)] [late] [miss]

### Contributions related to SEI messages (see section 6.2) (3)

[JVET-AF0068](https://jvet-experts.org/doc_end_user/current_document.php?id=13316) AHG8/AHG9: Signalling of encoder preprocessing information [W. Jia, Y. Li, Y.-K. Wang, K. Zhang, L. Zhang (Bytedance)]

[JVET-AF0138](https://jvet-experts.org/doc_end_user/current_document.php?id=13396) AHG8/AHG9: Truncated bit depth support SEI messages [D. Ding, X. Zhao, S. Liu, G. Teniou, S. Wenger (Tencent)]

[JVET-AF0147](https://jvet-experts.org/doc_end_user/current_document.php?id=13405) AHG8/AHG9: On Picture Modality Type [J. Gao, H.-B. Teo, C.-S. Lim, K. Abe (Panasonic)]

## AHG10: Encoding algorithm optimization (3)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0089](https://jvet-experts.org/doc_end_user/current_document.php?id=13293) AhG10: Lagrange multiplier and QP adaptation at CTU-level for VVC [H. Guo, C. Zhu, L. Luo, J. Chen (UESTC), Y. Huo, Y. Liu (Transsion)]

[JVET-AF0111](https://jvet-experts.org/doc_end_user/current_document.php?id=13358) AHG10 MTT split modes early termination [W. Ahmad, P. Wennersten, K. Andersson (Ericsson)]

[JVET-AF0247](https://jvet-experts.org/doc_end_user/current_document.php?id=13510) Cross-check of JVET-AF0111 (AHG10: MTT split modes early termination) [T. Dumas (Interdigital)] [late] [miss]

[JVET-AF0122](https://jvet-experts.org/doc_end_user/current_document.php?id=13291) AhG10: Lagrange multiplier optimization for chroma ALF and CCALF [S.-W. Xie, Y. Gao, M.-H. Jia, Y.-X. Bai, C. Huang, P. Wu (ZTE)]

## AHG13: Film grain synthesis (4+2)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0142](https://jvet-experts.org/doc_end_user/current_document.php?id=13400) [AHG9] Local Film Grain Synthesis using Annotated Regions SEI [G. Teniou, S. Wenger (Tencent)]

See section 6.3

[JVET-AF0144](https://jvet-experts.org/doc_end_user/current_document.php?id=13402) [AHG9] Adaptive Film grain synthesis using Alpha Channel Information SEI message [G. Teniou, S. Wenger (Tencent)]

See section 6.3

[JVET-AF0209](https://jvet-experts.org/doc_end_user/current_document.php?id=13472) AHG13: Frequency domain Film Grain Objective Metrics X. Meng, W. Zhang, S. Labrozzi (Disney Streaming) [late] [miss]

[JVET-AF0210](https://jvet-experts.org/doc_end_user/current_document.php?id=13473) AHG13: Exploration on the Capability of Frequency-Based Film Grain Synthesis X. Meng, W. Zhang, S. Labrozzi (Disney Streaming) [late] [miss]

[JVET-AF0262](https://jvet-experts.org/doc_end_user/current_document.php?id=13526) New Film Grain Material based on a Ground Truth approach [D. Ugur, D. Podborski, A. M. Tourapis (Apple Inc)] [late]

[JVET-AF0263](https://jvet-experts.org/doc_end_user/current_document.php?id=13527) Suggested process for measuring Grain Fidelity using the Ground Truth test set [A. M. Tourapis, J. Kim, S. Paluri, D. Podborski (Apple Inc)] [late]

## Implementation studies (1)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0211](https://jvet-experts.org/doc_end_user/current_document.php?id=13474) Latest update on Ali266: performance and deployment S. Fang, Z. Huang, S. Xu, L. Yu, J. Chen, R.-L. Liao, Y. Ye (Alibaba), X. Zhai, Y. Jia, D. Fan, Y. Zhang, C. Dou, X. Fu, F. Hu, R. Li (Youku) [late] [miss]

## Profile/tier/level specification (1)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0063](https://jvet-experts.org/doc_end_user/current_document.php?id=13311) On MV-HEVC profiles [Y.-K. Wang, H. Liu, L. Zhang, S. Jiao, C. Hu, J. Cui, G. Xu (Bytedance)]

## General aspects of standards development and applications of standards (1)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0022](https://jvet-experts.org/doc_end_user/current_document.php?id=13450) Summary of time spans for NB comment availability [G. J. Sullivan (SC 29 chair)]

# Low-level tool technology proposals (111)

## AHG11/AHG14: Neural network-based video coding (27+2)

### Summary, BoG reports, and information documents (2)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0023](https://jvet-experts.org/doc_end_user/current_document.php?id=13469) EE1: Summary report of exploration experiment on neural network-based video coding [E. Alshina, F. Galpin, Y. Li, D. Rusanovskyy, M. Santamaria, J. Ström, L. Wang, Z. Xie]

[JVET-AF0042](https://jvet-experts.org/doc_end_user/current_document.php?id=13286) AhG11/AhG14 teleconference [E. Alshina, F. Galpin]

### EE1 contributions: Neural network-based video coding (16)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0041](https://jvet-experts.org/doc_end_user/current_document.php?id=13285) AhG11: HOP full results [F. Galpin (InterDigital), D. Rusanovskyy, Y. Li (Qualcomm), Y. Li, J. Li (Bytedance), L. Wang, R. Chang (Tencent), Z. Xie (Oppo), E. Alshina (Huawei)]

[JVET-AF0043](https://jvet-experts.org/doc_end_user/current_document.php?id=13287) AhG11/EE1: Status of the joint EE1-0 (LOP.2) training [D. Rusanovskyy, Y. Li (Qualcomm), J. N. Shingala, A. Shyam, A. Suneja, S. P. Badya (Ittiam), T. Shao, P. Yin (Dolby)]

[JVET-AF0056](https://jvet-experts.org/doc_end_user/current_document.php?id=13304) EE1-1.2.2: Content-adaptive LOP filter R. Yang, M. Santamaria, F. Cricri, H. Zhang, J. Lainema, M. M. Hannuksela, A. Hallapuro (Nokia)]

[JVET-AF0119](https://jvet-experts.org/doc_end_user/current_document.php?id=13366) Crosscheck of JVET-AF0056 (EE1-1.2.2: Content-adaptive LOP filter) [J. N. Shingala, A. Shyam, S. P. Badya (Ittiam)] [late] [miss]

[JVET-AF0216](https://jvet-experts.org/doc_end_user/current_document.php?id=13479) Crosscheck of JVET-AF0056 (EE1-1.2.2: Content-adaptive LOP filter) [Z. Dai (OPPO)] [late] [miss]

[JVET-AF0085](https://jvet-experts.org/doc_end_user/current_document.php?id=13333) EE1-1.2.1: On residual adjustments for NNLF [Z. Dai, Y. Yu, H. Yu, D. Wang (OPPO)]

[JVET-AF0254](https://jvet-experts.org/doc_end_user/current_document.php?id=13517) Cross-check of JVET-AF0085 (EE1-1.2.1: on residual adjustments of NNLF) [T. Dumas (Interdigital)] [late]

[JVET-AF0086](https://jvet-experts.org/doc_end_user/current_document.php?id=13334) EE1-1.2.6: On flipping of input and output of model in NNVC HOP filter [Z. Xie, Y. Yu, H. Yu, D. Wang (OPPO)]

[JVET-AF0272](https://jvet-experts.org/doc_end_user/current_document.php?id=13536) Crosscheck of JVET-AF0086 (EE1-1.2.6: On flipping of input and output of model in NNVC HOP filter) [R. Chang (Tencent)] [late] [miss]

[JVET-AF0102](https://jvet-experts.org/doc_end_user/current_document.php?id=13349) EE1-1.1.2 Complexity-performance tradeoff of decomposition [D. Rusanovskyy, Y. Li, M. Karczewicz (Qualcomm)]

[JVET-AF0103](https://jvet-experts.org/doc_end_user/current_document.php?id=13350) EE1-1.1.3 Study on input feature set optimization [D. Rusanovskyy, Y. Li, M. Karczewicz (Qualcomm)]

[JVET-AF0258](https://jvet-experts.org/doc_end_user/current_document.php?id=13521) Crosscheck of JVET-AF0103 (EE1-1.1.3 Study on input feature set optimization) [F. Galpin (InterDigital)] [late] [miss]

[JVET-AF0139](https://jvet-experts.org/doc_end_user/current_document.php?id=13397) EE1-3.1: neural network-based intra prediction with reduced complexity [T. Dumas, F. Galpin, P. Bordes (InterDigital)]

[JVET-AF0217](https://jvet-experts.org/doc_end_user/current_document.php?id=13480) Crosscheck of JVET-AF0139 (EE1-3.1: neural network-based intra prediction with reduced complexity) [Z. Dai (OPPO)] [late] [miss]

[JVET-AF0153](https://jvet-experts.org/doc_end_user/current_document.php?id=13411) EE1-1.1.1: Optimization for complexity-performance trade-off of HOP network [R. Chang, L. Wang, X. Xu, S. Liu (Tencent)]

[JVET-AF0266](https://jvet-experts.org/doc_end_user/current_document.php?id=13530) Crosscheck of JVET-AF0153 (EE1-1.1.1: Optimization for complexity-performance trade-off of HOP network) test1 [Z. Xie (OPPO)] [late] [miss]

[JVET-AF0154](https://jvet-experts.org/doc_end_user/current_document.php?id=13412) EE1-1.2.3: Input and output rotation of model for NNVC in-loop filter [R. Chang, L. Wang, X. Xu, S. Liu (Tencent)]

[JVET-AF0257](https://jvet-experts.org/doc_end_user/current_document.php?id=13520) Crosscheck of JVET-AF0154 (EE1-1.2.3: Input and output rotation of model for NNVC in-loop filter) [D. Liu (Ericsson)] [late] [miss]

[JVET-AF0181](https://jvet-experts.org/doc_end_user/current_document.php?id=13439) EE1-1.1.4.a: Simplified feature extraction for HOP [Y. Li, K. Zhang, L. Zhang (Bytedance)]

[JVET-AF0182](https://jvet-experts.org/doc_end_user/current_document.php?id=13440) EE1-1.1.4.b: Group convolution for HOP [Y. Li, K. Zhang, L. Zhang (Bytedance)]

[JVET-AF0183](https://jvet-experts.org/doc_end_user/current_document.php?id=13441) EE1-1.1.4.c/d: Separate models for HOP [Y. Li, K. Zhang, L. Zhang (Bytedance)]

[JVET-AF0260](https://jvet-experts.org/doc_end_user/current_document.php?id=13523) Crosscheck of JVET-AF0183 (EE1-1.1.4.c/d: Separate models for HOP) [F. Galpin (InterDigital)] [late] [miss]

[JVET-AF0192](https://jvet-experts.org/doc_end_user/current_document.php?id=13453) EE1-1.1.5: Combination test of EE1-1.1.1 and EE1-1.1.2 [R. Chang, L. Wang, X. Xu, S. Liu (Tencent), D. Rusanovskyy, Y. Li, M. Karczewicz (Qualcomm)]

[JVET-AF0267](https://jvet-experts.org/doc_end_user/current_document.php?id=13531) Crosscheck of JVET-AF0192 (EE1-1.1.5: Combination test of EE1-1.1.1 and EE1-1.1.2) [Z. Xie (OPPO)] [late] [miss]

[JVET-AF0205](https://jvet-experts.org/doc_end_user/current_document.php?id=13466) EE1-1.2.4: An improved inference design of NN-based loop-filters at high operation point [J. Li, Y. Li, C. Lin, K. Zhang, L. Zhang (Bytedance)]

[JVET-AF0208](https://jvet-experts.org/doc_end_user/current_document.php?id=13471) EE1-2.1: Deep Reference Frame Generation for Inter Prediction Enhancement W. Bao, X. Chen, J. Jia, Y. Zhang, Z. Chen (Wuhan Univ.), Z. Liu, X. Xu, S. Liu (Tencent) [late]

[JVET-AF0268](https://jvet-experts.org/doc_end_user/current_document.php?id=13532) Crosscheck of JVET-AF0208 (EE1-2.1: Deep Reference Frame Generation for Inter Prediction Enhancement) [Z. Xie (OPPO)] [late] [miss]

### EE1 related contributions: Neural network-based video coding (1)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0071](https://jvet-experts.org/doc_end_user/current_document.php?id=13319) EE1-related: Further complexity reduction on the joint EE1-0 (LOP.2) unified filter [[T. Shao](mailto:tong.shao@dolby.com), [P. Yin](mailto:pyin@dolby.com), S. McCarthy (Dolby), [J. N. Shingala](mailto:jay.shingala@ittiam.com), [A. Shyam](mailto:ajayshyam@ittiam.com), A. Suneja, S. P. Badya (Ittiam)]

### Improvements of NNVC software beyond EE1 (10)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0143](https://jvet-experts.org/doc_end_user/current_document.php?id=13401) AHG11: Unified CNN super resolution for resampling-based video coding [C. Lin, Y. Li, J. Li, K. Zhang, L. Zhang (Bytedance)]

[JVET-AF0150](https://jvet-experts.org/doc_end_user/current_document.php?id=13408) AhG11: on HOP batch size [F. Galpin, T. Dumas, P. Bordes (InterDigital)]

[JVET-AF0152](https://jvet-experts.org/doc_end_user/current_document.php?id=13410) AhG14: SADL update [F. Galpin, T. Dumas, P. Bordes, E. Francois (InterDigital)]

[JVET-AF0155](https://jvet-experts.org/doc_end_user/current_document.php?id=13413) AhG11: on HOP luma/chroma balance [F. Galpin, T. Dumas, P. Bordes (InterDigital)]

[JVET-AF0158](https://jvet-experts.org/doc_end_user/current_document.php?id=13416) AHG11: HOP In-loop filter with transformer blocks [Y. Li, D. Rusanovskyy, T. Ryder, S. Eadie, M. Karczewicz (Qualcomm)]

[JVET-AF0172](https://jvet-experts.org/doc_end_user/current_document.php?id=13430) AHG14: Cleanup on scale flag signalling for HOP [Y. Li, K. Zhang, L. Zhang (Bytedance)]

[JVET-AF0259](https://jvet-experts.org/doc_end_user/current_document.php?id=13522) Crosscheck of JVET-AF0172 (AHG14: Cleanup on scale flag signalling for HOP) [F. Galpin (InterDigital)] [late] [miss]

[JVET-AF0180](https://jvet-experts.org/doc_end_user/current_document.php?id=13438) AHG11: HOP training adjustment to improve luma/chroma coding gain balance [D. Rusanovskyy, Y. Li, M. Karczewicz (Qualcomm)]

[JVET-AF0193](https://jvet-experts.org/doc_end_user/current_document.php?id=13454) AHG11: Decoder complexity optimization for NNVC in-loop filter [R. Chang, L. Wang, X. Xu, S. Liu (Tencent)]

[JVET-AF0256](https://jvet-experts.org/doc_end_user/current_document.php?id=13519) Crosscheck of JVET-AF0193 (AHG11: Decoder complexity optimization for NNVC in-loop filter) [D. Liu (Ericsson)] [late] [miss]

[JVET-AF0206](https://jvet-experts.org/doc_end_user/current_document.php?id=13467) AHG11: Complexity reduction of NN-based loop-filters [J. Li, Y. Li, C. Lin, K. Zhang, L. Zhang (Bytedance)]

[JVET-AF0236](https://jvet-experts.org/doc_end_user/current_document.php?id=13499) AHG14: The extension of SADL library [W. Bao, Y. Cai, Y. Zhang, Z. Chen (Wuhan Univ.)] [late]

### Other aspects of neural network-based video coding (0)

Section kept as a template for future use.

## AHG6/AHG12: Enhanced compression beyond VVC capability (76+1)

### Summary and BoG reports (1)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0024](https://jvet-experts.org/doc_end_user/current_document.php?id=13470) EE2: Summary report of exploration experiment on enhanced compression beyond VVC capability [V. Seregin, J. Chen, R. Chernyak, K. Naser, J. Ström, F. Wang, M. Winken, X. Xiu, K. Zhang]

### EE2 contributions: Enhanced compression beyond VVC capability (24)

There was no presentation or discussion about specific proposals in this category.

For actions decided to be taken, see section 5.2.1, unless otherwise noted.

[JVET-AF0057](https://jvet-experts.org/doc_end_user/current_document.php?id=13305) EE2-3.5: DMVR with robust MV derivation [K. Andersson, R. Yu (Ericsson)]

[JVET-AF0218](https://jvet-experts.org/doc_end_user/current_document.php?id=13481) Cross-check of JVET-AF0057 (EE2-3.5: DMVR with robust MV derivation) H. Huang (Qualcomm)

[JVET-AF0066](https://jvet-experts.org/doc_end_user/current_document.php?id=13314) EE2: Test 2.9 Enable DBV in single tree [H. Huang, H. Wang, V. Seregin, M. Karczewicz (Qualcomm)]

[JVET-AF0076](https://jvet-experts.org/doc_end_user/current_document.php?id=13324) Crosscheck of JVET-AF0066 (EE2: Test 2.9 Enable DBV in single tree) [L. Xu (OPPO)] [late] [miss]

[JVET-AF0073](https://jvet-experts.org/doc_end_user/current_document.php?id=13321) EE2-3.1 and EE2-3.3: Cross-component prediction merge mode for chroma inter coding [M.-S. Chiang, H.-Y. Tseng, C.-M. Tsai, C.-Y. Chuang, C.-W. Hsu, C.-Y. Chen, T.-D. Chuang, O. Chubach, Y.-W. Chen, Y.-W. Huang, S.-M. Lei (MediaTek), Z. Deng, K. Zhang, L. Zhang (Bytedance)]

[JVET-AF0213](https://jvet-experts.org/doc_end_user/current_document.php?id=13476) Crosscheck of JVET-AF0073 (EE2-3.1 and EE2-3.3: Cross-component prediction merge mode for chroma inter coding) test 3.1d F. Wang (OPPO) [late] [miss]

[JVET-AF0233](https://jvet-experts.org/doc_end_user/current_document.php?id=13496) Crosscheck of JVET-AF0073 (EE2-3.1b: Cross-component prediction merge mode for chroma inter coding) [Y.-J. Chang (Qualcomm)] [late] [miss]

[JVET-AF0240](https://jvet-experts.org/doc_end_user/current_document.php?id=13503) crosscheck of JVET-AF0073: EE2-3.1a: Cross-component prediction merge mode for chroma inter coding [K. Naser (InterDigital)] [late] [miss]

[JVET-AF0242](https://jvet-experts.org/doc_end_user/current_document.php?id=13505) Crosscheck of JVET-AF0073 (EE2-3.1 and EE2-3.3: Cross-component prediction merge mode for chroma inter coding) test3.3b and test3.1d [Z. Lv (vivo)] [late] [miss]

[JVET-AF0079](https://jvet-experts.org/doc_end_user/current_document.php?id=13327) EE2-2.6: IntraTMP block vector storing [Y. Yu, L. Zhang, L. Xu, H. Yu, J. Gan, F. Wang, Z. Xie, D. Wang (OPPO), P.-H Lin, J. -L Lin, V. Seregin, M. Karczewicz (Qualcomm)]

[JVET-AF0227](https://jvet-experts.org/doc_end_user/current_document.php?id=13490) Crosscheck of JVET-AF0079 (EE2: Test 2.6a, Test 2.6b and Test 2.6c - Combination of Test 2.6a and Test 2.6b) [W. Lim, S.-C. Lim (ETRI)] [late] [miss]

[JVET-AF0080](https://jvet-experts.org/doc_end_user/current_document.php?id=13328) EE2-2.7: An extrapolation filter-based intra prediction mode [L. Xu, Y. Yu, H. Yu, J. Gan, D. Wang (OPPO)]

[JVET-AF0221](https://jvet-experts.org/doc_end_user/current_document.php?id=13484) Crosscheck of JVET-AF0080 (EE2-2.7: An extrapolation filter-based intra prediction mode) [X. Li (Alibaba)] [late] [miss]

[JVET-AF0230](https://jvet-experts.org/doc_end_user/current_document.php?id=13493) Crosscheck of JVET-AF0080 (EE2-2.7: An extrapolation filter-based intra prediction mode) [H.-J. Jhu (Kwai)] [late] [miss]

[JVET-AF0081](https://jvet-experts.org/doc_end_user/current_document.php?id=13329) EE2-2.8: DBV improvement [L. Xu, Y. Yu, H. Yu, J. Gan, D. Wang (OPPO)]

[JVET-AF0219](https://jvet-experts.org/doc_end_user/current_document.php?id=13482) Cross-check of JVET-AF0081 ( EE2-2.8: DBV improvement) [H. Huang (Qualcomm)] [late] [miss]

[JVET-AF0108](https://jvet-experts.org/doc_end_user/current_document.php?id=13355) EE2-1.1: Non-square quadtree partitioning [Y. Ahn, J. Nam, N. Park, J. Lim, S. Kim (LGE)]

[JVET-AF0249](https://jvet-experts.org/doc_end_user/current_document.php?id=13512) Crosscheck of JVET-AF0108 (EE2-1.1: Non-square quadtree partitioning) [R. Utida, F. Le Léannec, T. Dumas (InterDigital)] [late] [miss]

[JVET-AF0109](https://jvet-experts.org/doc_end_user/current_document.php?id=13356) EE2-6.1: Spatial CABAC tuning [J. Lainema, A. Aminlou, P. Astola, D. B. Sansli (Nokia)]

[JVET-AF0188](https://jvet-experts.org/doc_end_user/current_document.php?id=13446) Cross-check of JVET-AF0109 (EE2-6.1: Spatial CABAC tuning) [P. Nikitin, I. Jumakulyyev (Qualcomm)] [late] [miss]

[JVET-AF0110](https://jvet-experts.org/doc_end_user/current_document.php?id=13357) EE2-6.3: Combination of EE2-6.1 and EE2-6.2 [J. Lainema, A. Aminlou, P. Astola, D. B. Sansli (Nokia), R.-L. Liao, Y. Ye, J. Chen, X. Li (Alibaba)]

[JVET-AF0232](https://jvet-experts.org/doc_end_user/current_document.php?id=13495) Crosscheck of JVET-AF0110 (EE2-6.3: Combination of EE2-6.1 and EE2-6.2) [X. Xiu (Kwai)] [late] [miss]

[JVET-AF0112](https://jvet-experts.org/doc_end_user/current_document.php?id=13359) EE2-5.1: Dynamic Scaling of Bilateral Filter (BIF) [V. Shchukin, P. Wennersten, J. Ström (Ericsson)]

[JVET-AF0203](https://jvet-experts.org/doc_end_user/current_document.php?id=13464) Crosscheck of JVET-AF0112 (EE2-5.1: Dynamic Scaling of Bilateral Filter) [W. Yin (Bytedance)] [late] [miss]

[JVET-AF0120](https://jvet-experts.org/doc_end_user/current_document.php?id=13367) EE2-2.1 DIMD merge [S. Blasi, I. Zupancic, J. Lainema (Nokia)]

[JVET-AF0124](https://jvet-experts.org/doc_end_user/current_document.php?id=13369) Crosscheck of JVET-AF0120 (EE2-2.1: DIMD merge) [P. Andrivon (Ofinno)]

[JVET-AF0126](https://jvet-experts.org/doc_end_user/current_document.php?id=13371) EE2-2.3: Combination of DIMD related tests (EE2-2.1 + EE2-2.2) [S. Blasi, I. Zupancic, J. Lainema (Nokia)]

[JVET-AF0204](https://jvet-experts.org/doc_end_user/current_document.php?id=13465) Crosscheck of JVET-AF0126 (EE2-2.3-AB: Combination of DIMD Related Tests) [W. Yin (Bytedance)] [late] [miss]

[JVET-AF0128](https://jvet-experts.org/doc_end_user/current_document.php?id=13386) EE2-3.2: LIC flag derivation for merge candidates with template costs [N. Zhang, K. Zhang, H. Liu, Y. Wang, L. Zhang (Bytedance)]

[JVET-AF0269](https://jvet-experts.org/doc_end_user/current_document.php?id=13533) Crosscheck of JVET-AF0128 (EE2-3.2: LIC flag derivation for merge candidates with template costs) [Z. Xie (OPPO)] [late] [miss]

[JVET-AF0130](https://jvet-experts.org/doc_end_user/current_document.php?id=13388) EE2-2.4: IntraCIIP as additional mode of IntraTMP [K. Naser, P. Bordes, F. Galpin, K. Reuzé (InterDigital)]

[JVET-AF0131](https://jvet-experts.org/doc_end_user/current_document.php?id=13389) EE2-2.2: DIMD with filtered template [C. Zhou, Z. Lv (vivo)]

[JVET-AF0235](https://jvet-experts.org/doc_end_user/current_document.php?id=13498) Crosscheck of JVET-AF0131 (EE2-2.2: DIMD with filtered template [J. Chen (Alibaba)] [late] [miss]

[JVET-AF0133](https://jvet-experts.org/doc_end_user/current_document.php?id=13391) EE2-6.2: updating I-slice context model parameters [R.-L. Liao, Y. Ye, J. Chen, X. Li (Alibaba)]

[JVET-AF0239](https://jvet-experts.org/doc_end_user/current_document.php?id=13502) crosscheck of JVET-AF0133: EE2-6.2: updating I-slice context model parameters [K. Naser (InterDigital)] [late] [miss]

[JVET-AF0136](https://jvet-experts.org/doc_end_user/current_document.php?id=13394) EE2-2.5: TIMD with IntraTMP and IBC [K. Naser, F. Le Léannec, P. Bordes, F. Galpin, A. Robert (InterDigital)]

[JVET-AF0125](https://jvet-experts.org/doc_end_user/current_document.php?id=13370) Crosscheck of JVET-AF0136 (EE2-2.5a: TIMD with IntraTMP/IBC merge) [P. Andrivon (Ofinno)]

[JVET-AF0215](https://jvet-experts.org/doc_end_user/current_document.php?id=13478) Crosscheck of JVET-AF0136 (EE2-2.5: TIMD with IntraTMP and IBC) test 2.5b F. Wang (OPPO) [late] [miss]

[JVET-AF0243](https://jvet-experts.org/doc_end_user/current_document.php?id=13506) Crosscheck of JVET-AF0136 (EE2-2.5: TIMD with IntraTMP and IBC) test 2.5b [S. Blasi (Nokia)] [late] [miss]

[JVET-AF0159](https://jvet-experts.org/doc_end_user/current_document.php?id=13417) EE2-3.6: Affine subblock BDOF refinement [Z. Zhang, H. Huang, J.-L Lin, V. Seregin, M. Karczewicz (Qualcomm)]

[JVET-AF0231](https://jvet-experts.org/doc_end_user/current_document.php?id=13494) Crosscheck of JVET-AF0159 (EE2-3.6: Affine subblock BDOF refinement) [X. Xiu (Kwai)] [late] [miss]

[JVET-AF0163](https://jvet-experts.org/doc_end_user/current_document.php?id=13421) EE2-3.4: Enhanced subblock-based motion compensation [L. Zhao, K. Zhang, L. Zhang (Bytedance)]

[JVET-AF0270](https://jvet-experts.org/doc_end_user/current_document.php?id=13534) Crosscheck of JVET-AF0163 (EE2-3.4: Enhanced subblock-based motion compensation) [Z. Xie (OPPO)] [late] [miss]

[JVET-AF0173](https://jvet-experts.org/doc_end_user/current_document.php?id=13431) EE2-2.4: Weighted edge enhancement filtering [T. Claßen, M. Wien (RWTH)]

[JVET-AF0265](https://jvet-experts.org/doc_end_user/current_document.php?id=13529) Crosscheck of JVET-AF0173 (EE2-2.4: Weighted edge enhancement filtering) [J. Samuelsson-Allendes (Sharp)] [late] [miss]

[JVET-AF0190](https://jvet-experts.org/doc_end_user/current_document.php?id=13451) EE2-Test4.1: Enabling template-based inter tools for the RPR [X. Xiu, H.-J. Jhu, C.-W. Kuo, C. Ma, N. Yan, W. Chen, X. Wang (Kwai)]

[JVET-AF0261](https://jvet-experts.org/doc_end_user/current_document.php?id=13525) Crosscheck of JVET-AF0190 (EE2-Test4.1: Enabling template-based inter tools for the RPR) [Z. Zhang (Qualcomm)] [late] [miss]

[JVET-AF0197](https://jvet-experts.org/doc_end_user/current_document.php?id=13458) EE2-5.2: Luma Residual Taps in Chroma-ALF and CCALF [W. Yin, K. Zhang, Z. Deng, L. Zhang (Bytedance)]

[JVET-AF0225](https://jvet-experts.org/doc_end_user/current_document.php?id=13488) Crosscheck of JVET-AF0197 (EE2-5.2: Luma Residual Taps in Chroma-ALF and CCALF) [V. Shchukin (Ericsson)] [late] [miss]

[JVET-AF0207](https://jvet-experts.org/doc_end_user/current_document.php?id=13468) EE2: Test 2.10 Combination of Test 2.8 and Test 2.9 [H. Huang, H. Wang, V. Seregin, M. Karczewicz (Qualcomm), L. Xu, Y. Yu, H. Yu, J. Gan, D. Wang (OPPO)]

[JVET-AF0220](https://jvet-experts.org/doc_end_user/current_document.php?id=13483) Cross-check of JVET-AF0207 (EE2: Test 2.10 Combination of Test 2.8 and Test 2.9) [C. Zhou (vivo)] [late] [miss]

[JVET-AF0229](https://jvet-experts.org/doc_end_user/current_document.php?id=13492) EE2-2.3: Combination of DIMD/TIMD related tests (EE2-2.3 + EE2-2.5) [K. Naser, F. Le Léannec, P. Bordes, A. Robert (InterDigital), S. Blasi, I. Zupancic, J. Lainema (Nokia), C. Zhou, Z. Lv (Vivo)] [late]

[JVET-AF0244](https://jvet-experts.org/doc_end_user/current_document.php?id=13507) Crosscheck of JVET-AF0229 (EE2-2.11: Combination of DIMD/TIMD related tests) [R. G. Youvalari, M. Abdoli (Xiaomi)] [late] [miss]

### EE2 related contributions (4)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0053](https://jvet-experts.org/doc_end_user/current_document.php?id=13301) EE2-related: Test 2.5a and TIMD fusion improvement [P. Andrivon, M. Blestel (Ofinno), K. Naser (InterDigital)]

[JVET-AF0245](https://jvet-experts.org/doc_end_user/current_document.php?id=13508) Crosscheck of JVET-AF0053 (EE2-related: Test 2.5a and TIMD fusion improvement) [S. Blasi (Nokia)] [late] [miss]

[JVET-AF0106](https://jvet-experts.org/doc_end_user/current_document.php?id=13353) EE2-related: Non-adjacent spatial candidates for DIMD merge [J. Huo, J. Fan, Z. Zhang, Y. Ma, F. Yang (Xidian Univ.), M. Li (OPPO)]

[JVET-AF0223](https://jvet-experts.org/doc_end_user/current_document.php?id=13486) Crosscheck of JVET-AF0106 (EE2-related: Non-adjacent spatial candidates for DIMD merge) [X. Li (Alibaba)] [late] [miss]

[JVET-AF0151](https://jvet-experts.org/doc_end_user/current_document.php?id=13409) EE2 related: CABAC parameters retraining [F. Galpin, F. Lo Bianco, C. Salmon-Legagneur, K. Naser (InterDigital)]

[JVET-AF0252](https://jvet-experts.org/doc_end_user/current_document.php?id=13515) Crosscheck of JVET-AF0151 (EE2 related: CABAC parameters retraining) [M. Abdoli, R. G. Youvalari (Xiaomi)] [late] [miss]

[JVET-AF0202](https://jvet-experts.org/doc_end_user/current_document.php?id=13463) EE2 related: CABAC context initialization retraining and slice type based window offsets [V. Seregin, M. Karczewicz (Qualcomm)]

### ECM modifications and software improvements beyond EE2 (39)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

#### Intra and CIIP (19)

[JVET-AF0059](https://jvet-experts.org/doc_end_user/current_document.php?id=13307) AHG12: Fix to interpolation filter for intra prediction [K. Andersson (Ericsson)]

[JVET-AF0072](https://jvet-experts.org/doc_end_user/current_document.php?id=13320) AHG12: FIBC flag inherits IntraTMP-FLM flag [M.-H. Jia, Y. Gao, Y. -X. Bai, S.-W. Xie, P. Wu, C. Huang (ZTE)]

[JVET-AF0074](https://jvet-experts.org/doc_end_user/current_document.php?id=13322) Crosscheck of JVET-AF0072 (AHG12: FIBC flag inherits IntraTMP-FLM flag) [J. Fu, [S. Ma (PKU)](mailto:swma@pku.edu.cn)]

[JVET-AF0084](https://jvet-experts.org/doc_end_user/current_document.php?id=13332) Non-EE2: Update on IBC-LIC Model Merge mode [L. Zhang, Y. Yu, H. Yu, D. Wang (OPPO)]

[JVET-AF0271](https://jvet-experts.org/doc_end_user/current_document.php?id=13535) Crosscheck of JVET-AF0084 (Non-EE2: Update on IBC-LIC Model Merge mode) [Y. Wang (Bytedance)] [late] [miss]

[JVET-AF0104](https://jvet-experts.org/doc_end_user/current_document.php?id=13351) Non-EE2: Direct Decoder-side Intra Mode Derivation for IntraTMP blocks [J. Huo, N. Qiu, Y. Ma, F. Yang (Xidian Univ.), M. Li (OPPO)]

[JVET-AF0222](https://jvet-experts.org/doc_end_user/current_document.php?id=13485) Crosscheck of JVET-AF0104 (Non-EE2: Direct Decoder-side Intra Mode Derivation for IntraTMP blocks) [X. Li (Alibaba)] [late] [miss]

[JVET-AF0115](https://jvet-experts.org/doc_end_user/current_document.php?id=13362) Non-EE2: IBC with a further upward-extended reference area for screen content [Y. Kidani, H. Kato, K. Kawamura (KDDI)]

[JVET-AF0116](https://jvet-experts.org/doc_end_user/current_document.php?id=13363) Non-EE2: slope adjustment for IBC LIC [C. Ma, X. Xiu, W. Chen, H.-H.Jhu, C.-W. Kuo, N. Yan, X. Wang (Kwai)]

[JVET-AF0117](https://jvet-experts.org/doc_end_user/current_document.php?id=13364) Non-EE2: extensions of IBC GPM [C. Ma, X. Xiu, W. Chen, H.-H.Jhu, C.-W. Kuo, N. Yan, X. Wang (Kwai)]

[JVET-AF0129](https://jvet-experts.org/doc_end_user/current_document.php?id=13387) Non-EE2: Auto relocated block vector prediction [N. Zhang, K. Zhang, L. Zhang (Bytedance)]

[JVET-AF0132](https://jvet-experts.org/doc_end_user/current_document.php?id=13390) Non-EE2: Optimization of TIMD blending mode [C. Zhou, Z. Lv (vivo)]

[JVET-AF0137](https://jvet-experts.org/doc_end_user/current_document.php?id=13395) AHG12: IntraTMP with Merge Candidates [K. Naser, F. Le Léannec, A. Robert, F. Galpin (InterDigital)]

[JVET-AF0161](https://jvet-experts.org/doc_end_user/current_document.php?id=13419) AHG12: Harmonized IBC/ITMP search area with adaptive sampling [D. Ruiz Coll, B. Chen (Ofinno), K. Naser, P. Bordes, F. Le Léannec, F. Galpin (InterDigital)]

[JVET-AF0166](https://jvet-experts.org/doc_end_user/current_document.php?id=13424) Non-EE2: Intra TMP fusion probing [J.-L. Lin, P.-H. Lin, Y.-J. Chang, Z. Zhang, V. Seregin, M. Karczewicz (Qualcomm)]

[JVET-AF0170](https://jvet-experts.org/doc_end_user/current_document.php?id=13428) Non-EE2: CIIP with subblock-based motion compensation [L. Zhao, K. Zhang, L. Zhang (Bytedance)]

[JVET-AF0171](https://jvet-experts.org/doc_end_user/current_document.php?id=13429) Non-EE2: Sample distance-based weighting for CIIP [J. Zhao, S. Kim (LGE)]

[JVET-AF0184](https://jvet-experts.org/doc_end_user/current_document.php?id=13442) Non-EE2: Search range optimization for Intra TMP [G. Verba, Z. Zhang, V. Seregin, M. Karczewicz (Qualcomm)]

[JVET-AF0199](https://jvet-experts.org/doc_end_user/current_document.php?id=13460) Non-EE2: Bilateral Filtering for Intra Prediction [W. Yin, K. Zhang, Y. Wang, L. Zhang (Bytedance)]

[JVET-AF0226](https://jvet-experts.org/doc_end_user/current_document.php?id=13489) AHG12: SGPM with IntraTMP and IBC [K. Naser, F. Le Léannec, P. Bordes, Y. Chen (InterDigital)] [late]

[JVET-AF0246](https://jvet-experts.org/doc_end_user/current_document.php?id=13509) AHG12: Harmonization of intra prediction mode derivation from neighboring blocks [D. Kim, K. Kim, J.-H. Son, J. -S. Kwak (WILUS)] [late]

[JVET-AF0248](https://jvet-experts.org/doc_end_user/current_document.php?id=13511) Non-EE2: TIMD fusion optimization [P. Andrivon, M. Blestel (Ofinno), C. Zhou, Zhuoyi Lv (vivo)] [late] [miss]

#### Inter (12)

[JVET-AF0082](https://jvet-experts.org/doc_end_user/current_document.php?id=13330) Non-EE2: on LFNST/NSPT for inter coding [F. Wang, J. Gan, Y. Yue, H. Yu, D. Wang (OPPO)]

[JVET-AF0113](https://jvet-experts.org/doc_end_user/current_document.php?id=13360) Non-EE2: Modifications of affine merge candidates [K. Kim, D. Kim, J.-H. Son, [J.-S. Kwak (WILUS)](mailto:jinsam.kwak@wilusgroup.com)]

[JVET-AF0251](https://jvet-experts.org/doc_end_user/current_document.php?id=13514) Crosscheck of JVET-AF0113 (Non-EE2: Modifications of affine merge candidates) [R.-L. Liao (Alibaba)] [late] [miss]

[JVET-AF0118](https://jvet-experts.org/doc_end_user/current_document.php?id=13365) Non-EE2: Regression-based GPM blending [P. Bordes, F. Galpin, K. Naser, F. Urban, K. Reuzé, F. Le Léannec, E. François (InterDigital)]

[JVET-AF0121](https://jvet-experts.org/doc_end_user/current_document.php?id=13368) AHG12: Adjusting out-of-boundary prediction samples [P. Astola, J. Lainema (Nokia)]

[JVET-AF0134](https://jvet-experts.org/doc_end_user/current_document.php?id=13392) AHG12: AMVP with SbTMVP mode [R.-L. Liao, J. Chen, Y. Ye, X. Li (Alibaba)]

[JVET-AF0250](https://jvet-experts.org/doc_end_user/current_document.php?id=13513) Crosscheck of JVET-AF0134 (AHG12: AMVP with SbTMVP mode) [F. Pu (Dolby)] [late] [miss]

[JVET-AF0135](https://jvet-experts.org/doc_end_user/current_document.php?id=13393) AHG12: Additional SbTMVP candidates [R.-L. Liao, J. Chen, Y. Ye, X. Li (Alibaba)]

[JVET-AF0238](https://jvet-experts.org/doc_end_user/current_document.php?id=13501) Crosscheck of JVET-AF0135 (AHG12: Additional SbTMVP candidates) [L. Zhao (Bytedance)] [late] [miss]

[JVET-AF0160](https://jvet-experts.org/doc_end_user/current_document.php?id=13418) Non-EE2: On DMVR Extensions [M. Salehifar, Y. He, K. Zhang, L. Zhang (Bytedance)]

[JVET-AF0162](https://jvet-experts.org/doc_end_user/current_document.php?id=13420) AHG12: Fixes to template matching [J. Chen, R.-L. Liao, X. Li, Y. Ye (Alibaba)]

[JVET-AF0264](https://jvet-experts.org/doc_end_user/current_document.php?id=13528) Crosscheck of JVET-AF0162 (AHG12: Fixes to template matching) [Y. Wang (Bytedance)] [late] [miss]

[JVET-AF0168](https://jvet-experts.org/doc_end_user/current_document.php?id=13426) Non-EE2: Geometric partitioning mode with affine prediction [K. Zhang, Z. Deng, L. Zhang (Bytedance)]

[JVET-AF0191](https://jvet-experts.org/doc_end_user/current_document.php?id=13452) Non-EE2: Enhancements on local illumination compensation [X. Xiu, C. Ma, N. Yan, H.-J. Jhu, C.-W. Kuo, W. Chen, X. Wang (Kwai)]

[JVET-AF0194](https://jvet-experts.org/doc_end_user/current_document.php?id=13455) Non-EE2: On LIC flag in merge mode [Y. Zhang, V. Seregin, H. Wang, Z. Zhang, C.-C. Chen, H. Huang, M. Karczewicz (Qualcomm)]

[JVET-AF0200](https://jvet-experts.org/doc_end_user/current_document.php?id=13461) Non-EE2: Extension of local illumination compensation [Y. Wang, K. Zhang, Y. He, H. Liu, L. Zhang (Bytedance)]

#### Cross Component Prediction (3)

[JVET-AF0083](https://jvet-experts.org/doc_end_user/current_document.php?id=13331) Non-EE2: Enhancements on CCP merge [H. Huang, Y. Yu, H. Yu, D. Wang (OPPO), Z. Deng, K. Zhang, L. Zhang (Bytedance)]

[JVET-AF0114](https://jvet-experts.org/doc_end_user/current_document.php?id=13361) AHG12: Local-Boosting on Cross-Component Merge Mode [H. Qin, K. Ding, Z. Xu (TCL)]

[JVET-AF0176](https://jvet-experts.org/doc_end_user/current_document.php?id=13434) Non-EE2: Decoder Derived Cross-Component Prediction [Y.-J. Chang, P.-H. Lin, V. Seregin, J.-L. Lin, M. Karczewicz (Qualcomm)]

#### In-Loop Filters (3)

[JVET-AF0178](https://jvet-experts.org/doc_end_user/current_document.php?id=13436) Non-EE2: Applying fixed filters to output of the Gaussian filter [N. Hu, M. Karczewicz, V. Seregin (Qualcomm)]

[JVET-AF0179](https://jvet-experts.org/doc_end_user/current_document.php?id=13437) Non-EE2: Fixed filter for Chroma ALF [N. Hu, M. Karczewicz, H. Wang, V. Seregin (Qualcomm)]

[JVET-AF0198](https://jvet-experts.org/doc_end_user/current_document.php?id=13459) Non-EE2: Coefficient Precision Adjustment for ALF [W. Yin, K. Zhang, L. Zhang (Bytedance)]

#### Entropy coding and transform coefficient coding (3)

[JVET-AF0164](https://jvet-experts.org/doc_end_user/current_document.php?id=13422) AHG12: CABAC inter/intra model switch [F. Lo Bianco, F. Galpin, C. Salmon-Legagneur (InterDigital)]

[JVET-AF0169](https://jvet-experts.org/doc_end_user/current_document.php?id=13427) Non-EE2: Adaptive clipping with signaled lower and upper bounds [K. Cui, Z. Zhang, H. Huang, V. Seregin, M. Karczewicz (Qualcomm)]

[JVET-AF0185](https://jvet-experts.org/doc_end_user/current_document.php?id=13443) Non-EE2: Transform Coefficient Coding [P. Nikitin, M. Karczewicz, M. Coban, V. Seregin (Qualcomm)]

#### RPR (1)

[JVET-AF0058](https://jvet-experts.org/doc_end_user/current_document.php?id=13306) AHG12: GOP-based RPR encoder control for ECM [K. Andersson, J. Ström, R. Yu, W. Ahmad, P. Wennersten (Ericsson)]

### CTC for EE2/ECM and general ECM improvements (7)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0090](https://jvet-experts.org/doc_end_user/current_document.php?id=13337) AHG6: Encoder memory profiling on ECM software [Y. Yasugi, T. Ikai (Sharp), R. Chernyak, Shan Liu (Tencent)]

[JVET-AF0101](https://jvet-experts.org/doc_end_user/current_document.php?id=13348) AHG12: ECM software cleanup for decoder side intra predictions acceleration [Z. Fan, Y. Yasugi, T. Ikai (Sharp)]

[JVET-AF0212](https://jvet-experts.org/doc_end_user/current_document.php?id=13475) Crosscheck of JVET-AF0101 (AHG12: ECM software cleanup for decoder side intra predictions acceleration) F. Wang (OPPO) [late] [miss]

[JVET-AF0156](https://jvet-experts.org/doc_end_user/current_document.php?id=13414) AHG6: ECM software optimizations [F. Urban, T. Poirier, F. Le Léannec (InterDigital)]

[JVET-AF0165](https://jvet-experts.org/doc_end_user/current_document.php?id=13423) Ahg7/Ahg12: On VTM-11ecm anchor low-delay test conditions [F. Le Léannec, S. Puri, E. François, K. Naser (InterDigital)]

[JVET-AF0177](https://jvet-experts.org/doc_end_user/current_document.php?id=13435) AHG6: Memory reduction for ECM encoder [N. Hu, V. Seregin, M. Karczewicz (Qualcomm), Y. Yasugi, T. Ikai (Sharp)]

[JVET-AF0201](https://jvet-experts.org/doc_end_user/current_document.php?id=13462) AHG6: On ECM SW memory consumption [R. Chernyak, M. Xu, S. Liu (Tencent), Y. Yasugi, T. Ikai (Sharp)]

[JVET-AF0237](https://jvet-experts.org/doc_end_user/current_document.php?id=13500) AHG6: ECM encoder memory reduction [C.-W. Kuo, X. Xiu, W. Chen, H.-J. Jhu, N. Yan, C. Ma, X. Wang (Kwai)] [late]

# High-level syntax (HLS) and related proposals (42)

## AHG9: SEI messages on NNPF aspects other than grouping (1)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0045](https://jvet-experts.org/doc_end_user/current_document.php?id=13289) AHG2/AHG9: On the use of NNPF SEI messages in AVC [M. M. Hannuksela (Nokia)]

## AHG9: General direction of grouping of post-processing fitlers (PPFs), including NNPFs (3)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0050](https://jvet-experts.org/doc_end_user/current_document.php?id=13298) AHG9: On NNPF groups [M. M. Hannuksela, F. Cricri (Nokia)]

Item 3 of this contribution belongs to this category.

Item 3: Except for the changes proposed in items 1 and 2 in this contributiion, other aspects of the NNPF group design in the VSEI TuC are considered mature in this contribution and are proposed to be included in the VSEI output document of the JVET-AF meeting, which may either be a working draft or a new version of the VSEI TuC document.

[JVET-AF0061](https://jvet-experts.org/doc_end_user/current_document.php?id=13309) AHG9: On grouping of post-processing filters [Y.-K. Wang, W. Jia, J. Xu, L. Zhang (Bytedance)]

[JVET-AF0174](https://jvet-experts.org/doc_end_user/current_document.php?id=13432) AHG9: On the SEI processing order SEI message and NNPF groups [Y. Sanchez, C. Hellge, T. Schierl (Fraunhofer HHI)]

## AHG9: Detailed aspects of NNPF grouping (9)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0050](https://jvet-experts.org/doc_end_user/current_document.php?id=13298) AHG9: On NNPF groups [M. M. Hannuksela, F. Cricri (Nokia)]

Items 1 and 2 of this contribution belong to this category.

[JVET-AF0051](https://jvet-experts.org/doc_end_user/current_document.php?id=13299) AHG9: Signalling the gain provided by NNPFs and NNPF groups [M. M. Hannuksela, F. Cricri, A. Hallapuro (Nokia)]

[JVET-AF0067](https://jvet-experts.org/doc_end_user/current_document.php?id=13315) AHG9: On the SEI processing order SEI message (Part 2) [L. Chen, O. Chubach, Y.-W. Huang, S. Lei (MediaTek)]

[JVET-AF0091](https://jvet-experts.org/doc_end_user/current_document.php?id=13338) [AHG9] On design for signalling purpose information for NNPFGC [[Hendry](mailto:dr.hendry@lge.com), J. Nam, S. Kim, J. Lim (LGE)]

[JVET-AF0092](https://jvet-experts.org/doc_end_user/current_document.php?id=13339) [AHG9] On the output pictures from NNPFGC with parallel grouping type [[Hendry](mailto:dr.hendry@lge.com), J. Nam, S. Kim, J. Lim (LGE)]

[JVET-AF0093](https://jvet-experts.org/doc_end_user/current_document.php?id=13340) [AHG9] On intermediary output picture(s) from activation of an NNPFGC [[Hendry](mailto:dr.hendry@lge.com), J. Nam, S. Kim, J. Lim (LGE)]

[JVET-AF0094](https://jvet-experts.org/doc_end_user/current_document.php?id=13341) [AHG9] On activation of an NNPFGC that contains another NNPFGC [[Hendry](mailto:dr.hendry@lge.com), J. Nam, S. Kim, J. Lim (LGE)]

[JVET-AF0095](https://jvet-experts.org/doc_end_user/current_document.php?id=13342) [AHG9] On order of output pictures when skipped candidate input pictures are present in NNPFGA [Hendry, J. Nam, S. Kim, J. Lim (LGE)]

[JVET-AF0096](https://jvet-experts.org/doc_end_user/current_document.php?id=13343) [AHG9] On miscellaneous aspects of NNPFGC and NNPFGA [Hendry, J. Nam, S. Kim, J. Lim (LGE)]

## AHG9: SEI processing order SEI message aspects other than PPF grouping (5)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0049](https://jvet-experts.org/doc_end_user/current_document.php?id=13297) AHG9: On the SEI processing order SEI message [M. M. Hannuksela (Nokia)]

[JVET-AF0062](https://jvet-experts.org/doc_end_user/current_document.php?id=13310) AHG9: Some syntax and semantics changes for the SEI processing order SEI message [Y.-K. Wang (Bytedance)]

[JVET-AF0065](https://jvet-experts.org/doc_end_user/current_document.php?id=13313) AHG9: On the SEI processing order SEI message (Part 1) [L. Chen, O. Chubach, Y.-W. Huang, S. Lei (MediaTek)]

[JVET-AF0070](https://jvet-experts.org/doc_end_user/current_document.php?id=13318) AHG9: On the SEI processing order SEI message [T. Chujoh, Y. Yasugi, T. Ikai (Sharp)]

[JVET-AF0189](https://jvet-experts.org/doc_end_user/current_document.php?id=13449) AHG9: Proposed modifications of the draft SEI processing order SEI message in VVC [G. J. Sullivan, S. McCarthy, P. Yin (Dolby Labs)]

## AHG9: SEI messages related to generative face video (3)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0048](https://jvet-experts.org/doc_end_user/current_document.php?id=13296) A Study on Decoder Interoperability of Generative Face Video Compression [B. Chen, S. Yin, J. Chen, Y. Ye (Alibaba), S. Wang (CityU HK)]

[JVET-AF0146](https://jvet-experts.org/doc_end_user/current_document.php?id=13404) AHG9: On Face Motion Information for Generative Face Video [H.-B. Teo, J.-Y Thong, K. Jayashree, C.-S. Lim, K. Abe (Panasonic)]

[JVET-AF0234](https://jvet-experts.org/doc_end_user/current_document.php?id=13497) AHG9: Common text for proposed generative face video SEI message [B. Chen, J. Chen, Y. Ye (Alibaba), S. Wang (CityU), S. McCarthy, P. Yin, G.-M. Su, A. K. Choudhury, W. Husak (Dolby)] [late] [miss]

## AHG9: Source picture timing information SEI message aspects (6)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0055](https://jvet-experts.org/doc_end_user/current_document.php?id=13303) AHG9: On Source Picture Timing Information (SPTI) SEI message [[J. Samuelsson-Allendes](mailto:samuelssonj@sharplabs.com), S. Deshpande (Sharp)]

[JVET-AF0069](https://jvet-experts.org/doc_end_user/current_document.php?id=13317) AHG9: On source picture timing information SEI message [S. McCarthy, G. J. Sullivan, P. Yin (Dolby)]

[JVET-AF0097](https://jvet-experts.org/doc_end_user/current_document.php?id=13344) [AHG9] On description of picture 0 in source picture timing information SEI message [Hendry, J. Nam, S. Kim, J. Lim (LGE)]

[JVET-AF0098](https://jvet-experts.org/doc_end_user/current_document.php?id=13345) [AHG9] On temporal reversal feature in source picture timing information SEI message [Hendry, J. Nam, S. Kim, J. Lim (LGE)]

[JVET-AF0099](https://jvet-experts.org/doc_end_user/current_document.php?id=13346) [AHG9] On signaling of source picture interval scale factor and sublayer synthesized flag in source picture timing information SEI message [Hendry, J. Nam, S. Kim, J. Lim (LGE)]

[JVET-AF0100](https://jvet-experts.org/doc_end_user/current_document.php?id=13347) [AHG9] On miscellaneous aspects of source picture timing information SEI message [Hendry, J. Nam, S. Kim, J. Lim (LGE)]

## AHG9: Encoder optimization information SEI message aspects (3)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0068](https://jvet-experts.org/doc_end_user/current_document.php?id=13316) AHG8/AHG9: Signalling of encoder preprocessing information [W. Jia, Y. Li, Y.-K. Wang, K. Zhang, L. Zhang (Bytedance)]

[JVET-AF0105](https://jvet-experts.org/doc_end_user/current_document.php?id=13352) AHG9: On color vision deficiency optimization type for encoder optimization info SEI message [C. Kim, Hendry, D. Gwak, J. Lim, S. Kim (LGE)]

[JVET-AF0107](https://jvet-experts.org/doc_end_user/current_document.php?id=13354) AHG9: On miscellaneous aspects for encoder optimization info SEI message [C. Kim, Hendry, D. Gwak, J. Lim, S. Kim (LGE)]

## AHG9: Object mask information SEI message aspects (2)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0087](https://jvet-experts.org/doc_end_user/current_document.php?id=13335) AHG9: Experimental results of object mask auxiliary picture coding [Z. Zhang, [J. Chen](mailto:jiechen.cj@alibaba-inc.com), Y. Ye, S. Wang (Alibaba)]

[JVET-AF0088](https://jvet-experts.org/doc_end_user/current_document.php?id=13336) AHG9: Software implementation and further fixes of the object mask information SEI message [J. Chen, Z. Zhang, Y. Ye, S. Wang (Alibaba)]

## AHG9: Other SEI topics (10)

Contributions in this area were discussed at XXXX–XXXX on XXday XX Oct. 2023 (chaired by XXX).

[JVET-AF0138](https://jvet-experts.org/doc_end_user/current_document.php?id=13396) AHG8/AHG9: Truncated bit depth support SEI messages [D. Ding, X. Zhao, S. Liu, G. Teniou, S. Wenger (Tencent)]

[JVET-AF0140](https://jvet-experts.org/doc_end_user/current_document.php?id=13398) [AHG9] Inter Picture Dependency SEI message [G. Teniou, S. Wenger, S. Liu (Tencent)]

[JVET-AF0141](https://jvet-experts.org/doc_end_user/current_document.php?id=13399) AHG9: SEI messages for common image metadata formats [A. Hinds, S. Wenger (Tencent)]

[JVET-AF0142](https://jvet-experts.org/doc_end_user/current_document.php?id=13400) [AHG9] Local Film Grain Synthesis using Annotated Regions SEI [G. Teniou, S. Wenger (Tencent)]

[JVET-AF0144](https://jvet-experts.org/doc_end_user/current_document.php?id=13402) [AHG9] Adaptive Film grain synthesis using Alpha Channel Information SEI message [G. Teniou, S. Wenger (Tencent)]

[JVET-AF0145](https://jvet-experts.org/doc_end_user/current_document.php?id=13403) AHG9: SEI message for text for generative AI [A. Hinds, S. Wenger (Tencent)]

[JVET-AF0147](https://jvet-experts.org/doc_end_user/current_document.php?id=13405) AHG8/AHG9: On Picture Modality Type [J. Gao, H.-B. Teo, C.-S. Lim, K. Abe (Panasonic)]

[JVET-AF0148](https://jvet-experts.org/doc_end_user/current_document.php?id=13406) [AHG9] Large SEI message signalling [G. Teniou, S. Wenger (Tencent)]

[JVET-AF0149](https://jvet-experts.org/doc_end_user/current_document.php?id=13407) [AHG9] Application-required SEI NAL Units [G. Teniou, S. Wenger (Tencent)]

[JVET-AF0167](https://jvet-experts.org/doc_end_user/current_document.php?id=13425) AHG9: On the Proposed Multiplane Image Information SEI Message [T. Lu, P. Yin, S. Oh, S. McCarthy, W. Husak, G. J. Sullivan (Dolby)]

[JVET-AF0255](https://jvet-experts.org/doc_end_user/current_document.php?id=13518) Crosscheck of JVET-AF0167 (AHG9: On the Proposed Multiplane Image Information SEI Message) [R.-L. Liao (Alibaba)] [late] [miss]

## Non-SEI HLS aspects (0)

Section kept as a template for future use.

# Plenary meetings, joint meetings, BoG reports, and liaison communications

## JVET plenaries

No intermediate plenaries were held, as document review and decisions were made in single-track mode at this meeting (with some BoG activity as noted). Further detail on scheduling is recorded in section 2.15.

Joint meetings involving JVET were held as follows:

* JVET, XXX on XXX topics, on XXday XX Oct. at XXXX–XXXX
* Further detail about these sessions with other groups is provided in the other subsections of this section.

General plenary wrap-up discussions are recorded under sections 8, 9, and 10.

## Information sharing meetings

Information sharing sessions with other WGs and AGs of the MPEG community were held on Monday 16 Oct. 0900–1130, Wednesday 18 Oct. 0900–1030, and Friday 20 Oct. 1400–1600.

The status and plans for the work in the MPEG WGs and AGs was reviewed at these information sharing sessions.

## Joint meeting of JVET, XXXX on XXX related topics

This joint session was held on XXday XX Oct. at XXXX–XXXX. About XXX people were present in the room and about XXX were connected on Zoom (substantially overlapping with those present in the room).

Agenda

* …

## BoGs (3)

The following break-out groups were established at this meeting to conduct discussion and develop recommendations on particular subjects.

## Liaison communications (1)

JPEG liaison [m64537](https://dms.mpeg.expert/doc_end_user/current_document.php?id=88881&id_meeting=195) provided an update on the status of work in the JPEG AI project. The JPEG AI VM2 evaluation reportedly showed 28% and 32% compression efficiency gains over the VVC Intra anchor, for the tools-off and tools-on configurations, respectively, requiring approximately 800 kMAC/pxl at the decoder side. A lightweight model was also adopted targeting mobile devices, reportedly providing 10% compression efficiency gains (tools off) over VVC at 20 kMAC/pxl and 15% gains (tools on) at ~30 kMAC/pxl.

DIS was scheduled for Oct. 2023.

A reply was drafted as WG 5 N 234, and was reviewed in JVET on Wednesday 19 July 1045. The draft reply was also presented in the AG 3 meeting Thursday 20 July at 1000.

# Project planning

## Software timeline

ECM 10 software (including all adoptions) was planned to be available 3 weeks after the meeting.

The NNVC 6.0 codebase software (integrating HOP loop filter with stage 2 optimization plus some bug fixes) was planned to be available 2 weeks after the meeting. An update 6.1 (including verified HOP stage 3 and verified simplified intra prediction) was planned to be available 4 weeks after the meeting.

VTM22.0 software was planned to be available on 2023-09-01. (Note that further updates may be released later)

Updates on top of HM17.0 software were not planned, but might be released after merging pending requests, as appropriate.

## Core experiment and exploration experiment planning

An EE on neural network-based video coding was established, as recorded in output document JVET-AF2023.

An EE on enhanced compression technology beyond VVC capability using techniques other than neural-network technology was also established, as recorded in output document JVET-AF2024.

Initial versions of these documents were presented and approved.

## Drafting of specification text, encoder algorithm descriptions, and software

The following agreement has been established: the editorial team has the discretion to not integrate recorded adoptions for which the available text is grossly inadequate (and cannot be fixed with a reasonable degree of effort), if such a situation hypothetically arises. In such an event, the text would record the intent expressed by the committee without including a full integration of the available inadequate text.

## Plans for improved efficiency and contribution consideration

The group considered it important to have the full design of proposals documented to enable proper study.

Adoptions need to be based on properly drafted working draft text (on normative elements) and HM/VTM encoder algorithm descriptions – relative to the existing drafts. Proposal contributions should also provide a software implementation (or at least such software should be made available for study and testing by other participants at the meeting, and software must be made available to cross-checkers in EEs).

Suggestions for future meetings included the following generally-supported principles:

* Normative contributions (relating to changes in bitstream/decoder) shall include draft specification text
* Proposals shall contain all details relevant for understanding and be self-contained. In cases where the document is a follow-up of a previous contribution, the overall concept and the novelties should be highlighted at minimum
* Coding tool and encoder optimization proposals shall contain Excel sheets that allow assessment on a per-sequence basis
* Algorithm description text is strongly encouraged for non-normative contributions that are intended to be included in model description documents (VTM, ECM, etc.), and that is required for inclusion in TR drafts.
* Early upload deadline to enable substantial study prior to the meeting
* Using a clock timer to ensure efficient proposal presentations (5 min) and discussions (nott exercised currently)

As general guidance, it was suggested to avoid usage of company names in document titles, software modules etc., and not to describe a technology by using a company name.

## General issues for experiments

It was emphasized that those rules which had been set up or refined during the 12th JVET meeting should be observed. In particular, for some CEs of some previous meetings, results were available late, and some changes in the experimental setup had not been sufficiently discussed on the JVET reflector.

Group coordinated experiments have been planned as follows:

* “Core experiments” (CEs) are the coordinated experiments on coding tools which are deemed to be interesting but require more investigation and could potentially become part of a draft standard by the next meeting or in the near future.
* “Exploration experiments” (EEs) are also coordinated experiments. These are conducted on technology which is not foreseen to become part of a draft standard in the near future. The investigating methodology for assessment of such technology can also be an important part of an EE. (Further general rules for EEs, as far as deviating from the CE rules below, should be discussed in a future meeting. For the current meeting, procedures as described in the EE description document are deemed to be sufficient.)
* A CE is a test of a specific fully described technology in a specific agreed way. It is not a forum for thinking of new ideas (like an AHG). The CE coordinators are responsible for making sure that the CE description is complete and correct and has adequate detail. Reflector discussions about CE description clarity and other aspects of CE plans are encouraged.
* A description of each experiment is to be approved at the meeting at which the experiment plan is established. This should include the issues that were raised by other experts when the tool was presented, e.g., interference with other tools, contribution of different elements that are part of a package, etc. The experiment description document should provide the names of individual people, not just company names.
* Software for tools investigated in a CE will be provided in one or more separate branches of the software repository. Each CE will have a “fork” of the software, and within the CE there may be multiple branches established by the CE coordinator. The software coordinator will help coordinate the creation of these forks and branches and their naming. All JVET members will have read access to the CE software branches (using shared read-only credentials as described below).
* During the experiment, revisions of the experiment plans can be made, but not substantial changes to the proposed technology. Withdrawing parts of experiments that were intended to show the individual benefits of a tool or parts of a tool is strongly discouraged. Combination tests may not be considered in such cases. Any changes made to individual tools in a combination shall be documented.
* The CE description must match the CE testing that is done. The CE description needs to be revised if there has been some change of plans.
* The CE summary report must describe any changes that were made in the process of finalizing the CE.
* By the next meeting it is expected that at least one independent cross-checker will report a detailed analysis of each proposed feature that has been tested and confirm that the implementation is correct. Commentary on the potential benefits and disadvantages of the proposed technology in cross-checking reports is highly encouraged. Having multiple cross-checking reports is also highly encouraged (especially if the cross-checking involves more than confirmation of correct test results). The reports of cross-checking activities may (and generally should) be integrated into the CE report rather than submitted as separate documents.
* It is mandatory to report encoder optimizations made for the benefit of a tool, and if an equivalent optimization could be applied on the anchor, a comparison against the improved anchor shall be provided.
* A new proposal can be included in a CE based on group decision, regardless if an independent party has already performed a cross-check in the meeting when it was first proposed.

It is possible to define sub-experiments within particular CEs, for example designated as CEX.a, CEX.b, etc., where X is the basic CE number.

As a general rule, it was agreed that each CE should be run under the same testing conditions using one software codebase, which should be based on the group test model software codebase. An experiment is not to be established as a CE unless there is access given to the participants in (any part of) the CE to the software used to perform the experiments.

The general agreed common conditions for single-layer coding efficiency experiments for SDR video are described in the prior output document JVET-T2010.

Experiment descriptions should be written in a way such that it is understood as a JVET output document (written from an objective “third party perspective”, not a proponent perspective – e.g. not referring to methods as “improved”, “optimized”, “enhanced”, etc.). The experiment descriptions should generally not express opinions or suggest conclusions – rather, they should just describe what technology will be tested, how it will be tested, who will participate, etc. Responsibilities for contributions to CE work should identify individuals in addition to company names.

CE descriptions contain a basic description of the technology under test, but should not contain excessively verbose descriptions of a technology (at least not unless the technology is not adequately documented elsewhere). Instead, the CE descriptions should refer to the relevant proposal contributions for any necessary further detail. However, the complete detail of what technology will be tested must be available – either in the CE description itself or in documents that are referenced in the CE description that are also available in the JVET document archive.

Any technology must have at least one cross-check partner to establish a CE – a single proponent is not enough. It is highly desirable have more than just one proponent and one cross-checker.

The CE development workflow is described at:

<https://vcgit.hhi.fraunhofer.de/jvet/VVCSoftware_VTM/wikis/Core-experiment-development-workflow>

CE read access is available using shared accounts: One account exists for MPEG members, which uses the usual MPEG account data. A second account exists for VCEG members with account information available in the TIES informal ftp area (IFA) system at:

<https://www.itu.int/ifa/t/2017/sg16/exchange/wp3/q06/vceg_account.txt>

Some agreements relating to CE activities were established as follows:

* Only qualified JVET members can participate in a CE.
* Participation in a CE is possible without a commitment of submitting an input document to the next meeting. Participation is requested by contacting the CE coordinator.
* All software, results, and documents produced in the CE should be announced and made available to JVET in a timely manner.
* A JVET CE reflector will be established and announced on the main JVET reflector. Discussion of logistics arrangements, exchange of data, minor refinement of the test plans, and preparation of documents shall be conducted on the JVET CE reflector, with subject lines prefixed by “[CEx: ]”, where “x” is the number of the CE. All substantial communications about a CE other than such details shall take place on main JVET reflector. In the case that large amounts of data are to be distributed, it is recommended to send a link to the data rather than the data itself, or upload the data as an input contribution to the next meeting.

General timeline for CEs

T1= 3 weeks after the JVET meeting: To revise the CE description and refine questions to be answered. Questions should be discussed and agreed on JVET reflector. Any changes of planned tests after this time need to be announced and discussed on the JVET reflector. Initially assigned description numbers shall not be changed later. If a test is skipped, it is to be marked as “withdrawn”.

T2 = Test model software release + 2 weeks: Integration of all tools into a separate CE branch of the VTM is completed and announced to JVET reflector.

* Initial study by cross-checkers can begin.
* Proponents may continue to modify the software in this branch until T3.
* 3rd parties are encouraged to study and make contributions to the next meeting with proposed changes

T3: 3 weeks before the next JVET meeting or T2 + 1 week, whichever is later: Any changes to the CE test branches of the software must be frozen, so the cross-checkers can know exactly what they are cross-checking. A software version tag should be created at this time. The name of the cross-checkers and list of specific tests for each tool under study in the CE plan description shall be documented in an updated CE description by this time.

T4: Regular document deadline minus 1 week: CE contribution documents including specification text and complete test results shall be uploaded to the JVET document repository (particularly for proposals targeting to be promoted to the draft standard at the next meeting).

The CE summary reports shall be available by the regular contribution deadline. This shall include documentation about crosscheck of software, matching of CE description and confirmation of the appropriateness of the text change, as well as sufficient crosscheck results to create evidence about correctness (crosscheckers must send this information to the CE coordinator at least 3 days ahead of the document deadline). Furthermore, any deviations from the timelines above shall be documented. The numbers used in the summary report shall not be changed relative to the description document.

CE reports may contain additional information about tests of straightforward combinations of the identified technologies. Such supplemental testing needs to be clearly identified in the report if it was not part of the CE plan.

New branches may be created which combine two or more tools included in the CE document or the VTM (as applicable).

It is not necessary to formally name cross-checkers in the initial version of the CE description document. To adopt a proposed feature at the next meeting, JVET would like to see comprehensive cross-checking done, with analysis of whether the description matches the software, and a recommendation of the value of the tool and given tradeoffs.

The establishment of a CE does not indicate that a proposed technology is mature for adoption or that the testing conducted in the CE is fully adequate for assessing the merits of the technology, and a favourable outcome of CE does not indicate a need for adoption of the technology into a standard or test model.

Availability of specification text is important to have a detailed understanding of the technology and also to judge what its impact on the complexity of the specification will be. There must also be sufficient time to study this in detail. CE contributions without sufficiently mature draft specification text in the CE input document should not be considered for adoption.

Lists of participants in CE documents should be pruned to include only the active participants. Read access to software will be available to all members.

# Establishment of ad hoc groups

The ad hoc groups established to progress work on particular subject areas until the next meeting are described in the table below. The discussion list for all of these ad hoc groups was agreed to be the main JVET reflector ([jvet@lists.rwth-aachen.de](mailto:jvet@lists.rwth-aachen.de)).

Review of AHG plans was conducted during the plenary on Tuesday 18 July 2023 at 1500, with some refinements on Wednesday 19 July 2023 at 1045.

|  |  |  |
| --- | --- | --- |
| **Title and Email Reflector** | **Chairs** | **Mtg** |
| **Project Management (AHG1)**  ([jvet@lists.rwth-aachen.de](mailto:jvet@lists.rwth-aachen.de))   * Coordinate overall JVET interim efforts. * Supervise AHG and experiment studies. * Report on project status to JVET reflector. * Provide a report to the next meeting on project coordination status. * Supervise processing and delivery of output documents | J.-R. Ohm (chair), G. J. Sullivan (vice‑chair) | N |
| **Draft text and test model algorithm description editing (AHG2)**  ([jvet@lists.rwth-aachen.de](mailto:jvet@lists.rwth-aachen.de))   * Produce and finalize draft text outputs of the meeting (JVET-AE1006, JVET-AE1016, JVET-AE2005, JVET-AE2006, and JVET-AE2027. * Collect reports of errata for the VVC, VSEI, HEVC, AVC, CICP, and the published related technical reports and produce the JVET-AE1004 errata output collection. * Coordinate with the test model software development AhG to address issues relating to mismatches between software and text. * Collect and consider errata reports on the texts. | B. Bross, C. Rosewarne (co-chairs), F. Bossen, A. Browne, S. Kim, S. Liu, J.‑R. Ohm, G. J. Sullivan, A. Tourapis, Y.-K. Wang, Y. Ye (vice‑chairs) | N |
| **Test model software development (AHG3)**  ([jvet@lists.rwth-aachen.de](mailto:jvet@lists.rwth-aachen.de))   * Coordinate development of test models (VTM, HM, SCM, SHM, HTM, MFC, MFCD, JM, JSVM, JMVM, 3DV-ATM, 360Lib, and HDRTools) software and associated configuration files. * Produce documentation of software usage for distribution with the software. * Enable software support for recently standardized additional SEI messages. * Discuss and make recommendations on the software development process. * Perform comparative tests of test model behaviour using common test conditions, including HDR, high bit depth and high bit rate. * Suggest configuration files for additional testing of tools. * Investigate how to minimize the number of separate codebases maintained for group reference software. * Coordinate with AHG on Draft text and test model algorithm description editing (AHG2) to identify any mismatches between software and text, and make further updates and cleanups to the software as appropriate. * Prepare drafts of merged and updated CTC documents for HM and VTM, as applicable. | F. Bossen, X. Li, K. Sühring (co-chairs), E. François, Y. He, K. Sharman, V. Seregin, A. Tourapis (vice‑chairs) | N |
| **Test material and visual assessment (AHG4)**  ([jvet@lists.rwth-aachen.de](mailto:jvet@lists.rwth-aachen.de))   * Consider plans for additional verification testing of VVC capability, particularly target conducting a first test for VVC multi-layer features by the next meeting, and update the test plan according to subsequent tests. * Coordinate with AHG13 on assessing new test material; improve and update the draft test plan for subjective quality testing of the FGC SEI message. * Maintain the video sequence test material database for testing the VVC and HEVC standards and potential future extensions, as well as exploration activities. * Study coding performance and characteristics of available and proposed video test material. * Identify and recommend appropriate test material for testing the VVC standard and potential future extensions, as well as exploration activities. * Identify and characterize missing types of video material, solicit contributions, collect, and make available a variety of video sequence test material, in coordination with other AHGs, as appropriate. * Maintain and update the directory structure for the test sequence repository, as necessary. * Collect information about test sequences that have been made available by other organizations. * Prepare and conduct expert viewing for purposes of subjective quality evaluation. * Coordinate with AG 5 in studying and developing further methods of subjective quality evaluation, e.g. based on crowd sourcing. * Prepare availability of viewing equipment and facilities arrangements for future meetings. | V. Baroncini, T. Suzuki, M. Wien (co-chairs), W. Husak, S. Iwamura, P. de Lagrange, S. Liu, S. Puri, A. Segall, S. Wenger (vice-chairs) | Y (tel., 2 weeks notice) |
| **Conformance testing (AHG5)**  ([jvet@lists.rwth-aachen.de](mailto:jvet@lists.rwth-aachen.de))   * Produce and finalize the draft of additional conformance bitstreams for VVC multilayer configurations JVET-AE2028, and investigate the need for future improvements of conformance testing specifications. * Study the conformance needs for HEVC multi-view profiles, and develop a set of conformance bitstreams as appropriate. * Study the requirements of VVC, HEVC, and AVC conformance testing to ensure interoperability. * Maintain and update the conformance bitstream database, and contribute to report problems, and suggest actions to resolve these. * Study additional testing methodologies to fulfil the needs for VVC conformance testing. | I. Moccagatta (chair), F. Bossen, K. Kawamura, P. de Lagrange, T. Ikai, S. Iwamura, H.-J. Jhu, S. Paluri, K. Sühring, Y. Yu (vice‑chairs) | N |
| **ECM software development (AHG6)**  ([jvet@lists.rwth-aachen.de](mailto:jvet@lists.rwth-aachen.de))   * Coordinate development of the ECM software and associated configuration files. * Produce documentation of software usage for distribution with the software. * Prepare and deliver ECM-10.0 software version and the reference configuration encodings according to the ECM common test conditions. * Investigate encoder speedup and other software optimization such as reduction of memory consumption. * Coordinate with ECM algorithm description editors to identify any mismatches between software and text, make further updates and cleanups to the software as appropriate. | V. Seregin (chair), J. Chen, R. Chernyak, F. Le Léannec, K. Zhang (vice-chairs) | N |
| **ECM tool assessment (AHG7)**  ([jvet@lists.rwth-aachen.de](mailto:jvet@lists.rwth-aachen.de))   * Investigate methodology of tool assessment. * Coordinate with AHG6 on resolving tool-off test related software issues (missing tool controls and software bugs). * Prepare configuration files and generate bitstreams and results of tool-on/tool-off testing. * Prepare reporting of tool assessment results. * Collect simulation results on non-CTC sequences, and report any issues identified with non-CTC sequences * Develop methodology of more reliable runtime measurement | X. Li (chair), L.-F. Chen, Z. Deng, J. Gan, E. François, H.-J. Jhu, X. Li, H. Wang (vice‑chairs) | N |
| **Optimization of encoders and receiving systems for machine analysis of coded video content (AHG8)**  ([jvet@lists.rwth-aachen.de](mailto:jvet@lists.rwth-aachen.de))   * Solicit and study non-normative encoder and receiving systems technologies that enhance performance of machine analysis tasks on coded video content. * Identify and collect test materials that are suitable to be used by JVET for machine analysis tasks. * Generate anchors according to the common test conditions JVET-AE2031. * Discuss improvements on the evaluation framework, including evaluation procedures and methodologies. * Coordinate software development, and continue to migrate the software basis used in AHG8 to newest VTM version. * Coordinate experiments on optimization of encoders and receiving systems for machine analysis of coded video content. * Maintain the software implementation example algorithms in the repository, including sufficient documentation in terms of operation and performance. * Evaluate proposed technologies and their suitability for machine analysis applications. * Propose improvements to the draft technical report JVET-AE2030 on optimization of encoders and receiving systems for machine analysis of coded video content. * Study the potentials of using SEI messages for the purpose of machine analysis in coordination with AHG9. * Coordinate with WG 4 VCM AHG on aspects such as common test conditions, evaluation metrics, test and training materials, usage of SEI messages, and on studying characteristics and requirements of targeted machine analysis tasks, etc. | C. Hollmann, S. Liu, S. Wang, M. Zhou (AHG chairs) | Y (tel., 2 weeks notice) |
| **SEI message studies (AHG9)**  ([jvet@lists.rwth-aachen.de](mailto:jvet@lists.rwth-aachen.de))   * Study the SEI messages in VSEI, VVC, HEVC and AVC. * Discuss the document for technologies under consideration for VSEI JVET-AE2032, and propose improvements as appropriate. * Collect software and showcase information for SEI messages, including encoder and decoder implementations and bitstreams for demonstration and testing. * Identify potential needs for additional SEI messages, including the study of SEI messages defined in HEVC and AVC for potential use in the VVC context. * Study the alignments of the same SEI messages in different standards * Coordinate with AHG8 and WG 4 to study mechanisms for signalling metadata in the context of machine analysis of coded video content. * Coordinate with AHG3 for software support of SEI messages. | S. McCarthy, Y.-K. Wang (co-chairs), T. Chujoh, S. Deshpande, C. Fogg, Hendry, P. de Lagrange, G. J. Sullivan, A. Tourapis, S. Wenger (vice-chairs) | N |
| **Encoding algorithm optimization (AHG10)**  ([jvet@lists.rwth-aachen.de](mailto:jvet@lists.rwth-aachen.de))   * Study the impact of using techniques such as tool adaptation and configuration, and perceptually optimized adaptive quantization for encoder optimization. * Study the impact of non-normative techniques of preprocessing for the benefit of encoder optimization. * Study encoding techniques of optimization for objective quality metrics and their relationship to subjective quality. * Study optimized encoding for reference picture resampling and scalability modes in VTM. * Study optimized encoding and tool combinations for low latency and low complexity. * Consider neural network-based encoding optimization technologies for video coding standards. * Investigate other methods of improving objective and/or subjective quality, including adaptive coding structures and multi-pass encoding. * Study methods of rate control and rate-distortion optimization and their impact on performance, subjective and objective quality. * Study the potential of defining default or alternate software configuration settings and test conditions optimized for either subjective quality, or higher objective quality, and coordinate such efforts with AHG3 and AHG6. * Study the effect of varying configuration parameters depending on temporal layer, such as those related to deblocking, partitioning, chroma QP. | P. de Lagrange, A. Duenas, R. Sjöberg, A. Tourapis (AHG chairs) | N |
| **Neural network-based video coding (AHG11)**  ([jvet@lists.rwth-aachen.de](mailto:jvet@lists.rwth-aachen.de))   * Evaluate and quantify the performance improvement potential of NN-based video coding technologies compared to existing video coding standards such as VVC, including both individual coding tools and novel architectures. * Discuss potential refinements of the test conditions for NN-based video coding in JVET-AE2016. Generate and distribute anchor encoding, and develop supporting software as needed. * Study the impact of training (including the impact of loss functions) on the performance of candidate technologies, and identify suitable material for testing and training. * Assess the results on 3rd stage of HOP filter training and simplified intra prediction training crosscheck for a possible inclusion in NNVC6 software. * Analyse complexity characteristics, perform complexity analysis, and develop complexity reductions of candidate technology. * Finalize and discuss the EE on neural network-based video coding. * Coordinate with other groups, including SC29/AG5 on the evaluation and assessment of visual quality, and AHG12 on the interaction with ECM coding tools. If possible, prepare encodings with combinations of tools included in the NNVC software for visual quality assessment at the next meeting. * Coordinate with AHG14 on items related to NNVC software development. | E. Alshina, F. Galpin, S. Liu, A. Segall (co‑chairs), J. Li, R.-L. Liao, D. Rusanovskyy, T. Shao, M. Wien, P. Wu (vice‑chairs) | Y (tel., 2 weeks notice), first on Aug. 9 |
| **Enhanced compression beyond VVC capability (AHG12)**  ([jvet@lists.rwth-aachen.de](mailto:jvet@lists.rwth-aachen.de))   * Solicit and study non-neural-network video coding tools with enhanced compression capabilities beyond VVC. * Discuss and propose refinements to the ECM10 algorithm description JVET-AE2025. * Coordinate with AHG7 to study the performance and complexity tradeoff of these video coding tools. * Coordinate with AHG6 on ECM software development. * Support AHG6 in generating anchors according to the test conditions in JVET-AE2017. * Analyse the results of exploration experiments described in JVET-AE2024 in coordination with the EE coordinators. * Coordinate with AHG11 to study the interaction with neural network-based coding tools. | M. Karczewicz, Y. Ye, L. Zhang (co-chairs), B. Bross, R. Chernyak, X. Li, K. Naser, Y. Yu (vice-chairs) | Y (tel., 2 weeks notice) |
| **Film grain technologies (AHG13)**  ([jvet@lists.rwth-aachen.de](mailto:jvet@lists.rwth-aachen.de))   * Study the benefits and characteristics of film grain technologies, including autoregressive and frequency-filtering technologies. * Study alternative film grain models and their associated documentation. * In consultation with AHG4, study and define content characteristics and test conditions that are desirable for the study and testing of film grain technologies, and perform an assessment of newly available test materials in that regard. * Given the study of desirable content characteristics, solicit or create new test material for further determining the operational characteristics of, testing, and developing any related technologies. * Study preprocessing and encoder technologies for determining values for FGC (Film Grain Characteristics) SEI message syntax elements. * Identify potential need for additional film grain technology and signalling, if needed. * Coordinate development of film grain technology software and configuration files. * Coordinate with AG 5 on improving the draft plan for subjective quality testing of the FGC SEI message JVET-AD2022, and conduct preparations for such testing. * Coordinate with AHG3 for software support of the FGC SEI message. | W. Husak, P. de Lagrange (co-chairs), A. Duenas, D. Grois, Y. He, X. Meng, M. Radosavljević, A. Segall, A. Tourapis, W. Zhang (vice-chairs) | Y (tel., 2 weeks notice) |
| **NNVC software development (AHG14)**  ([jvet@lists.rwth-aachen.de](mailto:jvet@lists.rwth-aachen.de))   * Coordinate development of the NNVC software and associated configuration files. * Prepare and deliver NNVC-6.0 software version and the reference configuration encodings according to the NNVC common test conditions as described in JVET-AE2016. * Investigate combinations of tools included in the NNVC software, prepare and release anchor data for all configurations of the software, including anchors for High and Low Operation Point (HOP/LOP) configurations. * Study and maintain the SADL (Small Adhoc Deep-Learning Library). Identify gaps in functionality and develop improvements as needed. * Coordinate with NNVC algorithm and software description (JVET-AE2019) editors to identify any mismatches between software and description document, suggest further updates to the description document as appropriate. * Coordinate with AHG11 on items related to NNVC activities. | F. Galpin (chair), Y. Li, Y. Li, J. Shingala, L. Wang, Z. Xie (vice chairs) | Y (tel., 2 weeks notice), first on Aug. 9 |

It was confirmed that the rules which can be found in document ISO/IEC JTC 1/‌SC 29/‌AG 2 [N 046](https://www.mpegstandards.org/wp-content/uploads/2022/01/ISO-IECJTC1-SC29-AG2_N0046_AhG.pdf) “Ad hoc group rules for MPEG AGs and WGs” (available at <https://www.mpegstandards.org/adhoc/>), are consistent with the operation mode of JVET AHGs. It is pointed out that JVET does not maintain separate AHG reflectors, such that any JVET member is implicitly a member of any AHG. This shall be mentioned in the related WG Recommendations. The list above was also issued as a separate WG 5 document (ISO/IEC JTC 1/‌SC 29/‌WG 5 N 235) in order to make it easy to reference.

# Output documents

The following documents were agreed to be produced or endorsed as outputs of the meeting. Names recorded below indicate the editors responsible for the document production. Where applicable, dates of planned finalization and corresponding parent-body document numbers are also noted.

It was reminded that in cases where the JVET document is also made available as a WG 5 output document, a separate version under the WG 5 document header should be generated. This version should be sent to GJS and JRO for upload.

The list of JVET ad hoc groups was also issued as a WG 5 output document WG 5 N 235, as noted in section 9.

[JVET-AE1000](https://jvet-experts.org/doc_end_user/current_document.php?id=13264) Meeting Report of the 31st JVET Meeting [J.-R. Ohm] [WG 5 N 216] (2023-08-16)

Initial versions of the meeting notes (d0 … d8) were made available on a daily basis during the meeting.

Remains valid – not updated: [JVET-AC1001](https://jvet-experts.org/doc_end_user/current_document.php?id=12566) Guidelines for HM-based software development [K. Sühring, F. Bossen, X. Li (software coordinators)]

Remains valid – not updated: [JVET-Y1002](https://jvet-experts.org/doc_end_user/current_document.php?id=11463) High Efficiency Video Coding (HEVC) Test Model 16 (HM 16) Encoder Description Update 16 [C. Rosewarne (primary editor), K. Sharman, R. Sjöberg, G. J. Sullivan (co-editors)] [WG 5 [N 103](https://dms.mpeg.expert/doc_end_user/current_document.php?id=82085&id_meeting=189)]

Remains valid – not updated: [JVET-AD1003](https://jvet-experts.org/doc_end_user/current_document.php?id=12970) Coding-independent code points for video signal type identification (Draft 2 of 3rd edition) [WG 5 preliminary FDIS N 206] [G. J. Sullivan, A. Tourapis] (2023-06-30)

The technical content was submitted for ITU consent (but will not be published until ST 2128 is available); ISO FDIS was to be delayed until it is available.

Post-meeting note: Expected *de facto* primary editor for ITU consent text: G. J. Sullivan.

[JVET-AE1004](https://jvet-experts.org/doc_end_user/current_document.php?id=13265) Errata report items for VVC, VSEI, HEVC, AVC, and Video CICP [Y.-K. Wang, B. Bross, I. Moccagatta, C. Rosewarne, G. J. Sullivan] (2023-09-30, near next meeting)

Post-meeting note: *De facto* primary editor: Y.-K. Wang.

Errata on post-filter hint SEI message in AVC and HEVC to be added from JVET-AE0155.

Remains valid – not updated: [JVET-Z1005](https://jvet-experts.org/doc_end_user/current_document.php?id=11707) New levels for HEVC (Draft 3) [T. Suzuki, A. Tourapis, Y.-K. Wang]

The content of this document (along with some errata corrections from JVET-AD1004) was included in a new edition of HEVC submitted for ITU consent (and had previously been included in the FDIS submitted as WG 5 N 179 issued from the January 2023 meeting).

Post-meeting note: *De facto* primary editor for ITU consent text: Y.-K. Wang.

(JVET-Z1005 can be removed after publication of the new edition of ISO/IEC 23008-2.)

[JVET-AE1006](https://jvet-experts.org/doc_end_user/current_document.php?id=13266) New profiles, colour descriptors, and SEI messages for HEVC (draft 1) [WG 5 CDAM N 226] [B. Bross, T. Ikai, G. J. Sullivan, A. Tourapis, Y.-K. Wang] (2023-08-11) [2023-08-11]

Post-meeting note: *De facto* primary editor for this document and WG 5 N 226: Y.-K. Wang.

NNPF and phase indication SEI messages from JVET-AE0101, colour descriptors from JVET-AD1008, fix for FGC SEI message (see notes under BoG report JVET-AE0294), and new multiview profiles from JVET-AE0296, plus an additional Multiview Monochrome 10 profile.

A request document was issued as WG 5 N 225.

Remains valid – not updated: [JCTVC-V1007](http://phenix.it-sudparis.eu/jct/doc_end_user/current_document.php?id=10312) SHVC Test Model 11 (SHM 11) Introduction and Encoder Description [G. Barroux, J. Boyce, J. Chen, M. M. Hannuksela, Y. Ye] [WG 11 N 15778]

Remains valid – not updated: [JVET-AD1008](https://jvet-experts.org/doc_end_user/current_document.php?id=12972) Additional colour type identifiers for AVC and HEVC (Draft 4) [G. J. Sullivan, W. Husak, A. Tourapis] [WG 5 Preliminary WD N 200] (2023-06-30)

Remains valid – not updated: [JCTVC-AC1009](https://jvet-experts.org/doc_end_user/current_document.php?id=12569) Common test conditions for SHVC [K. Sühring]

Remains valid – not updated [JCTVC-O1010](http://phenix.it-sudparis.eu/jct/doc_end_user/current_document.php?id=8511) Guidelines for Conformance Testing Bitstream Preparation [T. Suzuki, W. Wan]

[JVET-AE1011](https://jvet-experts.org/doc_end_user/current_document.php?id=13267) HEVC multiview profiles supporting extended bit depth (draft 2) [S. Paluri, W. Husak, A. Tourapis] [2023-08-11]

From JVET-AE0296. The specification of these profiles was also included in [JVET-AE1006](https://jvet-experts.org/doc_end_user/current_document.php?id=13266) and WG 5 N 226. This document, basically duplicating part of JVET-AE1006, was not issued as a separate WG 5 N document. See JVET-AE1006 for editorship note.

Draft 1 had been issued as preliminary WD WG 5 N 143.

(Number 1011 can be re-used when JVET-AE1006 progresses.)

Remains valid – not updated: JVET-[AD1012](https://jvet-experts.org/doc_end_user/current_document.php?id=12973) Overview of IT systems used in JVET [J.-R. Ohm, I. Moccagatta, K. Sühring, M. Wien] (2023-05-19)

Remains valid – not updated: [JCT3V-G1003](http://phenix.int-evry.fr/jct3v/doc_end_user/current_document.php?id=1884) 3D-AVC Test Model 9 [ D. Rusanovskyy, F. C. Chen, L. Zhang, T. Suzuki] [WG 11 N 14239]

Remains valid – not updated: [JCT3V-K1003](http://phenix.int-evry.fr/jct3v/doc_end_user/current_document.php?id=2499) Test Model 11 of 3D-HEVC and MV-HEVC [Y. Chen, G. Tech, K. Wegner, S. Yea] [WG 11 N 15141]

[JVET-AE1013](https://jvet-experts.org/doc_end_user/current_document.php?id=13268) Common test conditions of 3DV experiments [K. Sühring, M. Wien] [2023-09-01]

New licensing available from JVET-AE0179. Other owners have not responded, therefore we can assume that they don’t have a problem that the sequences are used.

Remains valid – not updated [JCTVC-V1014](http://phenix.it-sudparis.eu/jct/doc_end_user/current_document.php?id=10316) Screen Content Coding Test Model 7 Encoder Description (SCM 7) [R. Joshi, J. Xu, R. Cohen, S. Liu, Y. Ye] [WG 11 N 16049]

Remains valid – not updated: [JVET-AC1015](https://jvet-experts.org/doc_end_user/current_document.php?id=12571) Common test conditions for SCM-based screen content coding [K. Sühring]

This requires an update, as the previous version referred to an outdated location of test sequences.

[JVET-AE1016](https://jvet-experts.org/doc_end_user/current_document.php?id=13269) AVC with extensions and corrections (draft 1) [WG5 CD of 11th ed. N 218] [B. Bross, T. Ikai, G. J. Sullivan, A. Tourapis, Y.-K. Wang] [2023-08-11]

Post-meeting note: *De facto* primary editor and WG 5 N 218: B. Bross.

Target 15th edition of ITU-T H.264 in April 2024.

NNPF and phase indication SEI messages from JVET-AE0101, colour descriptors from JVET-AD1008, fix for FGC SEI message (see notes under BoG report JVET-AE0294 and corrigenda items from JVET-AD1004.

A request document was issued as WG 5 N 217.

No output: JVET-Axx1017 through JVET-Axx1099

Remains valid – not updated [JVET-AA1100](https://jvet-experts.org/doc_end_user/current_document.php?id=11944) Common Test Conditions for HM Video Coding Experiments [K. Sühring, K. Sharman]

This specifies only the CTC for non-4:2:0 colour formats. The corresponding document for VVC is JVET-T2013, with no unification yet.

**No output: JVET-Axx2001**

Remains valid – not updated: [JVET-AD2002](https://jvet-experts.org/doc_end_user/current_document.php?id=12974) Algorithm description for Versatile Video Coding and Test Model 20 (VTM 20) [A. Browne, Y. Ye, S. Kim] [WG 5 N 204] (2023-07-07, near next meeting)

(Text kept for future use.) It is noted that the list above may not be complete; if some adoption is missing that is recorded somewhere else in the meeting notes it shall also be considered included.

Remains valid – not updated: [JVET-AC2003](https://jvet-experts.org/doc_end_user/current_document.php?id=12573) Guidelines for VTM-based software development [F. Bossen, X. Li, K. Sühring]

Remains valid – not updated: [JVET-T2004](http://phenix.it-sudparis.eu/jvet/doc_end_user/current_document.php?id=10542) Algorithm descriptions of projection format conversion and video quality metrics in 360Lib (Version 12) [Y. Ye, J. Boyce]

[JVET-AE2005](https://jvet-experts.org/doc_end_user/current_document.php?id=13270) New level and systems-related supplemental enhancement information for VVC (Draft 6) [B. Bross, E. François, M. M. Hannuksela, A. Tourapis, Y.-K. Wang] (2023-08-18)

This was also delivered for ITU-T Consent as part of H.266 3rd ed.

The content of this delta (amendment style) document was included in a new edition of VVC. A DoCR on ISO/IEC 23090-3/DAM1 was issued as WG 5 N 227 (reviewed Tuesday 18 July 1245), and the FDIS text was issued as WG 5 N 228 with delivery date 2023-09-15.

Post-meeting note: *De facto* primary editor for this document, the corresponding ITU consent text, and the corresponding FDIS text WG 5 N 228: B. Bross.

See BoG report JVET-AE0272 for SEI elements included.

[JVET-AE2006](https://jvet-experts.org/doc_end_user/current_document.php?id=13271) Additional SEI messages for VSEI (Draft 5) [S. McCarthy, T. Chujoh, M. M. Hannuksela, G. J. Sullivan, Y.-K. Wang] (2023-08-18)

Post-meeting note: *De facto* primary editor for this document, the corresponding ITU consent text, and the corresponding FDIS text WG 5 N 220: Y.-K. Wang.

Text related to the remaining revisit from the BoG report JVET-AE0272 was presented on Tuesday 18 July at 1035. This is related to the issue that for frame interpolation between frames A and B only one activation shall be performed for all frames that are to be interpolated altogether. It was commented that the purpose may be difficult to understand for implementers. It was suggested to add a NOTE explaining the purpose of that constraint.

Decision (Ed./clarification): Adding such a note was agreed.

The technical content of this was also delivered for ITU-T consent as part of draft Rec. H.274 3rd ed.

The content of this delta (amendment style) document was included in a new edition of VSEI. A DoCR on ISO/IEC 23007-7/DAM1 was issued as WG 5 N 219 (reviewed Tuesday 18 July 1255), and the FDIS text was issued as WG 5 N 220 with delivery date 2023-09-15.

See BoG report JVET-AE0272 for elements included. Additionally, this should include the fix for the FGC SEI message (see notes under BoG report JVET-AE0294).

Remains valid – not updated: [JVET-AD2007](https://jvet-experts.org/doc_end_user/current_document.php?id=12977) Guidelines for NNVC software development [F. Galpin, S. Eadie, L. Wang, Z. Xie, Y. Li] (2023-05-26)

Remains valid – not updated: [JVET-X2008](https://jvet-experts.org/doc_end_user/current_document.php?id=11228) Conformance testing for versatile video coding (Draft 7) [J. Boyce, F. Bossen, K. Kawamura, I. Moccagatta, W. Wan]

Remains valid – not updated: [JVET-Y2009](https://jvet-experts.org/doc_end_user/current_document.php?id=11470) Reference software for versatile video coding (Draft 3) [F. Bossen, K. Sühring, X. Li]

Remains valid – not updated [JVET-AB2010](https://jvet-experts.org/doc_end_user/current_document.php?id=12216) VTM and HM common test conditions and software reference configurations for SDR 4:2:0 10 bit video [F. Bossen, X. Li, V. Seregin, K. Sharman, K. Sühring]

Remains valid – not updated: [JVET-AC2011](https://jvet-experts.org/doc_end_user/current_document.php?id=12575) VTM and HM common test conditions and evaluation procedures for HDR/WCG video [A. Segall, E. François, W. Husak, S. Iwamura, D. Rusanovskyy]

Remains valid – not updated: [JVET-U2012](https://jvet-experts.org/doc_end_user/current_document.php?id=10681) JVET common test conditions and evaluation procedures for 360° video [Y. He, J. Boyce, K. Choi, J.-L. Lin]

Remains valid – not updated: [JVET-T2013](http://phenix.it-sudparis.eu/jvet/doc_end_user/current_document.php?id=10546) VTM common test conditions and software reference configurations for non-4:2:0 colour formats [Y.-H. Chao, Y.-C. Sun, J. Xu, X. Xu]

Remains valid – not updated: [JVET-Q2014](http://phenix.it-sudparis.eu/jvet/doc_end_user/current_document.php?id=9683) JVET common test conditions and software reference configurations for lossless, near lossless, and mixed lossy/lossless coding [T.-C. Ma, A. Nalci, T. Nguyen]

Remains valid – not updated: [JVET-Q2015](http://phenix.it-sudparis.eu/jvet/doc_end_user/current_document.php?id=9684) JVET functionality confirmation test conditions for reference picture resampling [J. Luo, V. Seregin]

[JVET-AE2016](https://jvet-experts.org/doc_end_user/current_document.php?id=13272) Common test conditions and evaluation procedures for neural network-based video coding technology [E. Alshina, R.-L. Liao, S. Liu, A. Segall] (2023-07-28)

This includes some editorial updates.

[JVET-AE2017](https://jvet-experts.org/doc_end_user/current_document.php?id=13273) Common test conditions and evaluation procedures for enhanced compression tool testing [M. Karczewicz, Y. Ye] (2023-08-04)

This is to include a modified Excel sheet, and mention the requirement of documenting memory consumption (see discussion under JVET-AE0180).

Remains valid – not updated: [JVET-AA2018](https://jvet-experts.org/doc_end_user/current_document.php?id=11949) Common test conditions for high bit depth and high bit rate video coding [A. Browne, T. Ikai, D. Rusanovskyy, X. Xiu, Y. Yu]

[JVET-AE2019](https://jvet-experts.org/doc_end_user/current_document.php?id=13274) Description of algorithms and software in neural network-based video coding (NNVC) version 4 [F. Galpin, Y. Li, D. Rusanovskyy, J. Ström, L. Wang] [WG 5 N 231] (2023-09-01)

New elements from notes elsewhere in this report:

* Decision: Adopt JVET-AE0191 and JVET-AE0291 to NNVC6 SW and JVET-AE2019, subject to possible further changes from stage 3 training (post-meeting note: it was later confirmed in an AHG meeting on Aug. 9 that the model from stage 3 training will be included).

It is noted that the list above may not be complete; if some adoption is missing that is recorded somewhere else in the meeting notes it shall also be considered included.

[JVET-AE2020](https://jvet-experts.org/doc_end_user/current_document.php?id=13275) Film grain synthesis technology for video applications (Draft 5) [D. Grois, Y. He, W. Husak, P. de Lagrange, A. Norkin, M. Radosavljević, A. Tourapis, W. Wan] [WG 5 DTR N 223] (2023-09-08)

It was remarked that we would want the ballot results in time for the January meeting.

A DoCR on ISO/IEC 23007-9/CDTR was issued as WG 5 N 222 (reviewed Tuesday 18 July 1305-1350).

[JVET-AE2021](https://jvet-experts.org/doc_end_user/current_document.php?id=13276) Verification test plan for VVC multilayer coding (update 1) [S. Iwamura, P. de Lagrange, M. Wien] (2023-09-29)

See notes under section 4.5 for updates.

Remains valid – not updated: [JVET-AD2022](https://jvet-experts.org/doc_end_user/current_document.php?id=12982) Draft plan for subjective quality testing of FGC SEI message [P. de Lagrange, W. Husak, M. Radosavljević, M. Wien] (2023-06-16)

As new sequences were not available yet for viewing during the JVET meeting, an update of this document of this document was agreed to be postponed.

[JVET-AE2023](https://jvet-experts.org/doc_end_user/current_document.php?id=13261) Exploration experiment on neural network-based video coding (EE1) [E. Alshina, F. Galpin, Y. Li, D. Rusanovskyy, M. Santamaria, J. Ström, L. Wang, Z. Xie] [WG 5 N 230] (2023-08-11)

An initial draft of this document was reviewed and approved at 1200-1210 on Tuesday 18 July.

Categories are:

* Unified LOP
* Architectural changes of HOP
* Filter usage aspects of LOP and HOP
* Additional models for HOP (e.g., temporal filter)
* Inter prediction

[JVET-AE2024](https://jvet-experts.org/doc_end_user/current_document.php?id=13263) Exploration experiment on enhanced compression beyond VVC capability (EE2) [V. Seregin, J. Chen, R. Chernyak, K. Naser, J. Ström, F. Wang, M. Winken, X. Xiu, K. Zhang] [WG 5 N 232] (2023-08-18)

An initial draft of this document was reviewed and approved at 1210-1240 on Tuesday 18 July.

Categories are:

* Partitioning
* Intra prediction
* Inter prediction
* RPR
* In-loop filters
* Entropy coding

It was requested to add details to test 6.2, which changes are intended for the training script. Also a combination (retraining 6.1a with method from 6.2) was requested.

[JVET-AE2025](https://jvet-experts.org/doc_end_user/current_document.php?id=13277) Algorithm description of Enhanced Compression Model 10 (ECM 10) [M. Coban, R.-L. Liao, K. Naser, J. Ström, L. Zhang] [WG 5 N 233] (2023-09-29)

New elements from notes elsewhere in this report:

* Decision: Adopt JVET-AE0100, test 2.1b.
* Decision: Adopt JVET-AE0169 Test 2.2c, in CTC enabled only for screen content.
* Decision: Adopt JVET-AE0169 Test 2.3b, in CTC enabled only for camera-captured content.
* Decision: Adopt JVET-AE0169 Test 2.4a, in CTC enabled only for screen content.
* Decision: Adopt JVET-AE0159 Test 2.5c (enabled only for screen content).
* Decision: Adopt JVET-AE0094 Test 2.6c (enabled only for screen content).
* Decision: Adopt JVET-AE0043 test 2.7.
* Decision: Adopt JVET-AE 0077 test 2.9.
* Decision: Adopt JVET-AE0084 Test 2.11b. In the combination, both 2.10a and 2.11a should be enabled for camera captured content, also in CTC.
* Decision: Adopt JVET-AE0059 Test 3.1b.
* Decision: Adopt JVET-AE0046 Test 3.2.
* Decision: Adopt JVET-AE0091 Test 3.8.
* Decision: Adopt JVET-AE0125 Test 4.1.
* Decision: Adopt JVET-AE0086 Test 4.2.
* Decision: Adopt JVET-AE0102 Test 4.3.
* Decision: Adopt JVET-AE0151 Test 5.1b.
* Decision: Adopt JVET-AE0139 Test 5.2c.
* Decision: Adopt JVET-AE0097.

It is noted that the list above may not be complete; if some adoption is missing that is recorded somewhere else in the meeting notes it shall also be considered included.

Remains valid – not updated: [JVET-AC2026](https://jvet-experts.org/doc_end_user/current_document.php?id=12581) Conformance testing for VVC operation range extensions (Draft 4) [D. Rusanovskyy, T. Hashimoto, H.-J. Jhu, I. Moccagatta, Y. Yu] (2023-04-14)

This was integrated with v1 (JVET-X2008) and delivered for ITU-T consent as H.266.1 2nd ed.

Post-meeting note: *De facto* primary editor for the ITU consent text: I. Moccagatta.

[JVET-AE2027](https://jvet-experts.org/doc_end_user/current_document.php?id=13278) SEI processing order SEI message in VVC (draft 5) [S. McCarthy, M. M. Hannuksela, Y.-K. Wang] [WG 5 preliminary WD 5 N 229] (2023-09-01)

Updated from JVET-AE0156.

[JVET-AE2028](https://jvet-experts.org/doc_end_user/current_document.php?id=13279) Additional conformance bitstreams for VVC multilayer configurations [S. Iwamura, P. de Lagrange, I. Moccagatta] (2023-09-01)

This is to include the new bitstream from JVET-AE0111.

Remains valid – not updated: [JVET-AB2029](https://jvet-experts.org/doc_end_user/current_document.php?id=12225) Visual quality comparison of ECM/VTM encoding [V. Baroncini, J.-R. Ohm, M. Wien] [AG 5 N 75]

[JVET-AE2030](https://jvet-experts.org/doc_end_user/current_document.php?id=13280) Optimization of encoders and receiving systems for machine analysis of coded video content (draft 3) [J. Chen, C. Hollmann, S. Liu] [WG 5 N 224)] (2023-09-15)

See notes under JVET-AE0081, JVET-AE0081, and JVET-AE0099.

[JVET-AE2031](https://jvet-experts.org/doc_end_user/current_document.php?id=13281) Common test conditions for optimization of encoders and receiving systems for machine analysis of coded video content [S. Liu, C. Hollmann] (2023-08-11)

This is to contain editorial improvements, plus anchors from VTM20 as per JVET-AE0096 as additional anchors in the Excel sheet.

[JVET-AE2032](https://jvet-experts.org/doc_end_user/current_document.php?id=13282) Technologies under consideration for future extensions of VSEI (draft 1) [M. M. Hannuksela, J. Chen, S. Deshpande, S. McCarthy] [WG 5 N 221)] (2023-09-15)

Elements from JVET-AE0061, JVET-AE0298, JVET-AE0064, JVET-AE0079, JVET-AE0095; see detailed notes under these document numbers.

# Future meeting plans, expressions of thanks, and closing of the meeting

Future meeting plans were established according to the following guidelines (assuming face-to-face meetings):

* Meeting under ITU-T SG16 auspices when it meets (ordinarily starting meetings on the Tuesday or Wednesday of the first week and closing it on the Wednesday of the second week of the SG16 meeting – a total of 8-9 meeting days), and
* Otherwise meeting under ISO/IEC JTC 1/‌SC 29 auspices when its MPEG WGs meet (ordinarily starting meetings on the Thursday or Friday prior to the main week of such meetings and closing it on the same day as other MPEG WGs – a total of 8-9 meeting days).

In cases where an exceptionally high workload is expected for a meeting, an earlier starting date may be defined. In cases of online meetings, no sessions should be held on weekend days, such that meetings would typically start two days earlier.

Some specific future meeting plans (to be confirmed) were established as follows:

* During Wed. 17 – Fri. 19 and Mon. 22 – Fri. 26 January 2024, 33rd meeting under ISO/IEC JTC 1/‌SC 29 auspices, to be held as teleconference meeting,
* During Fri. 19 – Fri. 26 April 2024, 34th meeting under ITU-T SG16 auspices in Rennes, FR,
* During Fri. 12 – Fri. 19 July 2024, 35th meeting under ISO/IEC JTC 1/‌SC 29 auspices in Sapporo, JP,
* During October 2024, 36th meeting under ISO/IEC JTC 1/‌SC 29 auspices, date and location t.b.d.,
* During January 2025, 37th meeting under ITU-T SG16 auspices, date and location t.b.d.,
* During April 2025, 38th meeting under ISO/IEC JTC 1/‌SC 29 auspices, date and location t.b.d.,
* During Thu. 26 June – Fri. 4 July 2025, 39th meeting under ISO/IEC JTC 1/‌SC 29 auspices in Daejeon, KR,
* During October 2025, 40th meeting under ITU-T SG16 auspices, date and location t.b.d.

The agreed document deadline for the 33rd JVET meeting was planned to be Wednesday 10 January 2024.

Marius Preda was thanked for his support in maintaining the document site jvet-experts.org, as well as the document sites of JCT-VC and JCT-3V. Institut Mines-Télécom is thanked for hosting the sites.

Silke Kenzler was thanked for … The following members of KCM staff were thanked for their dedication and continuous help in the technical setup of meeting facilities: XXX.

The 32nd JVET meeting was closed at approximately XXXX hours CEST (UTC+2) on Friday 20 Oct. 2023.

# Annex A to JVET report: List of documents

(Dates and times in the table below are in Paris/Geneva time.)

# Annex B1 to JVET report: List of meeting participants attending in person

The participants who were personally present at the meeting site of the thirty-second meeting of the JVET, according to confirming in a sign-in sheet regularly circulated in the JVET meeting rooms (approximately XXX people in total), were as follows:

1. XXX (XXX – XX)

# Annex B2 to JVET report: List of meeting participants attending remotely

The remote participants of the thirty-second meeting of the JVET, according to the participation records from the Zoom teleconferencing tool used for the meeting sessions (approximately XXX people in total, not including those who had attended the meeting in person at least part-time (see annex B1), and not including those who attended only the joint sessions with other groups), were as follows:

1. XXX (XXX – XX)

# Annex C to JVET report: Recommendations of the 13th meeting of ISO/IEC JTC 1/SC 29/WG 5 MPEG Joint Video Experts Team with ITU-T SG 16

**ISO/IEC JTC 1/SC 29/WG 5 N XXX**