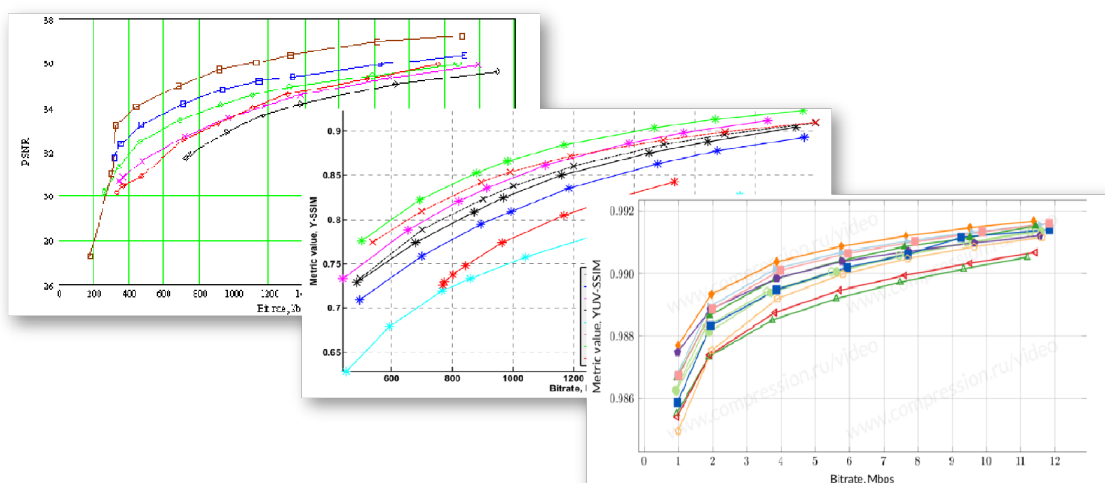


MSU Video-Codec Comparison Rules



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compression.ru



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Graphics and Media Lab
(Video Group)



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Institute for Information
Transmission Problems RAS

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http://www.compression.ru/video/codec_comparison/index_en.html

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MSU VIDEO-CODEC COMPARISON RULES

This document represents the rules for participation in annual video codecs comparisons conducted in Lomonosov Moscow State University since 2005. The rules are formulated for the participants in order to equalize their understanding of the process of the comparison. This document contains the main statements which are completed with additional information which may vary from year to year, such as a list of contests and reports, speed limitation for encoding use cases, etc. The additional information is published on http://compression.ru/video/codec_comparison/index_en.html website (see the latest call-for-codecs page).

1 Report Versions

MSU Video-Codec Comparison report comes in three editions:

- 1.1. **Public free edition:** a short version published on the web (PDF + HTML), containing several graphs (less than 10% of all graphs) and only SSIM-metric results.
- 1.2. **Public paid edition:** full report version with public codecs.
 - 1.2.1. **PDF edition** contains graphs for some videos.
 - 1.2.2. **HTML edition** contains all the graphs (including all metrics) for every public codec.
- 1.3. **Private edition:** similar to the public paid version, except it contains a private codec that is bespoke for each company participating privately. This report is only for internal use by a privately participating company and must include remarks that the report was specially prepared for that company.

2 Participation Options (Short Description)

2.1. Basic participation (for free)

Basic participants submit their codecs and required presets. The MSU team determines the minimum speed requirements, launches and analyzes all codecs using a video set that is unknown to the participants, and publishes the results.

2.2. Private participation

Private participants must pay a fee. Each one submits a codec and the required presets; the MSU team then determines the minimum speed requirements, and launches and analyzes all codecs on a video set that is unknown to the participants. Before publication, the team issues the results to the private participants, allowing them to review their codec along with codecs from basic participants. Each private participant then decides whether to permit publication of the results for their codec (in part or in whole) in public reports.

3 Basic Participation (for free)

- 3.1. Basic participants must submit their codec/presets under the rules for the basic option.

- 3.2. When submitting a codec binary, each participant must choose the publications in which to appear:
 - 3.2.1. **Main (FullHD) report:** participants must submit an encoding preset for each use case. (Participation in any or all use cases is permitted.)
 - 3.2.2. **Subjective report:** participants may submit another encoding preset and codec binary.
 - 3.2.3. **4K report:** participants may submit another encoding preset and codec binary.
 - 3.2.4. Depending on a year, additional use cases may be analysed (e.g. high-quality encoding (0.005 fps), hardware-accelerated, high-speed (60 fps), etc. Check call-for-codecs page for the relevant use cases.
- 3.3. Participants should submit their codecs and presets as soon as possible so they have time to provide any necessary clarifications or to speed up their presets before the end of the submission period. **After the preset-submission period ends, no binary/preset changes are accepted.**
- 3.4. Participants may not remove their codec (preset) results from the report once the comparison has begun.
 - 3.4.1. Cases involving removal of results for a codec or preset that suffers major technical problems in more than 50% of the test video sequences (force majeure) are discussed and paid individually.
Note: Technical problems take the following form: inability to encode some videos, generation of an incorrect bitstream, error/exception in the codec during the encoding process and so on.
- 3.5. Codecs are launched and quality measurements of encoded videos are performed during the time frame specified on the call-for-codecs page.
 - 3.5.1. In certain unpredictable cases (codec failure, etc.), the participant may receive a letter describing the situation (bug report).
- 3.6. Each public participant will receive a draft of the report (plots in PDF or HTML) containing results for all public participants, with a link to the original videos. They can thus check the results for their codec. If these results fail to match the report results, the participant must notify the MSU team, which will address the problem individually.
Note: The final report may include results for other participants (i.e., codec results for private participants that decided to make them public).
- 3.7. Participants will have an opportunity to submit comments about the draft report; the MSU team will check them and include them in the final report.
Note: If any errors made by the MSU team become apparent (for example, codec settings that differ from what the participant specified), the codec/preset will be remeasured to try to eliminate them.
 - 3.7.1. If the MSU team receives no response from the participant within one week, it will consider the results verified.
- 3.8. After receiving confirmation (and comments, if applicable) from all participants, public participants will each receive the final version of the report.
- 3.9. Comparison participants may:
 - 3.9.1. Get the original test videos after the comparison to verify the results.

- 3.9.2. Get video streams encoded using their codec.
- 3.9.3. Get video streams encoded using open-source codecs.
- 3.9.4. Get the encoding parameters for all public participants.
- 3.10. All participants (as well as those who bought the full report) have the unlimited right to republish the report, including source graphs (without changing them, such as by removing some bars from an overall bar chart), as long as they provide a link to the MSU Codec Comparison Project site.
- 3.11. Participants may not:
 - 3.11.1. Get videos used for testing until after the comparison (i.e., once the draft report is issued).
 - 3.11.2. Replace presets or codec during testing.
 - 3.11.3. Discover the identity of private participants.
 - 3.11.4. Receive detailed data (e.g., encoded streams) for other participants, except open-source codecs.
 - 3.11.5. Withdraw their codec or preset once the comparison has begun, except in force majeure cases (see [3.4.1.](#)).

4 Private Participation

There are several options of private participation differ by the number of analysed codecs and presets, additional types of deeper codec analysis (e.g. bitstream analysis), etc. Contact MSU video-codec analysis team getting detailed information for these options. The following rules are general for any kinds of private participation.

- 4.1. Private participants must submit their codec/presets under the rules for the private option.
- 4.2. When submitting a binary, each participant must choose which contests to participate in. Contests accord to the following reports:
 - 4.2.1. **Main (FullHD) report:** participants must submit a preset for each use case. (Participation in any or all use cases is permitted.)
 - 4.2.2. **Subjective report:** participants may submit another preset and codec binary.
 - 4.2.3. **4K report:** participants may submit another preset and codec binary.
 - 4.2.4. Depending on a year, additional use cases may be analysed (e.g. high-quality encoding (0.005 fps), hardware-accelerated, high-speed (60 fps), etc. Check call-for-codecs page for the relevant use cases.
- 4.3. The fee depends on the number of use cases and comparison parts that the participant elects to compete in, as well as on the number of submitted codecs/binaries. Fees are discussed individually.
- 4.4. Private participants must make 100% prepayment.
- 4.5. Codecs are launched and quality measurements of encoded videos are performed during the time frame specified on the call-for-codecs page.

- 4.5.1. In certain unpredictable cases (e.g., codec failure), the participant will receive a letter describing the situation (bug report).
- 4.6. After all measurements are taken, each participant will receive a draft HTML report with graphs including that participant's codec results and the results for all *public* participants (the results of other private participants are withheld).
- 4.7. On the basis of the issued draft report, private participants must each decide whether to publish their respective codec results.
 - 4.7.1. Private participants may formulate publishing conditions to suit their aims; for example, "I agree to publication of my results only if my codec is among the top three for all participants" or "I agree to publication of my results only if my codec is in first place among all participants." (In some situations, a tie may mean multiple codecs share the same place.) The formulated conditions must receive approval from the comparison organizers no later than one month before the draft report is issued.
 - 4.7.2. Participant results may be published only in the part of the reports and for the use cases that the participant selects (subjective, 4K, etc.).
 - 4.7.3. Other private participants may make decisions on the basis of similar reports for their codec.
 - 4.7.4. The participant must make a decision within a week of the draft being issued; if the MSU team receives no response, that participant's codec results will remain private and will not appear in the report.
 - 4.7.4.1. If the codec remains private, the MSU team will send a private report to the participant (see [1.3](#).—report type)
- 4.8. Comparison participants may:
 - 4.8.1. Get the original test videos after the comparison to verify the results.
 - 4.8.2. Get video streams encoded using their codec.
 - 4.8.3. Get video streams encoded using open-source codecs.
 - 4.8.4. Get the encoding parameters for all public participants.
 - 4.8.5. Use data from private reports under the following conditions:
 - 4.8.5.1. Participants that decide *not* to have their results published are prohibited from republishing the report, in whole or in part. They may only use results internally, and only with the *mandatory* indication of the link to the report's full public edition.
 - 4.8.5.2. When the report results are used externally (e.g., for customers or investors), the participant must credit MSU and note that the report is private and intended especially for that participant.
- 4.9. Private participants are under the same general limitations as basic participants. Namely, they may not:
 - 4.9.1. Get the videos used for testing until after the comparison (i.e., when the draft report is issued).

- 4.9.2. Replace the presets or codec during testing.
- 4.9.3. Find out which participants are involved privately.
- 4.9.4. Receive detailed data (e.g., encoded streams) for other participants, except open-source codecs.
- 4.9.5. Withdraw a codec or preset if the respective participant decided to include the results in the public report.

5 Rule Changes

- 5.1. To maintain fairness during the comparison, the MSU team may make rule changes that apply to all participants. If any loopholes become apparent, the MSU team can make the necessary changes to close them.

ABOUT THE GRAPHICS & MEDIA LAB VIDEO GROUP



The Graphics & Media Lab Video Group is part of the Computer Science Department of Moscow State University. The Graphics Group began at the end of 1980's, and the Graphics & Media Lab was officially founded in 1998. The main research avenues of the lab include areas of computer graphics, computer vision and media processing (audio, image and video). A number of patents have been acquired based on the lab's research, and other results have been presented in various publications.

The main research avenues of the Graphics & Media Lab Video Group are video processing (pre- and post-, as well as video analysis filters) and video compression (codec testing and tuning, quality metric research and codec development).

The main achievements of the Video Group in the area of video processing include:

- High-quality industrial filters for format conversion, including high-quality deinterlacing, high-quality frame rate conversion, new, fast practical super resolution and other processing tools.
- Methods for modern television sets, such as a large family of up-sampling methods, smart brightness and contrast control, smart sharpening and more.
- Artifact removal methods, including a family of denoising methods, flicking removal, video stabilization with frame edge restoration, and scratch, spot and drop-out removal.
- Application-specific methods such as subtitle removal, construction of panorama images from video, video to high-quality photo conversion, video watermarking, video segmentation and practical fast video deblur.

The main achievements of the Video Group in the area of video compression include:

- Well-known public comparisons of JPEG, JPEG-2000 and MPEG-2 decoders, as well as MPEG-4 and annual HEVC, AVC, AV1 and other standards codec testing; codec testing for weak and strong points, along with bug reports and codec tuning recommendations.
- Video quality metric research; the MSU Video Quality Measurement Tool and MSU Perceptual Video Quality Tool are publicly available.
- Internal research and contracts for modern video compression and publication of MSU Lossless Video Codec and MSU Screen Capture Video Codec; these codecs have one of the highest available compression ratios.

The Video Group has also worked for many years with companies like Intel, Samsung and RealNetworks.

In addition, the Video Group is continually seeking collaboration with other companies in the areas of video processing and video compression.

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