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| **Joint Collaborative Team on Video Coding (JCT-VC)**  **of ITU-T SG 16 WP 3 and ISO/IEC JTC 1/SC 29/WG 11**  23rd Meeting: San Diego, USA, 19–26 February 2016 | Document: JCTVC-W0114 / m37859 |

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| *Title:* | **HDR CE6:** **crosscheck of CE6.4.3 (JCTVC-W0063)** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Information | | |
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| *Source:* | Technicolor | | |

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# Abstract

This document reports the cross-checking of core experiment HDR CE6.4.3 described in document JCTVC-W0063. It is reported that objective results perfectly match those of JCTVC-W0063. It is also reported that the overall visual quality is equivalent to the quality provided by the anchors. Some observations on the differences in bitrate repartition compared to the anchors are also made.

# Introduction

Proposal JCTVC-W0063 provides the results of experiment CE6.4.3 on the Philips system in 4:2:0 and with automatic reshaper parameter derivation. The system is able to offer SDR backward compatibility. In this solution, reshaping is reshaping is applied on the 4:2:0 Y’Cb’Cr’ signal, based upon a max(R’,G’,B’,Y’) input, using a limited number of parameters, that are used to control an analytic function specified in the reshaping process. The metadata are supposed to be conveyed in a new SEI message.

The aim of this document is to report the objective cross-check and subjective assessment of JCTVC-W0063 results, compared to the HDR CE1 - v3.2 anchors. In addition, some observations about the differences in bitrate distribution between the anchors and the proposal are made.

# Comments on the proposal

Software changes from the proposal are implemented in HDRTools and relate to the pre-processing (reshaping) and post-processing (inverse reshaping). The HM is not modified and the metadata (of limited size) are not explicitly coded. Instead, a quantized version is used in the pre- and post-processing using metadata files. The cross-checkers consider that the actual coding of those metadata would have a negligible impact on the overall bitrate.

# Compression performance

## Objective results

No compilation issue has been identified for the distributed modified HDRTools and HM software. Simulations have been achieved on linux platform. Table 1 lists the cross-checking simulation results of CE6.4.3. They match the results provided by proponents.

Table 1. CE2.1.2a results compared to CE1 - V3.2 anchor.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | X | Y | Z | XYZ | tOSNR-XYZ | DE100 | MD100 | PSNRL100 |
| FireEaterClip4000r1 | 35.6% | 21.7% | 205.6% | 67.3% | 78.1% | 59.1% | -51.8% | 31.8% |
| Market3Clip4000r2 | 16.6% | 8.9% | 23.6% | 16.7% | 11.6% | 27.2% | -97.3% | -8.6% |
| SunRise | 27.9% | 22.1% | 41.7% | 31.2% | 24.6% | -9.4% | -29.0% | 5.3% |
| BikeSparklers cut 1 | 7.8% | 1.2% | 25.3% | 11.7% | 12.0% | 19.1% | -45.1% | 3.1% |
| BikeSparklers cut 2 | 12.1% | 5.2% | 27.4% | 14.4% | 15.2% | 22.7% | -15.6% | 7.1% |
| GarageExit | 19.0% | 11.1% | 32.7% | 21.7% | 18.4% | 28.2% | -64.6% | 9.2% |
| ShowGirl2Teaser | 19.2% | 13.4% | 42.7% | 26.0% | 22.6% | 4.4% | 0.0% | 9.0% |
| StEM\_MagicHour cut 1 | 8.4% | 3.5% | 15.0% | 10.4% | 10.1% | 2.4% | -62.6% | 0.5% |
| StEM\_MagicHour cut 2 | 9.7% | 5.7% | 20.4% | 13.6% | 13.7% | 8.3% | -31.8% | 1.0% |
| StEM\_MagicHour cut 3 | 11.3% | 5.9% | 25.0% | 16.8% | 18.8% | 10.9% | -11.9% | 0.4% |
| StEM\_WarmNight cut 1 | 10.1% | 5.1% | 16.8% | 11.4% | 12.3% | 5.0% | -29.2% | -1.9% |
| StEM\_WarmNight cut 2 | 12.7% | 4.5% | 22.5% | 14.7% | 23.2% | 2.7% | -79.5% | -0.2% |
| BalloonFestival | 14.7% | 10.5% | 45.1% | 26.1% | 28.7% | 20.1% | 0.0% | -0.7% |
| EBU\_04\_Hurdles | 18.0% | 1.4% | 10.2% | 9.5% | 5.4% | 33.9% | -16.0% | -8.0% |
| EBU\_06\_Start | 21.2% | 1.9% | 29.2% | 17.7% | 13.9% | 33.6% | -39.6% | -10.6% |
| **Overall** | 16.3% | 8.1% | 38.9% | 20.6% | 20.6% | 17.9% | -38.2% | 2.5% |

## Subjective results

According to HDR CE2 plan, subjective viewing was conducted, on SIM2 display. The evaluation was performed in priority in video mode, then in still picture mode to assess more specific details. The evaluation was only focused on HDR compression and the quality of the SDR has not been assessed.

Compared to the CE1 - V3.2 anchors, in average, the quality is judged as equivalent. The following more detailed comments can be made:

* BalloonFestival
  + Anchor slightly better
  + Rope a bit less sharp and a bit less details in mountain
  + In still picture mode, slight artefacts in borders of colored areas (not visible in video mode)
* BikeSparklers (cut1, cut2) :
  + slightly better than anchor (slightly sharper)
* Hurdles
  + slightly better than anchor (more details on track ground)
* Starting
  + slightly better than anchor
  + Rope and pylons have more contrast
  + Red line of foreground disappears
* Market
  + Equivalent to anchors
  + More details on wall and street ground
  + Orange label a bit less contrasted
  + Less details in foliage
  + Some artefacts visible in still picture mode, on border of red banner (not visible in video mode)
* Showgirl
  + Equivalent to anchors
  + Some artefacts visible in still picture mode in red flowers or face edges, not perceived in video mode
* Stem\_MagicHour (cut1, cut2,cut3)
  + Equivalent to anchors
* WarmNight (cut1, cut2)
  + Equivalent to anchors
* garageExit
  + Equivalent to anchors
  + Except end of sequence where anchor slightly better (ropes are less sharp than anchor)
* FireEater
  + Slightly worse than the anchor
  + Less details than the anchor on flame, smoke, background panel
  + A bit more blocky
* SunRise
  + Equivalent to the anchor

## Temporal bit cost evolution compared to the anchors

An analysis of the bitrate repartition has also been made to check the differences compared to the anchors. The figures below depict some examples of the bit cost difference, per frame, with the anchor, on different sequences and for rate R2. As in other CEs, it is observed that the solution generates different bitrate distribution than the anchors.

There is not a common trend for all the sequences. In some cases, the intra frames cost is higher than the anchor. In such a case, it seems that the overall visual quality is improved (bike, showgirl first part, hurdles). Inversely, on balloonFestival, where the intra frames cost is lower than the anchor, the overall quality is overall slightly lower. As observed for other CEs, the improvement of the intra frames quality generally leads to a quality improvement of the entire sequence, especially for sequences with low amplitude global motion. The bitrate repartition actually strongly depends on the automatic reshaping function and on the way the codewords are redistributed by the reshaping.

Figure 1. Bit cost difference with anchors, per frame.

# References

# Taoran Lu, Fangjun Pu, Peng Yin, Tao, “HDR CE2: CE2.a-2, CE2.c, CE2.d and CE2.e-3 “document ISO/IEC JTC 1/SC 29/WG 11 , 23rd Meeting: San Diego, USA, 19–26 February 2016

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