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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-W0113 / m37858 |

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| *Title:* | **HDR CE2: crosscheck of** **CE2.a-1 LCS (JCTVC-W0101)** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Information | | |
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# Abstract

This document reports the cross-checking of core experiment HDR CE2.a-1 reported in document JCTVC-W0101, related to luma-based chroma scaling (LCS). It is reported that objective results are perfectly matching. It is also claimed that CE2.a-1 LCS shows some visual quality improvements compared to CE1-V3.2 anchors, and LCS seems to be a relevant tool to improve the HDR compression performance. Some comments on the bitrate repartition are also made.

# Introduction

The proposal JCTVC-W0101/m37744 reports the results of CE2.a-1 on ETM with luma-based chroma scaling (LCS). Principle of luma-based chroma scaling (LCS) proposed in JCTVC-W0101 is to adapt the chroma quality depending on the luma (favouring chroma quality in high luma, while decreasing the quality for low luma).

The aim of this document is to report results of cross-checking and subjective assessment of this proposal, compared to CE1 - V3.2 anchors.

# Compression performance

## Objective results

Table 1 lists the cross-check simulation results of CE2.a-1 LCS. They match the results provided in contribution JCTVC-W0101.

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 | 2.0% | 4.5% | 2.7% | 2.9% | 0.7% | -1.4% | -43.8% | 12.2% |
| Market3Clip4000r2 | 18.5% | 17.5% | 13.6% | 16.3% | 9.1% | 3.0% | -60.1% | -6.2% |
| SunRise | -3.3% | -1.3% | -13.1% | -6.8% | -3.7% | -31.3% | -69.2% | 21.7% |
| BikeSparklers cut 1 | -7.2% | -7.4% | 4.0% | -3.4% | -3.9% | -2.7% | -57.5% | -0.9% |
| BikeSparklers cut 2 | -4.0% | -3.4% | 8.1% | -0.1% | 1.4% | 1.9% | -39.2% | 2.8% |
| GarageExit | 27.9% | 26.3% | 39.6% | 32.5% | 24.6% | 17.1% | -50.0% | 7.1% |
| ShowGirl2Teaser | 12.0% | 12.2% | 27.6% | 17.2% | 24.9% | 5.3% | -52.0% | 2.5% |
| StEM\_MagicHour cut 1 | -3.9% | -1.8% | 9.2% | 3.1% | 3.4% | -4.5% | -15.3% | -0.4% |
| StEM\_MagicHour cut 2 | -1.6% | -0.9% | 6.5% | 2.4% | 2.7% | -2.4% | -14.1% | 0.1% |
| StEM\_MagicHour cut 3 | -1.1% | -0.8% | 10.2% | 4.8% | 4.7% | 2.5% | 17.8% | 1.0% |
| StEM\_WarmNight cut 1 | -1.8% | -1.7% | 5.8% | 1.4% | 1.4% | -3.1% | 4.8% | 0.3% |
| StEM\_WarmNight cut 2 | 0.7% | 2.1% | 0.0% | 0.6% | 3.9% | -10.5% | -76.9% | -3.7% |
| BalloonFestival | 35.5% | 46.2% | 15.4% | 29.8% | 17.3% | 0.6% | 0.0% | -2.0% |
| EBU\_04\_Hurdles | 22.0% | 12.8% | 14.7% | 16.0% | 3.7% | 24.0% | 29.5% | -10.5% |
| EBU\_06\_Start | 41.3% | 32.3% | 28.8% | 33.7% | 20.3% | 20.8% | -39.3% | -5.1% |
| **Overall** | 9.1% | 9.1% | 11.5% | 10.0% | 7.4% | 1.3% | -31.0% | 1.3% |

## Subjective results

According to CE2 plan, subjective viewing was conducted, on SIM2 display. The evaluation was performed mostly in video mode, and in still picture mode to assess more specific details.

Compared to the CE1 - V3.2 anchors, the visual quality is better on the following sequences:

* BalloonFestival : Sharper on mountain, better on rope
* BikeSparklers (cut1, cut2) : Sharper (roof, ground)
* Hurdles : Racetrack sharper
* Starting : sharper on Grass, red line, roof, cameras, rope and pylons
* Market : sharper on wall and tower

A comparable quality was observed on:

* Showgirl
* Stem\_MagicHour (cut1, cut2,cut3) (slightly sharper in still picture mode)
* Stem\_WramNight (cut1, cut2) (slightly sharper in still picture mode)
* garageExit (faces and ropes slightly sharper in still picture mode)
* FireEater
* SunRise

In summary, CE2.a-1 LCS shows some visual quality improvements compared to CE-v3.2 anchors.

## Temporal bit cost evolution compared to the anchors

An analysis of the bitrate repartition has also been made to check if they are similar 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 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

# Adarsh K Ramasubramonian, Joel Sole, Dmytro Rusanovskyy, Done Bugdayci Sansli, Marta Karczewicz, “HDR CE2.a-1: Report on LCS “document ISO/IEC JTC 1/SC 29/WG 11 , 23rd Meeting: San Diego, USA, 19–26 February 2016

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