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| *Title:* | **AHG13: Crosscheck report of JCTVC-X0043: on Luma Adjustment** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Report | | |
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# Abstract

This document reports the crosscheck results for proposal JCTVC-X0043 on Luma Adjustment. The luma adjustment functionality can be switched on/off via the setting of parameter “ClosedLoopConversion” in configuration file. The luma adjustment off test is carried out by setting ClosedLoopConversion equal to 0. Two types of tests, conversion only (without compression) and conversion plus compression, were conducted and compared with HDR/WCG anchor v3.2. For objective metrics, they matched those results provided in JCTVC-X0043. Subjective evaluation was also conducted.

# Introduction

Luma adjustment was initially introduced in [3] to correct the luma error caused by chroma downsampling in the pre-processing (that is, conversion) stage before encoding. JCTVC-X0043 further tested its effect under various conditions. We cross-checked two simulation results based on HDR/WCG CTC [2]: (1) PSNR results of conversion without luma adjustment (EXR to YUV and converted back to EXR without compression); (2) end-to-end RD performance of conversion without luma adjustment plus compression.

# Simulation results

Table 1 shows the PSNR results for conversion only without luma adjustment. Table 2 shows the coding BD rate performance without luma adjustment compared to HDR/WCG anchor v3.2 with luma adjustment. These two results match those provided in JCTVC-X0043 (Table 2 and Table 3).

The detailed results can be found in the attached excel datasheets.

Table 1. PSNR for conversion results of Y’CbCr without luma adjustment

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | tPSNR X | tPSNR Y | tPSNR Z | tPSNR XYZ | tOSNR-XYZ | DE100 | MD100 | PSNRL100 |
| FireEaterClip4000r1 | 58.73 | 64.38 | 53.39 | 56.78 | 54.86 | 48.42 | 24.69 | 55.05 |
| Market3Clip4000r2 | 53.48 | 62.05 | 46.24 | 50.16 | 49.75 | 36.77 | 21.88 | 46.85 |
| SunRise | 58.60 | 67.76 | 51.34 | 55.28 | 54.62 | 37.87 | 24.21 | 47.70 |
| BikeSparklers cut 1 | 46.39 | 58.98 | 37.27 | 41.52 | 39.81 | 34.17 | 21.82 | 48.20 |
| BikeSparklers cut 2 | 47.57 | 59.92 | 38.65 | 42.87 | 41.60 | 34.51 | 21.77 | 48.46 |
| GarageExit | 55.21 | 65.61 | 47.08 | 51.17 | 49.89 | 38.08 | 22.85 | 48.77 |
| ShowGirl2Teaser | 52.11 | 62.98 | 44.86 | 48.81 | 47.49 | 39.23 | 22.50 | 50.84 |
| StEM\_MagicHour cut 1 | 52.66 | 63.91 | 40.06 | 44.59 | 42.01 | 36.55 | 24.95 | 50.33 |
| StEM\_MagicHour cut 2 | 50.22 | 62.70 | 38.62 | 43.08 | 40.59 | 35.97 | 24.70 | 50.27 |
| StEM\_MagicHour cut 3 | 49.48 | 61.22 | 37.39 | 41.88 | 39.46 | 36.03 | 24.28 | 50.10 |
| StEM\_WarmNight cut 1 | 51.10 | 61.83 | 38.65 | 43.16 | 40.73 | 36.64 | 25.11 | 50.59 |
| StEM\_WarmNight cut 2 | 52.05 | 61.07 | 39.45 | 43.96 | 41.81 | 37.00 | 23.35 | 49.76 |
| BalloonFestival | 52.78 | 62.06 | 45.61 | 49.54 | 51.91 | 40.62 | 21.15 | 46.98 |
| EBU\_04\_Hurdles | 52.12 | 62.75 | 46.85 | 50.41 | 48.82 | 36.84 | 22.23 | 45.36 |
| EBU\_06\_Start | 49.73 | 61.87 | 44.19 | 47.83 | 47.52 | 36.10 | 21.27 | 46.11 |
| Average | 52.15 | 62.61 | 43.31 | 47.40 | 46.06 | 37.65 | 23.12 | 49.02 |

Table 2. Comparison of Anchor 3.2 without luma adjustment against Anchor 3.2 (with luma adjustment) under HDR/WCG CTC [2]

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | X | Y | Z | XYZ | tOSNR-XYZ | DE100 | MD100 | PSNRL100 |
| class A | FireEaterClip4000r1 | 3.8% | 2.7% | -4.1% | 1.2% | 1.3% | 2.5% | -2.5% | 1.9% |
|  | Market3Clip4000r2 | 1.1% | 0.3% | -0.7% | 0.1% | 0.3% | 0.5% | -66.9% | 0.3% |
|  | SunRise | 1.3% | 0.3% | -2.3% | -0.4% | -0.1% | 1.0% | 15.9% | 0.3% |
| class B | BikeSparklers cut 1 | 2.0% | 0.8% | -3.4% | -0.3% | 0.2% | 0.2% | -0.4% | 0.6% |
|  | BikeSparklers cut 2 | 1.8% | 0.7% | -3.5% | -0.3% | -0.1% | 0.2% | 1.4% | 0.4% |
|  | GarageExit | 0.9% | 0.1% | 0.3% | 0.4% | 0.3% | 0.5% | 1.8% | 0.1% |
| class C | ShowGirl2Teaser | 1.3% | 0.4% | -0.2% | 0.5% | 3.7% | 0.7% | 22.2% | 0.3% |
| class D | StEM\_MagicHour cut 1 | 0.5% | 0.2% | -0.6% | -0.1% | -0.1% | -0.3% | -8.5% | 0.2% |
|  | StEM\_MagicHour cut 2 | 0.7% | 0.3% | -0.2% | 0.2% | 0.0% | 0.0% | -3.5% | 0.3% |
|  | StEM\_MagicHour cut 3 | 0.7% | 0.4% | 0.0% | 0.3% | 0.1% | 0.2% | 2.6% | 0.3% |
|  | StEM\_WarmNight cut 1 | 0.8% | 0.1% | -0.8% | -0.1% | -0.2% | 0.3% | 1.6% | 0.0% |
|  | StEM\_WarmNight cut 2 | 1.0% | 0.2% | -1.3% | -0.3% | -0.1% | 0.4% | 37.6% | 0.1% |
| class G | BalloonFestival | 1.1% | 0.6% | -2.5% | -0.6% | -0.2% | 1.0% | 1.0% | 0.7% |
| class H | EBU\_04\_Hurdles | 1.8% | 0.0% | -1.0% | 0.0% | 0.0% | 0.4% | 13.4% | -0.1% |
|  | EBU\_06\_Start | 2.6% | 0.1% | -1.1% | 0.3% | 0.3% | 0.1% | 4.2% | -0.1% |
|  | **Overall** | 1.4% | 0.5% | -1.4% | 0.1% | 0.4% | 0.5% | 1.3% | 0.3% |

# Subjective quality comparisons

Subjective viewing was conducted by the cross-checkers on SIM2 display. There are two viewings: (1) conversion without luma adjustment vs. conversion with luma adjustment; (2) the coding results without luma adjustment vs. the coding results of HDR/WCG anchor v3.2 (with luma adjustment).

Regarding viewing 1, the Market sequence was selected based on the observation in [3] (initial proposal). The cross-checkers observed no visual difference between with and without luma adjustment in continuous playback mode and in toggle mode.

Regarding viewing 2, all rates for all sequences were viewed in continuous playback. In terms of texture and color appearance, the cross-checkers did not see any visual difference.

# References

1. F. Pu, T. Lu, P. Yin, T. Chen, W. Husak, “AHG13: on Luma Adjustment”, JCTVC-X0043, May. 2016, Geneva, CH.
2. “Common Test Conditions for HDR/WCG video coding experiments”, JCTVC-W1020, March 2016.
3. J. Strom, J. Samuelsson, M. Pettersson, K. Andersson, P. Wennersten, R. Sjöberg, “Ericsson’s response to CfE for HDR and WCG”, MPEG m36184, Feb. 2015, Geneva, CH.