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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**  19th Meeting: Strasbourg, FR, 17–24 Oct 2014 | Document: JCTVC-S0124 |

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| *Title:* | **Crosscheck of CE2 Test3 – IBC with block vector derivation** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Report | | |
| *Author(s) or Contact(s):* | Xiaozhong Xu and Shan Liu 2860 Junction Ave  San Jose, CA 95134 USA | Email: | [xiaozhong.xu@mediatek.com](mailto:xiaozhong.xu@mediatek.com) |
| *Source:* | MediaTek | | |

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# Abstract

This documents reports the crosscheck results for CE2 Test 3 on IBC with block vector derivation (JCTVC-S0131). The source code provided by the proponents was verified to be consistent with the description in JCTVC-R1102. The rate-distortion performance was evaluated for CE2 test conditions JCTVC-R1102 and matches the one provided in JCTVC-S0131.

# Introduction

JCTVC-S0131 [2] describes a technique where a block vector or a motion vector is derived from spatial neighboring Intra BC coded blocks. The derived BV/MV is applied to two testing scenarios: 1) derived BV as additional Intra BC merge candidates; 2) derived BV/MV used as the vector in normal (non-merge) Intra BC mode. In the following section, T1 refers to scenario 1) (which corresponds to Test A in JCTVC-S0131) while T3 refers to 1) + 2) (which corresponds to Test B in JCTVC-S0131).

In order to access the derived BV/MV, two constraints are used in the proposed method. C1 is to use uncompressed BVs from the current CTU row and the one CTU row above; C2 is to use compressed BV field of the picture. In this cross-verification document, only results of C1 constraint are shown.

# Simulation results

The performance of the CE2 test 3 is cross-checked according to CE2 test conditions [3] and is summarized below. The detailed results can be found in the attached excel datasheets. Note that the runtime information in this document is not reliable.

Table 1. Average BD rate reduction for T1C1 lossless coding

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **All Intra** | | | |
|  | Bit-rate saving (Total) | Bit-rate saving (Average) | Bit-rate saving (Min) | Bit-rate saving (Max) |
|  |
| RGB, text & graphics with motion, 1080p | 2.8% | 2.8% | 2.5% | 3.0% |
| RGB, text & graphics with motion,720p | 0.6% | 0.7% | 0.1% | 1.2% |
| RGB, mixed content, 1440p | 1.9% | 1.7% | 0.3% | 3.0% |
| RGB, mixed content, 1080p | 1.6% | 1.6% | 1.6% | 1.6% |
| RGB, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | 1.8% | 1.7% | 1.0% | 2.4% |
| YUV, text & graphics with motion,720p | 0.5% | 0.6% | 0.1% | 0.9% |
| YUV, mixed content, 1440p | 1.8% | 1.6% | 0.4% | 2.8% |
| YUV, mixed content, 1080p | 1.4% | 1.4% | 1.4% | 1.4% |
| YUV, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| Enc Time[%] | 126% | | | |
| Dec Time[%] | 119% | | | |
|  |  |  |  |  |
|  | **Random Access** | | | |
|  | Bit-rate saving (Total) | Bit-rate saving (Average) | Bit-rate saving (Min) | Bit-rate saving (Max) |
|  |
| RGB, text & graphics with motion, 1080p | 2.6% | 2.6% | 1.9% | 3.2% |
| RGB, text & graphics with motion,720p | 0.2% | 0.4% | 0.1% | 0.8% |
| RGB, mixed content, 1440p | 0.3% | 0.4% | 0.0% | 0.7% |
| RGB, mixed content, 1080p | 0.3% | 0.3% | 0.3% | 0.3% |
| RGB, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | 2.2% | 2.1% | 1.4% | 2.6% |
| YUV, text & graphics with motion,720p | 0.2% | 0.3% | 0.1% | 0.7% |
| YUV, mixed content, 1440p | 0.3% | 0.3% | 0.0% | 0.6% |
| YUV, mixed content, 1080p | 0.2% | 0.2% | 0.2% | 0.2% |
| YUV, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| Enc Time[%] | 114% | | | |
| Dec Time[%] | 126% | | | |
|  |  |  |  |  |
|  |  |  |  |  |
|  | **Low Delay B** | | | |
|  | Bit-rate saving (Total) | Bit-rate saving (Average) | Bit-rate saving (Min) | Bit-rate saving (Max) |
|  |
| RGB, text & graphics with motion, 1080p | 2.7% | 2.6% | 1.7% | 3.3% |
| RGB, text & graphics with motion,720p | 0.1% | 0.2% | 0.1% | 0.5% |
| RGB, mixed content, 1440p | 0.2% | 0.2% | 0.0% | 0.3% |
| RGB, mixed content, 1080p | 0.1% | 0.1% | 0.1% | 0.1% |
| RGB, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | 2.2% | 2.2% | 1.3% | 3.1% |
| YUV, text & graphics with motion,720p | 0.1% | 0.2% | 0.0% | 0.6% |
| YUV, mixed content, 1440p | 0.1% | 0.1% | 0.0% | 0.3% |
| YUV, mixed content, 1080p | 0.1% | 0.1% | 0.1% | 0.1% |
| YUV, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| Enc Time[%] | 110% | | | |
| Dec Time[%] | 114% | | | |

Table 2. Average BD rate reduction for T1C1 lossy coding

|  |  |  |  |
| --- | --- | --- | --- |
|  | **All Intra** | | |
|  | G/Y | B/U | R/V |
| RGB, text & graphics with motion, 1080p | -5.0% | -6.4% | -6.2% |
| RGB, text & graphics with motion,720p | -2.6% | -3.3% | -3.2% |
| RGB, mixed content, 1440p | -2.4% | -2.7% | -2.9% |
| RGB, mixed content, 1080p | -2.2% | -2.7% | -2.7% |
| RGB, Animation, 720p | -0.1% | -0.1% | -0.1% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | -2.9% | -4.4% | -4.3% |
| YUV, text & graphics with motion,720p | -2.1% | -2.9% | -3.1% |
| YUV, mixed content, 1440p | -1.6% | -2.1% | -2.3% |
| YUV, mixed content, 1080p | -1.7% | -3.0% | -3.0% |
| YUV, Animation, 720p | -0.2% | -0.2% | -0.3% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| Enc Time[%] | 132% | | |
| Dec Time[%] | 122% | | |
|  |  |  |  |
|  | **Random Access** | | |
|  | G/Y | B/U | R/V |
| RGB, text & graphics with motion, 1080p | -4.2% | -6.1% | -5.8% |
| RGB, text & graphics with motion,720p | -2.0% | -3.1% | -3.0% |
| RGB, mixed content, 1440p | -1.7% | -2.6% | -2.7% |
| RGB, mixed content, 1080p | -2.0% | -2.9% | -3.0% |
| RGB, Animation, 720p | -0.1% | -0.2% | -0.2% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | -3.7% | -5.5% | -5.6% |
| YUV, text & graphics with motion,720p | -1.5% | -2.7% | -2.9% |
| YUV, mixed content, 1440p | -1.3% | -2.7% | -2.6% |
| YUV, mixed content, 1080p | -1.6% | -4.0% | -4.0% |
| YUV, Animation, 720p | 0.0% | -0.2% | -0.4% |
| YUV, camera captured, 1080p | 0.0% | 0.2% | -0.1% |
| Enc Time[%] | 116% | | |
| Dec Time[%] | 131% | | |
|  |  |  |  |
|  | **Low delay B** | | |
|  | G/Y | B/U | R/V |
| RGB, text & graphics with motion, 1080p | -4.0% | -5.4% | -5.2% |
| RGB, text & graphics with motion,720p | -1.2% | -2.3% | -2.2% |
| RGB, mixed content, 1440p | -1.4% | -2.0% | -2.1% |
| RGB, mixed content, 1080p | -1.3% | -2.7% | -2.4% |
| RGB, Animation, 720p | 0.0% | 0.2% | 0.0% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.1% |
| YUV, text & graphics with motion, 1080p | -3.7% | -5.4% | -5.3% |
| YUV, text & graphics with motion,720p | -1.1% | -2.1% | -2.7% |
| YUV, mixed content, 1440p | -1.2% | -2.4% | -2.1% |
| YUV, mixed content, 1080p | -1.2% | -4.3% | -5.2% |
| YUV, Animation, 720p | 0.1% | -0.3% | -0.1% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.2% |
| Enc Time[%] | 110% | | |
| Dec Time[%] | 118% | | |

Table 3. Average BD rate reduction for T3C1 lossless coding

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **All Intra** | | | |
|  | Bit-rate saving (Total) | Bit-rate saving (Average) | Bit-rate saving (Min) | Bit-rate saving (Max) |
|  |
| RGB, text & graphics with motion, 1080p | 3.1% | 3.2% | 2.9% | 3.3% |
| RGB, text & graphics with motion,720p | 0.6% | 0.7% | 0.1% | 1.1% |
| RGB, mixed content, 1440p | 2.0% | 1.7% | 0.4% | 3.0% |
| RGB, mixed content, 1080p | 1.7% | 1.7% | 1.7% | 1.7% |
| RGB, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | 2.1% | 2.0% | 1.2% | 2.7% |
| YUV, text & graphics with motion,720p | 0.7% | 0.8% | 0.1% | 1.3% |
| YUV, mixed content, 1440p | 1.9% | 1.7% | 0.5% | 2.9% |
| YUV, mixed content, 1080p | 1.4% | 1.4% | 1.4% | 1.4% |
| YUV, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| Enc Time[%] | 135% | | | |
| Dec Time[%] | 108% | | | |
|  |  |  |  |  |
|  | **Random Access** | | | |
|  | Bit-rate saving (Total) | Bit-rate saving (Average) | Bit-rate saving (Min) | Bit-rate saving (Max) |
|  |
| RGB, text & graphics with motion, 1080p | 2.8% | 2.8% | 2.1% | 3.4% |
| RGB, text & graphics with motion,720p | 0.2% | 0.4% | 0.2% | 0.9% |
| RGB, mixed content, 1440p | 0.4% | 0.4% | 0.0% | 0.7% |
| RGB, mixed content, 1080p | 0.3% | 0.3% | 0.3% | 0.3% |
| RGB, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | 2.4% | 2.3% | 1.5% | 2.7% |
| YUV, text & graphics with motion,720p | 0.2% | 0.4% | 0.1% | 0.8% |
| YUV, mixed content, 1440p | 0.3% | 0.4% | 0.0% | 0.7% |
| YUV, mixed content, 1080p | 0.3% | 0.3% | 0.3% | 0.3% |
| YUV, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| Enc Time[%] | 113% | | | |
| Dec Time[%] | 118% | | | |
|  |  |  |  |  |
|  | **Low Delay B** | | | |
|  | Bit-rate saving (Total) | Bit-rate saving (Average) | Bit-rate saving (Min) | Bit-rate saving (Max) |
|  |
| RGB, text & graphics with motion, 1080p | 2.9% | 2.7% | 1.7% | 3.3% |
| RGB, text & graphics with motion,720p | 0.1% | 0.2% | 0.1% | 0.5% |
| RGB, mixed content, 1440p | 0.2% | 0.2% | 0.0% | 0.4% |
| RGB, mixed content, 1080p | 0.1% | 0.1% | 0.1% | 0.1% |
| RGB, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | 2.4% | 2.3% | 1.4% | 3.1% |
| YUV, text & graphics with motion,720p | 0.1% | 0.2% | 0.1% | 0.6% |
| YUV, mixed content, 1440p | 0.1% | 0.2% | 0.0% | 0.3% |
| YUV, mixed content, 1080p | 0.1% | 0.1% | 0.1% | 0.1% |
| YUV, Animation, 720p | 0.0% | 0.0% | 0.0% | 0.0% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.0% | 0.0% |
| Enc Time[%] | 119% | | | |
| Dec Time[%] | 127% | | | |

Table 4. Average BD rate reduction for T3C1 lossy coding

|  |  |  |  |
| --- | --- | --- | --- |
|  | **All Intra** | | |
|  | G/Y | B/U | R/V |
| RGB, text & graphics with motion, 1080p | -5.5% | -6.8% | -6.7% |
| RGB, text & graphics with motion,720p | -3.0% | -3.7% | -3.6% |
| RGB, mixed content, 1440p | -2.6% | -2.9% | -3.1% |
| RGB, mixed content, 1080p | -2.4% | -2.8% | -2.8% |
| RGB, Animation, 720p | -0.1% | -0.1% | -0.1% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | -3.4% | -4.8% | -4.8% |
| YUV, text & graphics with motion,720p | -2.5% | -3.4% | -3.4% |
| YUV, mixed content, 1440p | -1.7% | -2.3% | -2.4% |
| YUV, mixed content, 1080p | -1.8% | -3.1% | -3.1% |
| YUV, Animation, 720p | -0.2% | -0.2% | -0.3% |
| YUV, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| Enc Time[%] | 144% | | |
| Dec Time[%] | 111% | | |
|  |  |  |  |
|  | **Random Access** | | |
|  | G/Y | B/U | R/V |
| RGB, text & graphics with motion, 1080p | -4.4% | -6.3% | -6.0% |
| RGB, text & graphics with motion,720p | -2.2% | -3.3% | -3.3% |
| RGB, mixed content, 1440p | -1.9% | -2.8% | -2.8% |
| RGB, mixed content, 1080p | -1.9% | -2.9% | -3.0% |
| RGB, Animation, 720p | -0.1% | -0.1% | -0.1% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.1% |
| YUV, text & graphics with motion, 1080p | -3.9% | -5.7% | -5.8% |
| YUV, text & graphics with motion,720p | -1.7% | -2.9% | -3.1% |
| YUV, mixed content, 1440p | -1.4% | -2.5% | -2.8% |
| YUV, mixed content, 1080p | -1.6% | -4.1% | -3.9% |
| YUV, Animation, 720p | -0.1% | -0.5% | -0.3% |
| YUV, camera captured, 1080p | 0.0% | 0.2% | 0.0% |
| Enc Time[%] | 113% | | |
| Dec Time[%] | 116% | | |
|  |  |  |  |
|  | **Low delay B** | | |
|  | G/Y | B/U | R/V |
| RGB, text & graphics with motion, 1080p | -4.1% | -5.6% | -5.3% |
| RGB, text & graphics with motion,720p | -1.2% | -2.1% | -2.3% |
| RGB, mixed content, 1440p | -1.3% | -1.8% | -2.3% |
| RGB, mixed content, 1080p | -1.2% | -2.2% | -2.4% |
| RGB, Animation, 720p | 0.0% | 0.1% | 0.1% |
| RGB, camera captured, 1080p | 0.0% | 0.0% | 0.0% |
| YUV, text & graphics with motion, 1080p | -3.8% | -5.6% | -5.4% |
| YUV, text & graphics with motion,720p | -1.1% | -2.2% | -2.4% |
| YUV, mixed content, 1440p | -1.3% | -2.9% | -2.5% |
| YUV, mixed content, 1080p | -1.1% | -4.6% | -5.4% |
| YUV, Animation, 720p | 0.0% | -0.4% | 0.1% |
| YUV, camera captured, 1080p | 0.0% | -0.1% | 0.2% |
| Enc Time[%] | 119% | | |
| Dec Time[%] | 141% | | |

# References

1. J. Xu, S. Liu, K. Rapaka, X. Xiu, “Description of Core Experiment 2 (CE2): IBC signalling and partitioning”, JCTVC-R1102, Jul. 2014, Sapporo, JP.
2. Y. He, Y. Ye, X. Xiu, “CE2: Test 3- IBC with block vector derivation”, JCTVC-S0131, Oct. 2014.
3. H. Yu, R. Cohen, K. Rapaka, J. Xu, “Common conditions for screen content coding tests” JCTVC-R1015, Sapporo, JP, 30 June – 9 July 2014.