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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**  15th Meeting: Geneva, CH, 23 Oct. – 1 Nov. 2013 | Document: JCTVC-Oxxxx | | Document: JCTVC-O0053 |  |

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| *Title:* | **RExt: On transform selection for Intra-BlockCopy blocks** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Proposal | | |
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# Abstract

In the July 2013 JCTVC meeting, Intra-Block Copy (Intra-BC) was adopted in the ongoing Range Extensions standardization for HEVC. Intra-BC blocks can be present in both Intra, as well as Inter frames. Currently, for the Intra-BC blocks, DCT is used as the transform at size 4x4 for Luma video component. However, in HEVC, at size 4x4 for Luma, DST is used for Intra blocks. In a conceivable All Intra profile in Range Extensions, it is asserted that it would be therefore desirable to use DST as the transform for Intra-BC blocks as well, which is presented in this proposal. Simulation results for this simplification show negligible compression efficiency drop, while eliminating the need of an extra transform core, viz., 4x4 DCT for Luma in Intra frames; and no potential requirement of switching quantization matrices at size 4x4 in Intra frames due to one transform core only.

# Introduction

In the July 2013 JCTVC meeting, Intra-Block Copy (Intra-BC) was adopted in the Committee Draft of ongoing Range Extensions standardization for HEVC. Typically, Intra-BC blocks can be present in both Intra, as well as Inter frames. Currently, for the Intra-BC blocks, a 4x4 DCT is being used as the transform at size 4x4 for Luma video component. However, in HEVC, at size 4x4 for Luma, 4x4 DST is used for Intra blocks.

In an All Intra profile for HEVC, the codec does not need to support a 4x4 DCT. Furthermore, by using only one transform for Intra blocks for Luma 4x4 blocks, there is no need for switching of quantization matrices associated with the transforms.

For screen content, and in a conceivable All Intra profile in Range Extensions, it would be also desirable to retain the same property, and use DST as the transform for Intra-BC blocks as well for sizes 4x4 Luma.

# Experimental results

In this section, coding results for using DST for 4x4 Luma Intra-BC blocks are presented according to the test conditions stipulated in RCE3 core experiment description [1] for lossy conditions. The anchor is HM 12.0+RExt-4.1 in lossy setting. The following table present the coding results.

**Table 1:** Use DST at size 4x4 for Intra-BC Luma blocks

Detailed results are in attached excel file.

**Table 1: DST on 4x4 Intra-BC Luma blocks. Anchor is HM12.0-RExt-4.1**



The present version of the document contains results with correct run-times. Also, an independent implementation of the proposed technique is also performed in JCTVC-O0183. Identical results have been obtained in JCTVC-O0183, and this confirms the cross-check.

# Complexity

The proposed technique is a simplification proposal, and reduces the complexity in two ways:

1. Eliminating the requirement of 4x4 DCT for Luma blocks for Intra frames.
2. Eliminating the need of switching quantization matrices at size 4x4 Luma for Intra frames.

# Conclusion

The proposed scheme is a simplification, and there is almost negligible drop in performance by the simplification. We therefore recommend adopting this proposal in committee draft of HEVC range extensions.

# References

1. A. Saxena, D. Kwon, M. Naccari and C. Pang, “HEVC Range Extensions Core Experiment 3 (RCE3): Intra Prediction techniques,” JCTVC-N1123, Vienna, Austria, July 2013.

# Patent rights declaration(s)

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# WD Text Changes

### The following change is with reference to JCTVC-N1005\_v3.doc, and changes are marked in yellow.

### 8.6.4Transformation process for scaled transform coefficients

#### 8.6.4.1General

If CuPredMode[ xTbY ][ yTbY ] is equal to MODE\_INTRA || MODE\_INTRA\_BC, nTbS is equal to 4, and cIdx is equal to 0, trType is set equal to 1.