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| **Source** | Samsung Electronics |
| **Status** | Input contribution |
| **Title** | [V-PCC] Report on CE2.29 based on m47612 |
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# Introduction

V-PCC uses different methods to select the projection direction depending on how the D1 value is generated. The 6 projection direction method [1] is used in the case of the absolute D1 mode and the Per Patch Projection [2] is used in the case of delta D1 mode. Using different methods depending on the conditions complicates TMC2 test model software and V-PCC specification.

# Proposal

In order to unify the projection direction methods for absolute D1 and delta D1 modes, it was proposed in [3] to extend the 6 projection direction method to delta D1 mode. This also resulted in improvement in compression efficiency. This proposal was tested in CE 2.29.

# Results

The objective results for C2 lossyG, lossyA, all-intra conditions and for C2 lossyG, lossyA, interRA are shown in Table 1 and Table 2, respectively. The experimental results show average improvement of 1.5% and 1.8% in geometry, and 1.7%, 1.6%, and 1.7% in texture in terms of BDBR under C2RA test conditions. The experimental results show average improvement of 0.8%, 1.6% in geometry, and 0.9%, 0.8%, and 0.7% in texture in terms of BDBR under the C2AI test conditions.

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| Table 1: C2 lossyG, lossyA, intra (test results compared against VPCC-V6 in case of absoluteD1=0 and projectionMode=2) |
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| Table 2: C2 lossyG, lossyA, inter-RA (test results compared against VPCC v6 in case of absoluteD1=0 and projectionMode=2) |
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# Visual results

Table 3 shows a sample of the visual results.

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| Table 3: Sample of visual tests | | |
| Sequence, Condition | Anchor (TMC2 6.0 in Delta D1 mode) | 6 direction projection in Delta D1 mode |
| Queen  0088, rp3,  all intra |  |  |
| Queen  0092, rp3,  all intra a |  |  |
| Queen  0107, rp3,  all intra |  |  |
| Redandblack  1479, rp3,  all intra |  |  |
| Redandblack  1584, rp3,  all intra |  |  |

The 6 direction projection method shows improvement in visual quality because outside image and inside image are processed separately.

# Conclusion

From the results of this core experiments, Samsung recommends the following adoptions in V-PCC:

* Adding “TMC2 Projection directions from bounding box” [1] to Delta D1 mode.

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# References

[1] [PCC] TMC2 Projection directions from bounding box, ISO/IEC JTC1/SC29 WG11 m43669, July 2018, Ljubljana, SI.

[2] Per patch projection optimization for PCC TMC2, ISO/IEC JTC1/SC29 WG11 m42644, April 2018, San Diego, USA

[3] [V-PCC][New Proposal] Use 6 direction method on delta D1 mode, ISO/IEC JTC1/SC29 WG11 m47612, March 2019, Geneva, CH.