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| *Title:* | **CU Adaptive Quantization Syntax Change for Better Decoder pipelining** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Proposal | | |
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| *Source:* | Sony Electronics Inc. | | |

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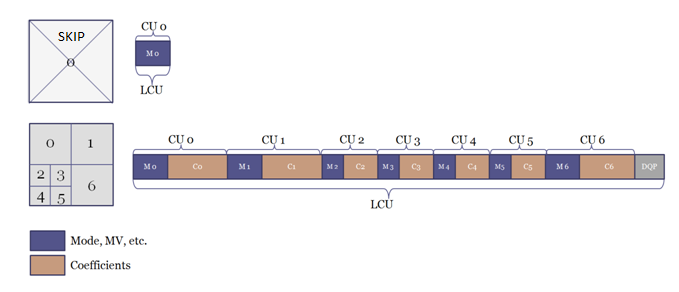
# Abstract

The current HM adaptive quantization syntax places “dQP” at the very end of each LCU when the whole LCU is not coded with SKIP mode. Such syntax could introduce delay in decoding. The proposed change is to place “dQP” after the mode information of the 1st non-skipped CU in an LCU. The proposed change will avoid unnecessary decoder delay and avoid unnecessary signaling when an LCU is further partitioned but every sub-CU is then skipped.

# Overview of Current DQP Syntax in HM

In the current HM syntax, if an LCU is not further split and coded in SKIP mode, no dQP is signaled; otherwise dQP is signaled in the bitstream following the last CU in the LCU. Figure 1 shows two example bitstream composition of LCU for the aforementioned two cases.

1. Examples of bitstream composition

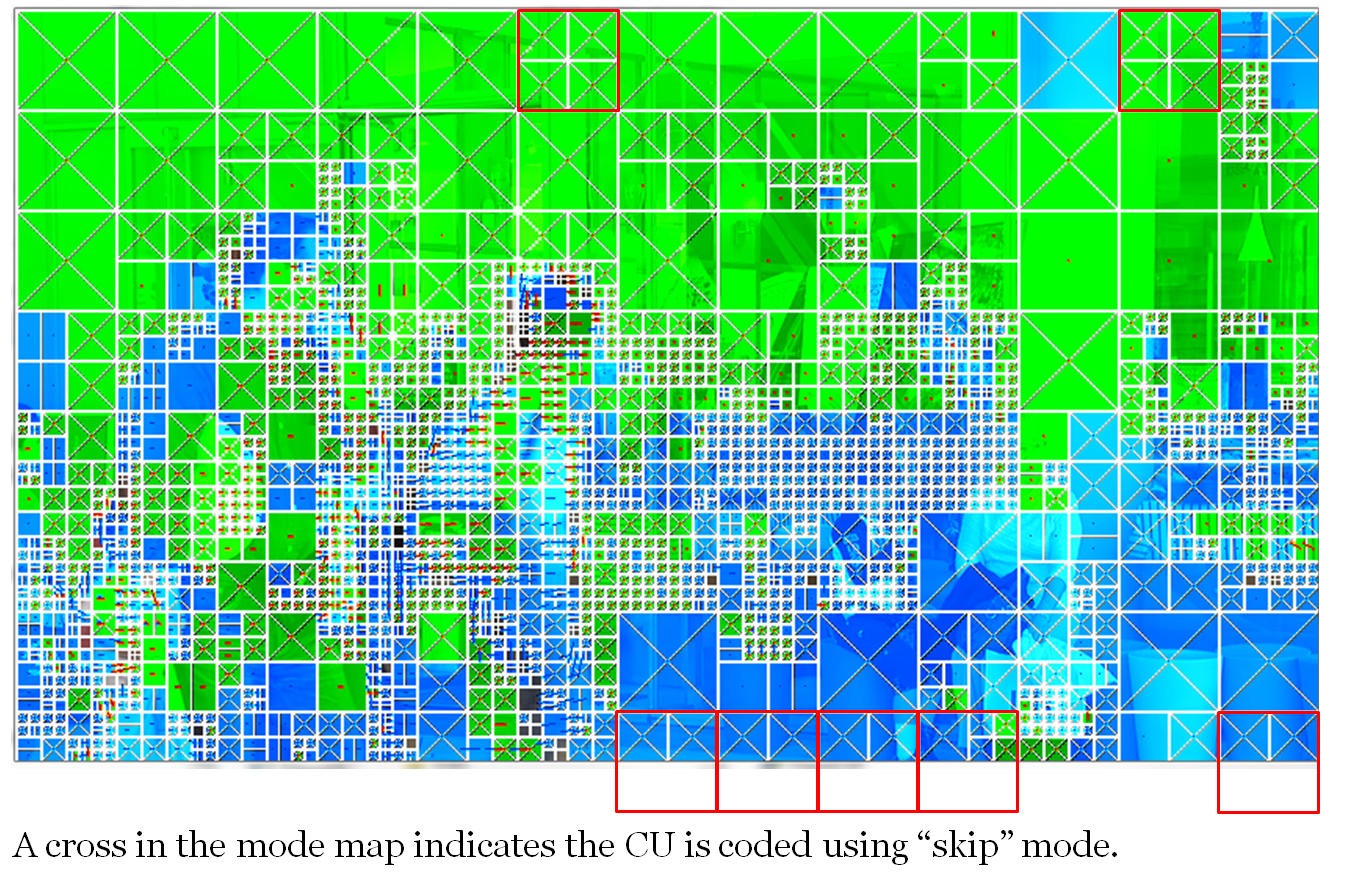


Two disadvantages come with the current syntax as discussed below:

First, as HM encodes each CU withing an LCU in z order and interleaves their mode and coefficients, placing “dQP” at the end of an LCU could introduce delay in decoding. For example, after the coefficients C0 are entropy decoded, reconstruction of CU0 is still not possible because inverse quantization requires dQP to be available.

And secondly, there may be cases where “dQP” is unnecessarily signaled. Such case includes when LCU is partitioned into multiple SKIP CU’s (see Figure 2 for some examples).

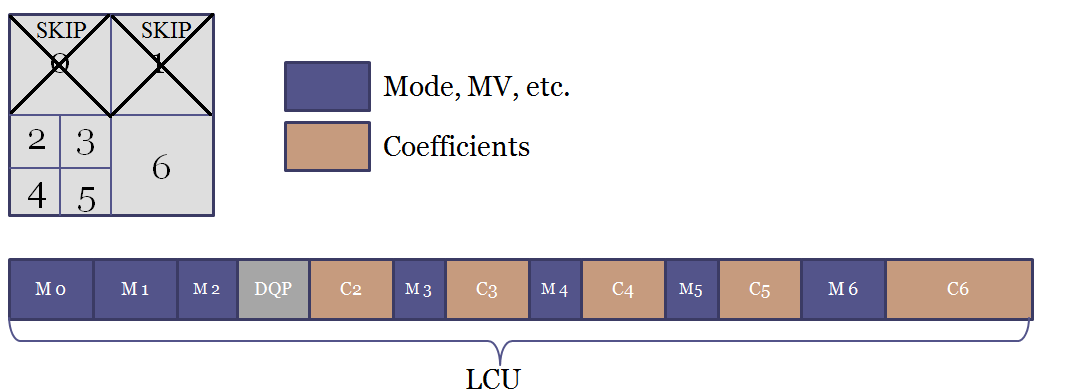
1. Examples of LCU’s partitioned into multiple SKIP CU’s (a cross in this figure shows CU’s encoded with SKIP mode)



# Proposed Approach

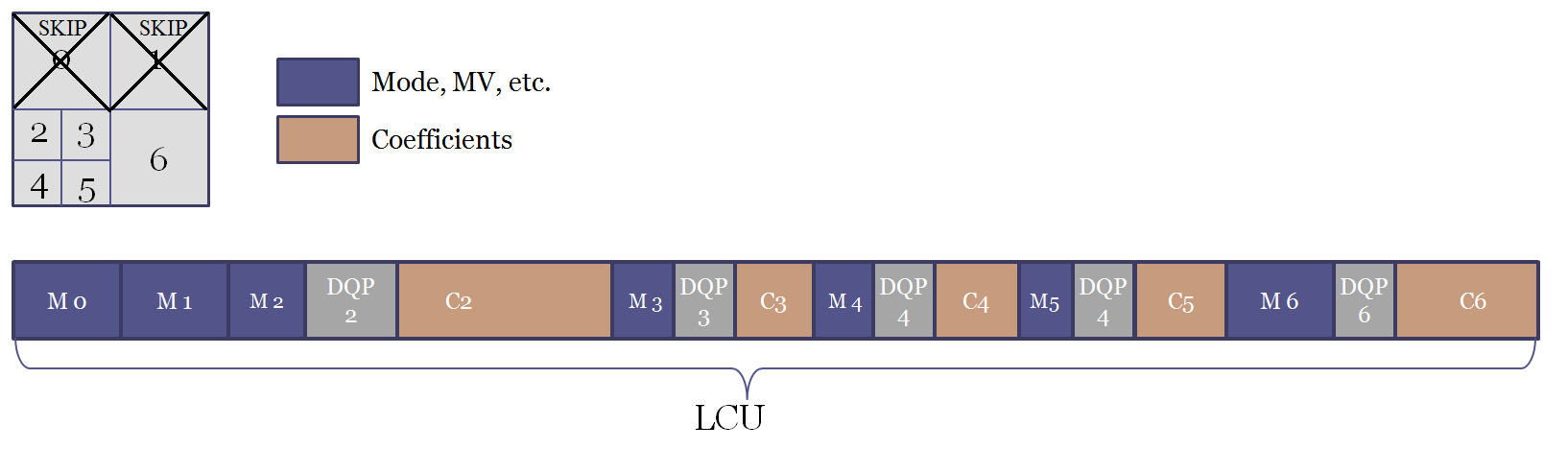
In order to reduce the decoder delay as well as save on unnecessary dQP signaling, we propose to place dQP signaling after the mode information of the 1st non-skipped CU in an LCU. Figure 3 shows an example of the bitstream when the first two CU’s in the LCU are coded using SKIP mode.

1. Example of proposed bitstream composition



This proposed change can easily be extended to support specifying dQP for each CU as proposed in [2], allowing dQP to be encoded after the mode information for each non-skipped CU. Figure 4 gives an example of a possible bitstream.

1. Example of proposed bitstream composition when dQP is specified for each CU



# Conclusion

The proposed change of dQP syntax can help avoid possible decoder delay. At the same time, it can help improve coding efficiency in cases where an LCU is further partitioned but every sub-CU is then skipped. Therefore we recommend that this proposal be adopted into HM and studied in Core Experiment.

# References

1. JCT-VC, Summary of HEVC working draft 1 and HEVC test model (HM), JCTVC-C405, 3rd JCT-VC meeting, Guangzhou, October 2010.
2. JCT-VC, Proposal on Large Block Structure and Quantization, JCTVC-C167, 3rd JCT-VC meeting, Guangzhou, October 2010.

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