



# Non-CE10: Removing QP Line Buffer

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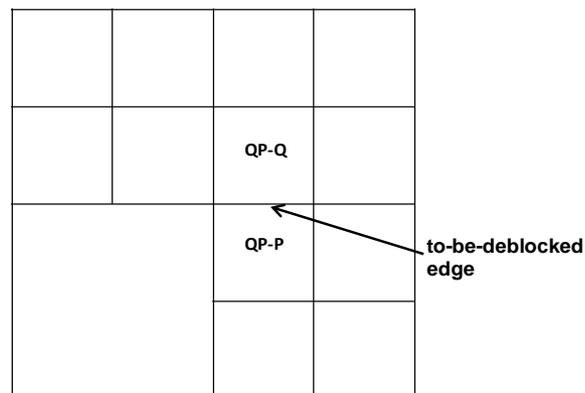
# Overall Summary

- Deblocking filter (DF) in HM-5.0
  - Use the average of QPs on both sides of the edge to find the  $\beta$  and  $t_c$  parameters
  - Need a line buffer for storing QPs from the upper LCU row
- In the proposed modification
  - Remove the line buffer for storing QPs by using the lower side QP for the deblocking of horizontal edges between two LCUs
  - No noticeable changes in terms of BD-rate and run time
  - The visual quality of the proposed method is the same as that of anchor under QP-varying conditions (JCTVC-G1200 with MaxQPAdaptationRange=6, dQpMinCuSize=8, and “TM5Step3” psycho-visual model)

# QP Line Buffer in HM5.0 DF

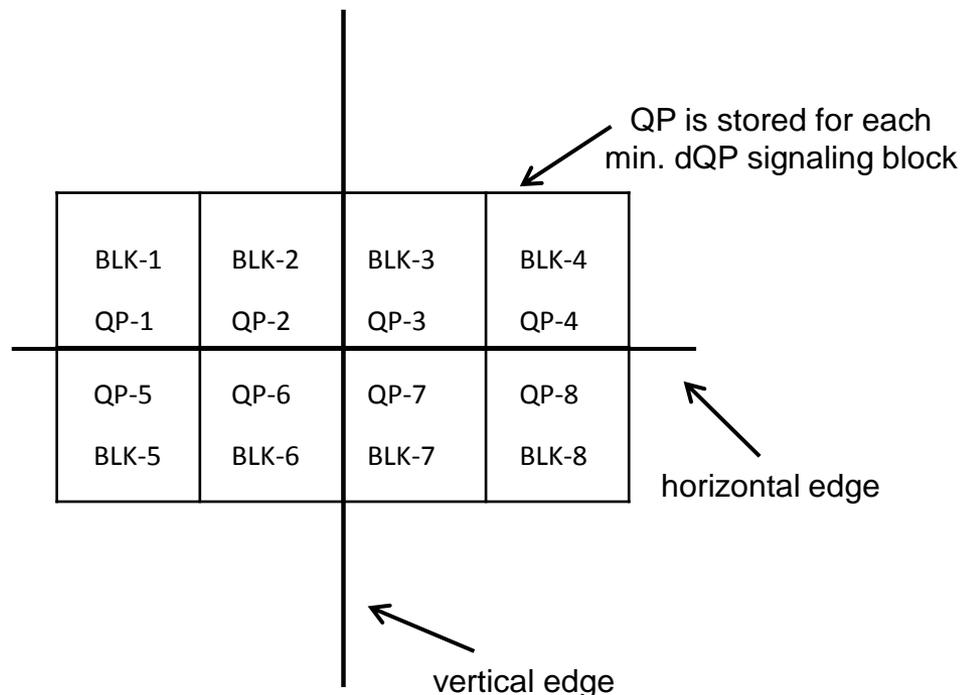
- The parameters  $\beta$  and  $t_c$  depend on the QP values on both sides of the edge
- When the largest coding units (LCUs) are processed by DF in a raster scan order
  - Require line buffer for storing QP values from upper LCU row

- $QP = (QP-P + QP-Q) \gg 1$
- Use QP for  $\beta$  and  $t_c$



# Proposed Change

- For each to-be-deblocked edge that needs to access the QP values of the upper LCU row
  - Only the QP below the horizontal LCU boundary is used
  - The QP line buffer is removed
- Example: If the horizontal edge between block 3 and block 7 is LCU boundary
  - DF will employ only QP-7 to find the  $\beta$  and  $t_c$  parameters



# Simulation Results

- Anchor: HM-5.0 is used with MaxQPAdaptationRange=6, dQpMinCuSize=8, “TM5Step3” psycho-visual model
- Similar subjective quality
- No coding efficiency loss
- The QP line buffer is removed

# Objective Results

- No coding efficiency loss

	All Intra HE			All Intra LC			Low Delay B HE			Low Delay B LC		
	Y	U	V	Y	U	V	Y	U	V	Y	U	V
Class A (8bit)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%						
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	-0.5%
Class C	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%
Class D	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	-0.1%	-0.5%	-0.4%
Class E	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	-0.1%	0.0%	-0.1%	-0.1%
<b>Overall</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.1%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>-0.1%</b>	<b>-0.3%</b>
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	-0.1%	-0.3%
Class F	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	-0.3%	-0.1%	-0.4%	0.3%
Enc Time[%]		100%			100%			100%			100%	
Dec Time[%]		100%			100%			100%			100%	

	Random Access HE			Random Access LC			Low Delay P HE			Low Delay P LC		
	Y	U	V	Y	U	V	Y	U	V	Y	U	V
Class A (8bit)	0.0%	0.1%	0.2%	0.0%	0.1%	-0.1%						
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%	0.1%	0.1%	0.4%
Class C	0.0%	-0.1%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.3%	0.0%	0.2%	0.1%
Class D	0.0%	0.0%	0.0%	0.0%	-0.1%	-0.2%	0.0%	-0.1%	0.7%	0.0%	-0.4%	-0.8%
Class E							-0.1%	-0.1%	0.1%	0.1%	0.2%	0.6%
<b>Overall</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>-0.1%</b>	<b>0.2%</b>	<b>0.0%</b>	<b>0.0%</b>	<b>0.1%</b>
	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%	-0.1%	0.2%	0.0%	0.1%	0.0%
Class F	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%	0.1%	0.2%	0.1%	-0.2%	0.2%
Enc Time[%]		100%			100%			100%			100%	
Dec Time[%]		100%			100%			99%			100%	

# Conclusion

- Proposed to remove QP line buffer in DF
  - No coding efficiency loss
  - The same subjective quality
- Suggest to be further studied in CE10 to confirm the visual quality