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JCTVC-J0318:

Consideration on ChromaQPRange Extension for HEVC version 1 and 2

Jun Xu, Ali Tabatabai, Sony Electronics
jun.xu@am.sony.com
ali.tabatabai@am.sony.com
Kazushi Sato, Sony Corp.
Kazushi.Sato@jp.sony.com

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Agenda

- Introduction / Problem Statement
- Proposed Methods
- Discussions
- Conclusion

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Introduction / Problem Statement

- When CPB is likely to overflow, one straightforward way to avoid it is to increase the value of QP.
- However, under the HEVC CD, upper bound of chroma QP is limited to 39, whereas luma QP can reach the value 51.
- This will become bottleneck for rate-control, especially if the sequence is in 4:2:2 or 4:4:4 format, although it happens in 4:2:0 cases.
- To solve this problem JCTVC-H0400 and -I0265 proposed ChromaQPRange extension.

HM- and Proposed Methods

- HM-method
  - QPCb = g_aucChromaScale (Clip(0, 51, QPY+Cb_QP_offset))
  - QPCr = g_aucChromaScale (Clip(0, 51, QPY+Cr_QP_offset))
- Method –A
  - QPCb = Clip(0, 51, QPY+Cb_QP_offset)
  - QPCr = Clip(0, 51, QPY+Cr_QP_offset)
- Method –B
  - QPCb = Clip(0, 51, g_aucChromaScale (QPY)+Cb_QP_offset)
  - QPCr = Clip(0, 51, g_aucChromaScale(QPY)+Cr_QP_offset)

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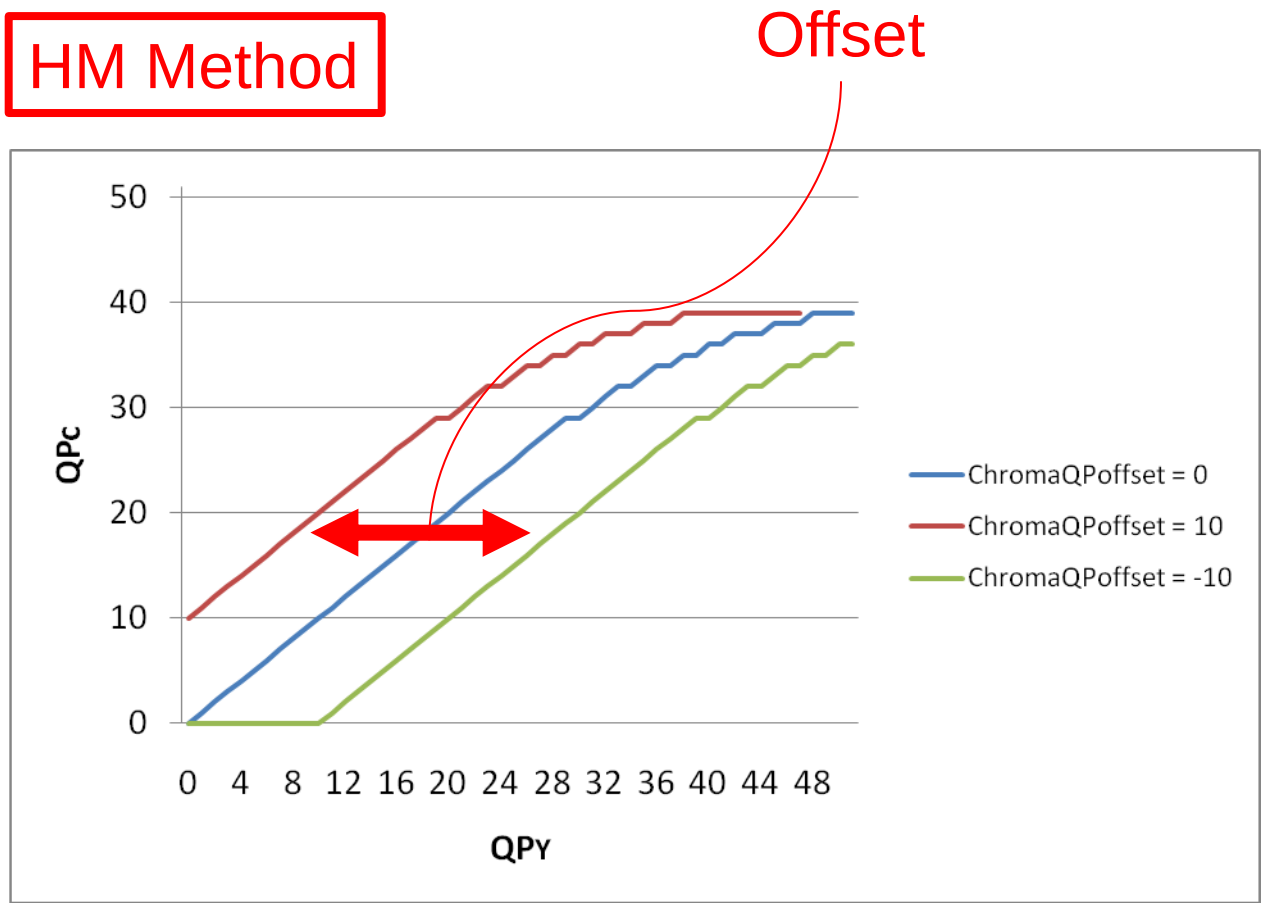
HM Method



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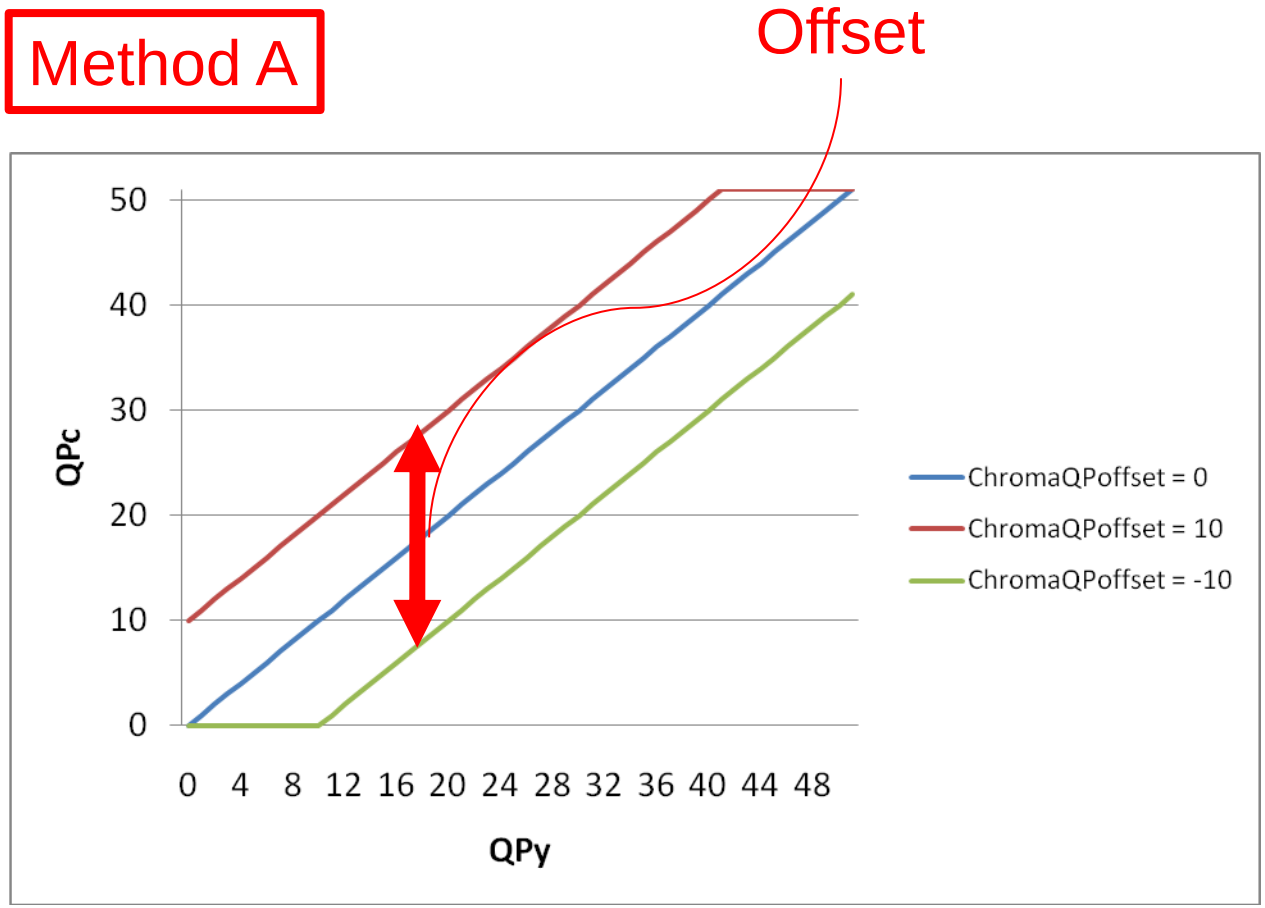
Method A



Pros: YtoC Table can be removed
Cons: Cb/Cr_QP_Offset values should be adjusted to remain luma-chroma quality balance with CTC

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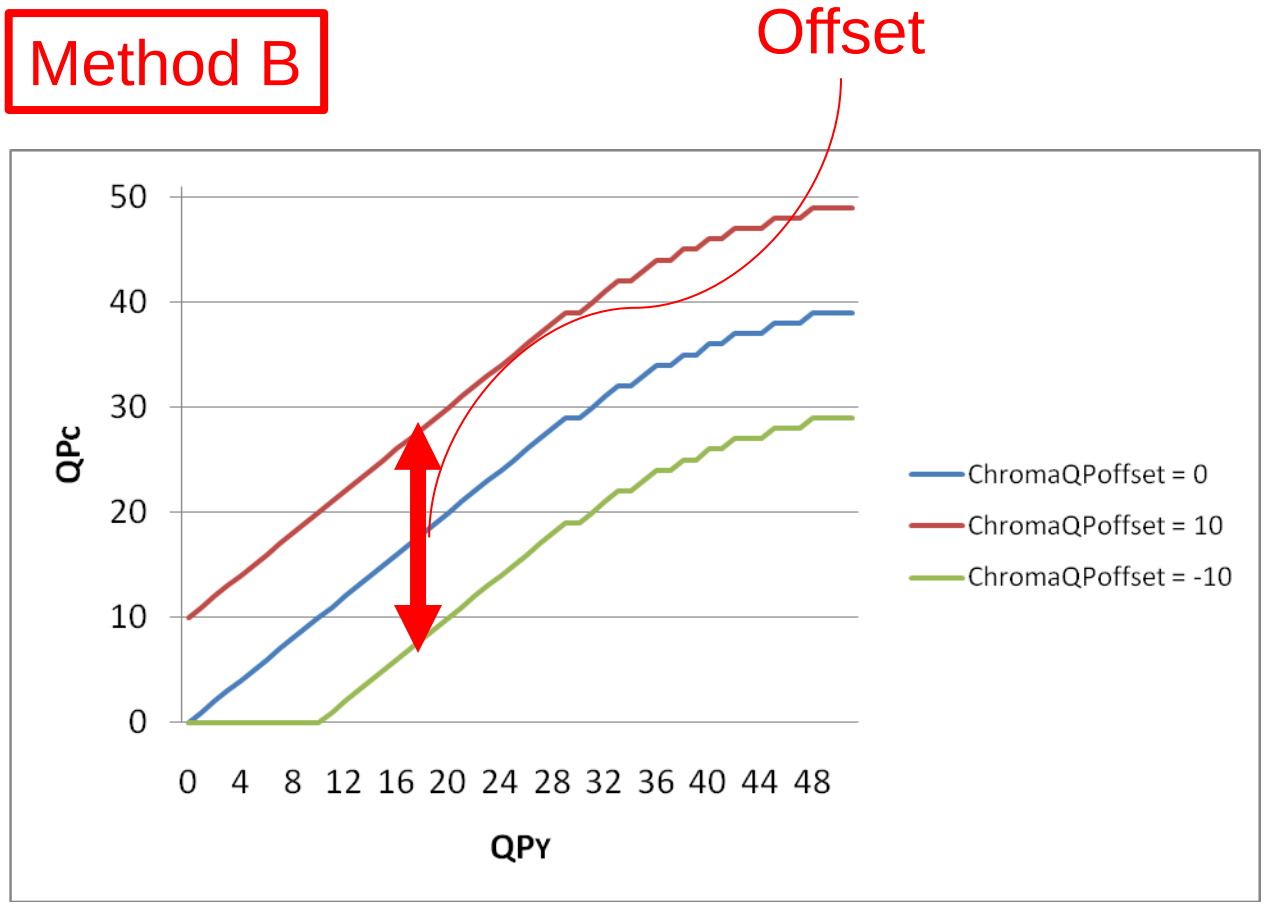
Method B



Pros: Luma-chroma quality balance remains same with Cb/Cr_QP_Offset=0
Cons: YtoC Table cannot be removed

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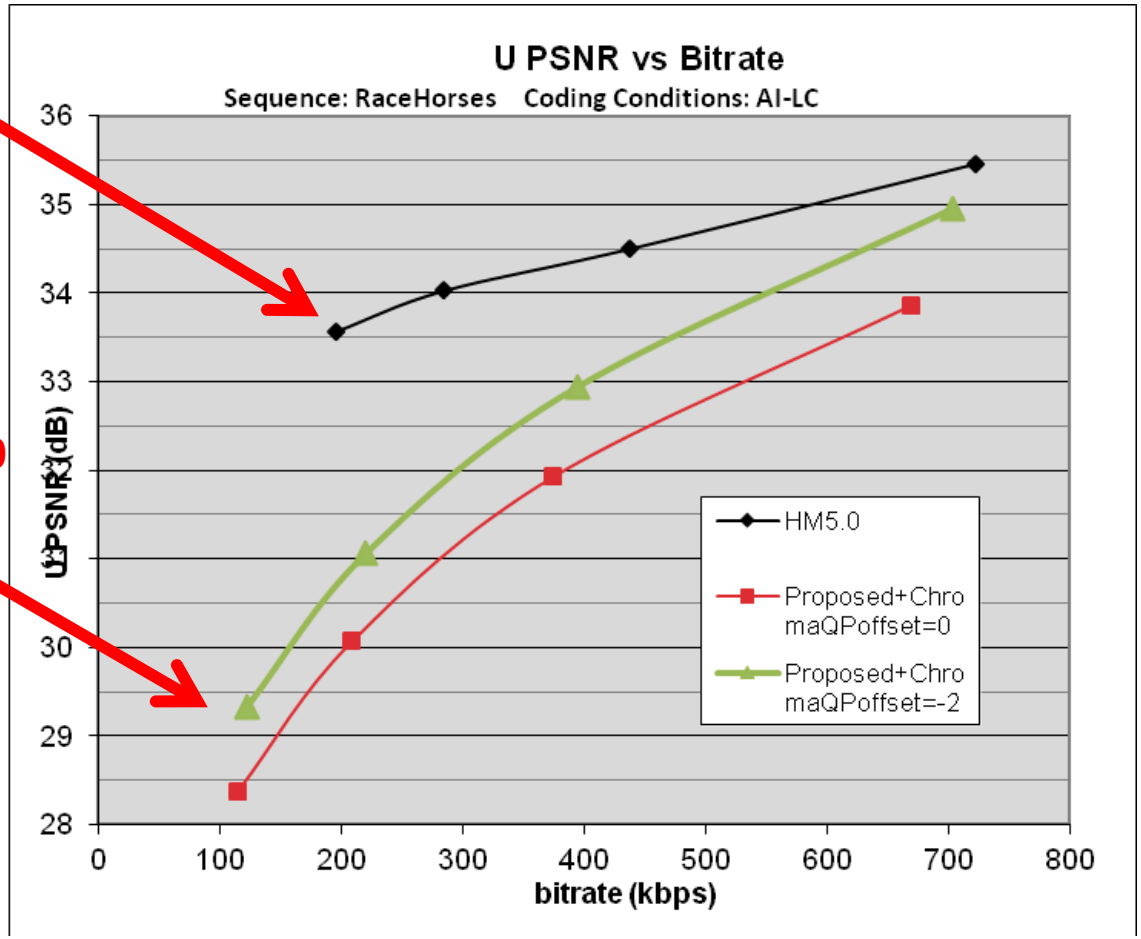
Discussions [1/]

- One expert claimed that
  - generated bits for chroma may be saturated at chroma QP=39
  - even if its value is increased further bit-saving cannot be expected.
- In JCTVC-H0400 we already showed the data that this is not true, as shown in the next slide.

LumaQP=(38, 42, 46, 50)

QPY=50; QPC=39
bitrate≒200kbps

QPY=50; QPC=50
bitrate≒100kbps



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Discussions [2/]

- There are some contributions addressed chroma QP problems in deblocking filter of chroma.
  - JCTVC-0091
  - JCTVC-0343
- In JCTVC-J0091, visual improvements can be observed by set chroma_qp_offset =12.
  - The reason is that large QP is generated to obtain larger deblocking threshold tc for chroma deblocking.
  - By removing the YtoC table as in Method A, chroma QP is actually increased and therefore deblocking threshold tc is increased.
  - What's more, Method A can also extend the QP range to [0, 51], thus more options on the values for tc are available in deblocking for chroma to address blocky artefacts appearing in chroma.

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Conclusion

- This contribution requests to consider chroma QP range extension proposed by JCTVC-H0400 and JCTVC-I0265 as:
  - one of the study items under AHG or CE for HEVC version 2
  - items to be adopted for HEVC version 1
- The proposed method will enable more flexibility
  - to avoid CPB overflow when the buffer constraint is tight
  - to control chroma deblocking more properly
- It will be more useful for 4:2:2 / 4:4:4 videos but also useful with 4:2:0 videos.

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