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Align ALF virtual boundary processes in the bottom CTU rows of one picture and one subpicture

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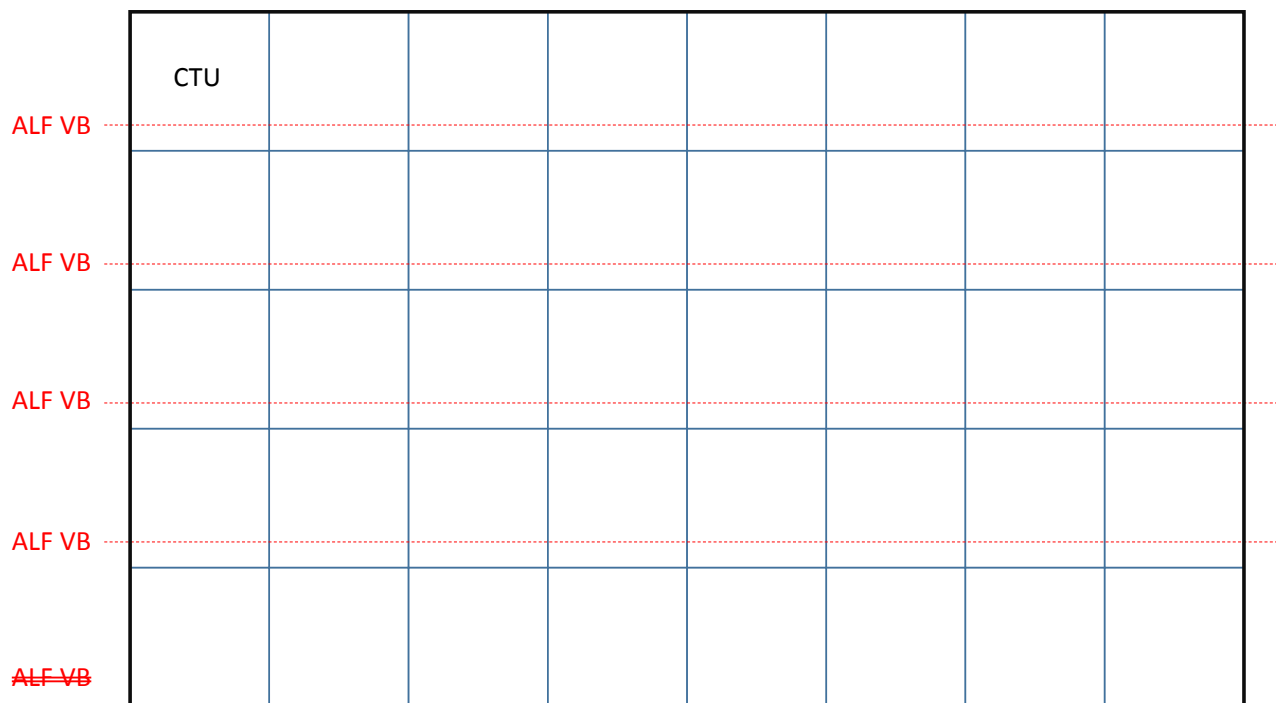
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Overall Summary

- One mismatch occurs, when one picture consists of multiple independent decodable subpictures
 - Adaptive loop filter (ALF) virtual boundary (VB) is applied to the bottom CTU row in one subpicture if the subpicture bottom boundary is not the picture bottom boundary.
 - When decoding one independent subpicture, ALF VB cannot be applied to the bottom CTU row in the subpicture
- Proposed to unify the condition of applying ALF VB at picture and subpicture bottom boundaries to solve this issue

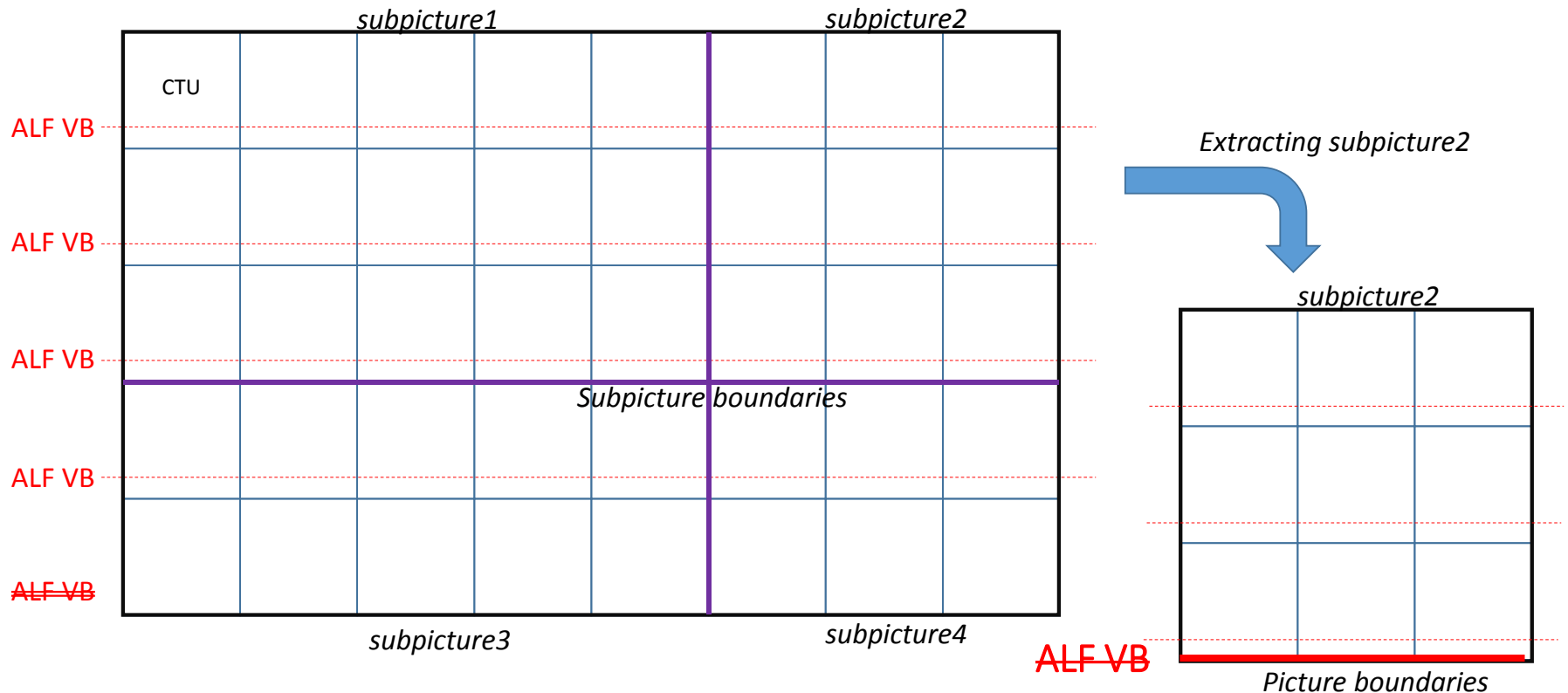
Introduction to ALF VB Process

- In order to remove the line buffers required in ALF, ALF VB is introduced
 - Applied to each coding tree unit (CTU) row in a picture except for the bottom CTU row



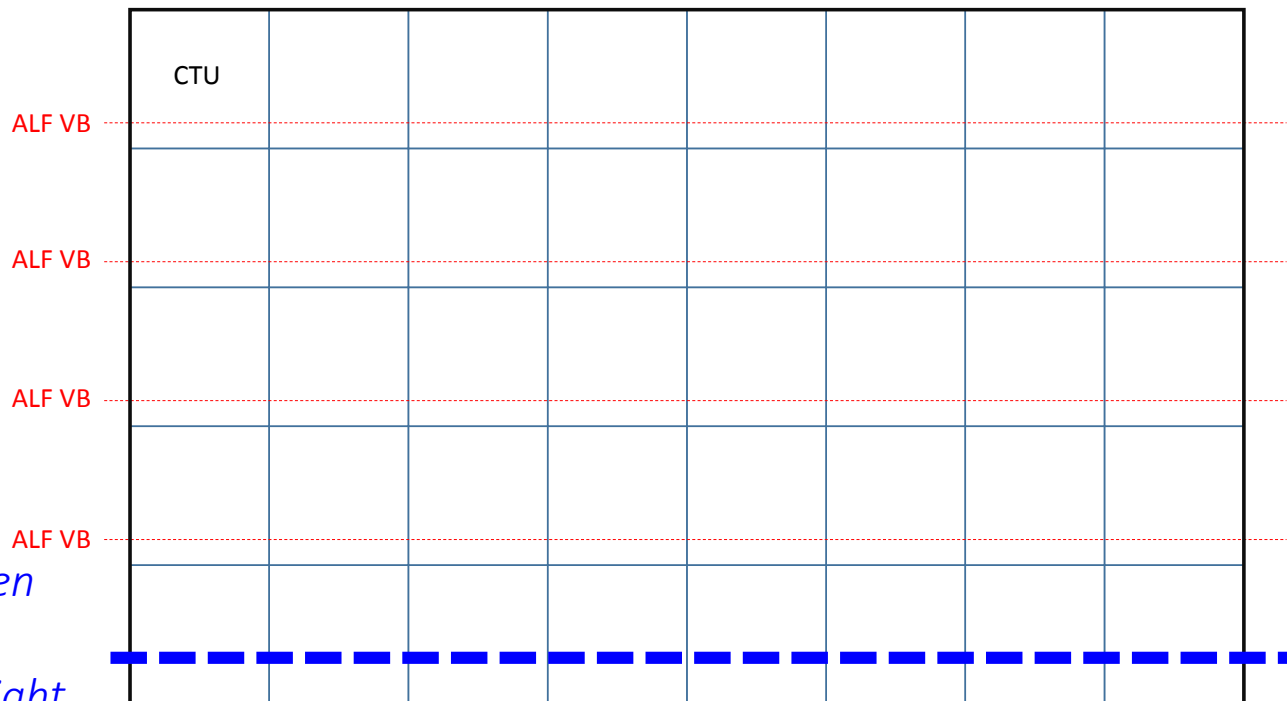
One Picture with Multiple Independent Decodable Subpictures

- Decoding *subpicture2* independently



Align ALF VB Processes in the Bottom CTU Rows of One Picture and One Subpicture

- Method 1: also apply ALF VB to the bottom CTU row in one picture
 - ALF VB is activated only when picture height is a multiple of CTU height



*Enable ALF VB, when
picture height is a
multiple of CTU height*

Align ALF VB Processes in the Bottom CTU Rows of One Picture and One Subpicture

- Method2: conditionally apply ALF VB to the bottom CTU row in one subpicture
 - If the current CTU row is the bottom CTU row of one picture or the bottom CTU row of one subpicture with enabled independently decoding for this subpicture (subpic_treated_as_pic_flag is equal to 1), do not apply ALF VB process to current CTU row.
 - Otherwise, apply ALF VB process to current CTU row.

Summary

Method	Bottom CTU row in one picture	Bottom CTU row in one subpicture	Other CTU rows
VVC Draft 6	Disable ALF VB	If the bottom CTU row is the bottom CTU row of one picture, Disable ALF VB Otherwise, Enable ALF VB	Enable ALF VB
Method 1	Enable ALF VB	Enable ALF VB	Enable ALF VB
Method 2	Disable ALF VB	If subpic_treated_as_pic_flag is equal to 1, Disable ALF VB Otherwise, Enable ALF VB	Enable ALF VB

Conclusion

- One mismatch occurs when one picture consists of multiple independent decodable subpictures
 - Do not apply ALF VB processes to the bottom CTU row in one picture
 - Apply ALF VB processes to the bottom CTU row in one subpicture, if the subpicture bottom boundary is not the picture bottom boundary
- Proposed to align ALF virtual boundary processes in the bottom CTU rows of one picture and one subpicture

