

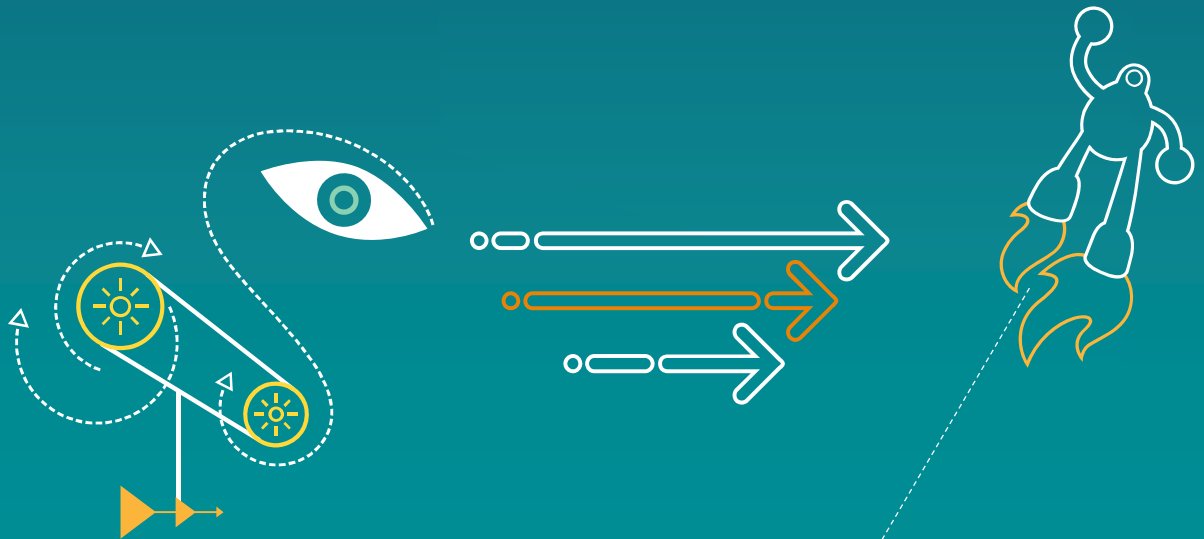
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**JCTVC-V0041**

# **Restriction on signalling for palette escape samples**

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# Restriction for palette\_escape\_val

- Last meeting Exp-Golomb code of order 3 was adopted for palette\_escape\_val syntax element
- Currently, infinite large palette\_escape\_val can be signalled
- It is proposed to restrict palette\_escape\_val, and two solutions are proposed

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## Software only aspect

- In the current SCM, palette encoder related functions are implemented in TComPrediction class, which are shared with decoder and decoder does not need it
- It is proposed, to move such functions to TEncSearch class, where other encoder functions are implemented for other modes
- No change in the performance of such modification

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# Solution 1. Bitdepth based restriction

- It is proposed to restrict `palette_escape_val` as follows:
  - It is a requirement of bitstream conformance that the value of `palette_escape_val` shall be in the range of 0 to  $(1 \ll (\text{bitDepth} + 1)) - 1$ , inclusive, where `bitDepth` is equal to `BitDepthY` for luma samples, and `bitDepth` is equal to `BitDepthC` for chroma samples.
- No other changes are required in this solution

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## Solution 2. Align with transform skip

- Escape pixels are similar to transform skip and coefficient coding can be reused for palette escapes.
- For escape pixels coding, it is proposed to reuse the following:
  - Coefficient coding dequantization process
    - It is similar to the current escape dequantization with the difference in the rounding offsets
  - Binarization of the `coeff_abs_level_remaining` with Rice parameter equal to 3
  - Limits  $\text{CoeffMax}_Y$  and  $\text{CoeffMax}_C$  for `palette_escape_val`

# Lossy 4:4:4 test results for Solution 2

Full frame Intra Block Copy search				Constrained Intra Block Copy Seaerch (1x4 CTUs)			
	All Intra				All Intra		
	G/Y	B/U	R/V		G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p & 720p	-0.1%	-0.1%	-0.1%	RGB, text & graphics with motion, 1080p & 720p	-0.1%	-0.1%	-0.1%
RGB, mixed content, 1440p & 1080p	-0.1%	-0.1%	-0.1%	RGB, mixed content, 1440p & 1080p	-0.2%	-0.2%	-0.1%
RGB, Animation, 720p	0.0%	0.0%	0.0%	RGB, Animation, 720p	0.0%	0.0%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	RGB, camera captured, 1080p	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p & 720p	0.0%	0.0%	-0.1%	YUV, text & graphics with motion, 1080p & 720p	0.0%	-0.1%	-0.1%
YUV, mixed content, 1440p & 1080p	0.0%	-0.1%	-0.1%	YUV, mixed content, 1440p & 1080p	0.0%	-0.1%	-0.1%
YUV, Animation, 720p	0.0%	0.0%	0.0%	YUV, Animation, 720p	0.0%	0.0%	0.0%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	YUV, camera captured, 1080p	0.0%	0.0%	0.0%
Enc Time[%]	99%			Enc Time[%]	120%		
Dec Time[%]	99%			Dec Time[%]	115%		
	Random Access				Random Access		
	G/Y	B/U	R/V		G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p & 720p	-0.1%	-0.1%	-0.1%	RGB, text & graphics with motion, 1080p & 720p	-0.1%	-0.1%	-0.1%
RGB, mixed content, 1440p & 1080p	-0.1%	-0.1%	-0.1%	RGB, mixed content, 1440p & 1080p	-0.1%	-0.1%	-0.1%
RGB, Animation, 720p	0.0%	0.0%	0.0%	RGB, Animation, 720p	0.0%	0.0%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	RGB, camera captured, 1080p	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p & 720p	0.0%	-0.1%	0.0%	YUV, text & graphics with motion, 1080p & 720p	0.0%	-0.1%	-0.1%
YUV, mixed content, 1440p & 1080p	0.0%	0.0%	-0.1%	YUV, mixed content, 1440p & 1080p	0.0%	-0.1%	-0.1%
YUV, Animation, 720p	0.1%	0.1%	0.1%	YUV, Animation, 720p	-0.1%	-0.1%	-0.1%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	YUV, camera captured, 1080p	0.0%	0.0%	0.0%
Enc Time[%]	100%			Enc Time[%]	115%		
Dec Time[%]	98%			Dec Time[%]	111%		
	Low delay B				Low delay B		
	G/Y	B/U	R/V		G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p & 720p	-0.2%	-0.1%	-0.2%	RGB, text & graphics with motion, 1080p & 720p	-0.1%	0.0%	-0.1%
RGB, mixed content, 1440p & 1080p	-0.2%	-0.2%	0.0%	RGB, mixed content, 1440p & 1080p	-0.1%	-0.1%	-0.1%
RGB, Animation, 720p	0.0%	0.0%	0.0%	RGB, Animation, 720p	0.0%	0.0%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	RGB, camera captured, 1080p	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p & 720p	0.0%	0.0%	-0.1%	YUV, text & graphics with motion, 1080p & 720p	0.0%	-0.1%	-0.1%
YUV, mixed content, 1440p & 1080p	-0.1%	-0.1%	-0.5%	YUV, mixed content, 1440p & 1080p	0.0%	-0.3%	-0.4%
YUV, Animation, 720p	-0.1%	0.1%	0.2%	YUV, Animation, 720p	0.0%	0.3%	0.0%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	YUV, camera captured, 1080p	0.0%	0.0%	0.0%
Enc Time[%]	97%			Enc Time[%]	107%		
Dec Time[%]	96%			Dec Time[%]	100%		

# Lossy 4:2:0 test results for Solution 2

	<b>All Intra</b>		
	G/Y	B/U	R/V
YUV, text & graphics with motion, 1080p & 720p	0.0%	0.0%	0.0%
YUV, mixed content, 1440p & 1080p	0.0%	0.0%	0.0%
YUV, Animation, 720p & 768p	0.0%	0.0%	0.0%
Enc Time[%]	97%		
Dec Time[%]	99%		
	<b>Random Access</b>		
	G/Y	B/U	R/V
YUV, text & graphics with motion, 1080p & 720p	0.0%	0.1%	0.0%
YUV, mixed content, 1440p & 1080p	0.0%	-0.1%	0.0%
YUV, Animation, 720p	0.0%	0.0%	-0.1%
Enc Time[%]	101%		
Dec Time[%]	112%		
	<b>Low delay B</b>		
	G/Y	B/U	R/V
YUV, text & graphics with motion, 1080p & 720p	0.0%	-0.1%	0.1%
YUV, mixed content, 1440p & 1080p	0.0%	-0.6%	0.1%
YUV, Animation, 720p	0.0%	0.2%	0.0%
Enc Time[%]	100%		
Dec Time[%]	101%		