JCTVC-S0047
Non-CE 6: Modifications of copy-left and copy-above modes in index coding

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Problem of copy modes

- In the current design, copy-above mode is unavailable when

    (a)The left index is coded by copy-left mode and the above index of the current index is identical to the left index

    (b)The left index is coded by copy-left mode and the above index of the current index is coded by escape mode

A (known)

A A A C

Copy-above mode is unavailable

Copy-left (known)
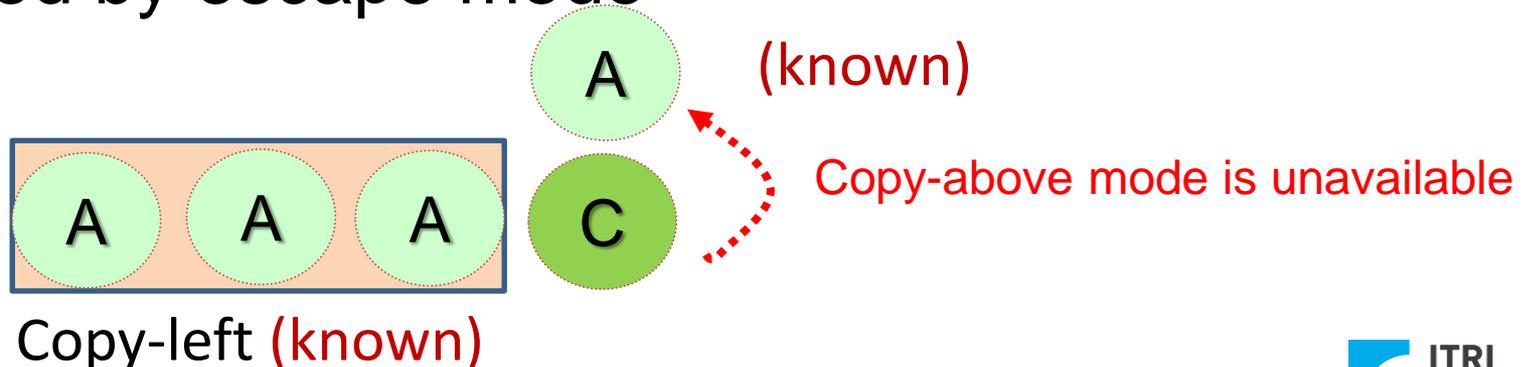
Proposed method 1

- If the above index is identical to the left index
- Use a predefined value (e.g., index 0) as a padding value to replace the above index

0 — Padding value

Copy-above mode is available if C is index 0

A   A   A   C

Copy-left (known)

Proposed method 1

0

Padding value

A

A A A C

Copy-left (known)

Only copy-left mode is available if C is not index 0
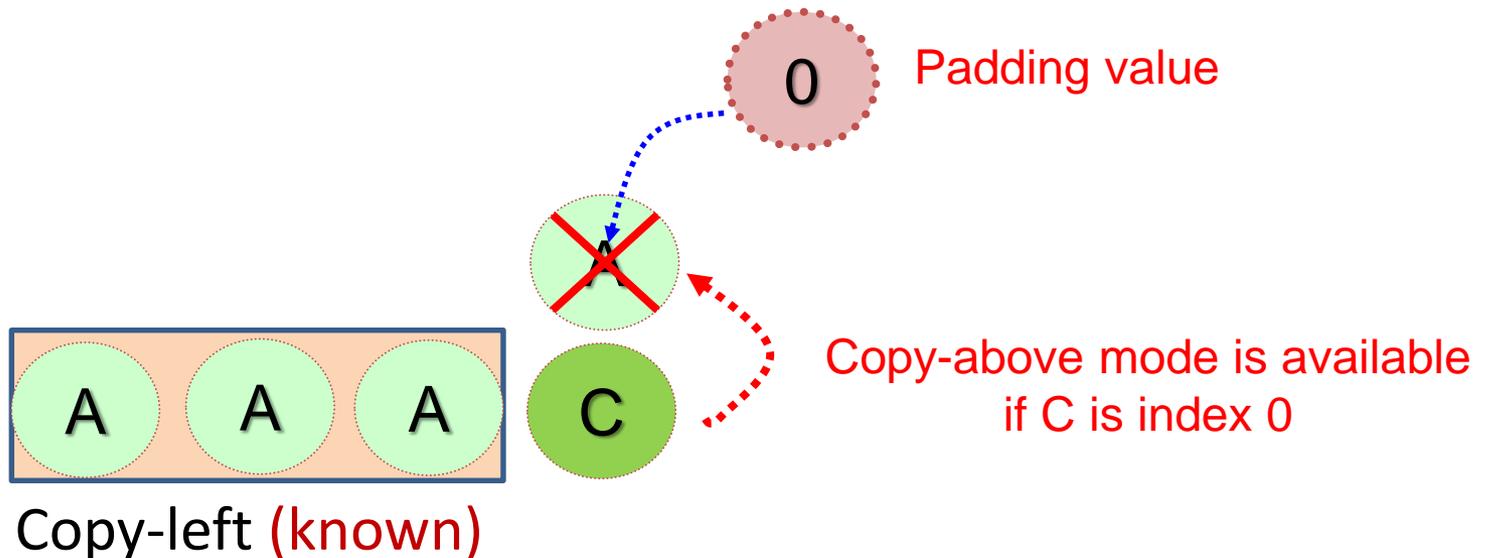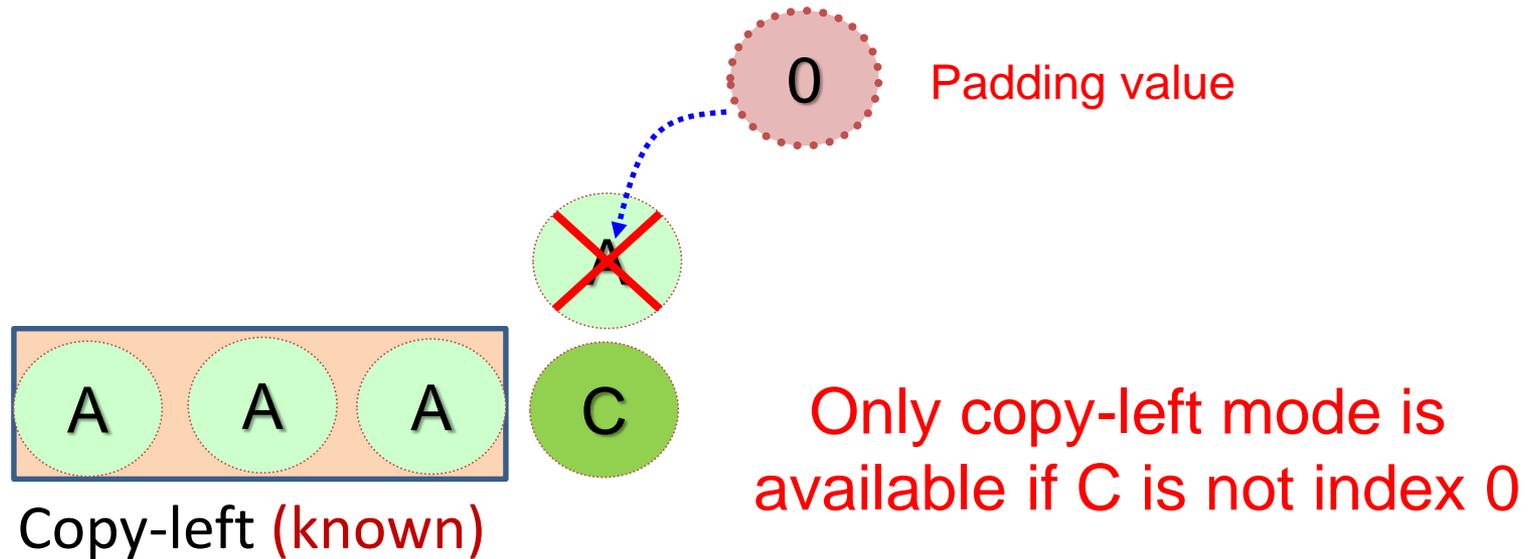
Index A and index 0 is impossible to be used as palette indices

Coding Syntax: Copy-left + reduced index + run

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Problem of copy modes
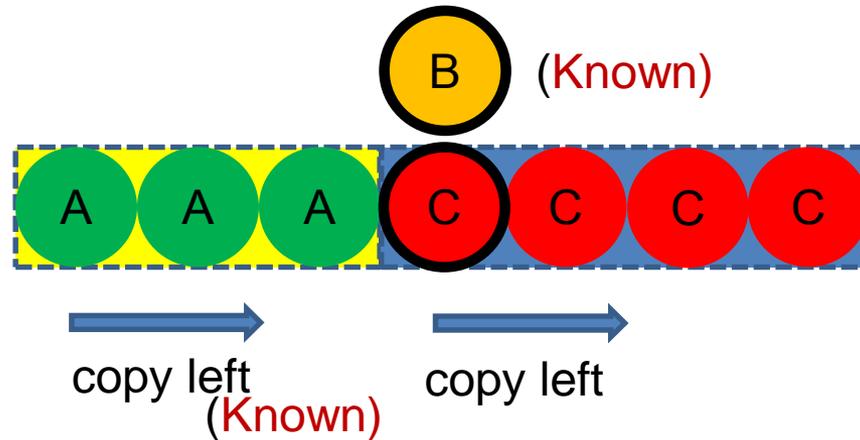
- A and C are copy left mode → C≠A
- Coding index of C by considering A and B impossible values
  - If run < 3, C and B must be different
  - If run ≥ 3, C and B may be the same

Proposed method 2(1/3)

- If run < 3 → Coding C: Copy-left + <u>reduced index C</u> + run
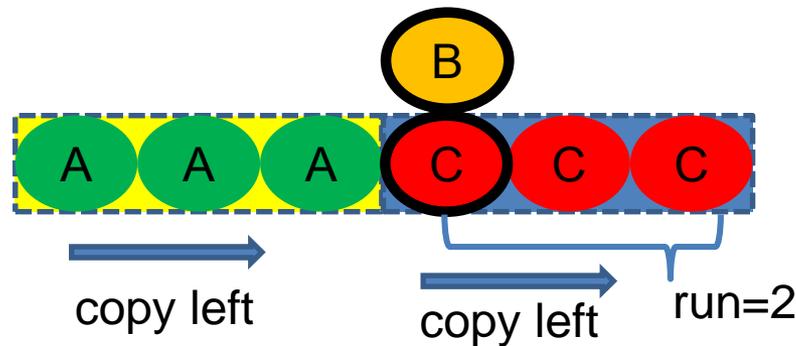
Proposed method 2(2/3)

- If run ≥ 3 & the current index = the above index

→ Coding C: Copy-left + index (0) + run + indicator(1)

copy left   copy left   copy left   copy left
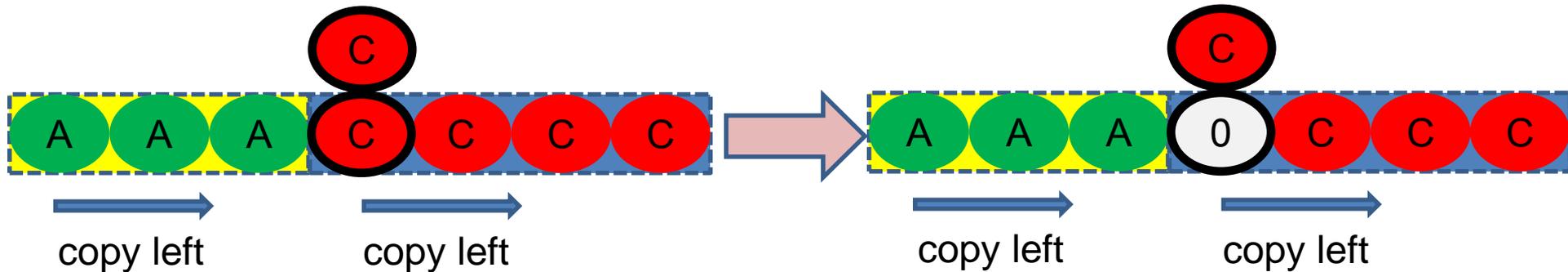
Proposed method 2(3/3)

- If run ≥ 3 & the current index ≠ the above index
  - If the codeword of the current index = 0

→ Coding C: Copy-left + index (0) + run + indicator(0)

- In other cases

→ Coding C: Copy-left + reduced index C + run

copy left   copy left
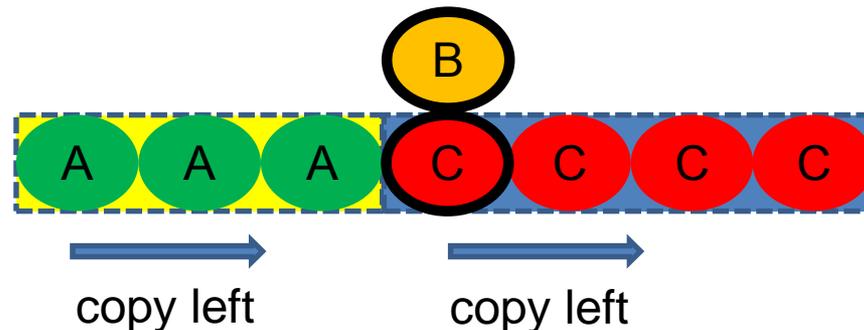
Results of AI, Lossy

- ## Common Test Condition:

|	All Intra		
	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p	-0.2%	-0.2%	-0.2%
RGB, text & graphics with motion,720p	-0.2%	-0.3%	-0.2%
RGB, mixed content, 1440p	0.0%	-0.1%	-0.1%
RGB, mixed content, 1080p	-0.1%	-0.1%	-0.1%
RGB, Animation, 720p	0.0%	0.0%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p	-0.3%	-0.3%	-0.4%
YUV, text & graphics with motion,720p	-0.2%	-0.3%	-0.4%
YUV, mixed content, 1440p	-0.1%	-0.2%	-0.2%
YUV, mixed content, 1080p	-0.1%	-0.2%	-0.2%
YUV, Animation, 720p	0.0%	-0.1%	-0.1%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%
Enc Time[%]	102%		
Dec Time[%]	102%		

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Results of AI, Lossless

- ## Common Test Condition:

	All Intra			
	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)
RGB, text & graphics with motion, 1080p	0.1%	0.1%	0.0%	0.1%
RGB, text & graphics with motion,720p	0.1%	0.1%	0.0%	0.2%
RGB, mixed content, 1440p	0.0%	0.0%	0.0%	0.0%
RGB, mixed content, 1080p	0.0%	0.0%	0.0%	0.0%
RGB, Animation, 720p	0.0%	0.0%	0.0%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p	0.1%	0.1%	0.0%	0.2%
YUV, text & graphics with motion,720p	0.1%	0.1%	0.0%	0.2%
YUV, mixed content, 1440p	0.0%	0.0%	0.0%	0.1%
YUV, mixed content, 1080p	0.0%	0.0%	0.0%	0.0%
YUV, Animation, 720p	0.0%	0.0%	0.0%	0.0%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%
Enc Time[%] *(Encoding time is not accurate)*	85%			
Dec Time[%]	102%			

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Proposed method 2(supplemental)
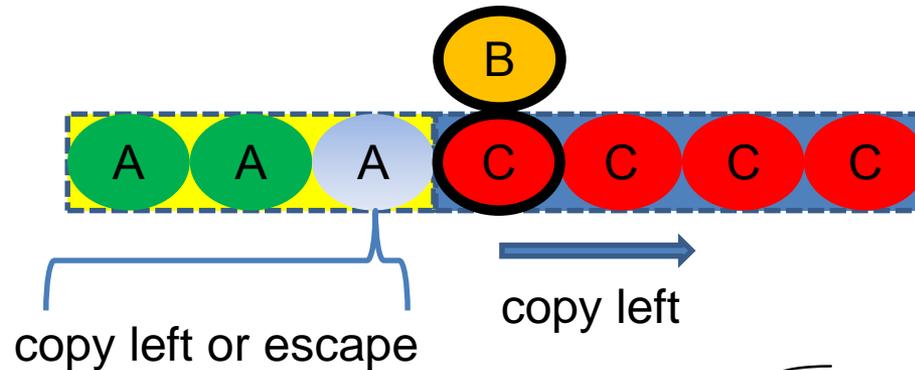
Coding C: Copy-left + reduced index C + run

Run
(run < 3)

Run + 0/1 indicator
(run ≥ 3 & codeword = 0)

- A is copy left mode and C is copy left mode
- A is escape mode and C is copy left mode

C≠A

- Coding index of C by considering A and B impossible values

Proposed method 2(supplemental)

- AI Lossy. Not crosschecked

	All Intra		
	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p	-0.2%	-0.2%	-0.2%
RGB, text & graphics with motion,720p	-0.2%	-0.3%	-0.2%
RGB, mixed content, 1440p	0.0%	-0.1%	-0.1%
RGB, mixed content, 1080p	-0.1%	-0.1%	-0.1%
RGB, Animation, 720p	0.0%	0.0%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p	-0.4%	-0.4%	-0.4%
YUV, text & graphics with motion,720p	-0.2%	-0.4%	-0.4%
YUV, mixed content, 1440p	-0.1%	-0.2%	-0.2%
YUV, mixed content, 1080p	-0.1%	-0.2%	-0.2%
YUV, Animation, 720p	0.0%	-0.1%	0.0%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%

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Conclusions(1/2)

- Modified copy-left and copy-above modes are proposed to efficiently code the index map.

- The proposed methods achieve 0.3% BD-rate saving for sequences of "text & graphics with motion, 1080p" under All Intra Lossy conditions.

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Conclusions(2/2)

- The supplemental results show 0.4% BD-rate saving for sequences of "text & graphics with motion, 1080p" under All Intra Lossy conditions.

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Recommendations

- Recommend to adopt this proposal for Screen Content Coding.

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Acknowledgement

- Thank Sharp for cross check

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Thank You

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Appendix

Run value reduction

- If there are only two colors in current palette table

copy left   copy left   run = 3
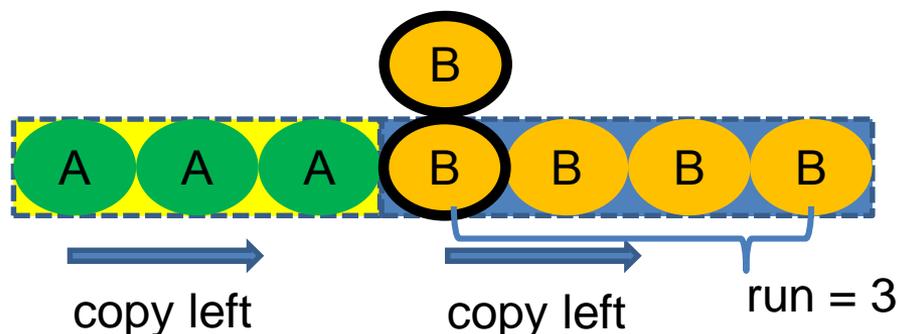
- In this case, the current run value R must ≥ 3. The run R can be coded as R–3 for saving coding bits

Results of RA, Lossy

- ## Common Test Condition:

	Random Access		
	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p	-0.1%	-0.1%	-0.1%
RGB, text & graphics with motion,720p	-0.1%	-0.2%	-0.2%
RGB, mixed content, 1440p	0.0%	-0.1%	0.0%
RGB, mixed content, 1080p	-0.1%	-0.3%	-0.3%
RGB, Animation, 720p	0.0%	0.0%	-0.1%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p	-0.2%	-0.2%	-0.2%
YUV, text & graphics with motion,720p	-0.1%	-0.3%	-0.3%
YUV, mixed content, 1440p	-0.2%	-0.2%	-0.3%
YUV, mixed content, 1080p	0.1%	-0.1%	-0.2%
YUV, Animation, 720p	0.0%	0.0%	-0.2%
YUV, camera captured, 1080p	0.0%	0.1%	-0.1%
Enc Time[%] *(Encoding time is not accurate)*	82%		
Dec Time[%]	94%		

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Results of LB, Lossy

- ## Common Test Condition:

	Low delay B		
	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p	-0.1%	-0.1%	-0.1%
RGB, text & graphics with motion,720p	-0.2%	-0.2%	0.0%
RGB, mixed content, 1440p	-0.1%	-0.3%	-0.1%
RGB, mixed content, 1080p	-0.3%	0.1%	0.2%
RGB, Animation, 720p	0.0%	0.0%	0.1%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p	-0.1%	-0.2%	-0.1%
YUV, text & graphics with motion,720p	-0.2%	0.1%	-0.2%
YUV, mixed content, 1440p	0.0%	0.1%	-0.2%
YUV, mixed content, 1080p	-0.1%	-0.1%	-0.2%
YUV, Animation, 720p	0.0%	-0.6%	-0.1%
YUV, camera captured, 1080p	0.0%	-0.1%	0.2%
Enc Time[%] *(Encoding time is not accurate)*	84%		
Dec Time[%]	92%		

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Results of RA, Lossless

- ## Common Test Condition:

	Random Access			
	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)
RGB, text & graphics with motion, 1080p	0.0%	0.1%	0.0%	0.1%
RGB, text & graphics with motion,720p	0.0%	0.0%	0.0%	0.1%
RGB, mixed content, 1440p	0.0%	0.0%	0.0%	0.0%
RGB, mixed content, 1080p	0.0%	0.0%	0.0%	0.0%
RGB, Animation, 720p	0.0%	0.0%	0.0%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p	0.0%	0.1%	0.0%	0.1%
YUV, text & graphics with motion,720p	0.0%	0.0%	0.0%	0.1%
YUV, mixed content, 1440p	0.0%	0.0%	0.0%	0.0%
YUV, mixed content, 1080p	0.0%	0.0%	0.0%	0.0%
YUV, Animation, 720p	0.0%	0.0%	0.0%	0.0%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%
Enc Time[%] *(Encoding time is not accurate)*	87%			
Dec Time[%]	103%			

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Results of LB, Lossless

- ## Common Test Condition:

	Low Delay B			
	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)
RGB, text & graphics with motion, 1080p	0.0%	0.1%	0.0%	0.1%
RGB, text & graphics with motion,720p	0.0%	0.0%	0.0%	0.0%
RGB, mixed content, 1440p	0.0%	0.0%	0.0%	0.0%
RGB, mixed content, 1080p	0.0%	0.0%	0.0%	0.0%
RGB, Animation, 720p	0.0%	0.0%	0.0%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p	0.0%	0.1%	0.0%	0.1%
YUV, text & graphics with motion,720p	0.0%	0.0%	0.0%	0.1%
YUV, mixed content, 1440p	0.0%	0.0%	0.0%	0.0%
YUV, mixed content, 1080p	0.0%	0.0%	0.0%	0.0%
YUV, Animation, 720p	0.0%	0.0%	0.0%	0.0%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%
Enc Time[%] *(Encoding time is not accurate)*	89%			
Dec Time[%]	102%			

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