

JCTVC-M0144:
Non-SCE5: Combined Tests of SCE5.1.5
and SCE5.2.*

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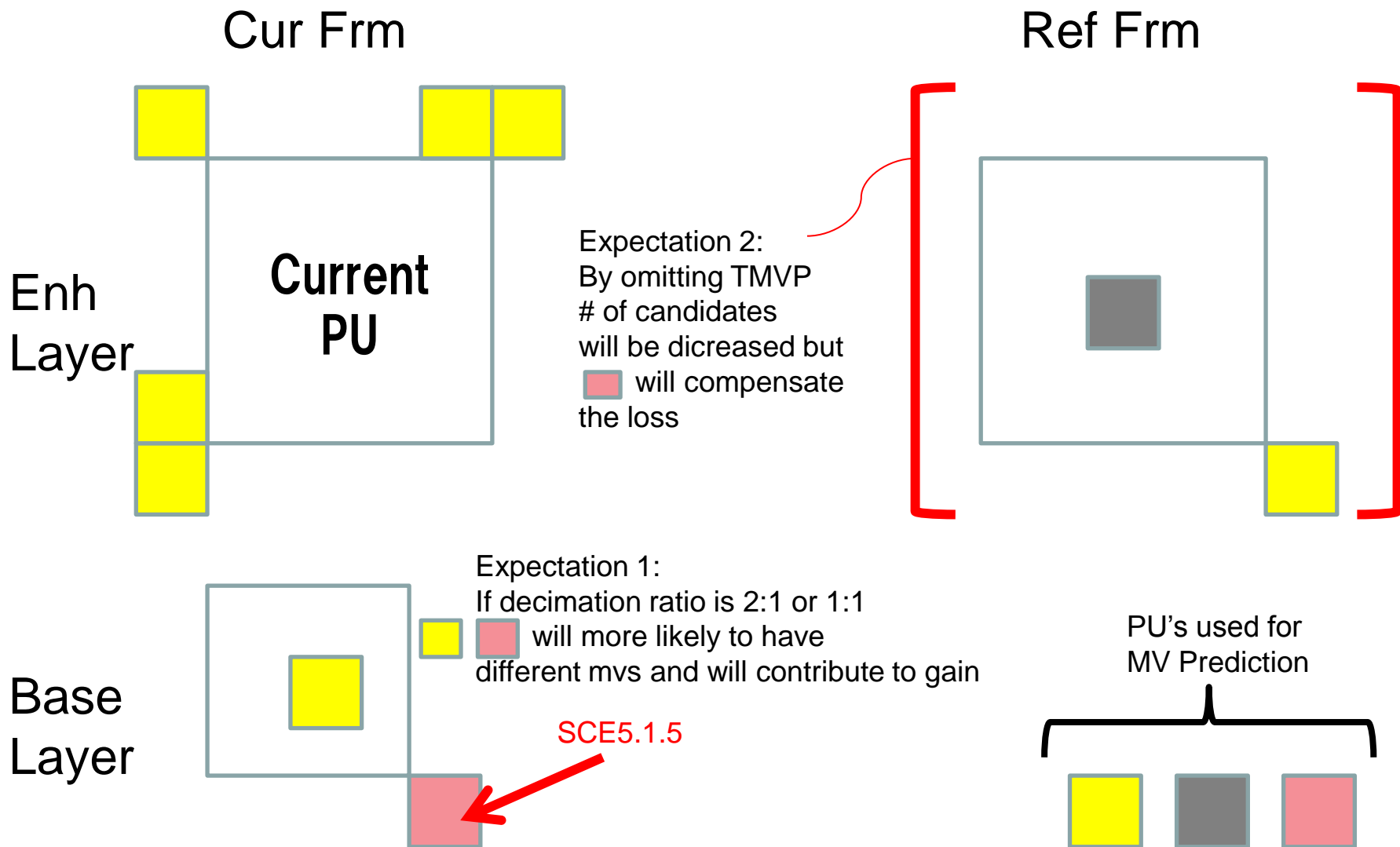
Agenda

- Introduction / Problem Statement
- Simulation Condition
- Simulation Result
- Discussions
- Conclusion

Introduction / Problem Statement

- SCE5.1.5 proposes to add the bottom-right position of the collocated base-layer motion in addition to the center for motion vector prediction with base layer to improve coding efficiency.
- It is proposed by SCE5.2.1 that temporal motion prediction be omitted at the enhancement layer to reduce the required buffer size, as the collocated base layer motion information takes part of TMVP in the enhancement layer.
 - With SCE5.2.1 loss in coding efficiency would be observed, but it is expected that having an additional candidate like SCE5.1.5 can compensate this loss.
- It is proposed by SCE5.2.2 to postpone motion data compression after encoding/decoding of the enhancement layer, or 2-stage motion data compression for improving coding efficiency.
 - If base layer motion data are compressed not by 4:1 but 2:1 or 1:1, it is more probable that the motion data of the bottom-right position differs from the one of the center position at the base layer. Therefore it is expected that more improvement in coding efficiency can be obtained.

Expected Synergy Effects of SCE5.1.5 + MV_compression Proposals



Simulation Condition

- SHM-1.0 is used as the anchor.
- On top of the anchor software the proponent of SCE5.1.5 implemented the proposed method and provided to the author for the purpose of crosschecking.
- Additionally the method proposed by SCE5.2.1 and SCE5.2.2 have been implemented by the author.
- The following combinations have been tested:
 - SCE515 + ELnoTemp (SCE521)
 - SCE515 + SCE522 (No BL MV Compression)
 - SCE515 + SCE522 (Half BL MV Compression)
 - SCE515 + SCE521 (ELnoTemp) + SCE522 (No BL MV Compression)
 - SCE515 + SCE521 (ELnoTemp) + SCE522 (Half BL MV Compression)
- Class A and B sequences have been tested with {RA, LP}_{2x,1.5x,SNR} conditions.
- Thank MediaTek for crosschecking (JCTVC-M0393).

Summary of results

	RA 2x	RA 1.5x	RA SNR	LP 2x	LP 1.5x	LP SNR	Average
SCE5.1.5	-0.6	-0.2	-0.6	-0.4	-0.2	-0.5	-0.4
SCE5.2.1	0.8	0.3	0.4	0.9	0.6	0.5	0.6
SCE5.1.5+ELnoTemp	-0.1	0.0	-0.4	0.3	0.3	-0.2	0.0
SCE515 + SCE522 (No BL MV Compression)	-1.5	-0.7	-1.0	-1.2	-0.5	-1.0	-1.0
SCE515 + SCE522 (Half BL MV Compression)	-1.3	-0.6	-0.9	-1.0	-0.5	-0.9	-0.9
SCE515+ELnoTemp+SCE522 (No BL MV Compression)	-1.1	-0.4	-0.8	-0.7	-0.1	-0.7	-0.6
SCE515+ELnoTemp+SCE522 (Half BL MV Compression)	-0.9	-0.4	-0.7	-0.5	-0.1	-0.7	-0.6

Conclusion

- Loss caused by disabling TMVP (SCE5.2.1) can be compensated with additional mv predictor candidate like SCE5.1.5.
- Additional gain is obtained with SCE5.1.5 if it is combined with 2:1 or 1:1 motion data compression.
 - Gain obtained with 2:1 is close to the one with 1:1 while the latter requires more buffer size.
- It is recommended that SCE5.1.5, SCE5.2.1 and SCE5.2.2 (2:1) be considered for adoption.

[Reference]

Anchor: SHM-1.0

Tested: SCE5.1.5

	RA HEVC 2x			RA HEVC 1.5x			RA HEVC SNR		
	Y	U	V	Y	U	V	Y	U	V
Class A	-0.7%	-1.1%	-1.1%				-0.6%	-1.0%	-1.1%
Class B	-0.6%	-0.8%	-0.9%	-0.2%	-0.3%	-0.3%	-0.6%	-0.8%	-1.0%
Overall (Test vs Ref)	-0.6%	-0.9%	-1.0%	-0.2%	-0.3%	-0.3%	-0.6%	-0.9%	-1.0%
Overall (Test vs single layer)	18.6%	30.8%	31.8%	16.3%	28.1%	30.5%	14.2%	27.7%	31.4%
EL only (Test vs Ref)	-0.8%	-1.1%	-1.1%	-0.1%	-0.2%	-0.3%	-0.8%	-1.1%	-1.3%
Enc Time[%]	99.3%			99.6%			99.9%		
Dec Time[%]	99.6%			99.7%			100.0%		
Enc Mem[%]	#DIV/0!			#DIV/0!			#DIV/0!		
BL Match	Matched			Matched			Matched		
	LD-P HEVC 2x			LD-P HEVC 1.5x			LD-P HEVC SNR		
	Y	U	V	Y	U	V	Y	U	V
Class A	-0.5%	-0.7%	-0.7%				-0.6%	-0.8%	-0.7%
Class B	-0.4%	-0.4%	-0.5%	-0.2%	-0.1%	-0.2%	-0.5%	-0.5%	-0.7%
Overall (Test vs Ref)	-0.4%	-0.5%	-0.5%	-0.2%	-0.1%	-0.2%	-0.5%	-0.6%	-0.7%
Overall (Test vs single layer)	25.6%	35.8%	37.5%	22.3%	33.0%	35.8%	21.7%	33.6%	38.1%
EL only (Test vs Ref)	-0.5%	-0.6%	-0.6%	-0.2%	-0.1%	-0.2%	-0.7%	-0.7%	-0.9%
Enc Time[%]	99.7%			99.7%			100.1%		
Dec Time[%]	99.8%			100.3%			100.0%		
Enc Mem[%]	#DIV/0!			#DIV/0!			#DIV/0!		
BL Match	Matched			Matched			Matched		

Anchor: SHM-1.0

Tested: SCE515 + ELnoTemp (SCE521)

	RA HEVC 2x			RA HEVC 1.5x			RA HEVC SNR		
	Y	U	V	Y	U	V	Y	U	V
Class A	-0.3%	-0.9%	-0.8%				-0.5%	-1.0%	-1.1%
Class B	0.0%	-0.7%	-0.8%				-0.3%	-0.9%	-1.0%
Overall (Test vs Ref)	-0.1%	-0.7%	-0.8%	0.0%	-0.3%	-0.3%	-0.4%	-0.9%	-1.0%
Overall (Test vs single layer)	19.2%	31.1%	32.0%	16.6%	28.2%	30.5%	14.4%	27.7%	31.4%
EL only (Test vs Ref)	-0.3%	-0.9%	-1.0%	0.1%	-0.2%	-0.3%	-0.6%	-1.2%	-1.3%
Enc Time[%]		98.6%			99.0%			99.6%	
Dec Time[%]		98.9%			99.5%			100.3%	
Enc Mem[%]		#DIV/0!			#DIV/0!			#DIV/0!	
BL Match		Matched			Matched			Matched	

	LD-P HEVC 2x			LD-P HEVC 1.5x			LD-P HEVC SNR		
	Y	U	V	Y	U	V	Y	U	V
Class A	0.0%	-0.1%	0.0%				-0.5%	-0.5%	-0.5%
Class B	0.4%	-0.1%	-0.1%				-0.1%	-0.3%	-0.4%
Overall (Test vs Ref)	0.3%	-0.1%	-0.1%	0.3%	0.0%	0.0%	-0.2%	-0.4%	-0.4%
Overall (Test vs single layer)	26.4%	36.3%	38.1%	22.9%	33.2%	36.0%	22.1%	33.9%	38.5%
EL only (Test vs Ref)	0.3%	-0.1%	0.0%	0.5%	0.2%	0.2%	-0.3%	-0.5%	-0.5%
Enc Time[%]		101.6%			100.9%			100.5%	
Dec Time[%]		100.5%			99.3%			103.4%	
Enc Mem[%]		#DIV/0!			#DIV/0!			#DIV/0!	
BL Match		Matched			Matched			Matched	

Anchor: SHM-1.0

Tested: SCE5.1.5 + No_MV_Comp

Class A	-2.3%	-4.1%	-4.0%				-1.2%	-2.6%	-2.8%
Class B	-1.2%	-2.1%	-2.2%	-0.7%	-1.0%	-1.1%	-0.9%	-1.5%	-1.7%
Overall (Test vs Ref)	-1.5%	-2.7%	-2.7%	-0.7%	-1.0%	-1.1%	-1.0%	-1.8%	-2.0%
Overall (Test vs single layer)	17.5%	28.4%	29.4%	15.8%	27.2%	29.4%	13.7%	26.5%	30.1%
EL only (Test vs Ref)	-2.3%	-3.4%	-3.5%	-0.8%	-1.2%	-1.3%	-1.4%	-2.3%	-2.5%
Enc Time[%]	99.4%			100.0%			100.3%		
Dec Time[%]	100.1%			100.6%			101.0%		
Enc Mem[%]	#DIV/0!			#DIV/0!			#DIV/0!		
BL Match	Matched			Matched			Matched		
	LD-P HEVC 2x			LD-P HEVC 1.5x			LD-P HEVC SNR		
	Y	U	V	Y	U	V	Y	U	V
Class A	-1.8%	-3.0%	-2.9%				-1.4%	-2.2%	-2.3%
Class B	-1.0%	-1.4%	-1.5%	-0.5%	-0.7%	-0.7%	-0.8%	-1.1%	-1.4%
Overall (Test vs Ref)	-1.2%	-1.9%	-1.9%	-0.5%	-0.7%	-0.7%	-1.0%	-1.5%	-1.6%
Overall (Test vs single layer)	24.5%	33.9%	35.6%	21.9%	32.2%	34.9%	21.1%	32.4%	36.8%
EL only (Test vs Ref)	-1.8%	-2.4%	-2.5%	-0.7%	-0.9%	-1.0%	-1.4%	-1.9%	-2.1%
Enc Time[%]	99.7%			100.0%			100.5%		
Dec Time[%]	100.6%			99.8%			101.0%		
Enc Mem[%]	#DIV/0!			#DIV/0!			#DIV/0!		
BL Match	Matched			Matched			Matched		

Anchor: SHM-1.0

Tested: SCE5.1.5 + Half_MV_Comp

	RA HEVC 2x			RA HEVC 1.5x			RA HEVC SNR		
	Y	U	V	Y	U	V	Y	U	V
Class A	-1.9%	-3.3%	-3.2%				-1.2%	-2.4%	-2.6%
Class B	-1.1%	-1.8%	-2.0%	-0.6%	-0.9%	-1.0%	-0.8%	-1.4%	-1.6%
Overall (Test vs Ref)	-1.3%	-2.2%	-2.3%	-0.6%	-0.9%	-1.0%	-0.9%	-1.7%	-1.9%
Overall (Test vs single layer)	17.7%	29.0%	30.0%	15.8%	27.3%	29.6%	13.8%	26.6%	30.2%
EL only (Test vs Ref)	-1.9%	-2.9%	-2.9%	-0.7%	-1.0%	-1.2%	-1.4%	-2.2%	-2.4%
Enc Time[%]	99.5%			99.6%			99.9%		
Dec Time[%]	100.2%			100.1%			100.6%		
Enc Mem[%]	#DIV/0!			#DIV/0!			#DIV/0!		
BL Match	Matched			Matched			Matched		
	LD-P HEVC 2x			LD-P HEVC 1.5x			LD-P HEVC SNR		
	Y	U	V	Y	U	V	Y	U	V
Class A	-1.3%	-2.2%	-2.1%				-1.3%	-2.0%	-2.0%
Class B	-0.8%	-1.0%	-1.1%	-0.5%	-0.6%	-0.6%	-0.8%	-1.0%	-1.2%
Overall (Test vs Ref)	-1.0%	-1.4%	-1.4%	-0.5%	-0.6%	-0.6%	-0.9%	-1.3%	-1.4%
Overall (Test vs single layer)	24.8%	34.7%	36.3%	22.0%	32.4%	35.1%	21.2%	32.7%	37.1%
EL only (Test vs Ref)	-1.4%	-1.8%	-1.8%	-0.6%	-0.8%	-0.8%	-1.3%	-1.7%	-1.9%
Enc Time[%]	99.3%			99.6%			99.9%		
Dec Time[%]	100.2%			99.6%			101.1%		
Enc Mem[%]	#DIV/0!			#DIV/0!			#DIV/0!		
BL Match	Matched			Matched			Matched		

Anchor: SHM-1.0

Tested: SCE5.1.5 + No_MV_Comp + NoTempEL

	RA HEVC 2x			RA HEVC 1.5x			RA HEVC SNR		
	Y	U	V	Y	U	V	Y	U	V
Class A	-2.0%	-4.1%	-3.9%				-1.2%	-2.7%	-2.8%
Class B	-0.8%	-2.0%	-2.1%	-0.4%	-1.0%	-1.1%	-0.6%	-1.5%	-1.7%
Overall (Test vs Ref)	-1.1%	-2.6%	-2.6%	-0.4%	-1.0%	-1.1%	-0.8%	-1.9%	-2.0%
Overall (Test vs single layer)	18.0%	28.5%	29.5%	16.0%	27.2%	29.4%	13.9%	26.4%	30.0%
EL only (Test vs Ref)	-1.9%	-3.4%	-3.4%	-0.6%	-1.3%	-1.5%	-1.3%	-2.5%	-2.6%
Enc Time[%]		98.6%			99.1%			99.8%	
Dec Time[%]		100.0%			100.1%			99.9%	
Enc Mem[%]		#DIV/0!			#DIV/0!			#DIV/0!	
BL Match		Matched			Matched			Matched	
	LD-P HEVC 2x			LD-P HEVC 1.5x			LD-P HEVC SNR		
	Y	U	V	Y	U	V	Y	U	V
Class A	-1.6%	-2.7%	-2.5%				-1.3%	-2.1%	-2.1%
Class B	-0.4%	-1.1%	-1.2%	-0.1%	-0.6%	-0.6%	-0.5%	-0.9%	-1.1%
Overall (Test vs Ref)	-0.7%	-1.6%	-1.6%	-0.1%	-0.6%	-0.6%	-0.7%	-1.3%	-1.4%
Overall (Test vs single layer)	25.1%	34.4%	36.0%	22.4%	32.4%	35.1%	21.4%	32.7%	37.1%
EL only (Test vs Ref)	-1.2%	-2.0%	-2.1%	-0.2%	-0.7%	-0.8%	-1.1%	-1.7%	-1.9%
Enc Time[%]		101.1%			101.2%			101.2%	
Dec Time[%]		99.9%			99.5%			100.4%	
Enc Mem[%]		#DIV/0!			#DIV/0!			#DIV/0!	
BL Match		Matched			Matched			Matched	

Anchor: SHM-1.0

Tested: SCE5.1.5 + 1/2_MV_Comp + NoTempEL

	RA HEVC 2x			RA HEVC 1.5x			RA HEVC SNR		
	Y	U	V	Y	U	V	Y	U	V
Class A	-1.6%	-3.2%	-3.1%				-1.1%	-2.5%	-2.6%
Class B	-0.6%	-1.7%	-1.8%	-0.4%	-0.9%	-1.0%	-0.6%	-1.5%	-1.6%
Overall (Test vs Ref)	-0.9%	-2.2%	-2.2%	-0.4%	-0.9%	-1.0%	-0.7%	-1.7%	-1.9%
Overall (Test vs single layer)	18.3%	29.1%	30.1%	16.1%	27.4%	29.6%	14.0%	26.6%	30.2%
EL only (Test vs Ref)	-1.5%	-2.8%	-2.8%	-0.5%	-1.1%	-1.2%	-1.2%	-2.3%	-2.5%
Enc Time[%]	98.1%			98.8%			99.4%		
Dec Time[%]	99.2%			99.9%			100.5%		
Enc Mem[%]	#DIV/0!			#DIV/0!			#DIV/0!		
BL Match	Matched			Matched			Matched		
	LD-P HEVC 2x			LD-P HEVC 1.5x			LD-P HEVC SNR		
	Y	U	V	Y	U	V	Y	U	V
Class A	-1.0%	-1.8%	-1.7%				-1.2%	-1.9%	-1.9%
Class B	-0.2%	-0.9%	-0.9%	-0.1%	-0.4%	-0.6%	-0.4%	-0.8%	-1.0%
Overall (Test vs Ref)	-0.5%	-1.2%	-1.1%	-0.1%	-0.4%	-0.6%	-0.7%	-1.1%	-1.2%
Overall (Test vs single layer)	25.5%	34.9%	36.7%	22.5%	32.5%	35.1%	21.5%	32.9%	37.4%
EL only (Test vs Ref)	-0.8%	-1.5%	-1.5%	-0.1%	-0.5%	-0.7%	-1.0%	-1.5%	-1.6%
Enc Time[%]	100.8%			100.8%			100.8%		
Dec Time[%]	99.7%			99.6%			99.8%		
Enc Mem[%]	#DIV/0!			#DIV/0!			#DIV/0!		
BL Match	Matched			Matched			Matched		

[Reference]

Anchor: SHM-1.0

Tested: SCE5.2.1

	RA HEVC 2x			RA HEVC 1.5x			RA HEVC SNR		
	Y	U	V	Y	U	V	Y	U	V
Class A	0.8%	0.6%	0.7%				0.3%	0.2%	0.2%
Class B	0.8%	0.3%	0.4%	0.3%	0.1%	0.0%	0.4%	0.1%	0.1%
Overall (Test vs Ref)	0.8%	0.4%	0.5%	0.3%	0.1%	0.0%	0.4%	0.1%	0.1%
Overall (Test vs single layer)	20.2%	32.5%	33.7%	16.9%	28.6%	31.0%	15.3%	29.0%	32.9%
EL only (Test vs Ref)	0.8%	0.5%	0.5%	0.3%	0.0%	0.0%	0.3%	0.0%	0.1%
Enc Time[%]	97.5%			99.1%			98.6%		
Dec Time[%]	97.6%			99.1%			98.9%		
Enc Mem[%]	100.0%			100.0%			100.0%		
BL Match	Matched			Matched			Matched		
	LD-P HEVC 2x			LD-P HEVC 1.5x			LD-P HEVC SNR		
	Y	U	V	Y	U	V	Y	U	V
Class A	0.8%	0.9%	1.1%				0.3%	0.3%	0.5%
Class B	1.0%	0.7%	0.6%	0.6%	0.3%	0.3%	0.6%	0.5%	0.4%
Overall (Test vs Ref)	0.9%	0.7%	0.7%	0.6%	0.3%	0.3%	0.5%	0.4%	0.4%
Overall (Test vs single layer)	27.2%	37.5%	39.2%	23.3%	33.5%	36.3%	22.9%	35.0%	39.7%
EL only (Test vs Ref)	1.2%	1.0%	1.0%	0.7%	0.4%	0.4%	0.6%	0.5%	0.5%
Enc Time[%]	104.4%			101.7%			97.5%		
Dec Time[%]	101.2%			98.3%			98.6%		
Enc Mem[%]	100.0%			100.0%			100.0%		
BL Match	Matched			Matched			Matched		



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