

JCTVC-R0074

# **Non-SCCE1: Adaptive switching between differential and direct coding for intra block copy vectors**

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# Summary

- Two methods are proposed to adaptively switch between differential coding and direct coding for intra BC block vectors
  - Method 1
    - Transmit a flag to indicate if the vector is predicted or not
    - Use Exp-Golomb codes with order 3 to encode the vectors
    - For lossy conditions, average gain is up to 3.0%, 1.5%, 1.0% for AI, RA, LB, respectively
  - Method 2
    - Method 1 + Modification of the coding process of sign flags
    - For lossy conditions, average gain is up to 3.5%, 1.7%, 1.2% for AI, RA, LB, respectively
- The proposed methods can enhance the performance of other related techniques evaluated in SCCE1 (Tests 3.5 and 3.6)
- Cross-checked by Qualcomm (JCTVC-R0315)

# Introduction

Intra BC vector prediction accuracy for screen contents (AI, QP22)

Sequence	$ BVD  \leq  BV $	$ BVD  >  BV $
FlyingGraphicstext	76%	24%
Desktop	75%	25%
Console	79%	21%

Inter motion vector prediction accuracy for camera captured contents (RA, QP22)

Sequence	$ MVD  \leq  MV $	$ MVD  >  MV $
EBURainFruits	98%	2%
Kimono1	94%	6%

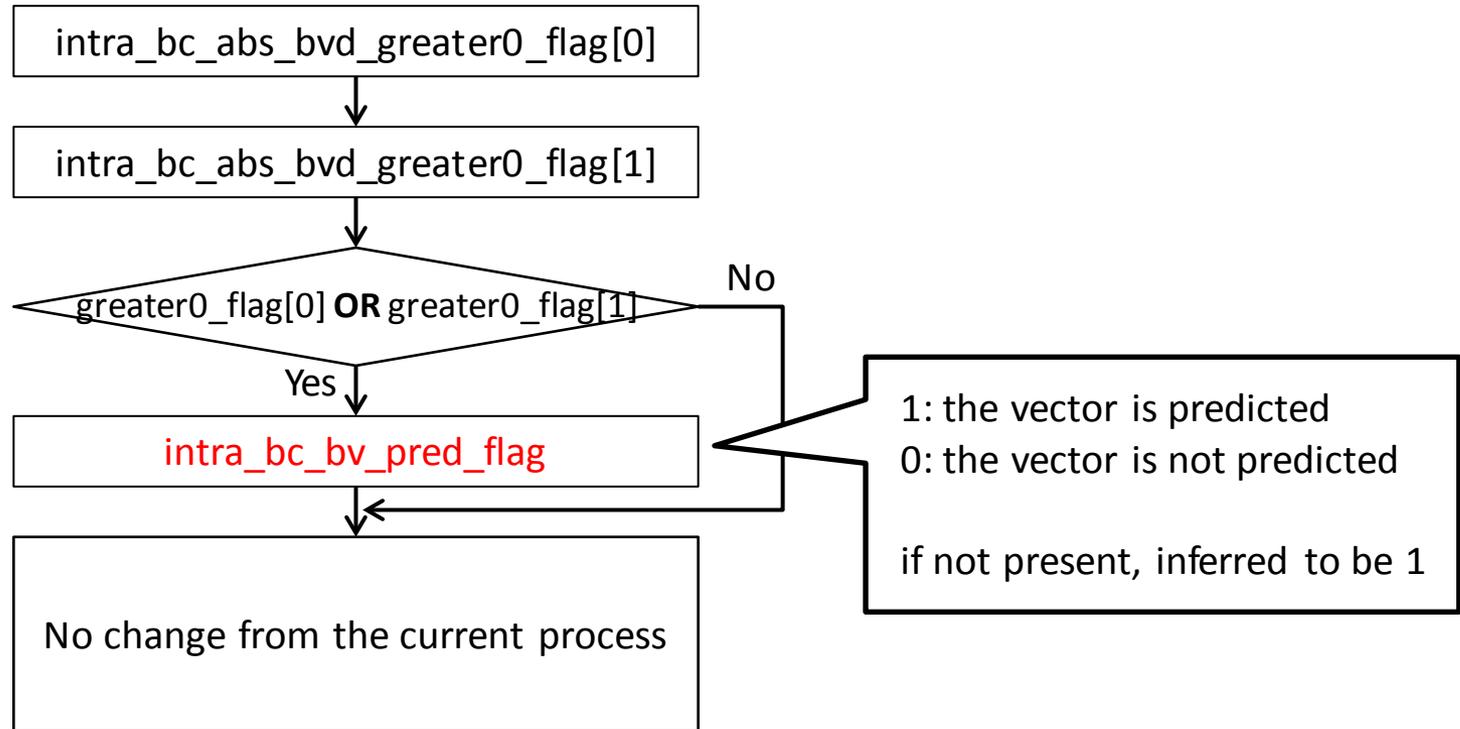
- Prediction of intra BC block vector is inherently difficult
- Direct coding of block vector without prediction often shows better efficiency than differential coding

# Proposed Method

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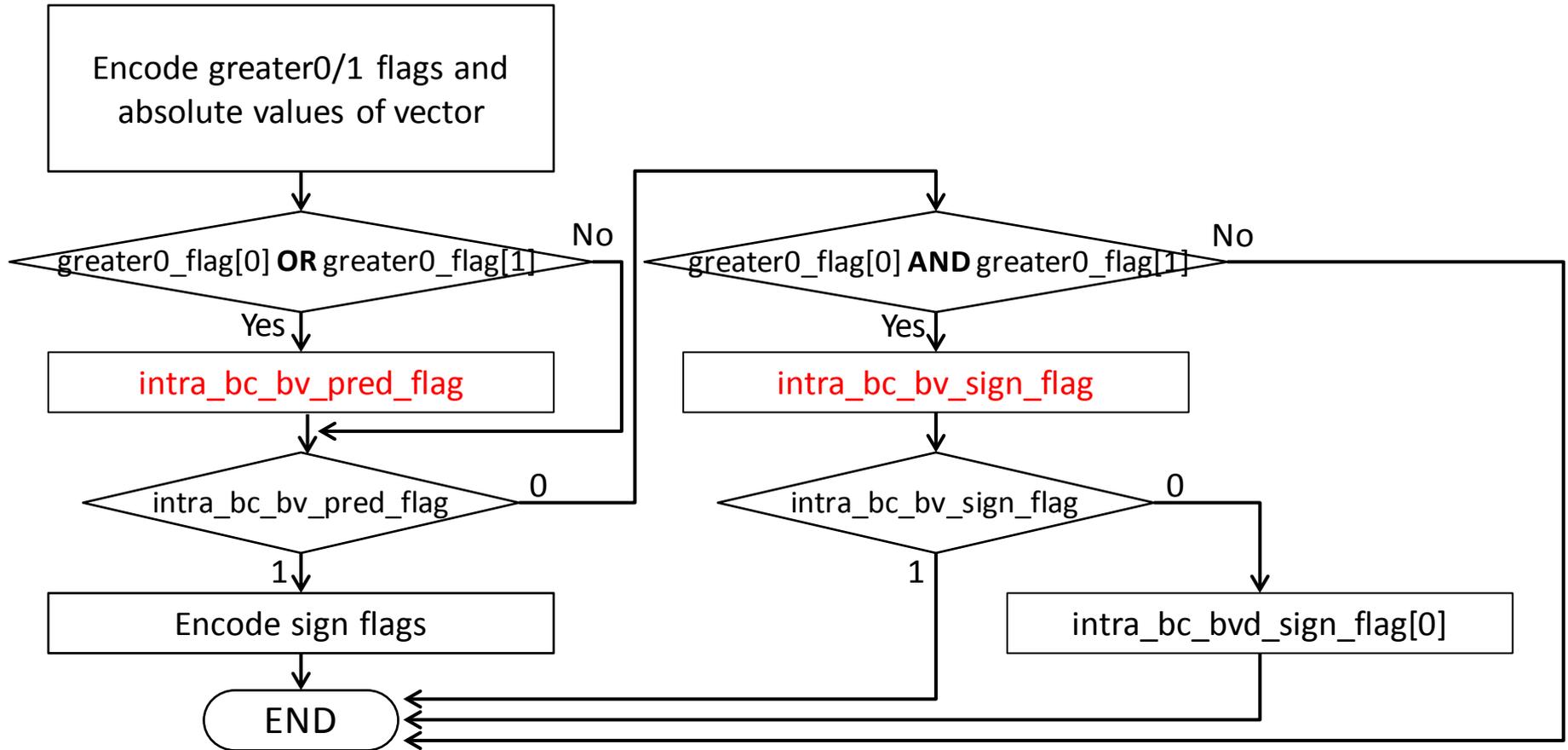
- Adaptively switch between differential coding (w/ prediction) and direct coding (w/o prediction) for intra BC block vectors
- Transmit a flag with a block vector to indicate whether two components of the vector are both predicted or not
  - Not using separate flags for each component to reduce the overhead of transmitting the flags
- Use Exp-Golomb codes with order 3 to encode the absolute values of vectors for both differential and direct coding
- Two methods are proposed
  - Method 1: Keep the current process as unchanged as possible
  - Method 2: Modify the encoding process of sign flags

# Method 1



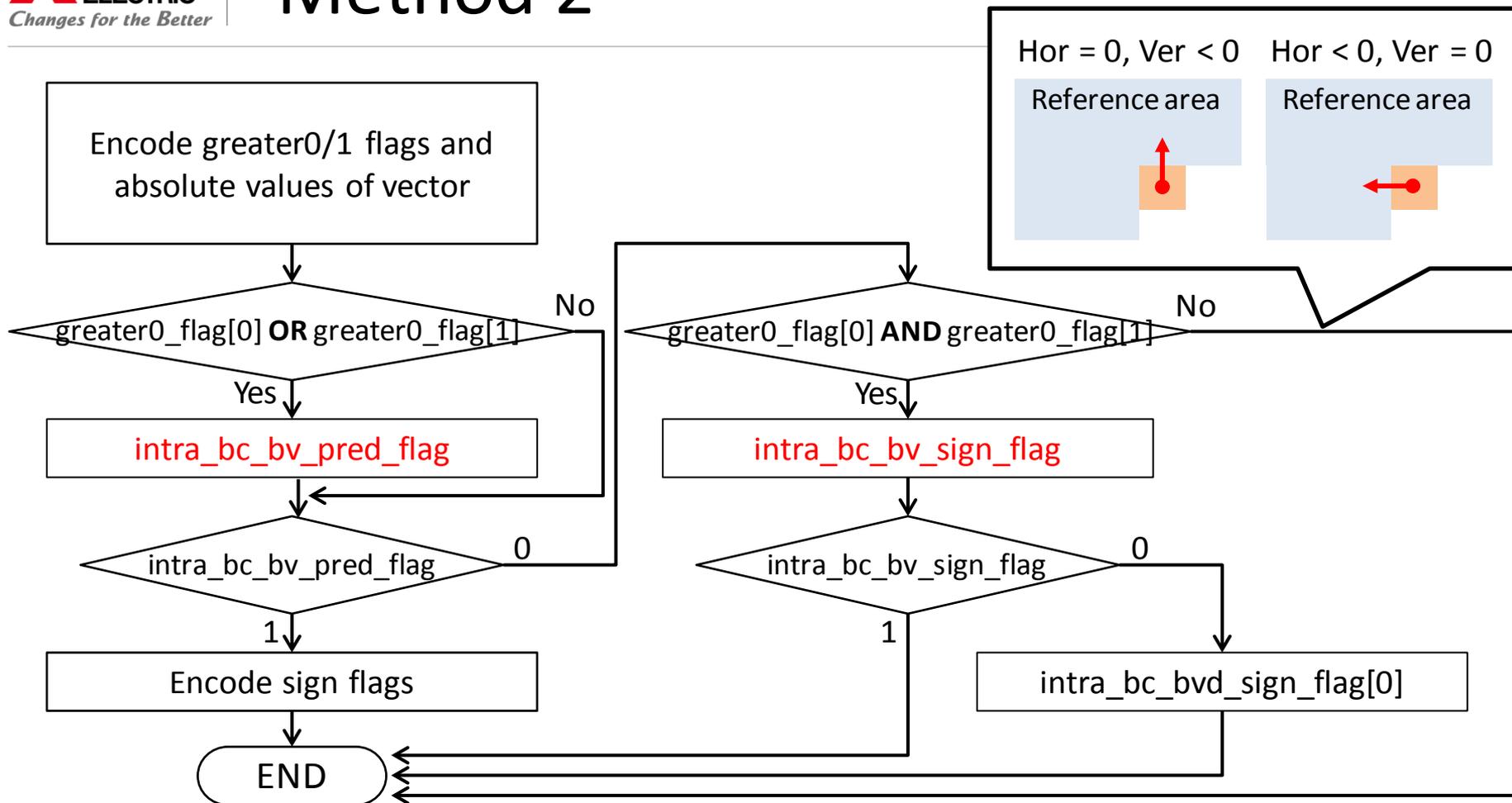
- Add a flag when one or both components of vector are non-zero
- If the two components are both zero, we can know that the differential coding was used since raw block vector cannot be zero

# Method 2



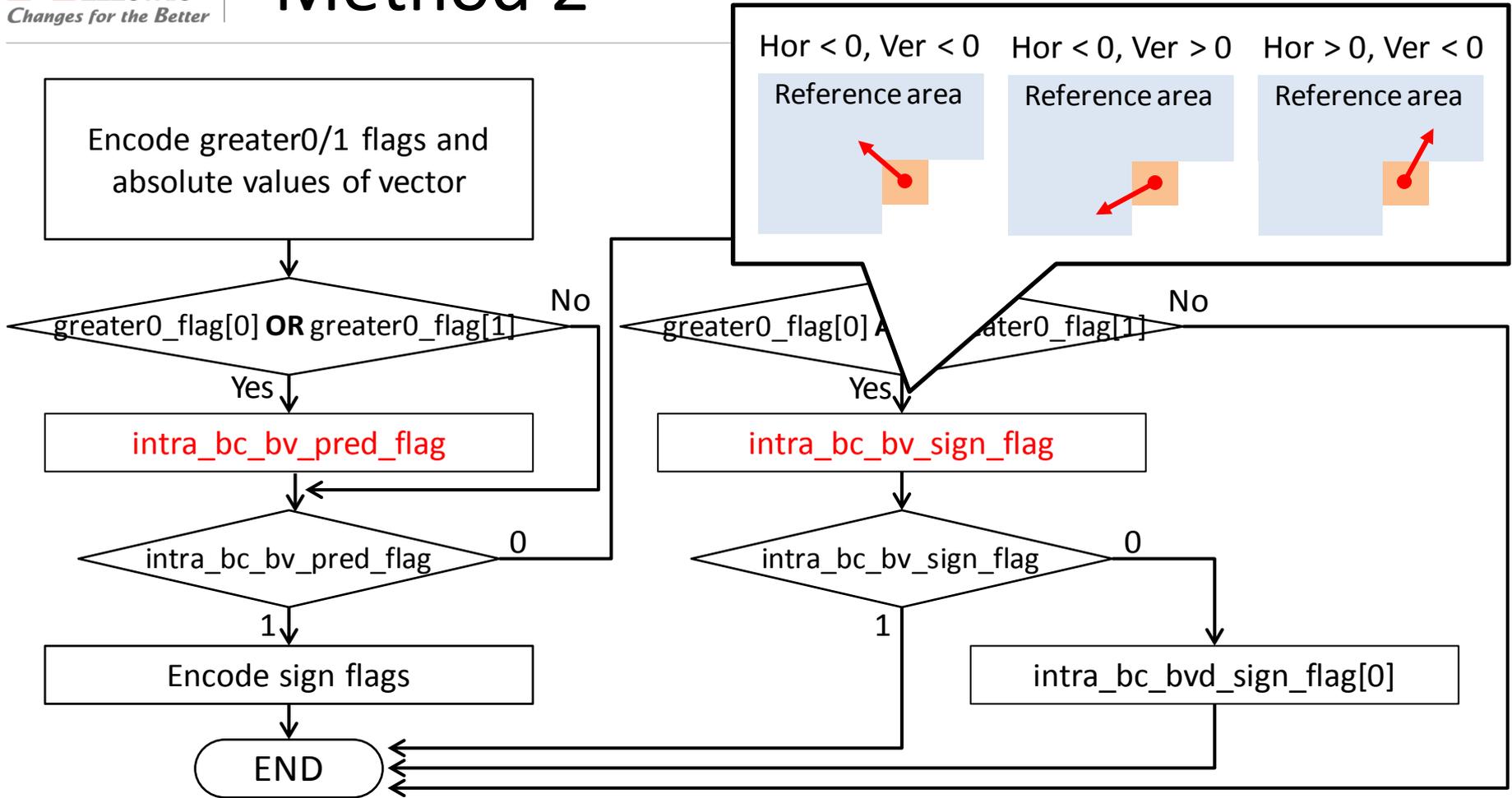
- Modify the encoding process of sign flags to exploit the fact that two components of raw vector cannot be both non-negative

# Method 2

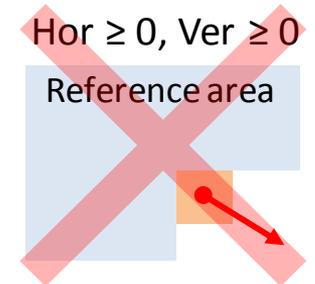


- When one component of raw vector is equal to zero, sign flag is not necessary since the other has always negative value

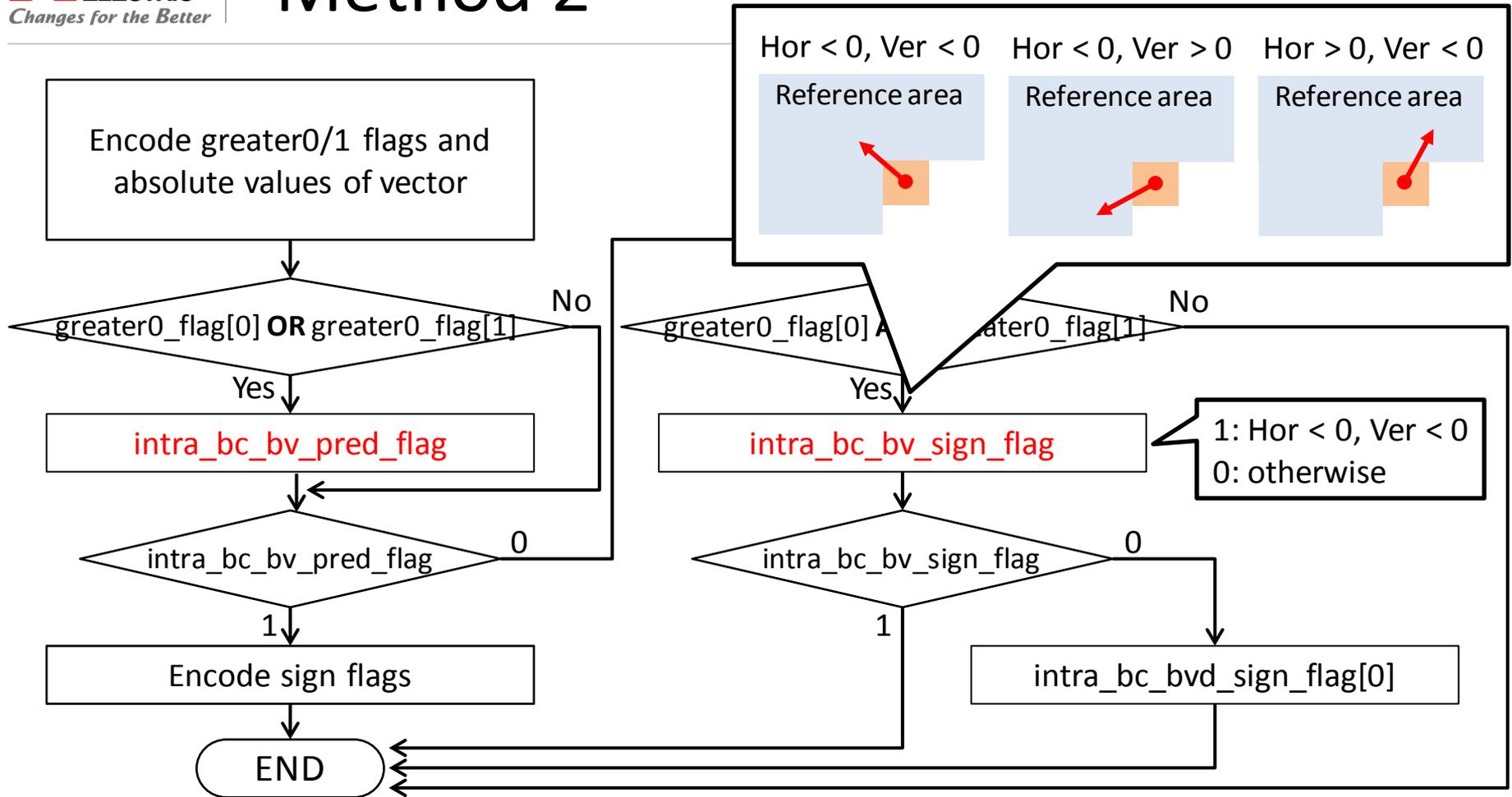
# Method 2



- Otherwise, sign flags have three combinations
  - Two components cannot be both non-negative



# Method 2



- A flag is added to indicate if the components are both negative
- If not, only sign flag of horizontal component is encoded

# SCM-1.0 vs. Method 1 (Lossy)

	All Intra			Random Access			Low delay B		
	G/Y	B/U	R/V	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p	-2.5%	-2.5%	-2.5%	-1.4%	-1.3%	-1.4%	-1.0%	-1.0%	-0.9%
RGB, text & graphics with motion, 720p	-1.2%	-1.2%	-1.2%	-0.8%	-0.8%	-0.9%	-0.3%	-0.4%	-0.3%
RGB, mixed content, 1440p	-0.9%	-0.9%	-0.9%	-0.6%	-0.6%	-0.5%	-0.4%	-0.6%	-0.4%
RGB, mixed content, 1080p	-1.1%	-1.1%	-1.1%	-0.8%	-0.8%	-0.8%	-0.4%	-0.2%	-0.4%
RGB, Animation, 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%	-0.1%
YUV, text & graphics with motion, 1080p	-3.0%	-3.0%	-2.9%	-1.5%	-1.5%	-1.5%	-1.0%	-1.0%	-1.1%
YUV, text & graphics with motion, 720p	-1.5%	-1.5%	-1.6%	-1.0%	-0.9%	-1.1%	-0.6%	-0.5%	-0.4%
YUV, mixed content, 1440p	-1.2%	-1.1%	-1.2%	-0.7%	-0.8%	-0.8%	-0.4%	-0.9%	-0.5%
YUV, mixed content, 1080p	-1.4%	-1.3%	-1.4%	-1.0%	-1.2%	-0.9%	-0.3%	-1.0%	-0.3%
YUV, Animation, 720p	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%	0.0%	-0.4%	-0.2%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%
Enc Time[%]		100%			100%			100%	
Dec Time[%]		99%			100%			100%	

- Average gain is up to
  - 3.0%, 1.5%, 1.0% for AI, RA, LB, respectively
- No additional encoder and decoder complexity

# SCM-1.0 vs. Method 1 (Lossless)

	All Intra				Random Access				Low Delay B			
	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)
RGB, text & graphics with motion, 1080p	2.0%	2.0%	1.3%	2.7%	1.0%	1.3%	0.7%	2.2%	1.0%	1.1%	0.5%	1.6%
RGB, text & graphics with motion, 720p	0.4%	0.5%	0.1%	1.2%	0.1%	0.3%	0.0%	1.0%	0.1%	0.1%	0.0%	0.3%
RGB, mixed content, 1440p	0.2%	0.2%	0.1%	0.2%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%
RGB, mixed content, 1080p	0.2%	0.2%	0.2%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB, Animation, 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p	2.2%	2.2%	1.3%	2.7%	1.1%	1.4%	1.0%	2.2%	1.0%	1.1%	0.7%	1.5%
YUV, text & graphics with motion, 720p	0.4%	0.6%	0.1%	1.4%	0.1%	0.4%	0.1%	1.2%	0.1%	0.2%	0.0%	0.4%
YUV, mixed content, 1440p	0.2%	0.2%	0.1%	0.3%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%
YUV, mixed content, 1080p	0.3%	0.3%	0.3%	0.3%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
YUV, Animation, 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
EncTime[%]	101%				100%				100%			
DecTime[%]	100%				100%				100%			

- Average gain is up to
  - 2.2%, 1.4%, 1.1% for AI, RA, LB, respectively

# SCM-1.0 vs. Method 2 (Lossy)

	All Intra			Random Access			Low delay B		
	G/Y	B/U	R/V	G/Y	B/U	R/V	G/Y	B/U	R/V
RGB, text & graphics with motion, 1080p	-2.9%	-2.9%	-2.9%	-1.5%	-1.6%	-1.6%	-1.1%	-1.1%	-1.1%
RGB, text & graphics with motion, 720p	-1.4%	-1.5%	-1.4%	-1.0%	-1.0%	-1.0%	-0.4%	-0.5%	-0.3%
RGB, mixed content, 1440p	-1.1%	-1.1%	-1.1%	-0.7%	-0.7%	-0.7%	-0.4%	-0.7%	-0.5%
RGB, mixed content, 1080p	-1.4%	-1.3%	-1.4%	-0.9%	-0.9%	-0.9%	-0.4%	-0.3%	-0.4%
RGB, Animation, 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.2%
RGB, camera captured, 1080p	0.0%	-0.1%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p	-3.5%	-3.4%	-3.4%	-1.7%	-1.7%	-1.8%	-1.2%	-1.2%	-1.2%
YUV, text & graphics with motion, 720p	-1.7%	-1.7%	-1.8%	-1.1%	-1.2%	-1.3%	-0.6%	-0.5%	-0.6%
YUV, mixed content, 1440p	-1.4%	-1.4%	-1.4%	-0.8%	-1.1%	-0.9%	-0.5%	-0.6%	-0.7%
YUV, mixed content, 1080p	-1.6%	-1.6%	-1.6%	-1.1%	-1.2%	-1.1%	-0.5%	-0.5%	-0.6%
YUV, Animation, 720p	0.0%	0.0%	0.0%	0.0%	-0.2%	0.1%	0.0%	-0.3%	-0.2%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
Enc Time[%]		100%			100%			100%	
Dec Time[%]		98%			99%			100%	

- Average gain is up to
  - 3.5%, 1.7%, 1.2% for AI, RA, LB, respectively
- No additional encoder and decoder complexity

# SCM-1.0 vs. Method 2 (Lossless)

	All Intra				Random Access				Low Delay B			
	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)
RGB, text & graphics with motion, 1080p	2.3%	2.3%	1.5%	3.0%	1.2%	1.5%	0.9%	2.5%	1.1%	1.2%	0.6%	1.8%
RGB, text & graphics with motion, 720p	0.5%	0.6%	0.1%	1.4%	0.1%	0.4%	0.1%	1.1%	0.1%	0.2%	0.0%	0.4%
RGB, mixed content, 1440p	0.2%	0.2%	0.1%	0.3%	0.1%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%
RGB, mixed content, 1080p	0.3%	0.3%	0.3%	0.3%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
RGB, Animation, 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p	2.5%	2.5%	1.5%	3.1%	1.2%	1.6%	1.1%	2.5%	1.1%	1.2%	0.8%	1.8%
YUV, text & graphics with motion, 720p	0.5%	0.7%	0.1%	1.6%	0.1%	0.5%	0.1%	1.3%	0.1%	0.2%	0.0%	0.4%
YUV, mixed content, 1440p	0.2%	0.2%	0.2%	0.3%	0.1%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%
YUV, mixed content, 1080p	0.3%	0.3%	0.3%	0.3%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
YUV, Animation, 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
EncTime [%]	100%				100%				100%			
DecTime [%]	100%				101%				98%			

- Average gain is up to
  - 2.5%, 1.6%, 1.2% for AI, RA, LB, respectively

# SCM-1.0 vs. Method 1 + SCCE1 Test 3.5

## Lossy

	All Intra			Random Access			Low delay B		
	G/Y	B/U	R/V	G/Y	B/U	R/V	G/Y	B/U	R/V
YUV, text & graphics with motion, 1080p	-4.5%	-4.4%	-4.4%	-2.3%	-2.3%	-2.3%	-1.8%	-1.6%	-1.7%
YUV, text & graphics with motion, 720p	-2.7%	-2.7%	-2.7%	-1.7%	-1.8%	-1.9%	-0.9%	-0.5%	-1.1%
YUV, mixed content, 1440p	-1.7%	-1.7%	-1.7%	-1.0%	-1.2%	-1.1%	-0.6%	-1.0%	-0.5%
YUV, mixed content, 1080p	-2.0%	-1.9%	-1.9%	-1.4%	-1.4%	-1.5%	-0.6%	-1.2%	-0.4%
YUV, Animation, 720p	-0.1%	-0.1%	0.0%	-0.1%	-0.2%	0.1%	-0.1%	-0.7%	-0.2%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	-0.1%	0.1%	0.0%	0.1%	-0.2%
Enc Time[%]	96%			100%			100%		
Dec Time[%]	99%			100%			100%		

- Up to 4.5%, 2.3%, 1.8% for AI, RA, LB (Test 3.5: 3.7%, 1.8%, 1.4%)

## Lossless

	All Intra				Random Access				Low Delay B			
	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)
YUV, text & graphics with motion, 1080p	2.5%	2.5%	1.5%	3.1%	1.2%	1.6%	1.1%	2.5%	1.1%	1.2%	0.8%	1.8%
YUV, text & graphics with motion, 720p	0.5%	0.7%	0.1%	1.6%	0.1%	0.5%	0.1%	1.3%	0.1%	0.2%	0.0%	0.4%
YUV, mixed content, 1440p	0.2%	0.2%	0.2%	0.3%	0.1%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%
YUV, mixed content, 1080p	0.3%	0.3%	0.3%	0.3%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
YUV, Animation, 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Enc Time[%]	100%				100%				100%			
Dec Time[%]	100%				101%				98%			

- Up to 2.5%, 1.6%, 1.2% for AI, RA, LB (Test 3.5: 1.5%, 1.1%, 0.8%)

# SCM-1.0 vs. Method 2 + SCCE1 Test 3.5

## Lossy

	All Intra			Random Access			Low delay B		
	G/Y	B/U	R/V	G/Y	B/U	R/V	G/Y	B/U	R/V
YUV, text & graphics with motion, 1080p	-5.1%	-5.0%	-4.9%	-2.6%	-2.6%	-2.6%	-2.0%	-1.9%	-1.9%
YUV, text & graphics with motion, 720p	-3.0%	-3.0%	-3.0%	-2.0%	-1.9%	-2.0%	-1.0%	-1.0%	-1.0%
YUV, mixed content, 1440p	-2.0%	-2.0%	-2.0%	-1.2%	-1.3%	-1.3%	-0.8%	-0.9%	-0.7%
YUV, mixed content, 1080p	-2.3%	-2.3%	-2.2%	-1.6%	-1.5%	-1.5%	-0.7%	-1.0%	-0.3%
YUV, Animation, 720p	-0.1%	-0.2%	-0.1%	0.1%	0.0%	0.1%	0.0%	-0.5%	0.0%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	-0.1%	0.1%	0.0%	0.0%	-0.1%
Enc Time[%]	96%			100%			100%		
Dec Time[%]	99%			100%			101%		

- Up to 5.1%, 2.6%, 2.0% for AI, RA, LB (Test 3.5: 3.7%, 1.8%, 1.4%)

## Lossless

	All Intra				Random Access				Low Delay B			
	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)
YUV, text & graphics with motion, 1080p	2.9%	2.9%	1.7%	3.8%	1.4%	1.9%	1.3%	3.0%	1.3%	1.5%	0.9%	2.2%
YUV, text & graphics with motion, 720p	0.6%	0.9%	0.2%	2.2%	0.2%	0.6%	0.1%	1.7%	0.1%	0.2%	0.0%	0.6%
YUV, mixed content, 1440p	0.3%	0.3%	0.2%	0.4%	0.1%	0.1%	0.0%	0.1%	0.1%	0.1%	0.0%	0.1%
YUV, mixed content, 1080p	0.4%	0.4%	0.4%	0.4%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
YUV, Animation, 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Enc Time[%]	95%				100%				100%			
Dec Time[%]	101%				100%				99%			

- Up to 2.9%, 1.9%, 1.5% for AI, RA, LB (Test 3.5: 1.5%, 1.1%, 0.8%)

# SCM-1.0 vs. Method 1 + SCCE1 Test 3.6

## Lossy

	All Intra			Random Access			Low delay B		
	G/Y	B/U	R/V	G/Y	B/U	R/V	G/Y	B/U	R/V
YUV, text & graphics with motion, 1080p	-3.9%	-3.8%	-3.8%	-2.0%	-2.1%	-2.1%	-1.5%	-1.6%	-1.6%
YUV, text & graphics with motion, 720p	-2.1%	-2.1%	-2.2%	-1.4%	-1.4%	-1.6%	-0.8%	-0.6%	-0.8%
YUV, mixed content, 1440p	-1.5%	-1.6%	-1.7%	-0.9%	-1.2%	-1.1%	-0.7%	-0.9%	-0.8%
YUV, mixed content, 1080p	-1.8%	-1.8%	-1.8%	-1.3%	-1.3%	-1.4%	-0.6%	-0.4%	-0.4%
YUV, Animation, 720p	0.0%	0.0%	0.0%	0.0%	-0.1%	0.1%	-0.1%	-0.4%	-0.2%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%
Enc Time[%]	99%			100%			100%		
Dec Time[%]	99%			99%			100%		

- Up to 3.9%, 2.0%, 1.5% for AI, RA, LB (Test 3.6: 2.9%, 1.5%, 1.2%)

## Lossless

	All Intra				Random Access				Low Delay B			
	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)
YUV, text & graphics with motion, 1080p	2.3%	2.3%	1.4%	3.0%	1.2%	1.5%	1.1%	2.4%	1.1%	1.2%	0.8%	1.7%
YUV, text & graphics with motion, 720p	0.5%	0.7%	0.1%	1.6%	0.1%	0.4%	0.1%	1.3%	0.1%	0.2%	0.0%	0.4%
YUV, mixed content, 1440p	0.2%	0.2%	0.2%	0.3%	0.1%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%
YUV, mixed content, 1080p	0.3%	0.3%	0.3%	0.3%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
YUV, Animation, 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Enc Time[%]	100%				99%				99%			
Dec Time[%]	101%				98%				100%			

- Up to 2.3%, 1.5%, 1.2% for AI, RA, LB (Test 3.6: 1.1%, 0.9%, 0.7%)

# SCM-1.0 vs. Method 2 + SCCE1 Test 3.6

## Lossy

	All Intra			Random Access			Low delay B		
	G/Y	B/U	R/V	G/Y	B/U	R/V	G/Y	B/U	R/V
YUV, text & graphics with motion, 1080p	-4.4%	-4.4%	-4.3%	-2.3%	-2.2%	-2.3%	-1.7%	-1.9%	-1.8%
YUV, text & graphics with motion, 720p	-2.4%	-2.5%	-2.5%	-1.5%	-1.6%	-1.7%	-0.9%	-0.6%	-0.8%
YUV, mixed content, 1440p	-1.8%	-1.9%	-1.9%	-1.1%	-1.5%	-1.2%	-0.7%	-1.0%	-0.9%
YUV, mixed content, 1080p	-2.1%	-2.1%	-2.0%	-1.6%	-1.4%	-1.5%	-0.7%	-1.5%	-0.3%
YUV, Animation, 720p	0.0%	-0.1%	0.0%	-0.1%	-0.3%	0.0%	0.0%	-0.6%	-0.2%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%
Enc Time[%]	99%			100%			100%		
Dec Time[%]	99%			100%			99%		

- Up to 4.4%, 2.3%, 1.7% for AI, RA, LB (Test 3.6: 2.9%, 1.5%, 1.2%)

## Lossless

	All Intra				Random Access				Low Delay B			
	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)	Bit-rate saving (Total)	Bit-rate saving (Average)	Bit-rate saving (Min)	Bit-rate saving (Max)
YUV, text & graphics with motion, 1080p	2.6%	2.7%	1.6%	3.4%	1.3%	1.7%	1.2%	2.7%	1.2%	1.4%	0.9%	2.0%
YUV, text & graphics with motion, 720p	0.6%	0.8%	0.1%	1.8%	0.1%	0.5%	0.1%	1.4%	0.1%	0.2%	0.1%	0.5%
YUV, mixed content, 1440p	0.3%	0.3%	0.2%	0.4%	0.1%	0.1%	0.0%	0.1%	0.1%	0.1%	0.0%	0.1%
YUV, mixed content, 1080p	0.4%	0.4%	0.4%	0.4%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
YUV, Animation, 720p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YUV, camera captured, 1080p	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Enc Time[%]	99%				100%				100%			
Dec Time[%]	99%				98%				98%			

- Up to 2.7%, 1.7%, 1.4% for AI, RA, LB (Test 3.6: 1.1%, 0.9%, 0.7%)

# Complexity

	SCM	Method 1	Method 2
# context coded bins per BV	4	4	4
# additional contexts	0	0	0
Binarization as in HEVC	Yes	No (just add a flag)	No (add two flags/ modify sign flag coding)

- The proposed methods add one or two flags to be encoded with equal probability
  - No changes on the number of context coded bins and the number of contexts compared with SCM
  - Only change binarization process of BV

# Conclusion

- Two methods are proposed to adaptively switch between differential coding and direct coding for intra BC block vectors
  - Method 1
    - Transmit a flag to indicate if the vector is predicted or not
    - Use Exp-Golomb codes with order 3 to encode the vectors
    - For lossy conditions, average gain is up to 3.0%, 1.5%, 1.0% for AI, RA, LB
  - Method 2
    - Method 1 + Modification of the coding process of sign flags
    - For lossy conditions, average gain is up to 3.5%, 1.7%, 1.2% for AI, RA, LB
- The proposed methods can enhance the performance of other related techniques evaluated in SCCE1
- Recommend to adopt one of the proposed methods to SCC draft text or to evaluate them in SCCE

Thank Qualcomm for cross-checking (JCTVC-R0315)