

# JCTVC-L0053

## NON-TE2: MODIFIED MOTION VECTOR SIGNALING FOR REF\_IDX FRAMEWORK

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# Introduction

- TE2 3.2.1 (JCTVC-L0051) shows the benefits of forcing zero MV for ILR pictures
  - Improves performance, and
  - Reduces complexity for both encoder and decoder
- Setting 2 + zeroMV gives the best performance for ref\_idx based signaling
- Modified motion vector signaling in the EL
  - Given zero MV constraint, **remove MVD and MVP signaling** when using ILR
  - Two implementation choices:
    - Option 1: Skip MV signaling during RD decision and entropy coding
    - Option 2: Skip MV signaling only during entropy coding

# Proposed Syntax Changes

prediction_unit( x0, y0, nPbW, nPbH ) {	<b>Descriptor</b>
if( skip_flag[ x0 ][ y0 ] ) {	
if( MaxNumMergeCand > 1 )	
<b>merge_idx</b> [ x0 ][ y0 ]	ae(v)
} else { /* MODE_INTER */	
<b>merge_flag</b> [ x0 ][ y0 ]	ae(v)
if( merge_flag[ x0 ][ y0 ] ) {	
if( MaxNumMergeCand > 1 )	
<b>merge_idx</b> [ x0 ][ y0 ]	ae(v)
} else {	
if( slice_type == B )	
<b>inter_pred_idc</b> [ x0 ][ y0 ]	ae(v)
if( inter_pred_idc[ x0 ][ y0 ] != Pred_L1 ) {	
if( num_ref_idx_l0_active_minus1 > 0 )	
<b>ref_idx_l0</b> [ x0 ][ y0 ]	ae(v)
if( layer_id && IsILRPic( L0, ref_idx_l0[ x0 ][ y0 ] ) ) {	
MvdL0[ x0 ][ y0 ][ 0 ] = 0	
MvdL0[ x0 ][ y0 ][ 1 ] = 0	
} else	
mvd_coding( x0, y0, 0 )	
if( layer_id && IsILRPic( L0, ref_idx_l0[ x0 ][ y0 ] ) ) {	
MvpL0[ x0 ][ y0 ][ 0 ] = 0	
MvpL0[ x0 ][ y0 ][ 1 ] = 0	
} else	
<b>mvp_l0_flag</b> [ x0 ][ y0 ]	ae(v)
}	

# Proposed Syntax Changes (cont.)

if( inter_pred_idc[ x0 ][ y0 ] != Pred_L0 ) {	
if( num_ref_idx_l1_active_minus1 > 0 )	
<b>ref_idx_l1</b> [ x0 ][ y0 ]	ae(v)
if( mvd_l1_zero_flag && inter_pred_idc[ x0 ][ y0 ] == Pred_BI ) {	
MvdL1[ x0 ][ y0 ][ 0 ] = 0	
MvdL1[ x0 ][ y0 ][ 1 ] = 0	
} else{	
if( layer_id && IsILRPic( L1, ref_idx_l1[ x0 ][ y0 ] )){	
MvdL1[ x0 ][ y0 ][ 0 ] = 0	
MvdL1[ x0 ][ y0 ][ 1 ] = 0	
}else	
mvd_coding( x0, y0, 1 )	
}	
if( layer_id && IsILRPic( L1, ref_idx_l1[ x0 ][ y0 ] )){	
MvpL1[ x0 ][ y0 ][ 0 ] = 0	
MvpL1[ x0 ][ y0 ][ 1 ] = 0	
}else	
<b>mvp_l1_flag</b> [ x0 ][ y0 ]	ae(v)
}	
}	
}	
}	

# Simulation Results (option 1 vs JCTVC-L0051 setting 2 + zero MV)

	AI HEVC 2x			AI HEVC 1.5x		
	Y	U	V	Y	U	V
Class A	0.0%	0.0%	0.0%			
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<b>Overall (EL+BL)</b>	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<b>Overall (EL)</b>	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Enc Time[%]	99.1%			95.4%		
Dec Time[%]	100.9%			96.3%		
BL Match	Matched			Matched		

	RA HEVC 2x			RA HEVC 1.5x			RA HEVC SNR		
	Y	U	V	Y	U	V	Y	U	V
Class A	-0.3%	-0.3%	-0.3%				-0.3%	-0.3%	-0.2%
Class B	-0.2%	-0.1%	-0.1%	-0.2%	-0.1%	-0.1%	-0.2%	0.0%	0.0%
<b>Overall (EL+BL)</b>	-0.2%	-0.1%	-0.1%	-0.2%	-0.1%	-0.1%	-0.2%	-0.1%	0.0%
<b>Overall (EL)</b>	-0.4%	-0.3%	-0.3%	-0.5%	-0.2%	-0.2%	-0.4%	-0.2%	-0.1%
Enc Time[%]	89.5%			96.4%			87.2%		
Dec Time[%]	93.0%			96.4%			88.0%		
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	-0.4%	-0.2%	-0.2%				-0.4%	-0.2%	0.0%
Class B	-0.3%	0.1%	-0.1%	-0.3%	0.0%	0.0%	-0.3%	0.0%	0.3%
<b>Overall (EL+BL)</b>	-0.3%	0.0%	-0.1%	-0.3%	0.0%	0.0%	-0.3%	0.0%	0.2%
<b>Overall (EL)</b>	-0.6%	-0.1%	-0.2%	-0.6%	-0.1%	-0.1%	-0.5%	-0.1%	0.2%
Enc Time[%]	103.3%			103.4%			108.6%		
Dec Time[%]	100.4%			101.3%			108.7%		
BL Match	Matched			Matched			Matched		

# Simulation Results (option 2 vs JCTVC-L0051 setting 2 + zero MV)

We thank Canon for cross checking

	AI HEVC 2x			AI HEVC 1.5x		
	Y	U	V	Y	U	V
Class A	0.0%	0.0%	0.0%			
Class B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<b>Overall (EL+BL)</b>	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<b>Overall (EL)</b>	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Enc Time[%]	101.1%			93.0%		
Dec Time[%]	101.2%			93.2%		
BL Match	Matched			Matched		

	RA HEVC 2x			RA HEVC 1.5x			RA HEVC SNR		
	Y	U	V	Y	U	V	Y	U	V
Class A	-0.3%	-0.3%	-0.3%				-0.2%	-0.3%	-0.3%
Class B	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.3%	-0.2%
<b>Overall (EL+BL)</b>	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%	-0.3%	-0.3%
<b>Overall (EL)</b>	-0.3%	-0.4%	-0.4%	-0.4%	-0.4%	-0.4%	-0.4%	-0.5%	-0.5%
Enc Time[%]	91.4%			92.1%			89.3%		
Dec Time[%]	94.3%			93.8%			90.4%		
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	-0.4%	-0.4%	-0.4%				-0.3%	-0.4%	-0.3%
Class B	-0.2%	-0.2%	-0.3%	-0.2%	-0.3%	-0.3%	-0.2%	-0.4%	-0.3%
<b>Overall (EL+BL)</b>	-0.2%	-0.3%	-0.3%	-0.2%	-0.3%	-0.3%	-0.3%	-0.4%	-0.3%
<b>Overall (EL)</b>	-0.4%	-0.5%	-0.5%	-0.4%	-0.5%	-0.6%	-0.4%	-0.7%	-0.5%
Enc Time[%]	107.7%			99.2%			109.6%		
Dec Time[%]	104.8%			98.2%			109.2%		
BL Match	Matched			Matched			Matched		

# Conclusion

- Remove MVD and MVP signaling in the EL
  - Straightforward extension when ILR MV is forced to be zero in ref\_idx framework (TE2 3.2.1)
- BD rate improvement:
  - RA average: (0.2%, 0.2%, 0.2%)
  - LDP average: (0.2%, 0.3%, 0.3%)
- Recommendations:
  - Adopt into ref\_idx framework in SMuC
  - Set up AHG to investigate block level tools on ref\_idx framework