

# Non-CE2: Intra block copy with Inter signaling

JCTVC-S0113

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# Proposed solution based on CE2 Test1

- Put the current picture into the reference picture list
  - Mark it as LTRP before decoding
  - Mark it as STRP after decoding
- Identify the IBC mode by reference index
- Keep current SCM2.0 methods:
  - BVD coding methods
  - integer BV
  - 4x4 block
- Benefits:
  - Not extra flag (intra\_bc\_flag)
  - Reused inter signaling without additional checks in the syntax table
  - No additional check during deblocking

# Necessary constraints

- Collocated picture cannot be the current picture.
- If constrained intra is enabled:
  - IBC can use intra or IBC coded blocks for prediction
  - TMVP cannot be used for IBC

# Spec text simplification

	Descriptor
coding_unit( x0, y0, log2CbSize ) {	
if( transquant_bypass_enabled_flag )	
<b>cu_transquant_bypass_flag</b>	ae(v)
if( slice_type != I )	
<b>cu_skip_flag</b> [ x0 ][ y0 ]	ae(v)
nCbS = ( 1 << log2CbSize )	
if( cu_skip_flag[ x0 ][ y0 ] )	
prediction_unit( x0, y0, nCbS, nCbS )	
else {	
<del>if( intra_block_copy_enabled_flag )</del>	-
<del>intra_be_flag</del> [ x0 ][ y0 ]	ae(v)
if( slice_type != I && <del>!intra_be_flag</del> [ x0 ][ y0 ] )	
<b>pred_mode_flag</b>	ae(v)
if( palette_mode_enabled_flag && ChromaArrayType == 3 && CuPredMode[ x0 ][ y0 ] == MODE_INTRA <del>&amp;&amp; !intra_be_flag</del> [ x0 ][ y0 ] )	
<b>palette_mode_flag</b> [ x0 ][ y0 ]	ae(v)
if( palette_mode_flag[ x0 ][ y0 ] )	
palette_coding( x0, y0, nCbS )	
else {	
if( CuPredMode[ x0 ][ y0 ] != MODE_INTRA <del>++ intra_be_flag</del> [ x0 ][ y0 ]    log2CbSize == MinCbLog2SizeY )	
<b>part_mode</b>	ae(v)
if( CuPredMode[ x0 ][ y0 ] == MODE_INTRA <del>&amp;&amp; !intra_be_flag</del> [ x0 ][ y0 ] ) {	
if( PartMode == PART_2Nx2N && pcm_enabled_flag && log2CbSize >= Log2MinIpcmCbSizeY && log2CbSize <= Log2MaxIpcmCbSizeY )	
<b>pcm_flag</b> [ x0 ][ y0 ]	ae(v)
if( pcm_flag[ x0 ][ y0 ] ) {	
if( !pcm_flag[ x0 ][ y0 ] ) {	
if( ( CuPredMode[ x0 ][ y0 ] != MODE_INTRA && !( PartMode == PART_2Nx2N && merge_flag[ x0 ][ y0 ] ) )    ( CuPredMode[ x0 ][ y0 ] == MODE_INTRA <del>&amp;&amp; !intra_be_flag</del> [ x0 ][ y0 ] ) )	
<b>rqt_root_cbf</b>	ae(v)

# Spec text simplification

## 0.1.1.1.1 ~~Specification of intra-block copying prediction mode~~

Inputs to this process are:

- ~~— a sample location (  $xTb0$ ,  $yTb0$  ) specifying the top-left sample of the current transform block relative to the top-left sample of the current picture,~~
- ~~— a variable  $nTbS$  specifying the transform block size,~~
- ~~— a variable  $trafoDepth$  specifying the hierarchy depth of the current block relative to the coding unit,~~
- ~~— a variable  $bvIntra$  specifying the block-copying vector,~~
- ~~— a variable  $cIdx$  specifying the colour component of the current block.~~

Output of this process is the predicted samples  $predSamples[x][y]$ , with  $x, y = 0..nTbS - 1$ .

The luma sample location (  $xTbY$ ,  $yTbY$  ) specifying the top-left sample of the current luma transform block relative to the top-left luma sample of the current picture is derived as follows:

$$(xTbY, yTbY) = (cIdx == 0) ? (xTb0, yTb0) : (xTb0 * SubWidthC, yTb0 * SubHeightC) \quad (8-62)$$

Depending upon the values of  $trafoDepth$ ,  $PartMode$  and  $nTbS$ , the following applies:

- ~~— If  $trafoDepth$  is equal to 0,  $PartMode$  is not equal to  $PART\_2Nx2N$ , and  $nTbS$  is greater than 4, the following applies, for the variable  $tempIdx$  proceeding over the values 0..3:~~
  - ~~— The variable  $nTbS1$  is set equal to  $nTbS / 2$ .~~
  - ~~— The variable  $xTb1$  is set equal to  $xTb0 + nTbS1 * (blkIdx \% 2)$ .~~
  - ~~— The variable  $yTb1$  is set equal to  $yTb0 + nTbS1 * (blkIdx / 2)$ .~~
  - ~~— The general intra-block copying process as specified in this subclause is invoked with the location (  $xTb1$ ,  $yTb1$  ), the variable  $nTbS$  set equal to  $nTbS1$ , the variable  $bvIntra$ , the variable  $trafoDepth$  is set equal to 1, and the variable  $cIdx$  as inputs, and the output is an (  $nTbS1$  ) x (  $nTbS1$  ) array  $predSamples$ . [Ed.: This should be  $tempSamples$ , and then copied into  $predSamples$ ]~~

# Results

## Proposed results

	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	-4.5%	-6.0%	-5.8%	-5.3%	-7.3%	-7.0%	-5.1%	-6.6%	-6.5%
RGB, text & graphics with motion,720p	-2.4%	-3.4%	-3.3%	-2.0%	-3.4%	-3.4%	-1.2%	-2.5%	-2.6%
RGB, mixed content, 1440p	-2.3%	-2.7%	-2.9%	-1.8%	-2.9%	-3.1%	-1.2%	-2.4%	-2.4%
RGB, mixed content, 1080p	-2.1%	-2.7%	-2.7%	-1.8%	-3.3%	-3.3%	-1.2%	-3.0%	-3.1%
RGB, Animation, 720p	0.0%	0.0%	0.0%	-0.1%	-0.2%	-0.2%	0.0%	-0.1%	0.0%
RGB, camera captured, 1080p	0.1%	0.0%	0.0%	-0.2%	-0.1%	-0.2%	0.0%	0.0%	0.0%
YUV, text & graphics with motion, 1080p	-2.4%	-3.9%	-3.9%	-4.8%	-6.7%	-6.6%	-4.9%	-6.5%	-6.4%
YUV, text & graphics with motion,720p	-1.6%	-2.5%	-2.7%	-1.5%	-2.9%	-3.1%	-1.1%	-2.3%	-2.5%
YUV, mixed content, 1440p	-1.6%	-2.3%	-2.4%	-1.5%	-3.1%	-3.0%	-1.5%	-2.8%	-2.7%
YUV, mixed content, 1080p	-1.6%	-3.0%	-3.0%	-1.5%	-4.0%	-4.0%	-1.3%	-5.1%	-5.6%
YUV, Animation, 720p	-0.1%	-0.1%	-0.2%	0.0%	-0.2%	-0.2%	0.0%	-0.2%	0.1%
YUV, camera captured, 1080p	0.1%	0.1%	0.1%	-0.1%	0.0%	0.0%	0.1%	0.1%	0.3%
Enc Time[%]	121%			104%			104%		
Dec Time[%]	96%			89%			93%		

## Proposed results + CE1 Test 2.1 MVD binarization

	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	-4.7%	-6.2%	-6.1%	-7.4%	-9.3%	-9.1%	-7.7%	-9.2%	-9.0%
RGB, text & graphics with motion,720p	-2.6%	-3.6%	-3.4%	-2.5%	-3.9%	-3.9%	-2.5%	-3.5%	-3.5%
RGB, mixed content, 1440p	-2.3%	-2.7%	-2.9%	-1.9%	-3.0%	-3.2%	-1.4%	-2.6%	-2.7%
RGB, mixed content, 1080p	-2.1%	-2.7%	-2.8%	-1.9%	-3.1%	-3.3%	-1.8%	-3.3%	-3.3%
RGB, Animation, 720p	0.0%	-0.1%	0.0%	-0.1%	-0.3%	-0.3%	0.1%	-0.1%	-0.1%
RGB, camera captured, 1080p	0.0%	0.0%	0.0%	-0.1%	-0.1%	-0.2%	0.0%	0.0%	0.1%
YUV, text & graphics with motion, 1080p	-2.7%	-4.2%	-4.2%	-7.3%	-8.9%	-9.0%	-7.9%	-9.4%	-9.2%
YUV, text & graphics with motion,720p	-1.7%	-2.7%	-2.9%	-2.0%	-3.5%	-3.7%	-2.4%	-3.2%	-3.7%
YUV, mixed content, 1440p	-1.6%	-2.3%	-2.6%	-1.5%	-3.2%	-3.1%	-1.5%	-2.6%	-2.7%
YUV, mixed content, 1080p	-1.6%	-3.1%	-3.1%	-1.5%	-4.2%	-4.0%	-1.6%	-5.4%	-6.1%
YUV, Animation, 720p	-0.1%	-0.1%	-0.1%	-0.1%	-0.5%	-0.5%	0.0%	-0.5%	-0.4%
YUV, camera captured, 1080p	0.1%	0.1%	0.1%	-0.1%	0.0%	-0.2%	0.1%	0.0%	0.1%
Enc Time[%]	120%			104%			105%		
Dec Time[%]	94%			88%			91%		

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