

# **JCT3V-F0145 – CE4: Results on Simplification of Residual Prediction**

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# Applying only to 2Nx2N Merge

- ❖ In 3D-HEVC, the residual prediction is applied to 2Nx2N merge and AMVP modes
- ❖ We propose to apply only to 2Nx2N merge mode (**CE4 – Test4**)
  - Number of mode decision for RP can be reduced from "6" to "3" in 2Nx2N partition size
  - "DV derivation process" can be only performed in merge mode
- ❖ Experimental results (based on CTC with HTM 8.0)
  - No coding loss with 97.7% encoding time

	video 0	video 1	video 2	video PSNR / video bitrate	video PSNR / total bitrate	synth PSNR / total bitrate	enc time	dec time	ren time
Balloons	0.00%	0.04%	0.07%	0.01%	0.01%	0.03%	97.4%	94.5%	97.2%
Kendo	0.00%	0.06%	-0.02%	0.01%	-0.01%	-0.04%	96.7%	103.1%	97.2%
Newspaper_CC	0.00%	-0.03%	0.10%	0.01%	0.01%	-0.01%	98.0%	92.6%	97.3%
GT_Fly	0.00%	-0.09%	0.02%	-0.01%	0.00%	0.00%	97.8%	95.3%	100.9%
Poznan_Hall2	0.00%	0.07%	-0.08%	-0.02%	0.00%	-0.04%	98.6%	92.6%	97.1%
Poznan_Street	0.00%	0.10%	0.04%	0.02%	0.02%	0.01%	98.0%	92.9%	99.3%
Undo_Dancer	0.00%	0.12%	-0.02%	0.02%	0.02%	0.00%	97.7%	92.5%	100.0%
1024x768	0.00%	0.03%	0.05%	0.01%	0.00%	-0.01%	97.4%	96.7%	97.2%
1920x1088	0.00%	0.05%	-0.01%	0.00%	0.01%	-0.01%	98.0%	93.3%	99.3%
<b>average</b>	<b>0.00%</b>	<b>0.04%</b>	<b>0.01%</b>	<b>0.01%</b>	<b>0.01%</b>	<b>-0.01%</b>	<b>97.7%</b>	<b>94.8%</b>	<b>98.4%</b>
Shark	0.00%	0.03%	0.00%	0.00%	-0.01%	0.00%	97.8%	92.8%	98.5%

# Signaling of IC and RP

- ❖ We additionally propose to enable RP only when IC is enabled
  - This method proposed at the last meeting in JCT3V-E0144
  - Mode decision complexity can be reduced
  - Unnecessary RP weight signaling can be removed
- ❖ (Disabling RP when IC is enabled) = (Disabling IC when RP is enabled)

Proposed Method

		RP		
		0	1	2
IC	0	O	O	O
	1	O	X	X

CE4 Method

- ❖ Need to choose the method which can save more bit
  - Proposed method can save "(weight) index" signaling
  - CE4 method can save "flag" signaling

# Signaling of IC and RP

## ❖ Performance Comparison (w/ the first method, CTC with HTM 8.0)

### ■ **Proposed Method:** 0.03% & 0.04% bit-saving with 96.5% encoding time

	video 0	video 1	video 2	video PSNR / video bitrate	video PSNR / total bitrate	synth PSNR / total bitrate	enc time	dec time	ren time
Balloons	0.00%	-0.33%	-0.16%	-0.12%	-0.09%	-0.10%	95.7%	90.0%	97.7%
Kendo	0.00%	-0.24%	-0.30%	-0.11%	-0.10%	-0.11%	95.3%	100.8%	98.6%
Newspaper_CC	0.00%	0.04%	0.02%	0.00%	-0.01%	-0.01%	96.8%	97.1%	98.4%
GT_Fly	0.00%	-0.09%	0.02%	-0.01%	-0.01%	0.00%	98.1%	103.0%	100.6%
Poznan_Hall2	0.00%	-0.07%	-0.18%	-0.06%	-0.04%	-0.10%	96.6%	92.5%	99.6%
Poznan_Street	0.00%	0.19%	-0.03%	0.02%	0.02%	0.02%	97.0%	92.9%	100.6%
Undo_Dancer	0.00%	0.08%	0.05%	0.02%	0.02%	0.01%	95.9%	92.3%	98.4%
1024x768	0.00%	-0.17%	-0.14%	-0.07%	-0.06%	-0.07%	95.9%	95.9%	98.2%
1920x1088	0.00%	0.03%	-0.03%	-0.01%	0.00%	-0.02%	96.9%	95.2%	99.8%
<b>average</b>	<b>0.00%</b>	<b>-0.06%</b>	<b>-0.08%</b>	<b>-0.04%</b>	<b>-0.03%</b>	<b>-0.04%</b>	<b>96.5%</b>	<b>95.5%</b>	<b>99.1%</b>
Shark	0.00%	0.03%	0.00%	0.00%	-0.01%	0.00%	98.0%	101.0%	99.6%

### ■ **CE4 Method:** 0.01% & 0.02% bit-saving with 96.4% encoding time

	video 0	video 1	video 2	video PSNR / video bitrate	video PSNR / total bitrate	synth PSNR / total bitrate	enc time	dec time	ren time
Balloons	0.00%	-0.02%	-0.05%	-0.04%	-0.03%	-0.03%	95.8%	91.1%	97.1%
Kendo	0.00%	-0.12%	-0.21%	-0.08%	-0.07%	-0.08%	95.4%	104.0%	97.6%
Newspaper_CC	0.00%	0.00%	0.08%	0.01%	0.02%	-0.01%	96.5%	96.7%	97.7%
GT_Fly	0.00%	-0.08%	0.02%	-0.01%	0.00%	0.00%	97.7%	99.6%	100.1%
Poznan_Hall2	0.00%	0.07%	0.05%	-0.01%	-0.01%	-0.04%	96.4%	93.2%	99.2%
Poznan_Street	0.00%	0.07%	0.10%	0.02%	0.02%	0.02%	97.1%	98.5%	100.1%
Undo_Dancer	0.00%	0.09%	-0.03%	0.01%	0.01%	-0.01%	96.1%	98.5%	99.8%
1024x768	0.00%	-0.05%	-0.06%	-0.04%	-0.03%	-0.04%	95.9%	97.2%	97.5%
1920x1088	0.00%	0.04%	0.04%	0.00%	0.00%	-0.01%	96.8%	97.5%	99.8%
<b>average</b>	<b>0.00%</b>	<b>0.00%</b>	<b>-0.01%</b>	<b>-0.02%</b>	<b>-0.01%</b>	<b>-0.02%</b>	<b>96.4%</b>	<b>97.4%</b>	<b>98.8%</b>
Shark	0.00%	0.03%	0.00%	0.00%	-0.01%	0.00%	97.7%	97.7%	100.0%

# Conclusions

- ❖ We propose methods to simplify the residual prediction
  - Applying RP only to  $2N \times 2N$  merge mode
  - Disabling RP when IC is enabled
  - No coding loss with 96.5% encoding time
- ❖ We recommend to adopt the proposed methods into next 3D-HEVC WD

**Thanks LG for the cross checking (JCT3V-F0216).**

