

EE2-3.3 related: Fix on LFNST/NSPT index signalling (JVET-AG0237)

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Proposed fix

- EE2-3.3 (Utilizing LFNST/NSPT for inter coding)
 - LFNST/NSPT for inter coding is applied to the Luma component and also signalled, only when the Luma component satisfies “**DC condition**”
 - **DC condition**: last non-zero coefficient should not be at DC position.
- Procedure to decide overall DC condition in EE2-3.3 SW
 - **DC_cond = Y_DC_cond || Cb_DC_cond || Cr_DC_cond**
 - Cb_DC_cond (Cr_DC_cond) is always TRUE
 - Therefore, DC_cond becomes TRUE although Y_DC_cond is FALSE.
 - **Unnecessary index signalling occurs even for FALSE Y_DC_cond.**
- A simple and straightforward fix is proposed:
 - **DC_cond = Y_DC_cond**, by making Cb/Cr_DC_cond to be FALSE for inter coding
 - More aligned with the fact that inter LFNST/NSPT is not applied to Chroma

Experimental results

- Slight BD-rate changes for RA, relative to EE2-3.3

	Random access Main10				
	Over EE2-3.3 CTC				
	Y	U	V	EncT	DecT
Class A1	0.02%	-0.08%	-0.09%	100%	100%
Class A2*	0.00%	-0.12%	0.10%	100%	100%
Class B	0.02%	-0.27%	0.03%	100%	100%
Class C	-0.01%	-0.23%	0.02%	98%	99%
Class E					
Overall	0.01%	-0.19%	0.02%	100%	100%
Class D	0.01%	-0.36%	-0.22%	98%	99%
Class F	-0.02%	-0.08%	-0.05%	99%	99%

* QP-27 results of ParkRunning copied from their anchor

Conclusion

- The problem on how to decide DC condition for inter LFNST/NSPT in EE2-3.3 is pointed out
 - Luma DC condition becomes meaningless due to the always-TRUE Chroma DC condition.
 - Unnecessary LFNST/NSPT index signalling even for FALSE Luma DC condition
- A simple and straightforward fix was proposed.
 - Effectively not checking Chroma DC conditions for inter LFNST/NSPT
- It is recommended to adopt the proposed method in next ECM.

Thanks to OPPO and InterDigital for crosschecking!

Appendix

- SW changes by the proposed fix (CABACWriter.ccp)

```
if (... && tu.blocks[compID].height >= 4 && tu.blocks[compID].width >= 4)
{
    const int lfnstLastScanPosTh = isLuma( compID ) ?
        ( CU::isIntra(*(tu.cu)) ? LFNST_LAST_SIG_LUMA : LFNST_LAST_SIG_LUMA_INTER )
        : LFNST_LAST_SIG_CHROMA;
    cuCtx->lfnstLastScanPos |= ( CU::isIntra( *( tu.cu ) ) || isLuma( compID ) ) ?
        ( cctx.scanPosLast() >= lfnstLastScanPosTh ) : false;
}
```

- One encoder fix is accompanied (in InterSearch.cpp), because
 - DC condition is not relevant to Chroma anymore.

```
//else if (cu.lfnstIdx && !cuCtx.lfnstLastScanPos)
else if( cu.lfnstIdx && ( isLuma( compID ) && !cuCtx.lfnstLastScanPos ) )
{
    currCompCost = MAX_DOUBLE;
}
```

Supplementary results [1/2]

- BD-rate/run-time changes for LD, relative to EE2-3.3
 - LFNST/NSPT is enabled for both test and anchor.

	Low delay B Main10				
	Over EE2-3.3 w/ LFNST enabled CTC				
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	0.03%	-0.54%	-0.54%	101%	100%
Class C	0.01%	-0.50%	-0.40%	100%	100%
Class E	-0.03%	-0.28%	0.03%	100%	100%
Overall	0.01%	-0.46%	-0.35%	100%	100%
Class D	-0.14%	-0.32%	-1.62%	99%	100%
Class F	-0.03%	-0.33%	-0.41%	99%	100%

Supplementary results [2/2]

- JVET-AG0208 + JVET-AG0237 results for RA, relative to JVET-AG0208

		Random access Main10			
		Over JVET-AG0208 CTC			
	Y	U	V	EncT	DecT
Class A1	-0.03%	-0.07%	-0.20%	100%	99%
Class A2	0.00%	-0.10%	-0.19%	99%	99%
Class B	0.02%	0.01%	-0.13%	100%	100%
Class C	-0.03%	-0.18%	0.08%	99%	100%
Class E					
Overall	-0.01%	-0.08%	-0.10%	100%	100%
Class D	0.03%	-0.31%	-0.42%	99%	99%
Class F	0.03%	0.01%	0.02%	99%	98%