JCTVC-H0067

Non-CE8.a.2:
SAO with LCU-based syntax

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Summary

- SAO with LCU-based syntax

- Suitable for both single-pass and low-delay encoders

- Simplifications:
  - No band offset
  - Edge offset: +/-1
  - Reduction in code size: ~3 000 -> ~400

- BD-rate results:
  - 8-bit: -0.1%   -   +0.8%
  - 10-bit: +1.1%

LCU-based syntax

- New set of SAO parameters for each LCU

- SAO syntax elements are interleaved at the LCU level

Implementation benefits

- Suitable for single-pass encoders

- Suitable for encoders with sub-frame (slice-level) delay

- Error resilience

Parsing of SAO parameters

```
sao_enabled_flag                    // SAO on/off for LCU
if (sao_enabled_flag)
{
        sao_chroma_enabled_flag   // SAO on/off for chroma
        sao_type_idx              // Indicate EO type 1-4
}
```

Simplified edge offset

X1	X	X2

	X1	
	X	
	X2	

		X2
	X	
X1		

X1		
	X	
		X2

```
if (abs(x1+x2-x-x) > 1)
{
    if (x1 >= x && x2 >= x)
    {
        x = x + 1
    }
    else if (x1 <= x && x2 <= x)
    {
        x = x – 1
    }
}
```

BD-rate results (%)

Class	AI-HE	RA-HE	LB-HE	LP-HE	RA_HE10
Class A	0.2	0.4			1.1
Class B	-0.1	0.4	1.0	0.9	1.0
Class C	-0.3	0.0	0.2	0.3	
Class D	0.0	0.4	0.3	0.4	
Class E	0.0		1.7	1.5	
Average	**-0.1**	**0.3**	**0.8**	**0.7**	**1.1**

Comparison with H0273 (CE8.a.3)

Single-slice	AI-HE	RA-HE	LB-HE	LP-HE	RA_HE10
H0273	0.0	0.4	0.7	0.7	0.5
H0067	-0.1	0.3	0.8	0.7	1.1

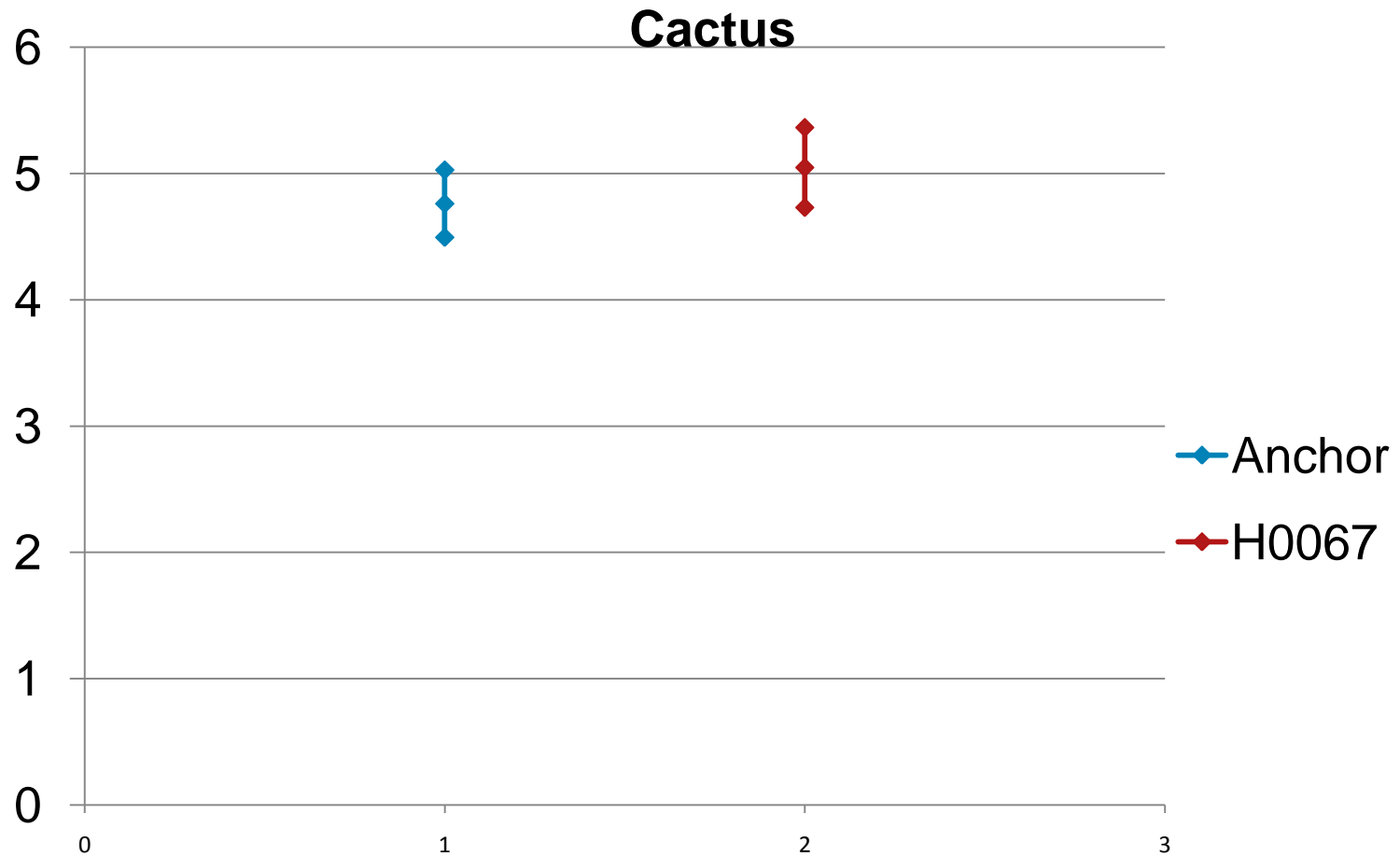| Multi-slice	AI-HE	RA-HE	LB-HE	LP-HE	RA_HE10
H0273			-1.7	-2.8	
H0067			-1.9	-3.1	

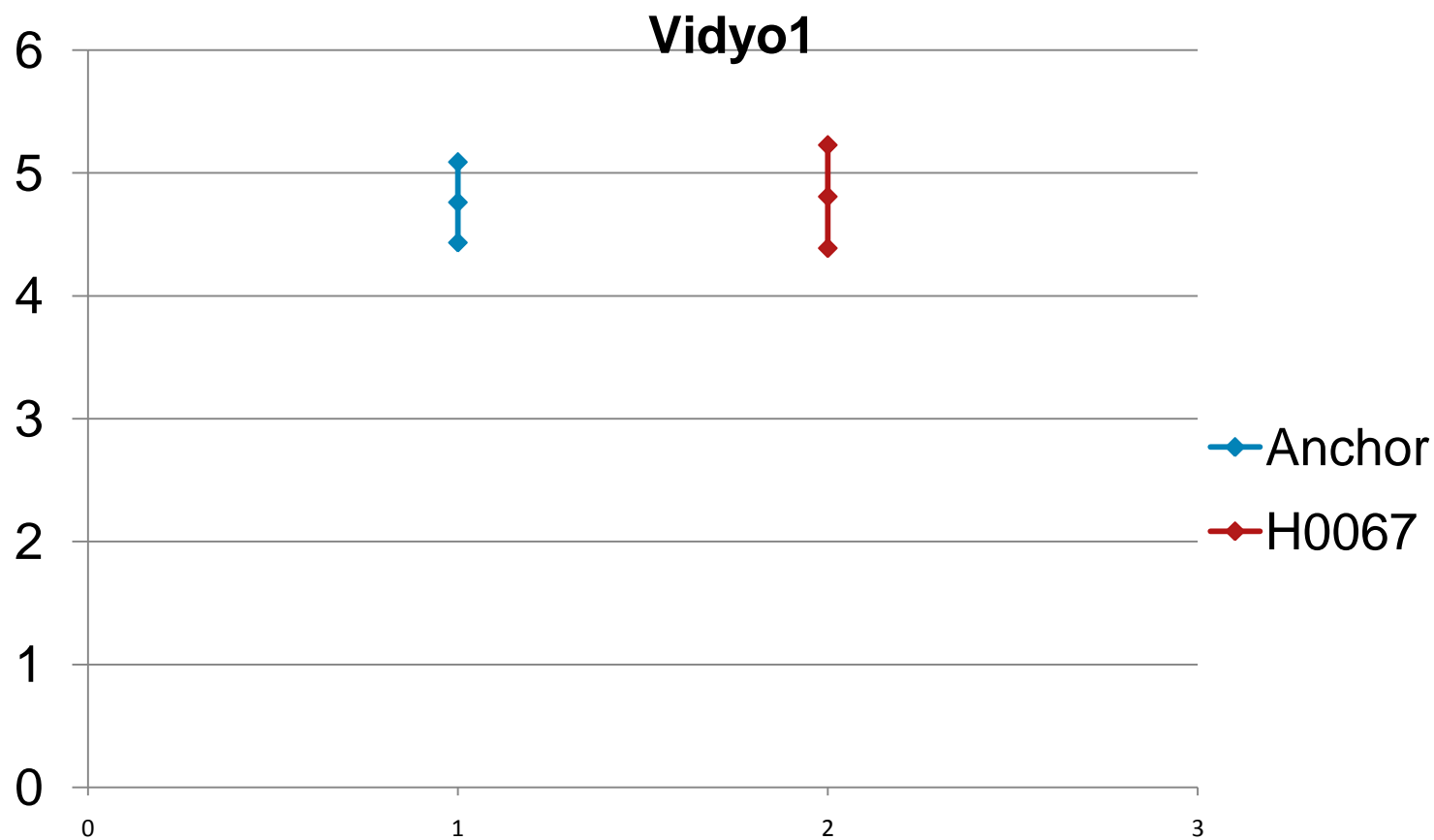Note: ALF disabled in anchor

Subjective viewing results

BasketballDrill
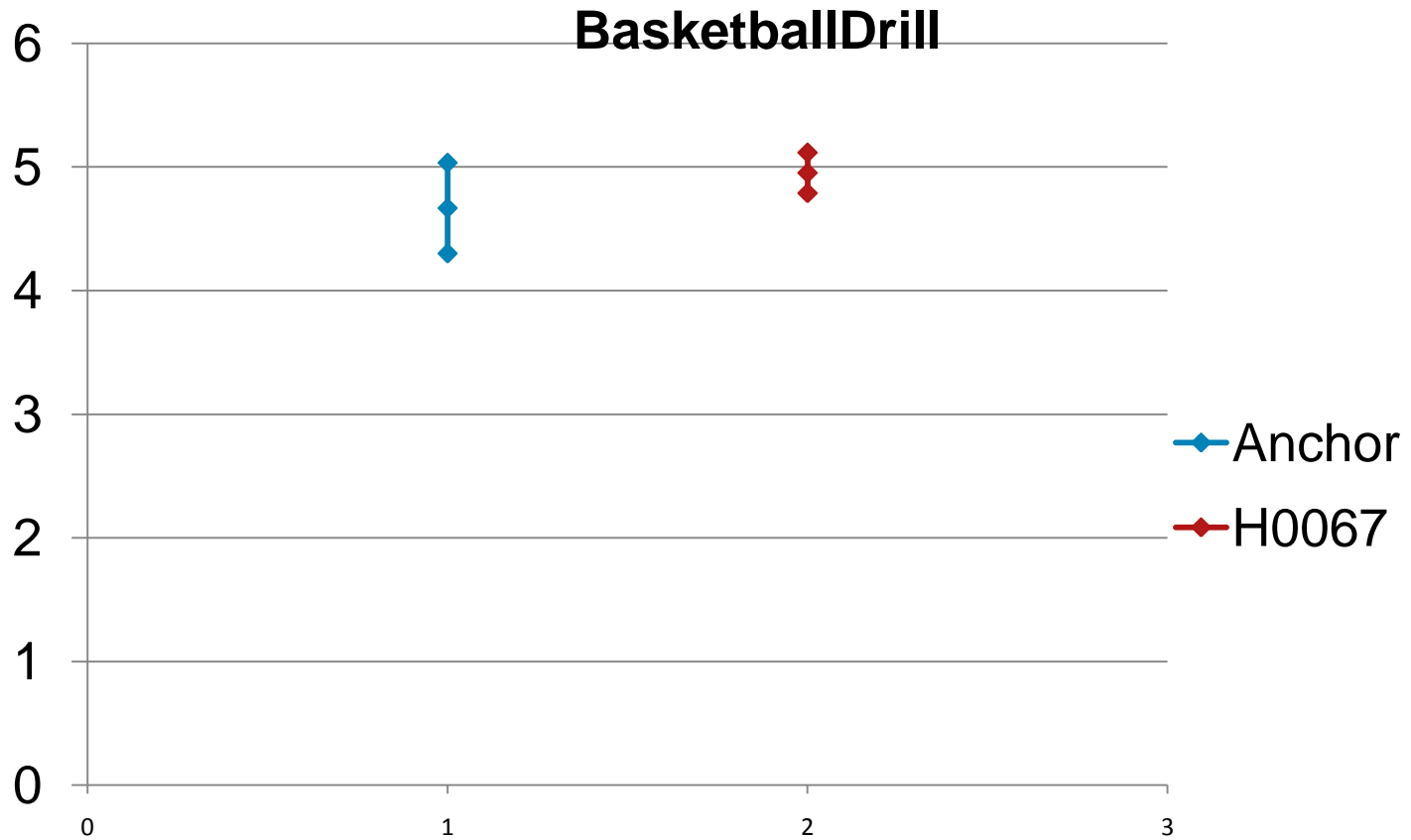
Subjective viewing results

Subjective viewing results

Additional results

- SAO processing at LCU boundaries:

    – Recursive or non-recursive

    – Negligible difference in BDR performance

Conclusion

- SAO with LCU-based syntax

- Suitable for both single-pass and low-delay encoders

- Significant simplification and reduction of code lines

- BD-rate results:

  - 8-bit: -0.1%   -   +0.8%

  - 10-bit: +1.1%

- Proposal: Adoption in HM & WD