

# **Non-CE11: Modified Context Derivation for last coefficient flag**

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## # Target

- 1st: Introduce a unified rule for Binarization for last coefficient flag
- 2nd: “bypass concatenation” for increasing BAC throughput
- 3rd : Reduce context size

## # Proposal

**Truncated Rice (TR) binarization is used for last coefficient flag.**

Context Coding : “Truncated Unary part of TR”

Bypass part : “Suffix part of TR”

Rice parameter is determined by Transform size.

## # Results

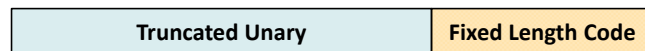
1st & 2nd: 0.00% (AI), 0.00% (RA), 0.00% (LD)

with providing unified binarization rule.

3rd: 0.06% (AI), 0.07% (RA), 0.08% (LD) loss

with reducing context size from 31 to 26 per slice (from 93 to 78 in WD)

## Current HM/WD



last coefficient flag binarization method is special.



Fixed Length part is determined "00, 10, 01, 11" for "0, 1, 2, 3"

4x4:

Prefix part : Truncated Unary ( Max Length = 3)

otherwise:

Prefix part : Truncated Unary Max length = half of TU size

Suffix part : Fixed Length length =  $\log_2(\text{half of TU size})$

## Proposal (1st step / Unification)

Introduce Truncated Rice (TR) for last coefficient flag binarization

\*TR is already determined for level-3 coding

→ No difference on bin stream length

with Rice Parameter =  $\log_2(\text{TU size}) - 2$

cTRMax = 3 for 4x4, (TU size  $\gg$  1) for others



## 8x8

Last position	Bin stream (HMv4)	Bin stream (TR)
0	1	1
1	01	01
2	001	001
3	0001	0001
4	0000 00	0000 00
5	0000 10	0000 01
6	0000 01	0000 10
7	0000 11	0000 11

Proposed binarization  
is consistent with other  
parts of the design.

## Proposal (2nd step / Bypass concatenation)

CtxCode(X)+ Bypass (X)+CtxCode(Y)+ Bypass (Y)

→ CtxCode(X)+CtxCode(Y)+Bypass(Y)+Bypass(X)

# condition for Y can be removed in this order in SW

→ Similar proposal on G201(MTK), G370(Sony)

## Proposal (3rd step / Context reduction)

4x4	RiceParameter = 0,	cTRMax=3 (same as HM4)
8x8	RiceParameter = 1,	cTRMax =4 (same as HM4)
16x16	RiceParameter = 2,	cTRMax =4
32x32	RiceParameter = 2,	cTRMax =8

### Context Idx

4x4: 0,1,2	: 0,1,2
8x8: 3,4,5,5	: 3,4,5,5
16x16: 6,7,8,9,10,10,11,11	: 6,7,8,9
32x32: 12,13,14,15,16,16,16,16,17,17,17,17,18,18,18,18	: 10,11,12,13,14,14,15,15
	➔ 19 to 16 (Luma) / 31 to 26 (Slice)

**BD-Rate**

	All Intra HE			Random Access HE			Low delay B HE		
	Y	U	V	Y	U	V	Y	U	V
<b>Step1&amp;2 (test2)</b>	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
<b>Step1&amp;2&amp;3 (test3)</b>	0.06%	0.10%	0.09%	0.07%	0.04%	0.07%	0.08%	0.04%	0.01%

*Cross checked by G942 (Sharp)***Conclusion**

Our proposal method (Step1&2)  
provides simple rule for binarization without any performance impact.

Our proposal method (Step3)  
provides 16% (93 to 78) context reduction with no significant loss.

It is suggested to consider the inclusion of this proposal in HM/WD of HEVC