



**JCTVC-N0143**

# **On Mode Dependent Intra Smoothing for Range Extension**

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# Current status of MDIS

## ■ Mode-dependent Intra Smoothing in HEVC v1

- A way to only predict low frequency content
- Luma-only
  - Chroma in 4:2:0 has little high frequency
- No filtering for 4x4 TU size
- No filtering for DC, VER and HOR
- Other modes are filtered according to a table

## ■ MDIS in Rext

- Activated for Chroma in 4:4:4 using the same conditions as Luma
- M0106: even more filtering for chroma

	TU size			
	4x4	8x8	16x16	32x32
0 (planar)	0	1	1	1
1 (DC)	0	0	0	0
2	0	1	1	1
3	0	0	1	1
4	0	0	1	1
5	0	0	1	1
6	0	0	1	1
7	0	0	1	1
8	0	0	1	1
9	0	0	0	1
10 (HOR)	0	0	0	0
11	0	0	0	1
12	0	0	1	1
13	0	0	1	1
14	0	0	1	1
15	0	0	1	1
16	0	0	1	1
17	0	0	1	1
18	0	1	1	1
19	0	0	1	1
20	0	0	1	1
21	0	0	1	1
22	0	0	1	1
23	0	0	1	1
24	0	0	1	1
25	0	0	0	1
26 (VER)	0	0	0	0
27	0	0	0	1
28	0	0	1	1
29	0	0	1	1
30	0	0	1	1
31	0	0	1	1
32	0	0	1	1
33	0	0	1	1
34	0	1	1	1

# Proposed modification

## ■ Also increase filtering of luma

- Current table more adapted to unequal frequency content behavior between chroma and luma in 4:2:0
- Chroma and luma now behave a lot more similarly for 4:4:4

## ■ Complexity considerations

- What should not be modified:
  - 4x4 because it is the worst case
  - DC/HOR/VER do not benefit from filtering and can be considered simple modes for a fast encoder
- Table reuse:
  - 4x4 not modified
  - All other TU sizes use the existing 32x32 table

TU size	N=4	8x8	16x16	N>4
0 (planar)	0	1	1	1
1 (DC)	0	0	0	0
2	0	1	1	1
3	0	0	1	1
4	0	0	1	1
5	0	0	1	1
6	0	0	1	1
7	0	0	1	1
8	0	0	1	1
9	0	0	0	1
10 (HOR)	0	0	0	0
11	0	0	0	1
12	0	0	1	1
13	0	0	1	1
14	0	0	1	1
15	0	0	1	1
16	0	0	1	1
17	0	0	1	1
18	0	1	1	1
19	0	0	1	1
20	0	0	1	1
21	0	0	1	1
22	0	0	1	1
23	0	0	1	1
24	0	0	1	1
25	0	0	0	1
26 (VER)	0	0	0	0
27	0	0	0	1
28	0	0	1	1
29	0	0	1	1
30	0	0	1	1
31	0	0	1	1
32	0	0	1	1
33	0	0	1	1
34	0	1	1	1

# Experiment

- Using RExt3.0 software and following K1006 common test conditions
- Results for AI configurations

	All Intra Main-tier					All Intra High-tier					All Intra Super-High-tier			
	Y	U	V	YUV		Y	U	V	YUV		Y	U	V	YUV
RGB 4:4:4	-0.5%	-0.3%	-0.3%	-0.4%		-0.4%	-0.2%	-0.3%	-0.3%		-0.3%	-0.1%	-0.2%	-0.2%
YCbCr 4:4:4	-0.2%	-0.1%	-0.2%	-0.2%		-0.3%	-0.1%	-0.1%	-0.2%		-0.3%	0.0%	-0.1%	-0.2%
YCbCr 4:2:2		N.A.		N.A.			N.A.		N.A.			N.A.		N.A.
<b>Overall</b>	-0.4%	-0.2%	-0.3%			-0.4%	-0.1%	-0.2%			-0.3%	-0.1%	-0.2%	
Enc Time[%]		100%					100%					100%		
Dec Time[%]		101%					100%					100%		

- Runtime unaffected
- Inter configurations have smaller yet present gain

# Conclusions

- Provides interesting gains for AI (MT/HT/SHT):  
–0.34%(Y), –0.14%(U), –0.21%(V)
- Designed to not increase worst case and reuse
- Minor modification
- It is proposed to adopt the modification into RExt