

JCTVC-J0079

On beyond 8 bit-depth support in HEVC

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technicolor



Bit-depth issues status

HM7.0

Issue w.r.t. bit-depth	Ticket	Fixed in
Intra TS offsets + underflow + typo (≥ 13 -bit)	#560	HM-7.1-dev r2483
WP and IF offsets (14-bit)	#595	HM-7.1-dev r2482
Overflows in RDOQ (14-bit)	#596	HM-7.1-dev r2488
Bit-depth scaling in RDOQ (≥ 10 -bit)	#597	HM-7.1-dev r2481

Draft 7

Issue w.r.t. bit-depth	Ticket	Fixed in
ALF SliceQPy range (≥ 10 -bit)	#466	JCTVC-I1003 d5
Deblocking filter mismatch WD6/HM6 (≥ 10 -bit)	#529	JCTVC-I1003 d2
Intra TS semantic (≥ 13 -bit)	#560	JCTVC-I1003 d3
Weighted Prediction offset (14-bit)	#594	JCTVC-I1003 d6

Experiments: JM18.3 vs HM7.X - 8/10/12/14 bits

Test material

- 6 x 1080p50 SVT, 250 frames

Test Conditions

- JM18.3: « HM-like » RA and AI configuration files
 - Same as in *I0409*
- Software - RA/AI-HE10, 12, 14-bit (JCTVC-I1100)
 - HM7.0/HM7.1 lossy
 - HM7.0 picture-level lossless
- BD-rate (4 QP)

Experiments: Test material

CrowdRun

difficult



Cpx motion
Texture
Colour
Noise

DucksTakeOff

difficult



High motion
Colour
Local texture

InToTree

easy



Slow motion
Zoom
Texture
Noise

OldTownCross

easy



Slow motion
Very textured
Noise

Seeking

Medium



High/cpx motion
Texture
Contrast

ParkJoy

difficult



High motion
Pan
Texture
Contrast



Experiments: Results

JM18.3 vs HM7.1 w/ 14-bit bugfixes (w/o #597) - BD-rate in %

Bitdepth/ GoP	8			10			12			14		
	Y	U	V	Y	U	V	Y	U	V	Y	U	V
AI-HE	-18.1	-31.3	-27.1	-17.7	-30.2	-24.8	-17.3	-29.6	-23.6	-17.1	-28.7	-22.2
RA-HE	-31.3	-50.6	-43.4	-31.8	-47.8	-35.9	-31.4	-46.7	-33.9	x	x	x

x: JM18.3 issues for 5 out of 6 sequences for RA-HE 14 bit test conditions

HM7.0 vs HM7.1 w/ 14-bit bugfixes (w/o #597) - BD-rate in %

GoP	Y	U	V
AI-HE 14-bit	-5.0	-7.2	-8.2
RA-HE 14-bit	-2.4	-5.1	-2.3

Comments

- Coherency across bit-depth comparative tests
- Picture-level lossless in HM7.0 performs perfect reconstruction (8, 10, 12, 14-bit)

Conclusion

Current beyond 8 bit-depth support in HM-7.1-dev:

- Consistent results acrosss bit-depth up to 14-bit
- 16-bit support if commercially justified would be hugely invasive

Picture-level lossless in HM7.0:

- 8, 10, 12, 14-bit: OK

Further studies:

- ALF and Intra LM
- Market needs in terms of bit-depth limit
- Experiments: test LowDelay cases + need of new test material

Suggestion:

- Define time-line for beyond 8 bit-depth (and non-4:2:0 chroma) support

