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Non-CE8: Additional Simulation Results of SAO and ALF

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Overall Summary

- SAO and ALF on/off experiments using common test condition (CTC) sequences and additional fifteen 720p and ten 1080p sequences
  - Investigate objective and subjective coding gains

- Results
  - Not only objective coding gains but also subjective coding gains
  - The BD-rate improvement is much large in high resolution videos
  - SAO takes 0.5% encoding time and 2% decoding time.
  - ALF takes 7% encoding time and 15% decoding time.
  - Not only objective but also subjective coding gains, especially for HD

- Suggest to keep both SAO and ALF in HEVC

HE Condition	CTC Sequences				Additional 720p/1080p			
	AI	RA	LDB	LDP	AI	RA	LDB	LDP
SAO+ALF Coding Gain	2.4%	5.1%	5.3%	15.3%	3.7%	7.6%	8.2%	28.6%
ALF Coding Gain	1.6%	3.3%	2.8%	4.2%	2.8%	4.7%	4.3%	8.7%
SAO Coding Gain	0.5%	1.3%	2.1%	2.6%	0.5%	1.9%	2.6%	3.4%

Consistent Data for HD Sequences

Condition		CTC Sequences				Additional 720p/1080p			
		HE-AI	HE-RA	HE-LDB	HE-LDP	HE-AI	HE-RA	HE-LDB	HE-LDP
SAO OFF & ALF OFF	BD-rate	2.4%	5.1%	5.3%	15.3%	3.7%	7.6%	8.2%	28.6%
	HD Part	3.1%	6.4%	6.5%	22.2%				
SAO ON & ALF OFF	BD-rate	1.6%	3.3%	2.8%	4.2%	2.8%	4.7%	4.3%	8.7%
	HD Part	2.2%	3.7%	3.1%	6.5%				
SAO OFF & ALF ON	BD-rate	0.5%	1.3%	2.1%	2.6%	0.5%	1.9%	2.6%	3.4%
	HD Part	0.5%	1.4%	2.5%	3.0%				

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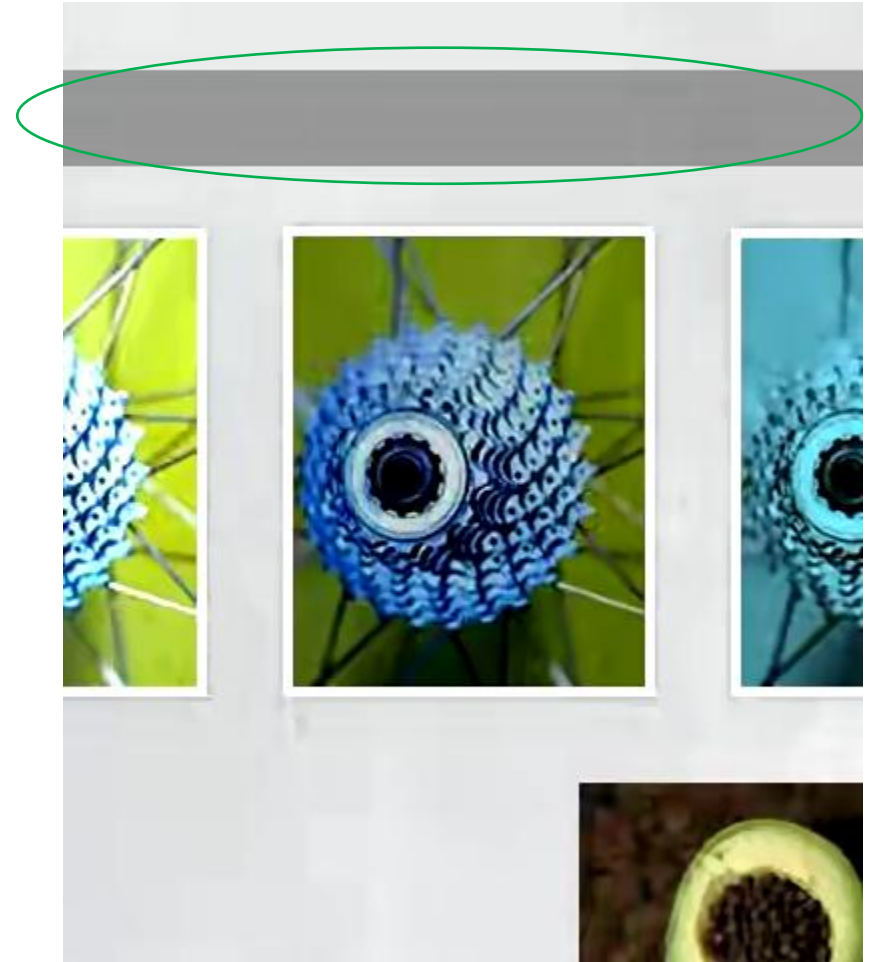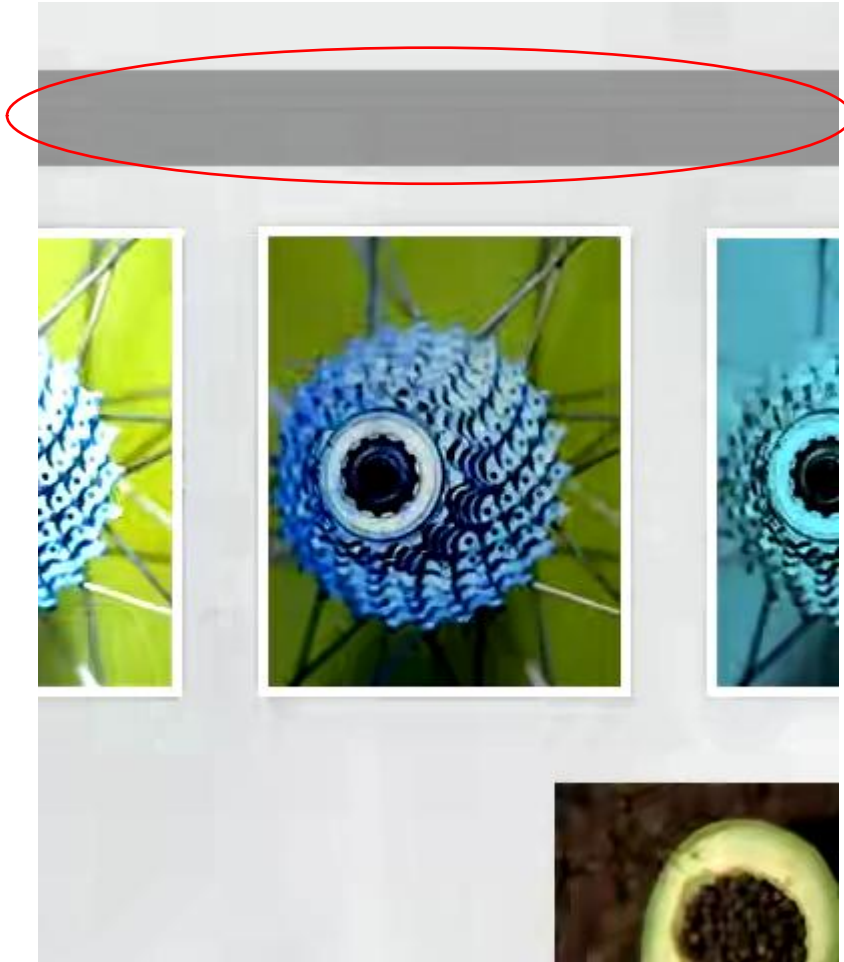# Common Test Condition Sequences

- Many sequences in the common test conditions are smaller than 720p, which cannot represent future applications well
  - Class A: 2560x1600
  - Class B: 1920x1080
  - Class C: 832x480
  - Class D: 416x240
  - Class E: 1280x720
  - Class F: 1280x720/1024x768/832x480

- Today even the mainstream videos on smart phones are 720p and will become 1080p soon.

- TVs are definitely 1080p now and will become larger.

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Additional Test Sequences

- All HD sequences we obtained for experiments during the VCEG KTA software study period

- Test everything instead of randomly pick some
  - Fifteen 720p and ten 1080p sequences

BigShips_1280x720_600.yuv	blue_sky_1920x1080_106.yuv
City_1280x720_900.yuv	pedestrian_area_1920x1080_375.yuv
Crew_1280x720_600.yuv	riverbed_1920x1080_250.yuv
Cyclists_1280x720_600.yuv	rush_hour_1920x1080_500.yuv
Harbour_1280x720_600.yuv	station2_1920x1080_313.yuv
Jets_1280x720_550.yuv	sunflower_1920x1080_500.yuv
Night_1280x720_460.yuv	toys_and_calendar_1920x1080_250.yuv
Optis_1280x720_600.yuv	tractor_1920x1080_690.yuv
Panslow_1280x720_550.yuv	vintage_car_1920x1080_300.yuv
Preakness_1280x720_600.yuv	walking_couple_1920x1080_250.yuv
Raven_1280x720_600.yuv	
Sailormen_1280x720_600.yuv	
Sheriff_1280x720_600.yuv	
ShuttleStart_1280x720_600.yuv	
Spincalendar_1280x720_550.yuv	

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Sequence : SlideShow, Configuration : HE-LDP, QP : 37, POC : 400 , artifact exists for POC = 399 - 472

Sequence : SlideEditing, Configuration : HE-LDP, QP : 37, POC : 161 , artifact exists for POC = 161 - 266

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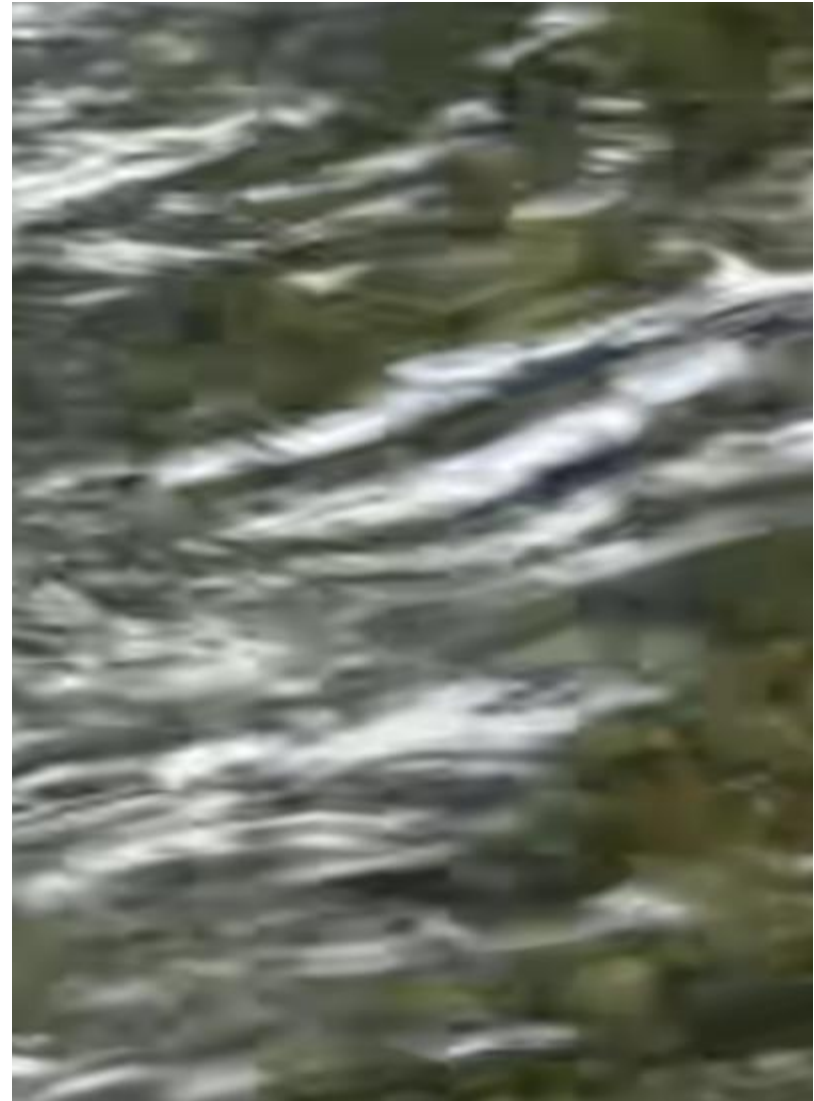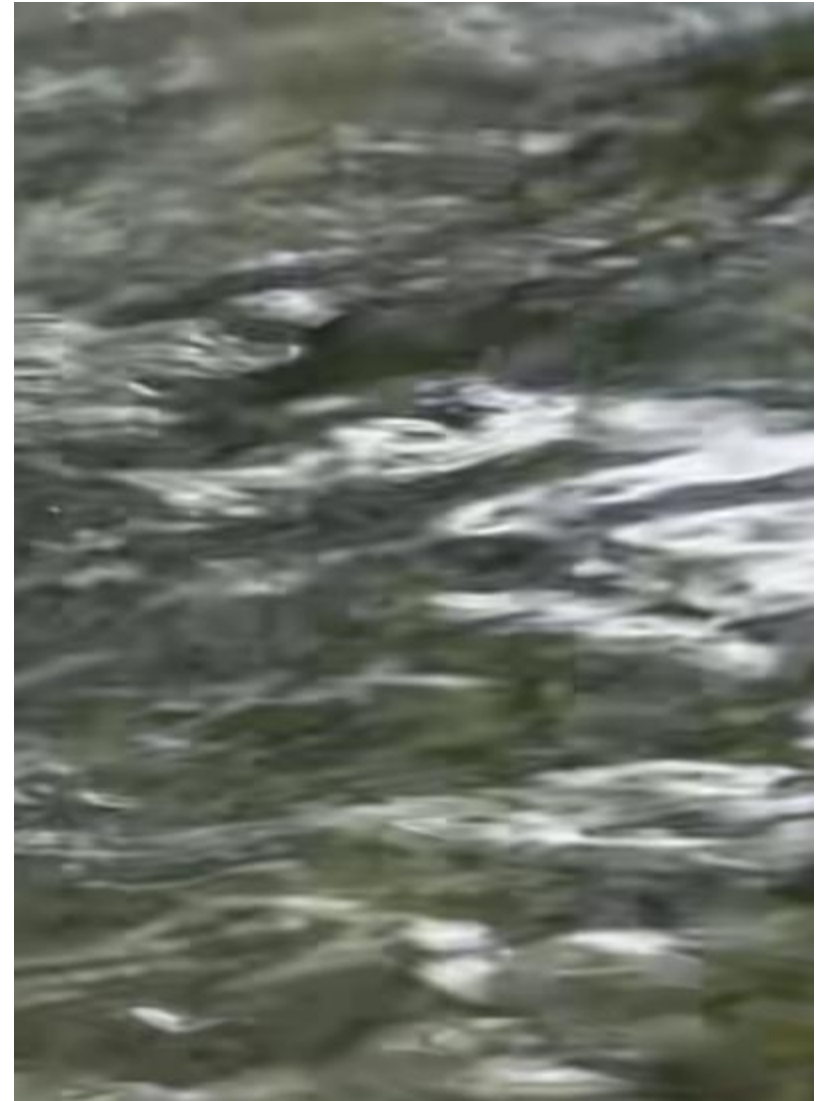
ALF-OFF   HM-5.0
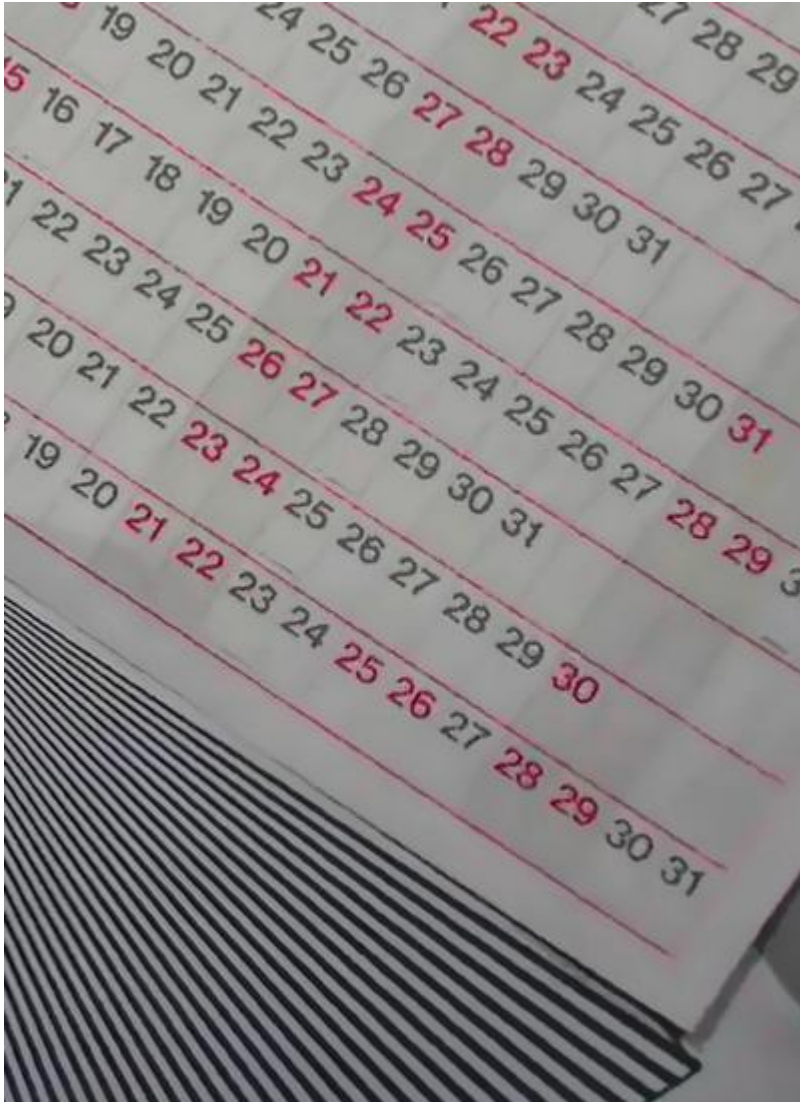
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Severe blocking artifact

Sequence : RiverBed, Configuration : HE-LDP, QP : 37, POC : 35 , artifact exists for most of inter pictures

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ALF-OFF

HM-5.0
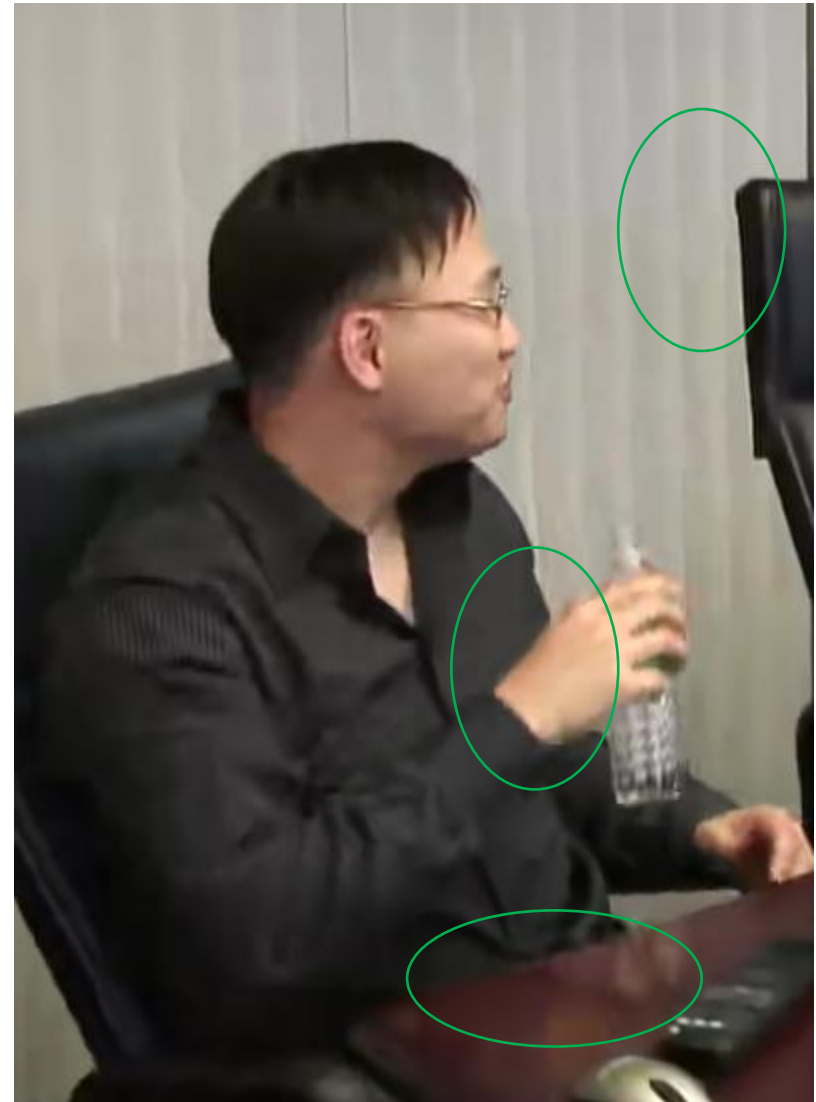
More visible blocking artifact

Sequence : RiverBed, Configuration : HE-LDP, QP : 32, POC : 117 , artifact exists for most of inter pictures
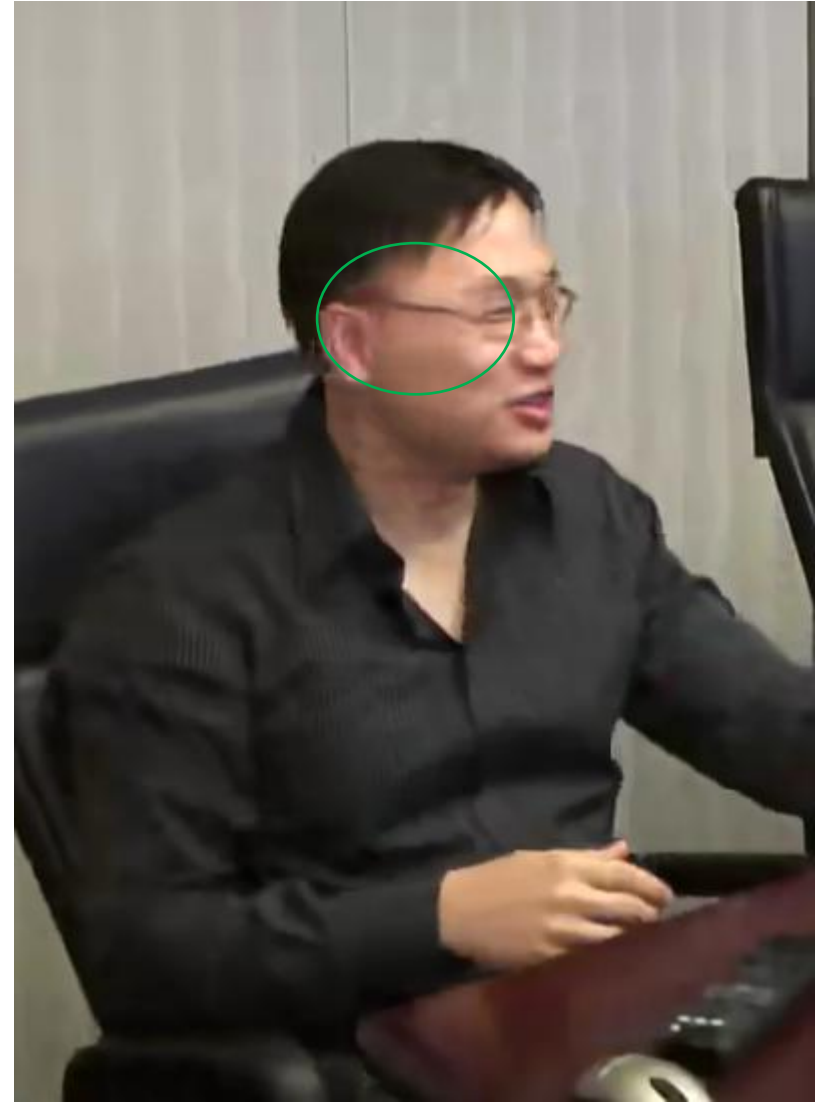
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More detail retained

Sequence : SpinCalendar, Configuration : HE-LDP, QP : 37, POC : 212, artifact exists for POC = 183 - 331
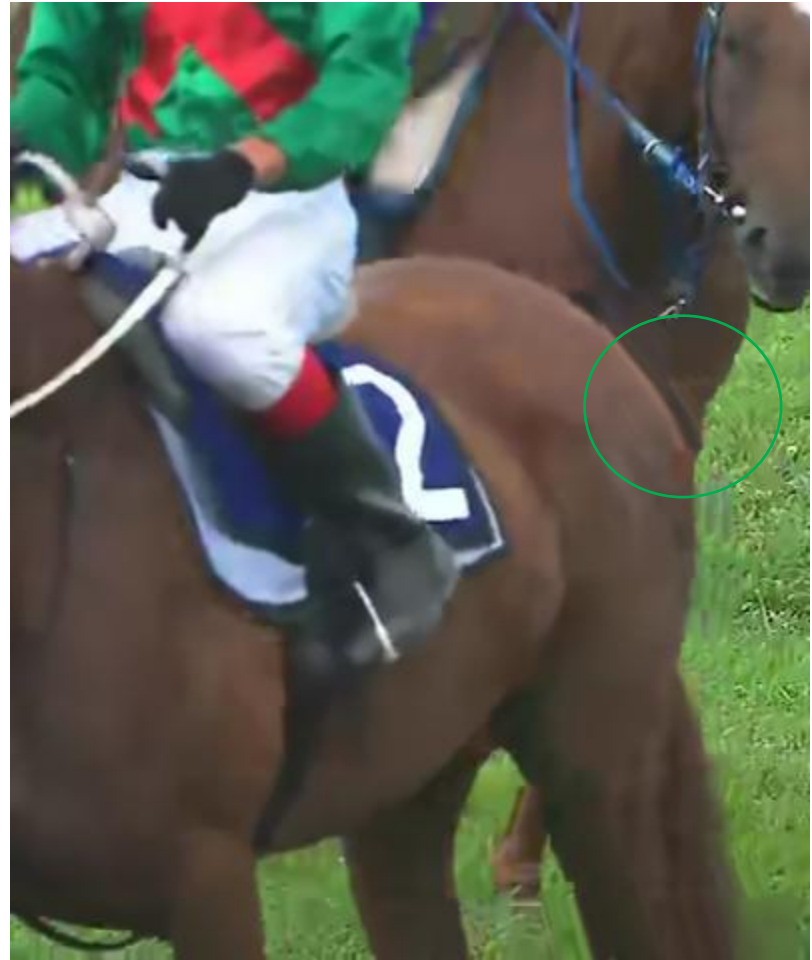
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Sequence : Vidyo1, Configuration : HE-LDP, QP : 37, POC : 205 , artifact exists for POC = 199 - 208

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ALF-OFF

HM-5.0

Sequence : Vidyo1, Configuration : HE-LDP, QP : 37, POC : 331 , artifact exists for POC = 328 - 335

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Sequence : RaceHorsesC, Configuration : HE-LDP, QP : 37, POC : 82 , artifact exists for POC = 81 - 83

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Sequence : PartyScene, Configuration : HE-LDP, QP : 37, POC : 350 , artifact exists for POC = 11, 62, 287, 315, 350, 454, 475
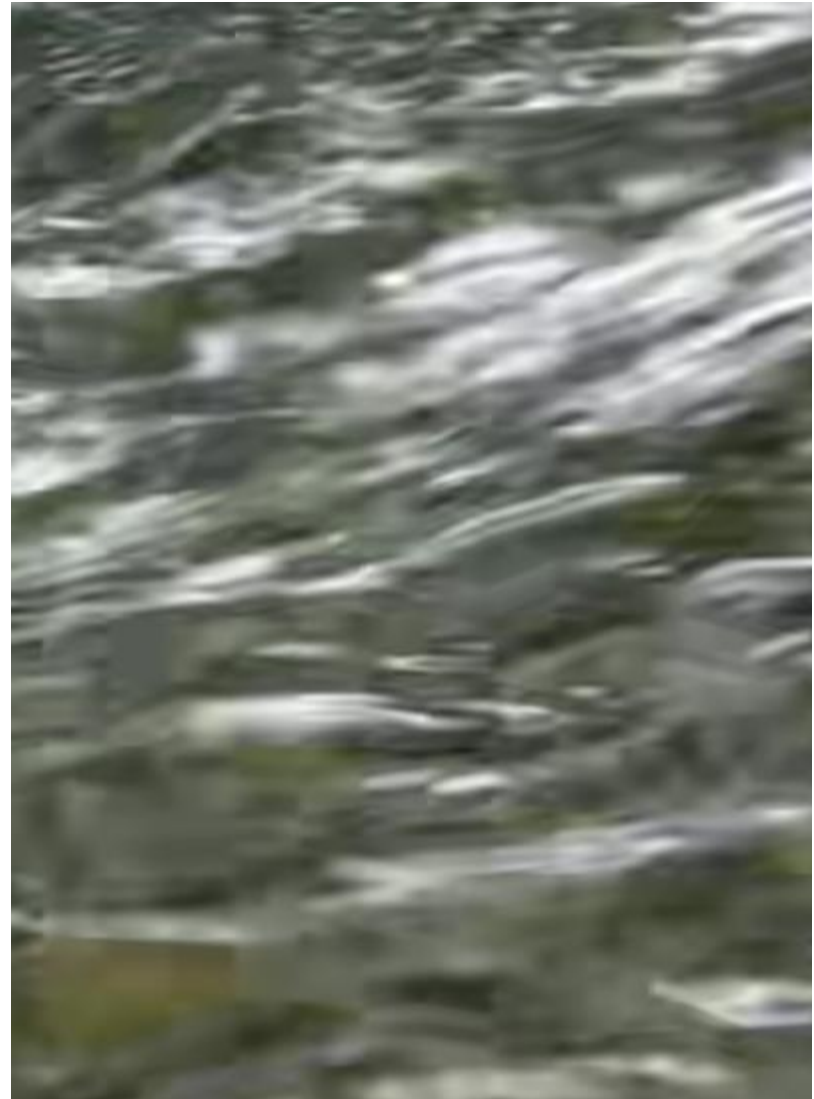
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ALF-OFF

HM-5.0

JCTVC-H0277

Severe blocking artifact

Sequence : RiverBed, Configuration : HE-LDB, QP : 37, POC : 35 , artifact exists for most of inter pictures

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Sequence : Raven, Configuration : HE-LDB, QP : 37, POC : 139

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Sequence : Raven, Configuration : HE-LDB, QP : 37, POC : 251

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Sequence : BQMall, Configuration : HE-RA, QP : 32, POC : 37 , artifact exists for POC = 36 - 39

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Sequence : Crew, Configuration : HE-RA, QP : 37, POC : 117 , artifact exists for POC = 116 - 119

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Sequence : Crew, Configuration : HE-RA, QP : 37, POC : 390 , artifact exists for POC = 389- 391

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Sequence : optis, Configuration : HE-RA, QP : 37, POC : 411 , artifact exists for POC = 410 - 412

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Sequence : Kimono, Configuration : HE-RA, QP : 37, POC : 91 , artifact exists for POC = 88 - 91

Conclusion

- SAO objective and subjective gains have been verified in CE3 and many other proposals.

- In this proposal, it is shown that ALF can provide not only objective but also subjective gains on top of SAO, especially for HD sequences

- Suggest to keep both SAO and ALF in HEVC

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