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Non-EE2: Adaptive Clipping with Signaled Lower and Upper Bounds

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Introduction and Proposal

- ECM: bit-depth based clipping is applied to multiple places
  - To avoid data overflow and remain the generated prediction/reconstruction samples in the defined dynamic range
  - The range is defined as [0, 2^bitdepth - 1]
  - Apply to filtering, sampling, weighted prediction, weighted combination, reconstruction, and other stages

- Proposal: signaled min/max values as the clipping bound
  - Min/max values are signaled in picture header
  - Min/max are obtained from the original picture. If motion compensated temporal filter (MCTF) is applied to a picture, min/max are obtained from the MCTF prefiltered picture
  - When clipping is in luma mapping chroma scaling (LMCS) mapped domain, the clipping bounds are derived by applying the forward LMCS look-up table to the signaled min/max values
  - The adaptive clipping is applied to the reconstruction stage (when adding residual to the prediction) and before saving the reconstructed picture into the decoded picture buffer

Simulation Results (ECM-10.0 as anchor)

AI: -0.06%/0.06%/-0.02% average BDR gain with 100.4% EncT, 100.3% DecT, and 100.0% VmPeak

RA: -0.08%/0.01%/-0.11% average BDR gain with 100.4% EncT, 100.6% DecT, and 100.0% VmPeak

	All Intra Main 10					
	Over ECM-10.0					
	Y	U	V	EncT	DecT	VmPeak
Class A1	-0.08%	-0.01%	-0.11%	100.2%	99.6%	100.0%
Class A2	-0.01%	0.02%	-0.03%	100.2%	100.9%	100.0%
Class B	-0.09%	0.03%	-0.09%	100.4%	100.2%	100.0%
Class C	-0.08%	0.06%	0.10%	100.9%	100.7%	100.0%
Class E	-0.03%	0.20%	0.01%	100.3%	100.1%	100.0%
Overall	**-0.06%**	**0.06%**	**-0.02%**	**100.4%**	**100.3%**	**100.0%**
Class D	-0.20%	-0.06%	-0.12%	100.1%	100.1%	100.0%
Class F	-0.29%	-0.26%	0.14%	100.0%	100.4%	100.0%
Class TGM	-0.36%	-0.18%	-0.18%	100.3%	100.5%	100.0%

	Random Access Main 10					
	Over ECM-10.0					
	Y	U	V	EncT	DecT	VmPeak
Class A1	-0.14%	-0.05%	-0.21%	100.2%	100.3%	100.0%
Class A2	0.04%	-0.05%	0.07%	101.0%	99.7%	99.7%
Class B	-0.07%	0.14%	-0.20%	100.2%	101.2%	100.1%
Class C	-0.13%	-0.04%	-0.06%	100.3%	100.9%	100.1%
Class E						
Overall	**-0.08%**	**0.01%**	**-0.11%**	**100.4%**	**100.6%**	**100.0%**
Class D	-0.38%	0.11%	-0.16%	100.0%	101.3%	100.0%
Class F	-0.10%	0.09%	0.18%	102.3%	104.0%	100.0%
Class TGM	-0.46%	-0.35%	-0.42%	100.7%	102.7%	100.0%

Thank you

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