

JVET-AH0117

AHG12: Modification of chroma QP mapping table for ECM

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ECM-12.0 vs. VTM-11.0ecm12.0

- BD-rate gain of chroma components is much higher than luma component

All Intra Main10					
Over VTM-11.0ecm12.0					
	Y	U	V	EncT	DecT
Class A1	-11.49%	-23.82%	-31.29%		
Class A2	-17.87%	-30.14%	-33.45%		
Class B	-12.19%	-28.03%	-26.89%		
Class C	-12.19%	-18.16%	-19.27%		
Class E	-16.00%	-26.76%	-24.38%		
Overall	-13.66%	-25.28%	-26.60%		
Class D	-10.16%	-15.74%	-16.30%		
Class F	-27.76%	-37.20%	-37.31%		
Class TGM	-40.85%	-48.69%	-47.92%		

Random access Main10					
Over VTM-11.0ecm12.0					
	Y	U	V	EncT	DecT
Class A1	-23.80%	-29.45%	-38.33%		
Class A2	-27.31%	-37.48%	-41.49%		
Class B	-22.31%	-36.57%	-34.80%		
Class C	-23.79%	-28.57%	-29.15%		
Class E					
Overall	-24.00%	-33.20%	-35.34%		
Class D	-24.62%	-29.48%	-30.46%		
Class F	-30.29%	-39.15%	-39.87%		
Class TGM	-38.31%	-45.25%	-45.36%		

Low delay B Main10					
Over VTM-11.0ecm12.0					
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	-18.68%	-41.71%	-39.50%		
Class C	-20.33%	-32.55%	-33.40%		
Class E	-17.84%	-33.16%	-31.46%		
Overall	-19.02%	-36.52%	-35.46%		
Class D	-22.12%	-35.14%	-34.68%		
Class F	-26.41%	-40.45%	-40.19%		
Class TGM	-36.79%	-46.01%	-46.24%		

Shift chroma gain to luma

- Modify chroma QP mapping table in the configuration files
 - AI: encoder_intra_ecm.cfg
 - RA: encoder_randomaccess_ecm.cfg
 - LDB: encoder_lowdelay_ecm.cfg

AI	ECM-12.0				
	QpInValCb	17	27	32	44
	QpOutValCb	17	29	34	41
	Proposed configuration				
	QpInValCb	17	26	31	43
	QpOutValCb	17	29	34	41
RA/LDB	ECM-12.0				
	QpInValCb	17	22	34	42
	QpOutValCb	17	23	35	39
	Proposed configuration				
	QpInValCb	17	22	32	40
	QpOutValCb	17	23	35	39

ECM-12.0

	All Intra Main10				
	Over VTM-11.0ecm12.0				
	Y	U	V	EncT	DecT
Class A1	-11.49%	-23.82%	-31.29%		
Class A2	-17.87%	-30.14%	-33.45%		
Class B	-12.19%	-28.03%	-26.89%		
Class C	-12.19%	-18.16%	-19.27%		
Class E	-16.00%	-26.76%	-24.38%		
Overall	-13.66%	-25.28%	-26.60%		
Class D	-10.16%	-15.74%	-16.30%		
Class F	-27.76%	-37.20%	-37.31%		
Class TGM	-40.85%	-48.69%	-47.92%		

	Random access Main10				
	Over VTM-11.0ecm12.0				
	Y	U	V	EncT	DecT
Class A1	-23.80%	-29.45%	-38.33%		
Class A2	-27.31%	-37.48%	-41.49%		
Class B	-22.31%	-36.57%	-34.80%		
Class C	-23.79%	-28.57%	-29.15%		
Class E					
Overall	-24.00%	-33.20%	-35.34%		
Class D	-24.62%	-29.48%	-30.46%		
Class F	-30.29%	-39.15%	-39.87%		
Class TGM	-38.31%	-45.25%	-45.36%		

	Low delay B Main10				
	Over VTM-11.0ecm12.0				
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	-18.68%	-41.71%	-39.50%		
Class C	-20.33%	-32.55%	-33.40%		
Class E	-17.84%	-33.16%	-31.46%		
Overall	-19.02%	-36.52%	-35.46%		
Class D	-22.12%	-35.14%	-34.68%		
Class F	-26.41%	-40.45%	-40.19%		
Class TGM	-36.79%	-46.01%	-46.24%		

Proposed configurations

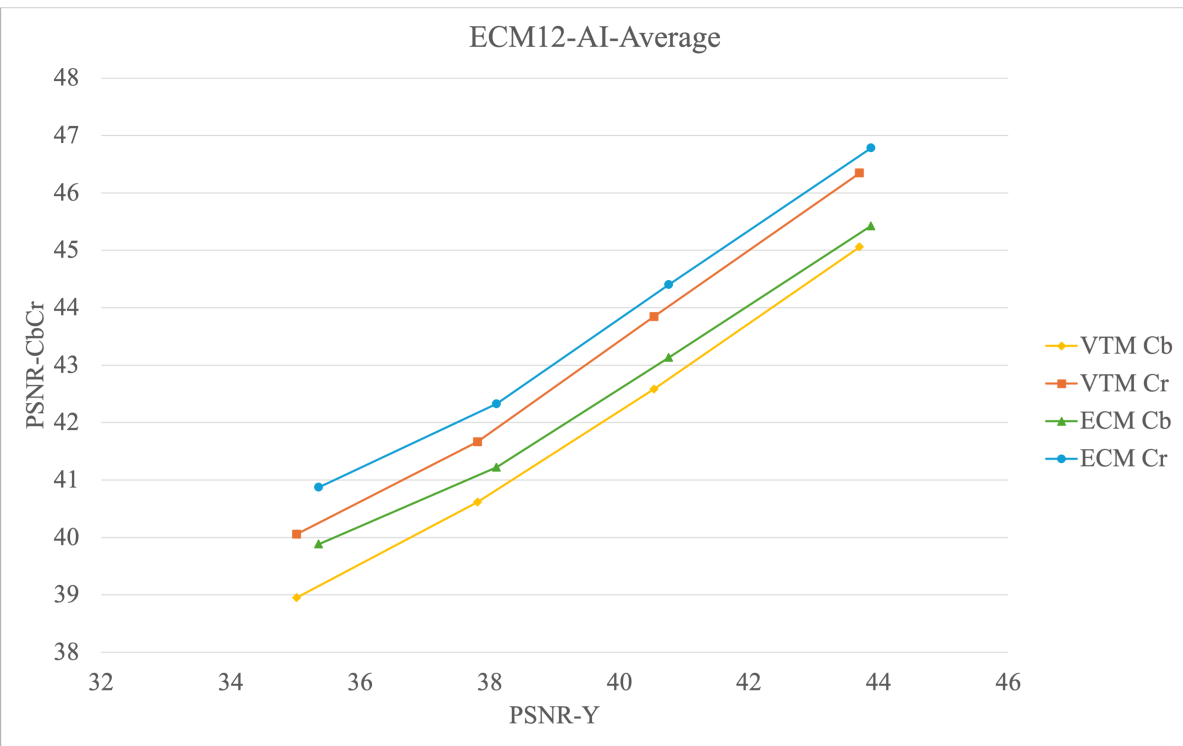
	All Intra Main10				
	Over VTM-11.0ecm12.0				
	Y	U	V	EncT	DecT
Class A1	-12.73%	-13.44%	-24.20%		
Class A2	-19.58%	-21.41%	-25.80%		
Class B	-12.94%	-19.29%	-17.16%		
Class C	-13.07%	-9.64%	-10.66%		
Class E	-16.60%	-19.31%	-16.49%		
Overall	-14.65%	-16.53%	-18.22%		
Class D	-11.07%	-6.65%	-7.16%		
Class F	-28.49%	-31.67%	-31.91%		
Class TGM	-41.53%	-46.86%	-46.30%		

	Random access Main10				
	Over VTM-11.0ecm12.0				
	Y	U	V	EncT	DecT
Class A1	-26.57%	-17.64%	-31.94%		
Class A2	-28.91%	-29.76%	-34.91%		
Class B	-22.93%	-26.69%	-24.47%		
Class C	-24.49%	-18.79%	-19.20%		
Class E					
Overall	-25.27%	-23.39%	-26.65%		
Class D	-25.24%	-20.45%	-20.80%		
Class F	-31.00%	-33.98%	-34.49%		
Class TGM	-39.21%	-42.81%	-42.99%		

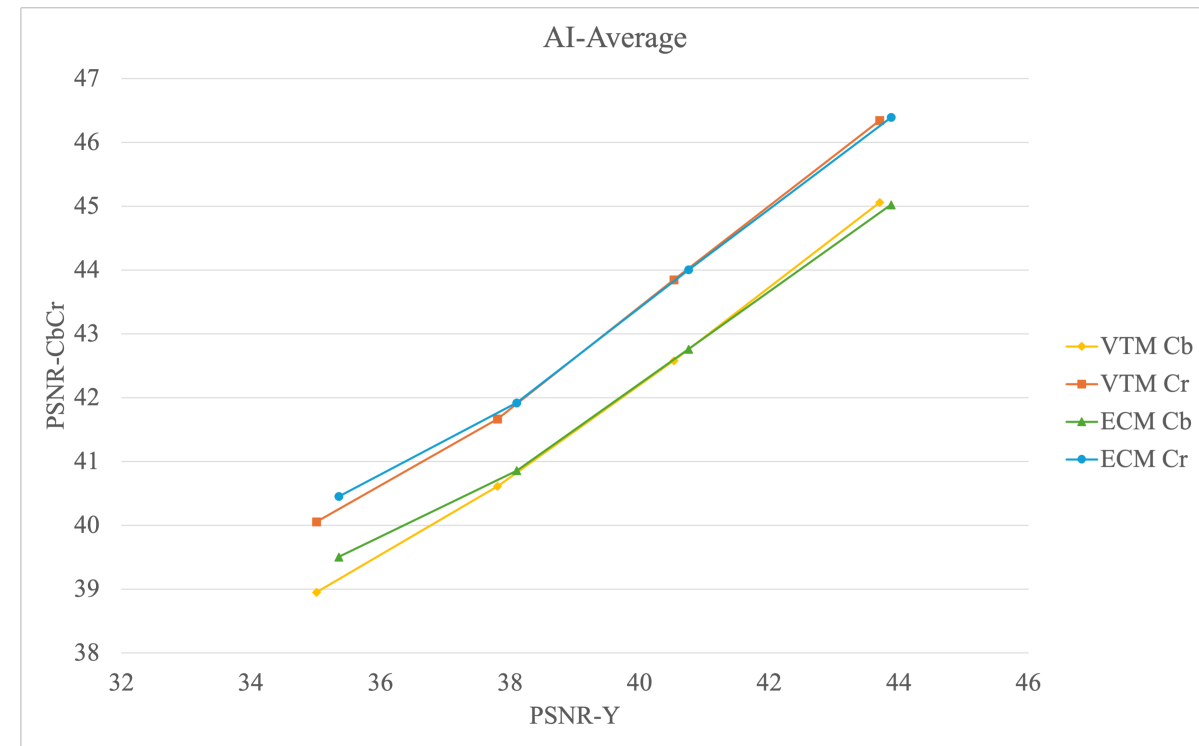
	Low delay B Main10				
	Over VTM-11.0ecm12.0				
	Y	U	V	EncT	DecT
Class A1					
Class A2					
Class B	-19.40%	-25.81%	-22.72%		
Class C	-21.14%	-16.46%	-16.91%		
Class E	-18.15%	-18.28%	-16.24%		
Overall	-19.67%	-20.81%	-19.16%		
Class D	-22.92%	-19.07%	-17.91%		
Class F	-27.32%	-30.96%	-30.68%		
Class TGM	-37.92%	-42.41%	-43.13%		

Analysis on PSNR comparison (AI)

ECM-12.0

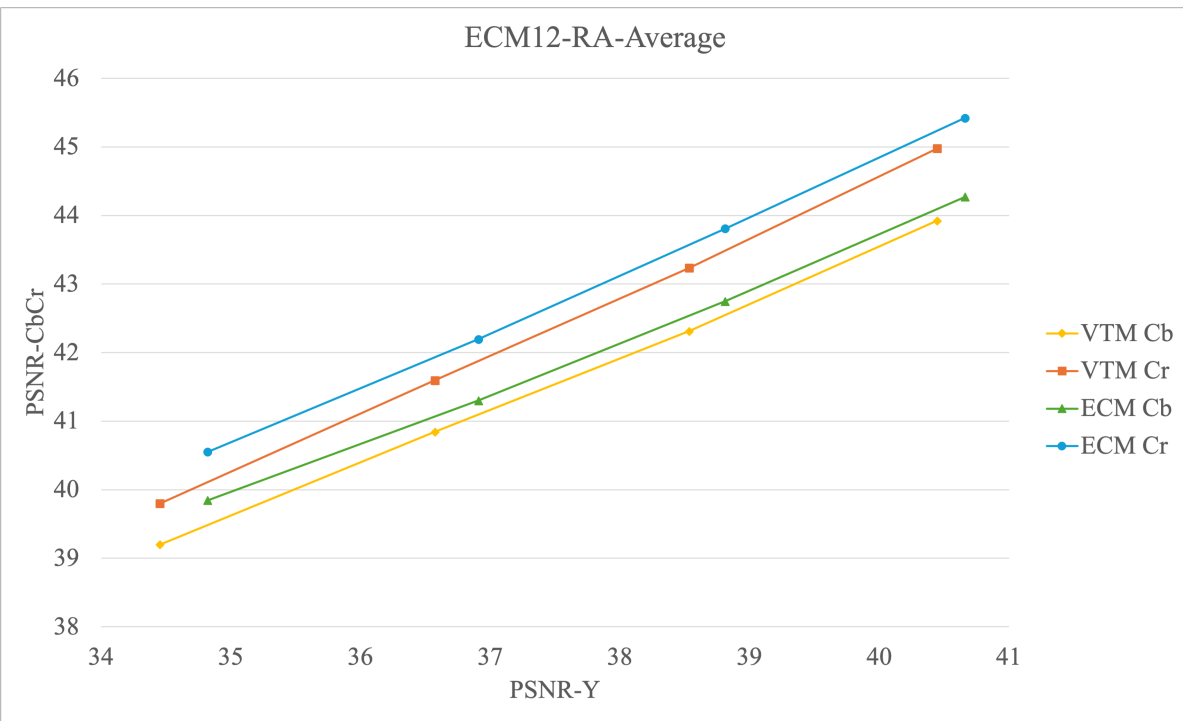


Proposed configurations

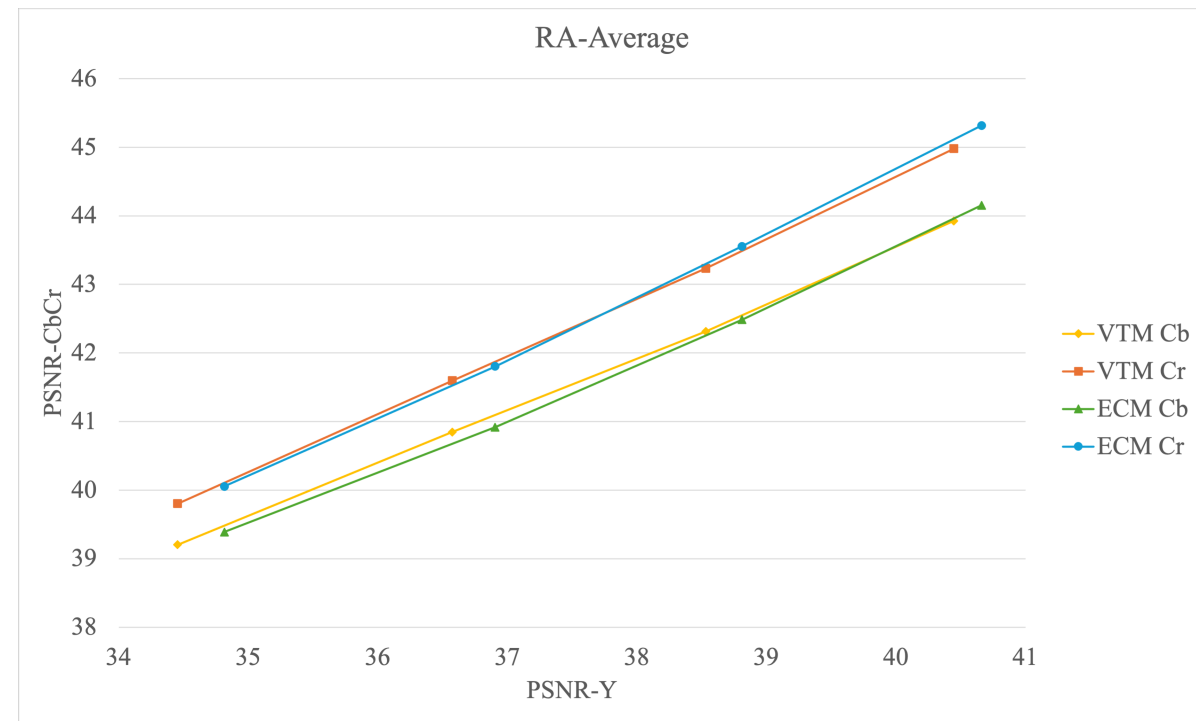


Analysis on PSNR comparison (RA)

ECM-12.0

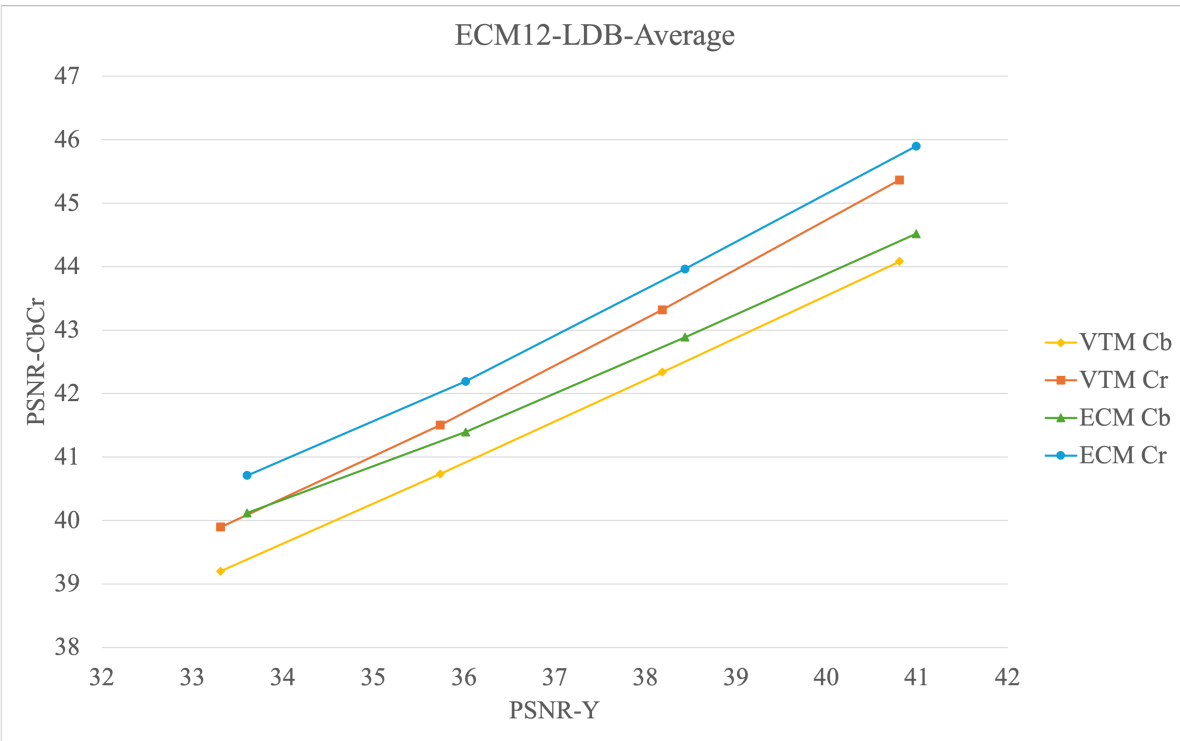


Proposed configurations

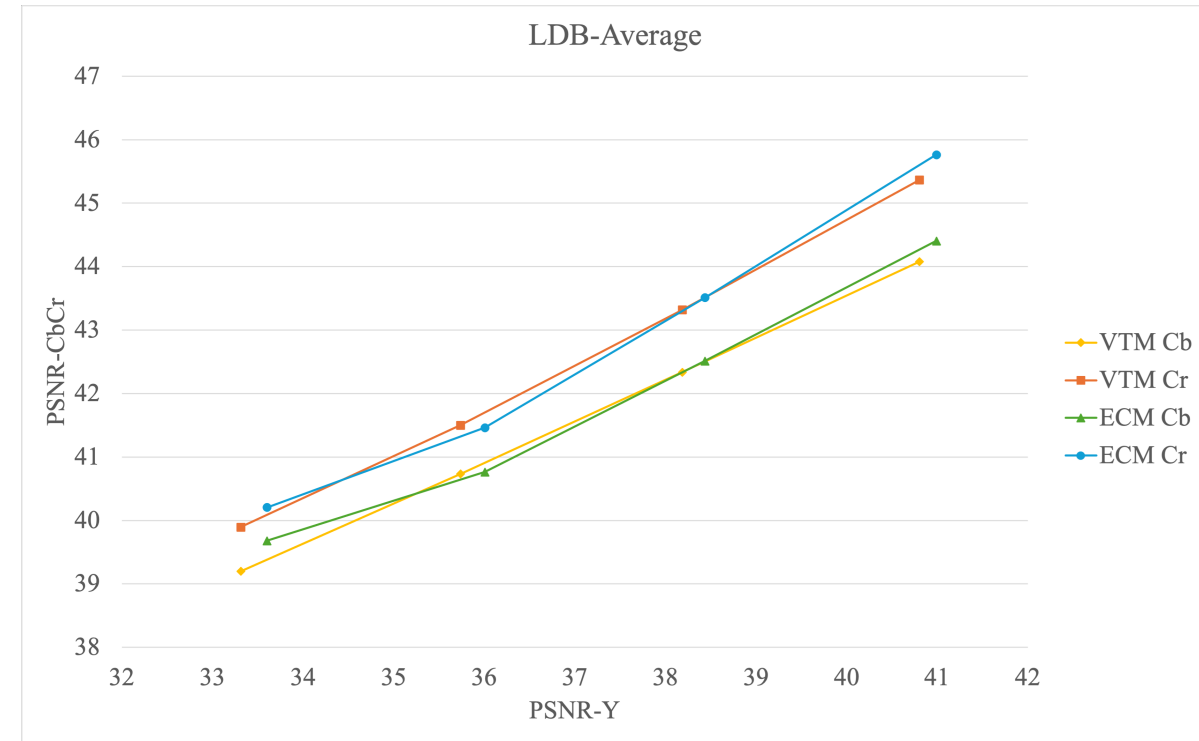


Analysis on PSNR comparison (LDB)

ECM-12.0



Proposed configurations



Option #2

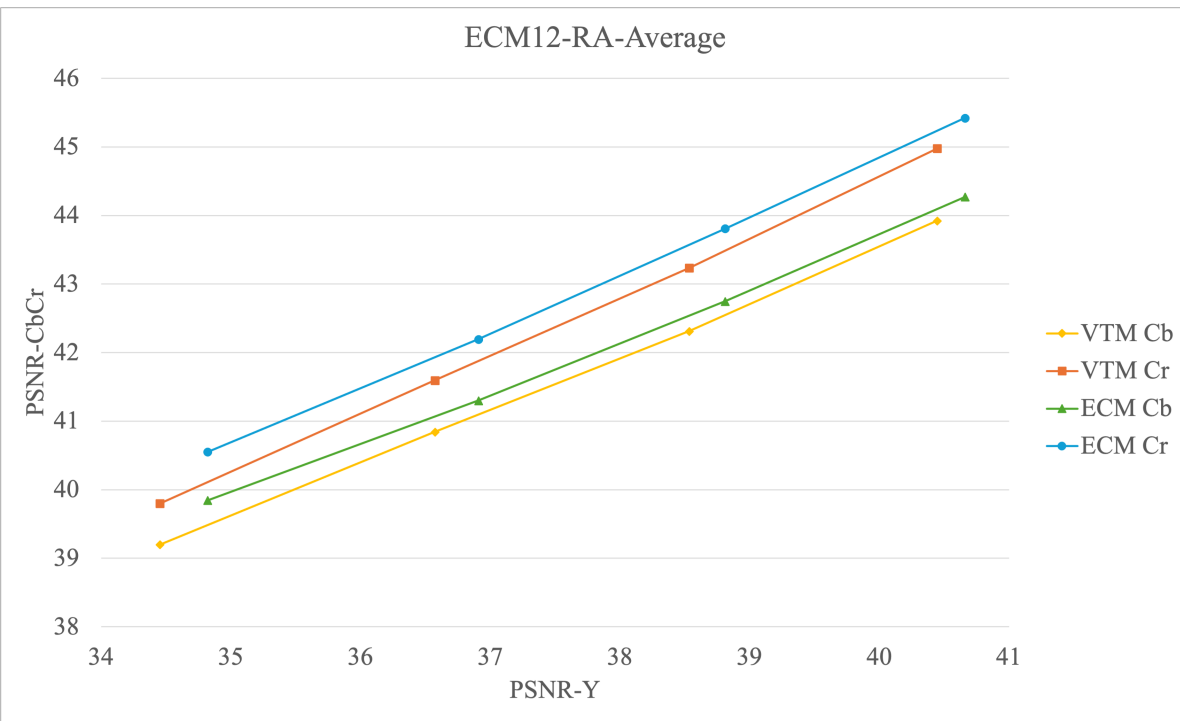
- Option #2: the configuration in the 1st version of JVE-AH0117
 - AI: same as Option #1
 - RA/LDB: Modify chroma QP mapping table in the configuration file as follows

RA/LDB	ECM-12.0				
	QpInValCb	17	22	34	42
	QpOutValCb	17	23	35	39
	Proposed configuration				
	QpInValCb	17	21	33	41
	QpOutValCb	17	23	35	39

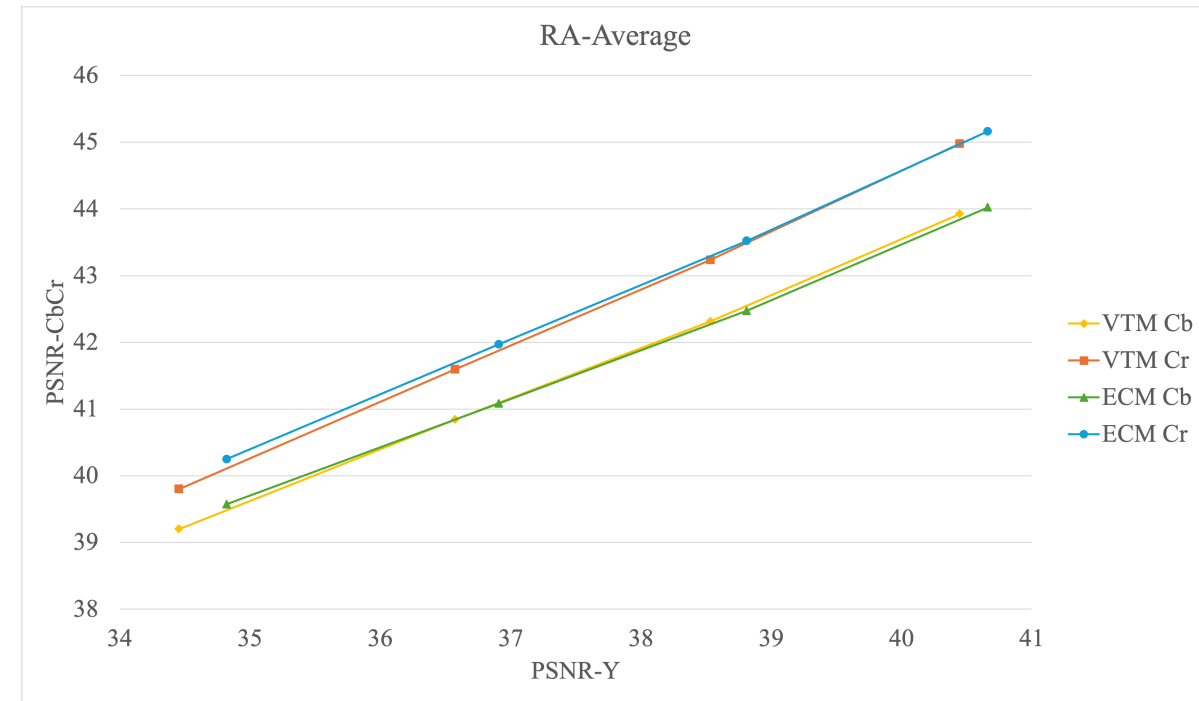
ECM-12.0						Option #1						Option #2					
	All Intra Main10						All Intra Main10						All Intra Main10				
	Over VTM-11.0ecm12.0						Over VTM-11.0ecm12.0						Over VTM-11.0ecm12.0				
	Y	U	V	EncT	DecT		Y	U	V	EncT	DecT		Y	U	V	EncT	DecT
Class A1	-11.49%	-23.82%	-31.29%			Class A1	-12.73%	-13.44%	-24.20%			Class A1	-12.73%	-13.44%	-24.20%		
Class A2	-17.87%	-30.14%	-33.45%			Class A2	-19.58%	-21.41%	-25.80%			Class A2	-19.58%	-21.41%	-25.80%		
Class B	-12.19%	-28.03%	-26.89%			Class B	-12.94%	-19.29%	-17.16%			Class B	-12.94%	-19.29%	-17.16%		
Class C	-12.19%	-18.16%	-19.27%			Class C	-13.07%	-9.64%	-10.66%			Class C	-13.07%	-9.64%	-10.66%		
Class E	-16.00%	-26.76%	-24.38%			Class E	-16.60%	-19.31%	-16.49%			Class E	-16.60%	-19.31%	-16.49%		
Overall	-13.66%	-25.28%	-26.60%			Overall	-14.65%	-16.53%	-18.22%			Overall	-14.65%	-16.53%	-18.22%		
Class D	-10.16%	-15.74%	-16.30%			Class D	-11.07%	-6.65%	-7.16%			Class D	-11.07%	-6.65%	-7.16%		
Class F	-27.76%	-37.20%	-37.31%			Class F	-28.49%	-31.67%	-31.91%			Class F	-28.49%	-31.67%	-31.91%		
Class TGM	-40.85%	-48.69%	-47.92%			Class TGM	-41.53%	-46.86%	-46.30%			Class TGM	-41.53%	-46.86%	-46.30%		
	Random access Main10						Random access Main10						Random access Main10				
	Over VTM-11.0ecm12.0						Over VTM-11.0ecm12.0						Over VTM-11.0ecm12.0				
	Y	U	V	EncT	DecT		Y	U	V	EncT	DecT		Y	U	V	EncT	DecT
Class A1	-23.80%	-29.45%	-38.33%			Class A1	-26.57%	-17.64%	-31.94%			Class A1	-25.53%	-21.31%	-33.42%		
Class A2	-27.31%	-37.48%	-41.49%			Class A2	-28.91%	-29.76%	-34.91%			Class A2	-28.56%	-31.07%	-36.09%		
Class B	-22.31%	-36.57%	-34.80%			Class B	-22.93%	-26.69%	-24.47%			Class B	-22.80%	-28.16%	-25.86%		
Class C	-23.79%	-28.57%	-29.15%			Class C	-24.49%	-18.79%	-19.20%			Class C	-24.37%	-19.58%	-20.25%		
Class E						Class E						Class E					
Overall	-24.00%	-33.20%	-35.34%			Overall	-25.27%	-23.39%	-26.65%			Overall	-24.92%	-25.09%	-27.92%		
Class D	-24.62%	-29.48%	-30.46%			Class D	-25.24%	-20.45%	-20.80%			Class D	-25.18%	-20.25%	-21.23%		
Class F	-30.29%	-39.15%	-39.87%			Class F	-31.00%	-33.98%	-34.49%			Class F	-31.00%	-33.23%	-34.06%		
Class TGM	-38.31%	-45.25%	-45.36%			Class TGM	-39.21%	-42.81%	-42.99%			Class TGM	-39.14%	-42.93%	-43.16%		
	Low delay B Main10						Low delay B Main10						Low delay B Main10				
	Over VTM-11.0ecm12.0						Over VTM-11.0ecm12.0						Over VTM-11.0ecm12.0				
	Y	U	V	EncT	DecT		Y	U	V	EncT	DecT		Y	U	V	EncT	DecT
Class A1						Class A1						Class A1					
Class A2						Class A2						Class A2					
Class B	-18.68%	-41.71%	-39.50%			Class B	-19.40%	-25.81%	-22.72%			Class B	-19.16%	-31.89%	-29.24%		
Class C	-20.33%	-32.55%	-33.40%			Class C	-21.14%	-16.46%	-16.91%			Class C	-20.92%	-21.92%	-23.36%		
Class E	-17.84%	-33.16%	-31.46%			Class E	-18.15%	-18.28%	-16.24%			Class E	-18.18%	-22.03%	-19.87%		
Overall	-19.02%	-36.52%	-35.46%			Overall	-19.67%	-20.81%	-19.16%			Overall	-19.50%	-26.10%	-24.94%		
Class D	-22.12%	-35.14%	-34.68%			Class D	-22.92%	-19.07%	-17.91%			Class D	-22.66%	-23.98%	-23.89%		
Class F	-26.41%	-40.45%	-40.19%			Class F	-27.32%	-30.96%	-30.68%			Class F	-27.00%	-34.74%	-34.87%		
Class TGM	-36.79%	-46.01%	-46.24%			Class TGM	-37.92%	-42.41%	-43.13%			Class TGM	-37.57%	-44.27%	-44.83%		

Analysis on PSNR comparison (Option #2 RA)

ECM-12.0

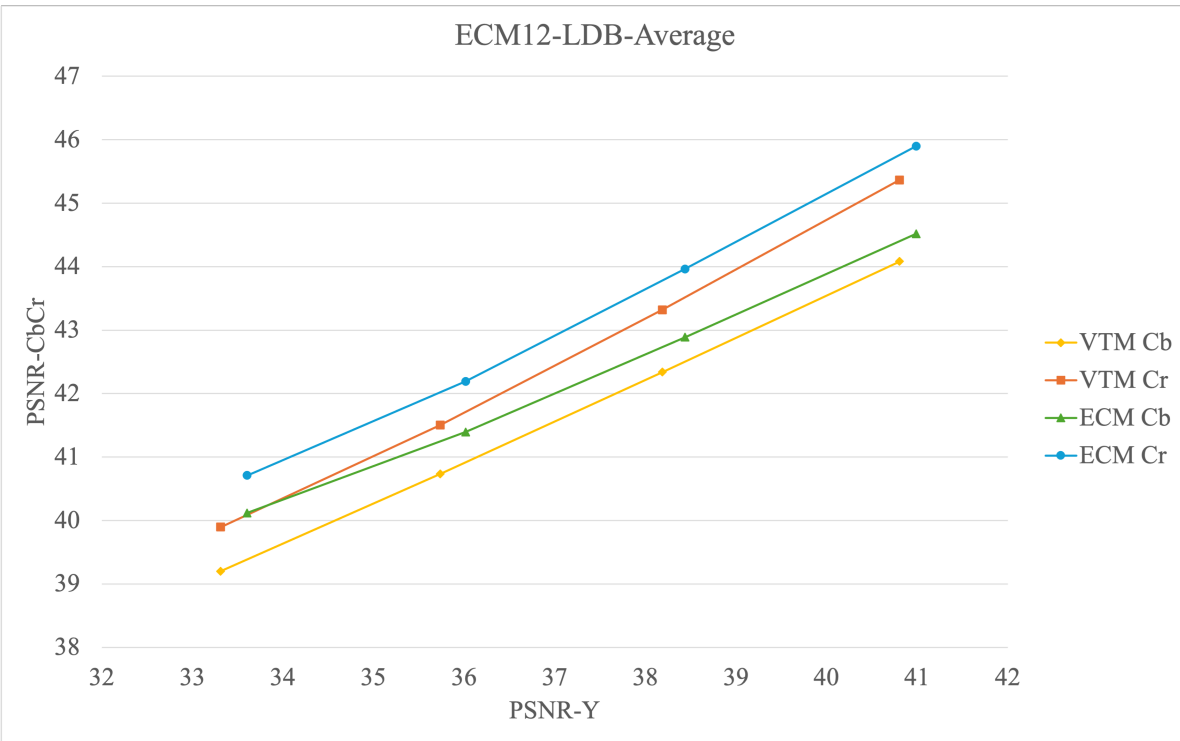


Proposed configurations

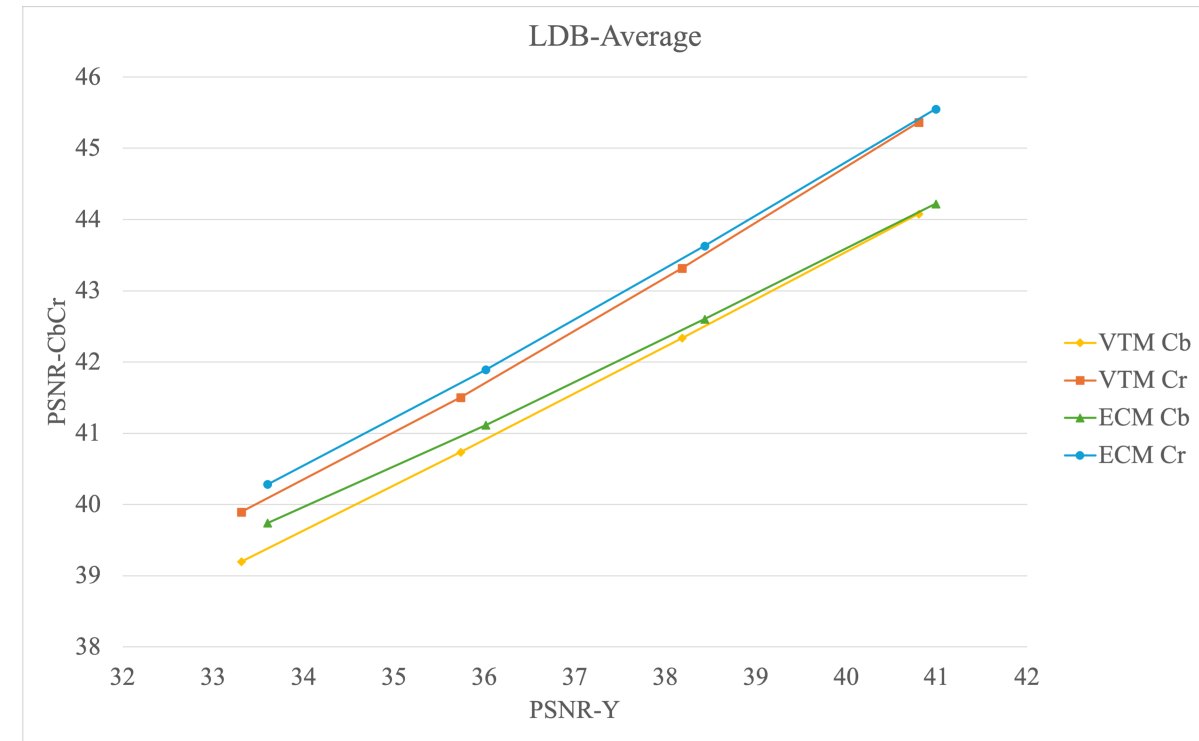


Analysis on PSNR comparison (Option #2 LDB)

ECM-12.0



Proposed configurations



Conclusions

- Proposed configuration:
 - It is proposed to change the chroma QP mapping table which is set in the configuration files of ECM software to obtain a balanced BD-rate gain of ECM over VTM between luma and chroma components
- It is recommended to adopt the proposed configurations into the next version of ECM

Thanks to OPPO and Kwai for
crosschecking!