

Title: Evaluation Report of Huawei and B-Com Test Sequences for Future Video Coding

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Purpose: Report

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Abstract

This document reports the encoding results of the test sequences provided by Huawei and B-Com for future video coding standardization. Objective RD-curves as well as subjective assessment are reported using both HM16.6 and KTA2.0 software. Visual artifacts are commented for each sequences and the behaviors of the coders are discussed. We suggest to include some interesting representative sequences to the JVET test set in the future common test conditions. In particular, the authors think that the sequence FreeSardines1 and Katana from B-Com should be included. A vertical video from Huawei, containing high camera motion, such as CStoreWalking, should also be added to the test set. It is representative of new video content which is uploaded from smartphones. These tests also raise the question of the QP selection. It appears that the QPs should be set per sequence, especially if noisy sequences like Huawei 4K content are selected. The encoded bitstreams and decoded YUV sequences using HM16.6 and KTA2.0 are provided at the meeting.

1 Test configuration

1.1 Preparation of test sequences

1.1.1 B-Com sequences conversion

Raw EXR content is provided by B-Com on the ftp server [3]. The following ffmpeg generic command line was used to convert EXR content into YUV 420 video sequences:

```
ffmpeg -start_number $firstFrame -i  
$rootUHDpath$UHDSequence"_3840x2160p_"$frameRate"_10_709_444_"%5d.dpx -sws_flags  
lanczos+accurate_rnd -pix_fmt yuv420p10le -frames $nbFrames  
$rootUHDpath$UHDSequence"_3840x2160p_"$frameRate"_10_709_420.yuv"
```

We confirm that the MD5 checksums of the converted YUV sequences match those provided by B-Com. For the objective and subjective evaluations, the following cuts have been performed according to [1]:

- 5 seconds (250 frames) for 50p sequences
- 5 seconds (300 frames) for 60p sequences
- 2.5 seconds (250 frames) for 100p sequences
- 2.5 seconds (300 frames) for 120p sequences

The MD5 checksums are shown in Table 1.

Table 1. MD5 checksums for the converted YUV sequences

#	Sequence (Scene)	Format	MD5 checksums
1	Drums2_3840x2160p_50_10_709_420	3840x2160	1df85ff9a82fb487afecab83b1d5aadf
2	Katana_3840x2160p_50_10_709_420	10 bit, 50p	86ffa131941d6c553db89ab04fa07f84
3	CatRobot1_3840x2160p_60_10_709_420	3840x2160	03a89792693fd9ecfd72ef2590025e97
4	FreeSardines1_3840x2160p_60_10_709_420	10 bit, 60p	6177966804650e18ecd6ca22f73a8480
5	Rowing2_3840x2160p_60_10_709_420		7c98d44379c0c42f690e2c04d642e5a3
6	Drums2_3840x2160p_100_10_709_420	3840x2160	f1a62b7004c1ceb0fe839f4ed2f30e73
7	Katana_3840x2160p_100_10_709_420	10 bit, 100p	83a284e777ff12c9eadb6137e211bb51
8	FreeSardines1_3840x2160p_120_10_709_420	3840x2160	1c998795f32b4d7f6681be797df51464
9	Rowing2_3840x2160p_120_10_709_420	10 bit, 120p	737737198accbb66dfb68abd23ecc146

1.1.2 Huawei sequences

The YUV 420 files are provided on the ftp server [3]. We confirm that the MD5 checksums of the converted YUV sequences, reported in Table 2, match those provided by Huawei.

Table 2. MD5 checksums for the Huawei YUV sequences

#	Sequence (Scene)	Format	MD5 checksums
1	AerialCrowd_3840x2160_30_10b_709_420	3840x2160	1157fa164d2262c9b959acf900551679
2	BridgeViewTraffic_3840x2160_60_10b_709_420	10 bit, 30p	
3	DaylightRoad_3840x2160_60_10b_709_420	3840x2160	c70357bc244b3349a544dae737d33087
4	NightRoad_3840x2160_60_10b_709_420	10 bit, 60p	165c70e3008d37b9ff476e997297fc5e
5	Square_3840x2160_60_10b_709_420		e13f46ff51607fd5eda429cd6f9b3d2d
6	Metro_3840x2160_60_10b_709_420		6d1fe01f3a97fcafb9adeff425afa2ed
7	CStoreWalking_720x960_30_300	ed4ac35cd1d659a3bf8cd846f5be0efc	
8	DrivingRecorder1_720x960_30_300	720x960	cf809af52eeeb43e6c2c5182641cfae3
9	DrivingRecorder2_720x960_30_300	8 bit, 30p	99f5af512fd3b367fd5c9eac049e6a2e
10	LakeWalking_720x960_30_300		e9f0b2683fc1d254462bc8a2d9f881f9
11	CStoreGoods_720x1280_30_300		b68f102b81faaeb73b4f64dfc6a65baa
12	ParkSunny_720x1280_30_300	720x1280	fc0b1bd9563d8d437b47a407ad3a48ce
13	ParkWalking_720x1280_30_300	8 bit, 30p	a57df6573e94b46ead3e912971bb1af7
			4ab4533fa72a8595bc0afd0d238f1755

1.2 Encoding condition

The encoding conditions described in [1] were used.

In particular, the coding parameters used specifically for the HM16.6-KTA2.0 encoder are the following ones:

MaxCUWidth : 256
MaxCUHeight : 256
MaxPartitionDepth : 6
QuadtreeTULog2MaxSize : 6
LoopFilterTcOffset_div2 : -2

In Randomaccess conditions:

CbQpOffset : 1
CrQpOffset : 1

1.3 Viewing equipment and methodology

TVLUM-560W: 56" 4K (3840 x 2160) 10 bit display was used for subjective evaluations.

The video sequences were viewed in two modes:

- video mode,
- frame-by-frame mode.

In video mode, a frame rate up-to 3.5 fps was obtained with 3840x2160 content.

Several people took part in this experiment. Coding artifact are reported by the authors of this contribution.

2 Evaluation of test sequences

2.1 Sequence and Evaluation Summary Table

Table 3 Evaluation Summary for the B-Com sequences

Scenario	Description	Thumbnail	Comments
Drums2_3840x2160p_50_10_709_420	A man playing the drums, with a coloured wall as a background.		Good signal to noise ratio. Slow global motion combined with fast moving objects in the foreground.
Katana_3840x2160p_50_10_709_420	Slow to fast moving man with a sword.		Very little noise also. Presence of both blurry and sharp edges. Fixed background.

CatRobot1_3840x2160p_60_10_709_420	Moving various objects: clothes, robot, book pages and a rotating target.		Many different colors. High amount of motion of different type. Very low noise.
FreeSardines1_3840x2160p_60_10_709_420	Falling water with slow panning.		Very low noise.
Rowing2_3840x2160p_60_10_709_420	Rowing scene with a global zooming motion.		Lots of spatial temporal activity in the texture correspond to the water.
Drums2_3840x2160p_100_10_709_420	A guy playing the drums, with a coloured wall as a background. Different depth compared to the 50fps sequence.		High contrast ratio between bright, enlightened areas and the black areas. Temporal blurring on the drumsticks.
Katana_3840x2160p_100_10_709_420	Slow to fast moving man with a sword.		Different scene from the Katana_50 sequence. Slightly darker.
FreeSardines1_3840x2160p_120_10_709_420	Falling water with slow panning.		More zoomed on the falling water, hence higher spatial and temporal activity in the signal.
Rowing2_3840x2160p_120_10_709_420	Rowing scene with a global zooming motion.		Darker shooting than the Rowing2_p60 sequence. Better visual details. Different hues also.

Table 3 Evaluation Summary for the Huawei sequences

Scenario	Description	Thumbnail	Comments
AerialCrowd_3840x2160_30_10b_709_420	Crowd of people walking, with a global panning scene motion.		Visual aspect looking like a bracketing system was used for the capture. Some temporal noise noticeable in the original sequence.

BridgeViewTraffic_3840x2160_60_10b_709_420	Car traffic under a bridge, in a fixed scene.		Signifiicant amount of noise in the road andvegetation.
DaylightRoad_3840x2160_60_10b_709_420	On a car board filmed road.		Significant amount of noise.
NightRoad_3840x2160_60_10b_709_420	Road filmed on board in a moving car.		High amount of noise.
Square_3840x2160_60_10b_709_420	Square with walking people in it.		High amount of noise. Some scene cuts. Panning motion.
Metro_3840x2160_60_10b_709_420	Fixed scene of a subway station with people walking in it.		Significant amount of noise. Edges with strange blue colors, in particular around white areas.
CStoreWalking_720x960_30_300	Vertical video. Goods in a store, filmed with a mobile phone.		Significant scene motion corresponding to the moving camera. Blurry content.
DrivingRecorder1_720x960_30_300	Road seen from a moving car, captured with a mobile phone.		Two types of motions, respectively linked to the car trajectory and to vibrations.
DrivingRecorder2_720x960_30_300	Road seen from a moving car, captured with a mobile phone.		Two types of motions, respectively linked to the car trajectory and to vibrations.

LakeWalking_720x960_30_300	Fixed scene filmed with a moving mobile phone.		High motion due to highly moving camera.
CStoreGoods_720x1280_30_300	Vertical video. Goods in a store, filmed with a mobile phone.		Fixed objects, scene motion corresponding to the moving camera. Blurry content.
ParkSunny_720x1280_30_300	Park filmed with a mobile phone. Panning motion.		Blurry content.
ParkWalking_720x1280_30_300	Park filmed with a mobile phone, by a walking person.		High amount of motion, due to low frame rate. Low detailed texture.

1.2 Results

The attached Excel tables contain all the simulation results. In this document, the RD-curves obtained as a result of objective evaluation are presented sequence by sequence below. Only Random access curves are reported in this document, please refer to the attached Excel sheets for other configurations. Some visual artifacts found while performing subjective evaluation are shown after the RD-curves that characterize this sequence. In addition, we commented artifacts for each sequence.

1.2.1 Drums2_3840x2160p_50_10_709_420

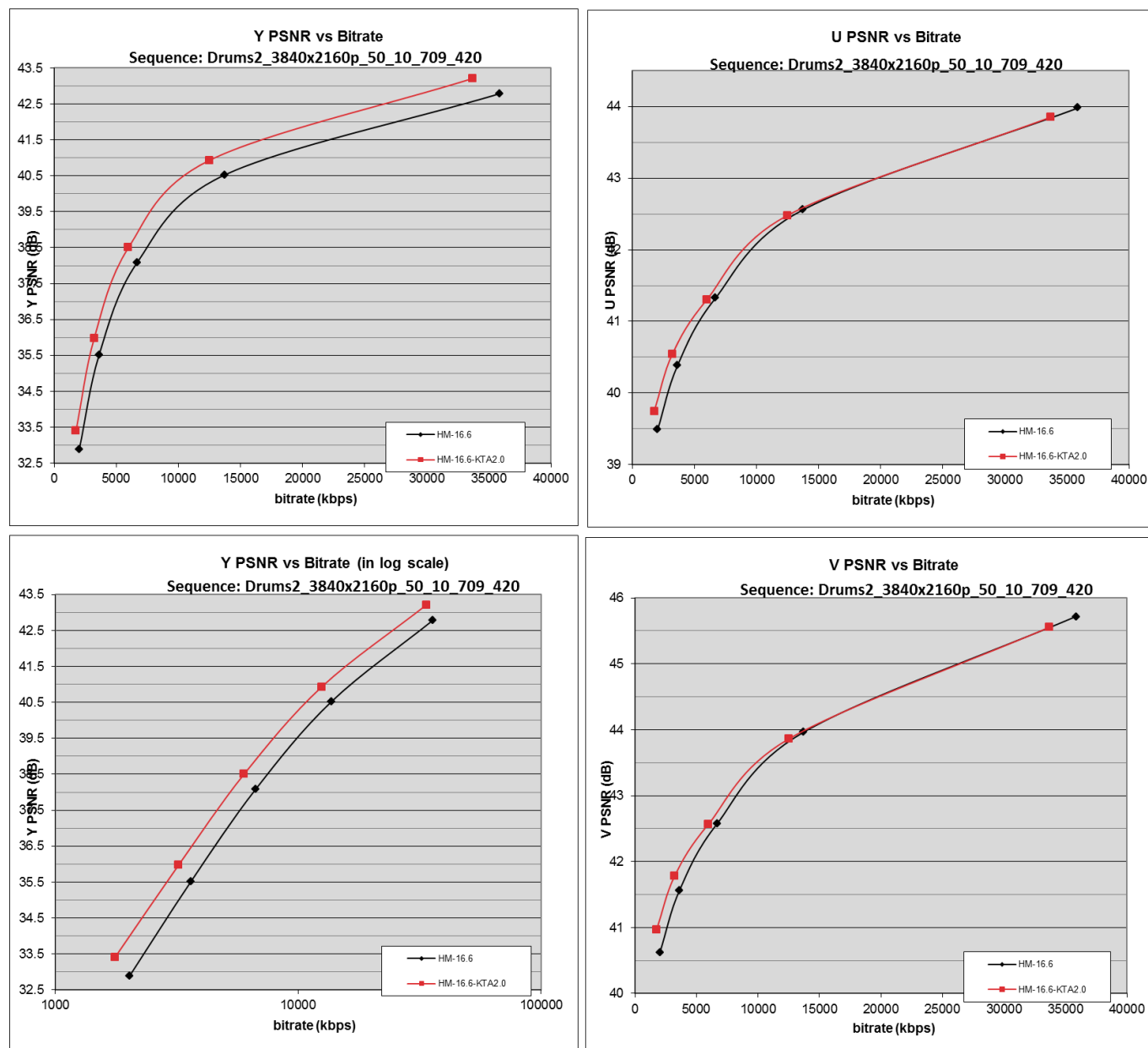


Figure 1: Drums2_3840x2160p_50_10_709_420 rate distortion curves (RA)

This sequence contains a lot of textures (e.g. background wall).

The most noticeable artifacts that can be seen due to HEVC coding lie in the grain of the texture areas, the directional intra prediction related visual effects, and the blocking artifacts that are quite noticeable on fast moving drumsticks. These artifacts are mostly viewable in frame-by-frame view mode, even if they can be noticed in video mode also.

In video viewing mode, a significant artefact concern the blocking artifacts observed on the block area (see Figure 5).

Texture grain is being significantly lost from QP=32 in RA configuration. See Figure 2.



Figure 2: Frame 57, texture degradation obtained with QP=32 (left) compared to QP=22 (right)



Figure 3: Frame 61: blocking artifacts obtained on QP=32 (left) and QP=27 (middle). Not visible with QP=22 (right)

In video mode, the blocking artifacts of Figure 3 become visible starting from QP=37. Moreover, KTA2 performs visually better than the HM16.6.

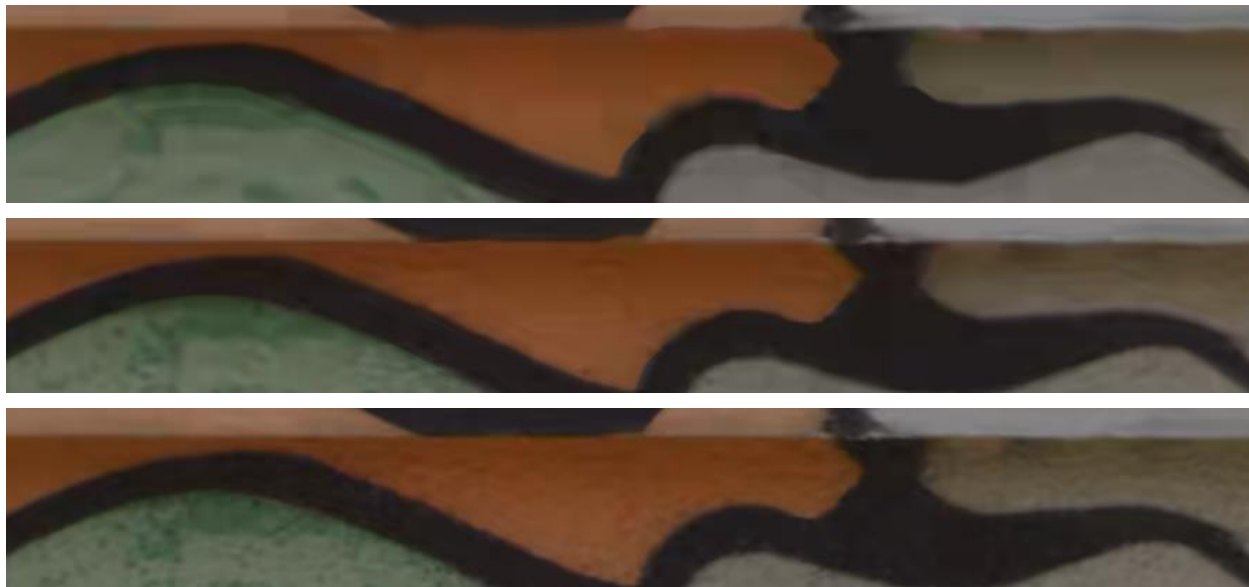
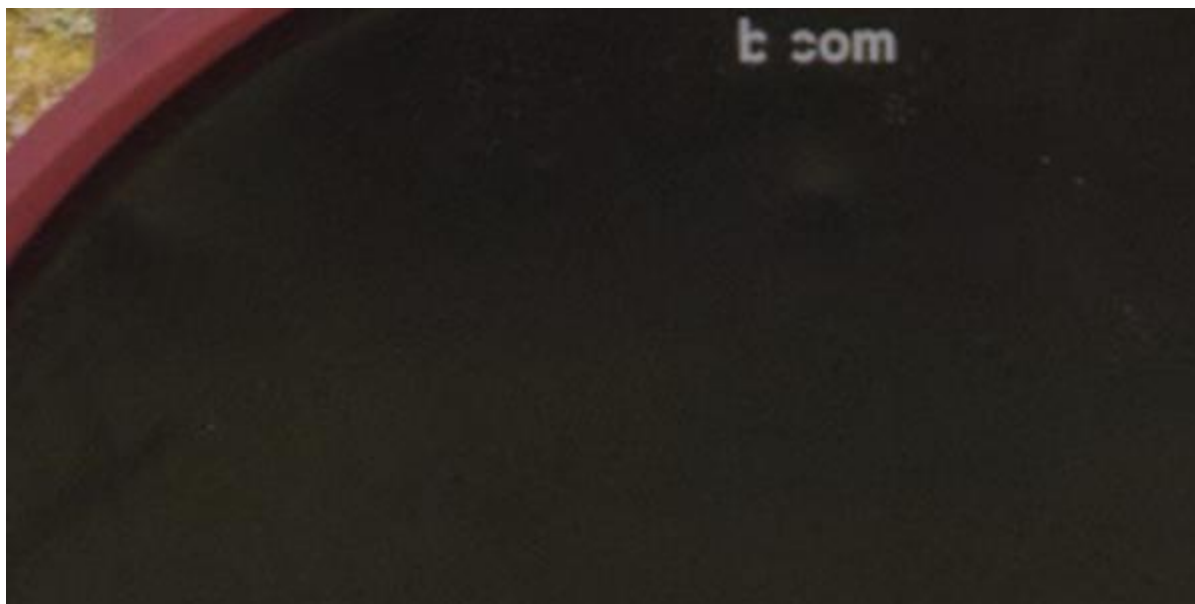


Figure 4: Frame 8, directional intra prediction artifacts (top: QP=42, middle: QP=37, bottom: QP=32)



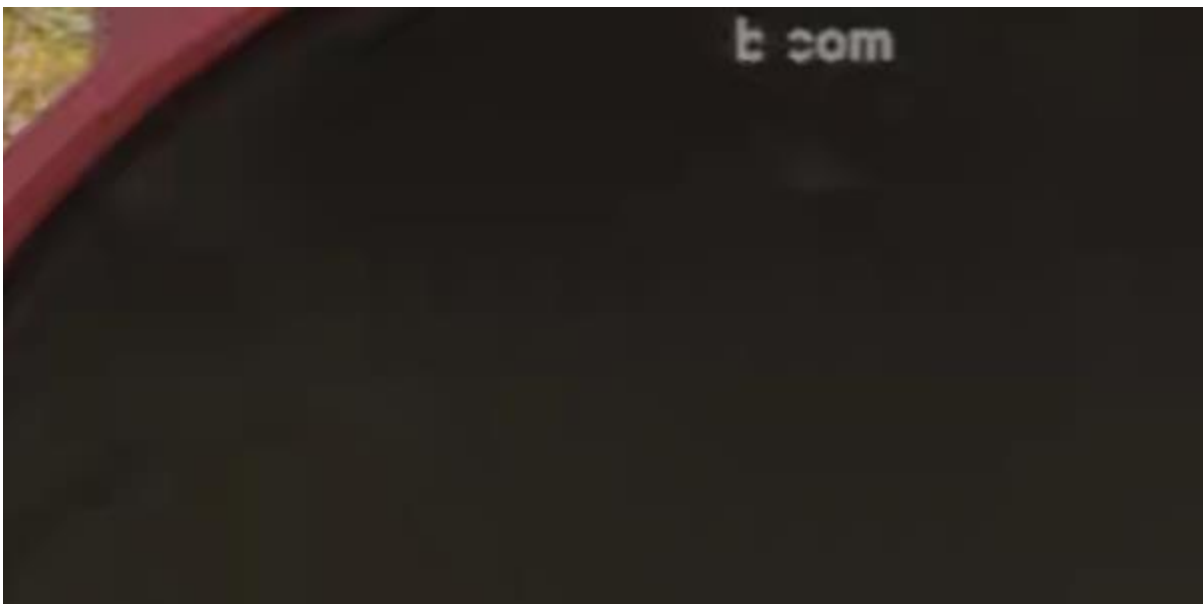
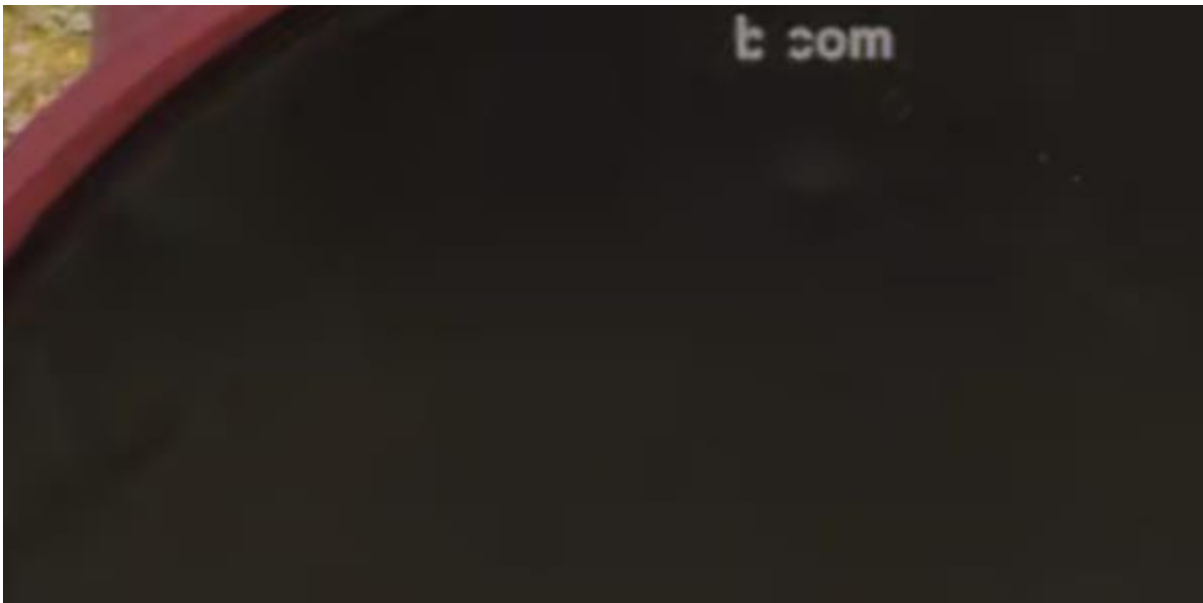
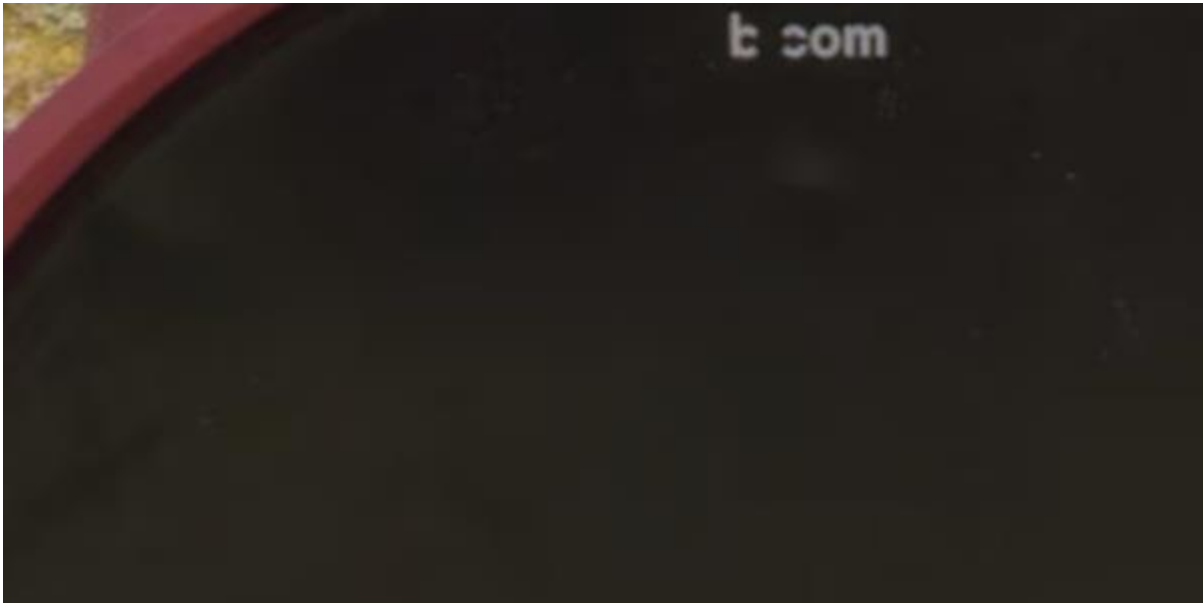


Figure 5: HM-16.2. Artifacts on black areas (QP from 22 to 37, from top to bottom)

In video mode, the dark areas' artefact of Figure 5 are low and depend on the viewing conditions.

1.2.2 Katana_3840x2160p_50_10_709_420

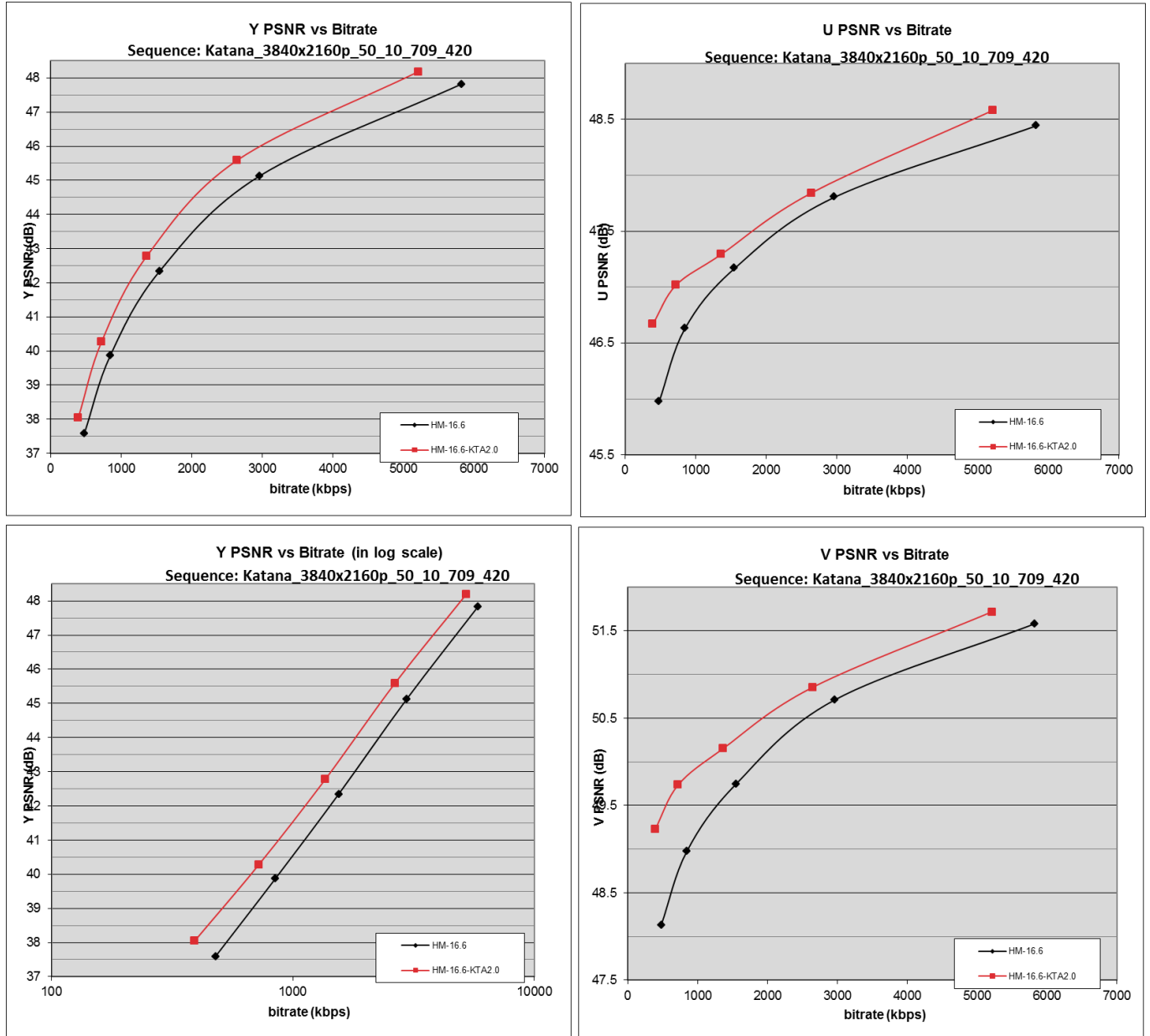


Figure 6: RD curves, random access mode, Katana_3840x2160_50_10b_709_420

This sequences contains a fixed, textured, background. In the foreground, some high motion is present.

The artifacts that are typically obtained here are the following ones:

- Significant Blocking artifacts in spatial and temporal areas with a high level of motion (see Figure 9)
- Intra prediction related artifacts and blocking artifacts in the moving black areas (cloth). See Figure 8.

- Intra prediction related artifacts and blocking artifacts on the man's face. See Figure 7 and Figure 9.



Figure 7: Picture 40. HM-16.6. Left: QP=37; middle: QP=32, right: QP=27

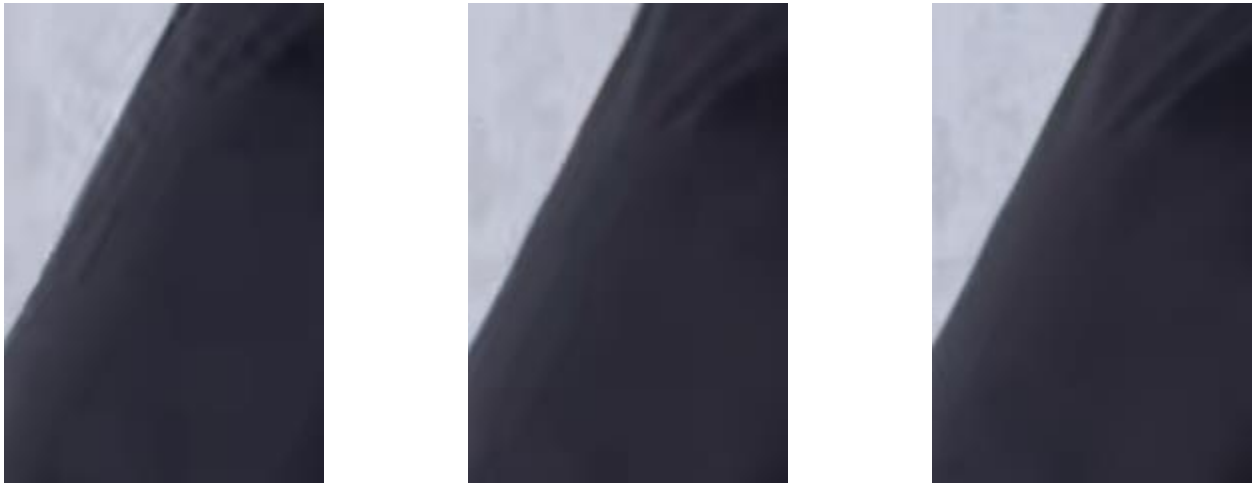


Figure 8: Picture 40. HM-16.6. Left: QP=37; middle: QP=32, right: QP=27



Figure 9: Picture 18; HM-16.6; left: QP=37, right: QP=32

In video mode, blocking artifacts appear very clearly as well, at QP=32 and beyond. Some chroma artifacts are also quite noticeable as well in video mode.

In smooth regions with high motion, motion compensation, which is mainly driven by the luma, can lead to strong chroma errors, as can be noticed in Figure 10.



Figure 10 : Blocking and chroma artifacts on Katana (POC #113) at QP37. Left: HM16.6, Right: KTA2.0

1.2.3 CatRobot1_3840x2160p_60_10_709_420

As shown in Figure 12, the texture grain remains at QP=22 and has disappeared at QP=27, which explains the shape of the rate distortion curves below.

At lower bitrates, the visible artifacts include Intra Prediction related artifacts (Figure 13), which are propagated along the temporal axis.

Note that these artifacts are much less visible with the KTA2 (Figure 13 and Figure 14) than with the HM.

Generally speaking, it is noticed that KTA2 tends to render much smoother textures than the HM at low bitrates.

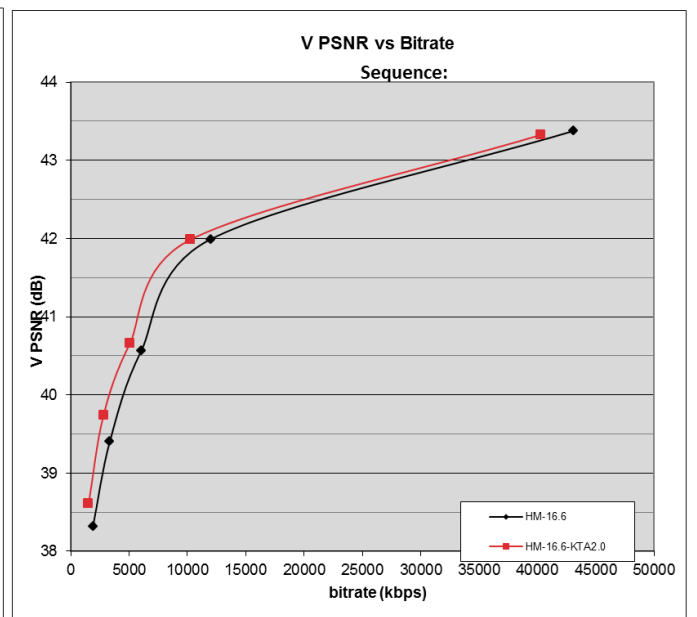
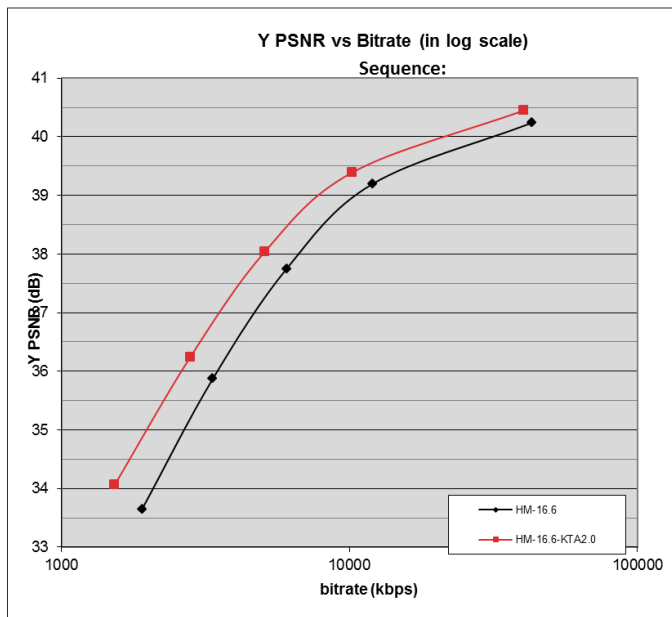
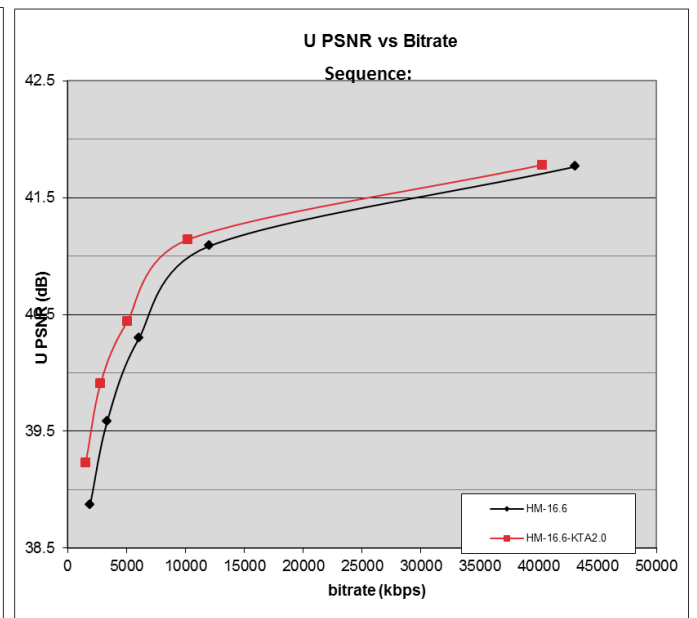
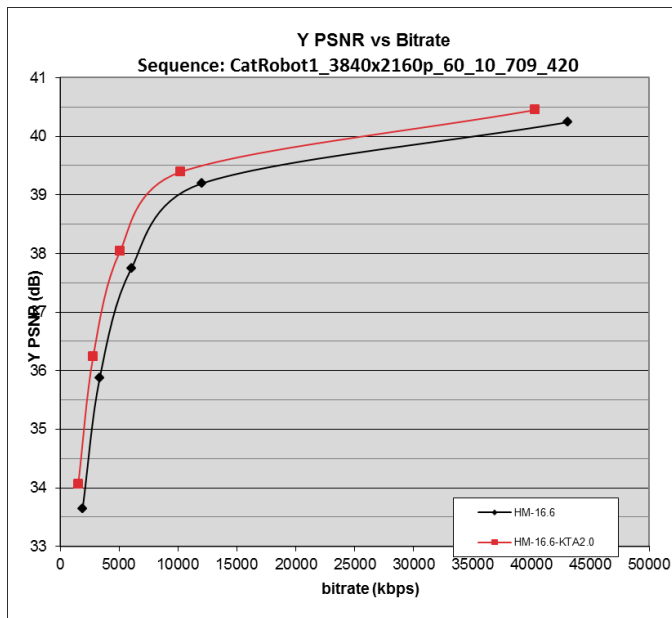


Figure 11: RD curves, random access mode, CatRobot_3840x2160_60_10b_709_420

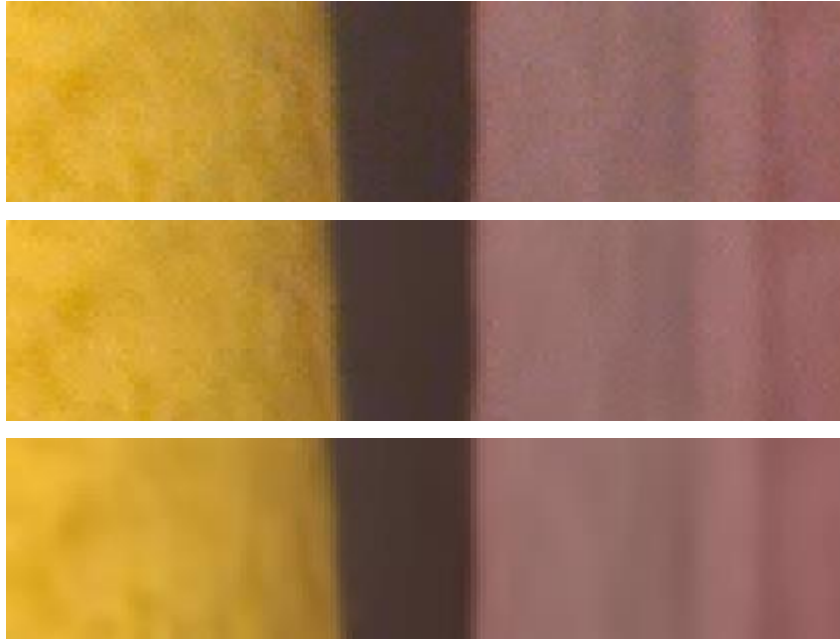


Figure 12: POC0; Top: original; Middle: QP=22; Bottom: QP=27

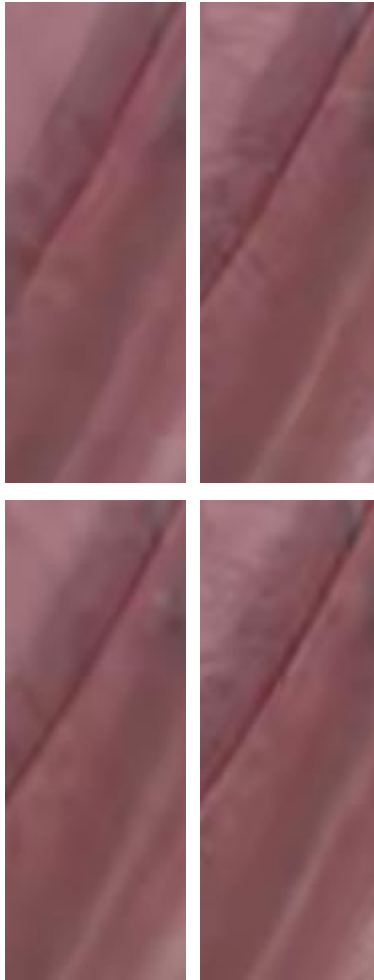


Figure 13: POC 65; TopLeft: HM QP=42; TopRight: HM QP=37; Bottom Left: KTA2 QP=42; Bottom Right KTA2 QP=37

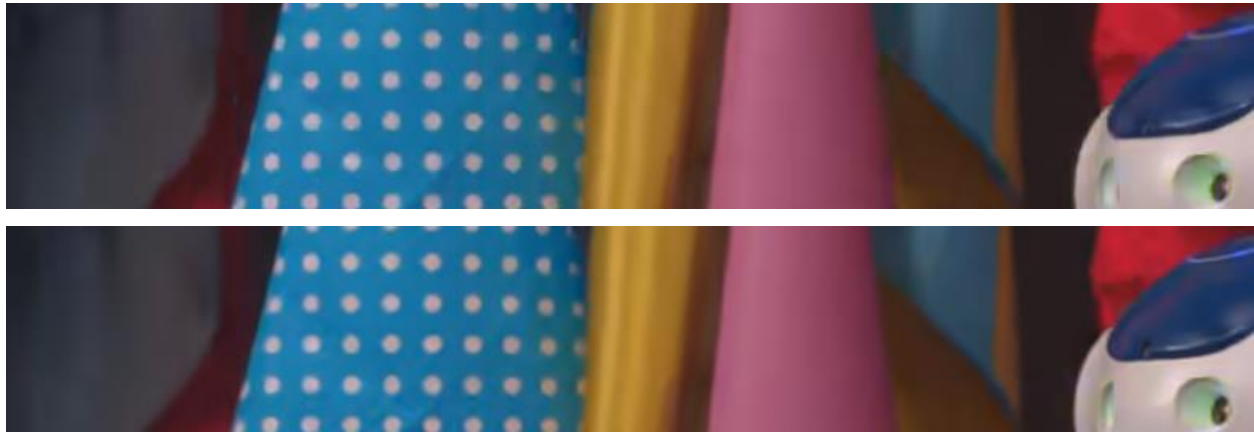


Figure 14: POC 86, QP=42; Top: HM-16.6; Bottom: HM-16.6-KTA2.0

1.2.4 FreeSardines1_3840x2160p_60_10_709_420

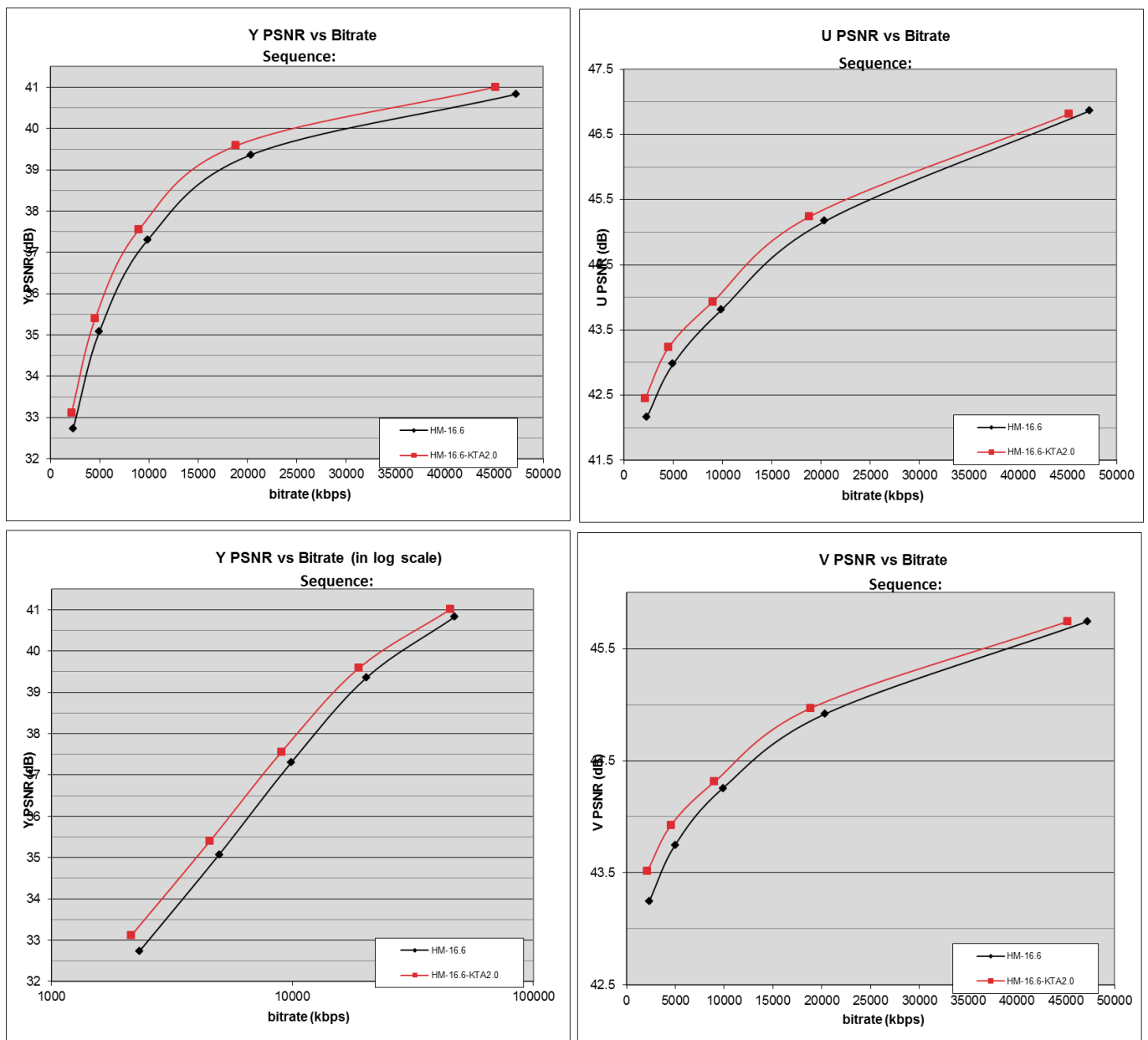


Figure 15: RD curves, random access mode, FreeSardines1_3840x2160_60_10b_709_420

The significant motion contained in this sequence leads to significant blocking artifacts, which appears from QP=32 (see Figure 16).

One notices that these blocking artifacts are much lower with the KTA2.0 than with the HM-16.6 codec (see Figure 17 and Figure 18).

The blocking artifacts lead to high temporal flickering in video mode, which becomes quite noticeable from QP=32. Temporal flickering appears both with RA and LDB coding structures.



Figure 16: POC 86, HM-16.6. Top: QP=27; Bottom: QP=32



Figure 17: POC 86; QP=37; Top: HM-16.6; Bottom: HM-16.6-KTA2.0



Figure 18: POC 86; QP=42; Top: HM-16.6; Bottom: HM-16.6-KTA2.0

1.2.5 Rowing2_3840x2160p_60_10_709_420

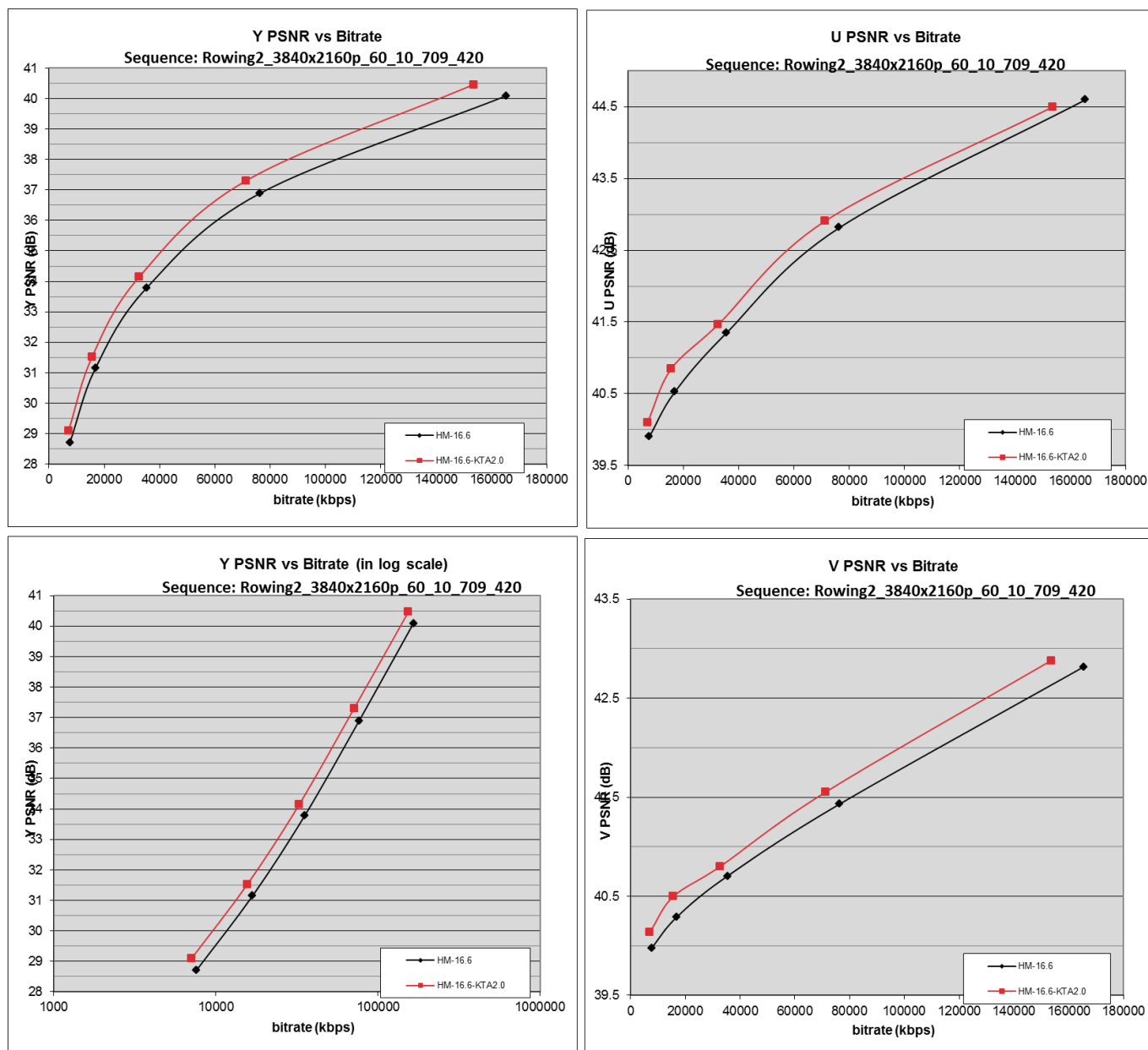


Figure 19: RD curves, random access mode, Rowing2_3840x2160_60_10b_709_420

Blocking artifacts can be viewed from QP=32 on this sequence (Figure 20).



Figure 20: POC 86, HM-16.6, QP=32. Blocking artifacts noticeable in high motion areas



Figure 21: POC 86, HM-16.6, QP=37



Figure 22: POC 86, HM-16.6, QP=42

One notes that blocking artifacts are much lower with the KTA2.0 than with the HM-16.6 (see Figure 23).



Figure 23: POC 86, QP=42. Top: HM-16.6. Bottom: HM-16.6-KTA2.0

In video mode, the hierarchical B picture coding structure leads to flickering artifacts. At QP=37, blocking artefact remain quite reasonably low. They're visible in water areas with high motion. KTA2 reconstructed textures reveal smoother. The KTA2 also generates some color artifacts in the water.

1.2.6 Drums2_3840x2160p_100_10_709_420

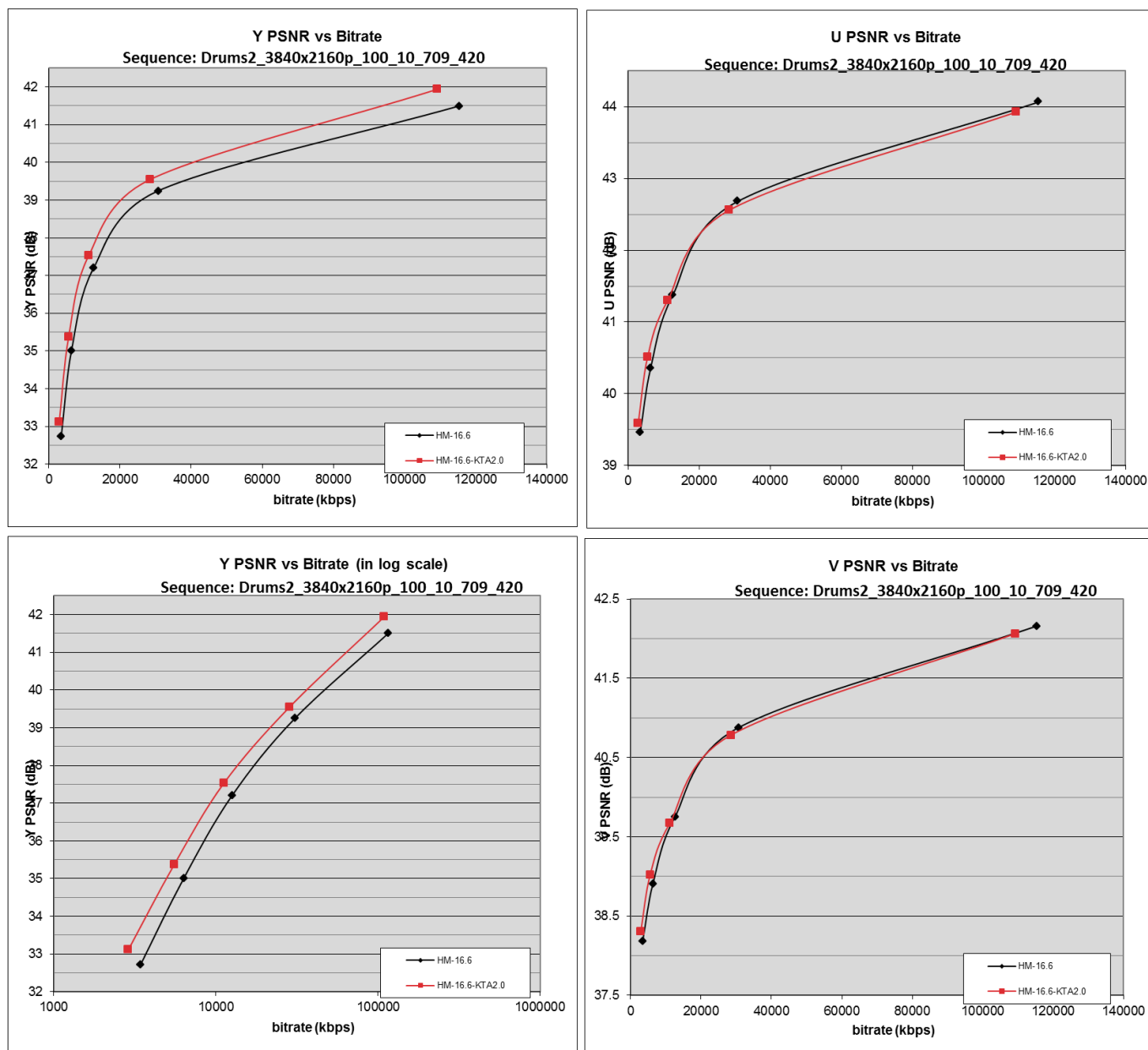


Figure 24: RD curves, random access mode, Drums2_3840x2160_100_10b_709_420

Artifacts similar to those of the Drums_p50 sequence are obtained on this sequence.

Additionally, the two following figures illustrate the different visual effects obtained respectively with the HM-16.6 and the KTA2.0, regarding blocking artifacts in high motion zones, and intra prediction related artifacts.

As already observed in the previous sections, the KTA2 produces much smoother reconstructed pictures, with less blocking and intra prediction related artifacts.



Figure 25: POC 195; QP=32; Top: HM-16.6; Bottom: HM-16.2-KTA2.0



Figure 26: POC 96, QP=42; Top: HM-16.6; Bottom: HM-16.6-KTA2.0

In video mode, same remarks as for the corresponding 50fps sequence can be done. The guy's arms are a bit less blocky.

1.2.7 Katana_3840x2160p_100_10_709_420

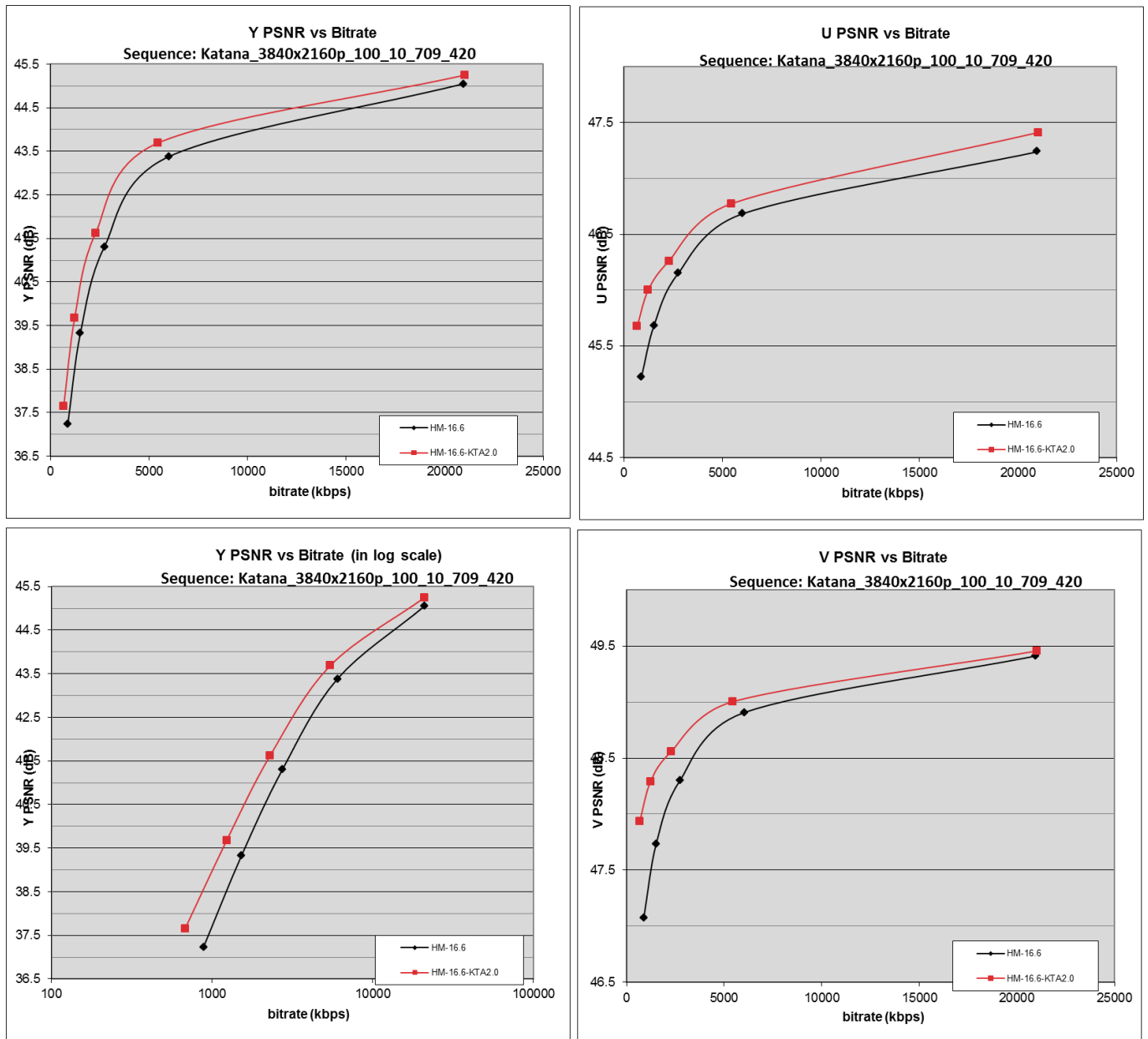


Figure 27: RD curves, random access mode, Katana100_3840x2160_100_10b_709_420



Figure 28: POC 42; QP=37; Top:HM-16.6; Bottom: KTA2.0

In video mode, blocking artifacts are noticeable, though they are a bit lower than with the 50 fps corresponding sequence.

1.2.8 FreeSardines1_3840x2160p_120_10_709_420

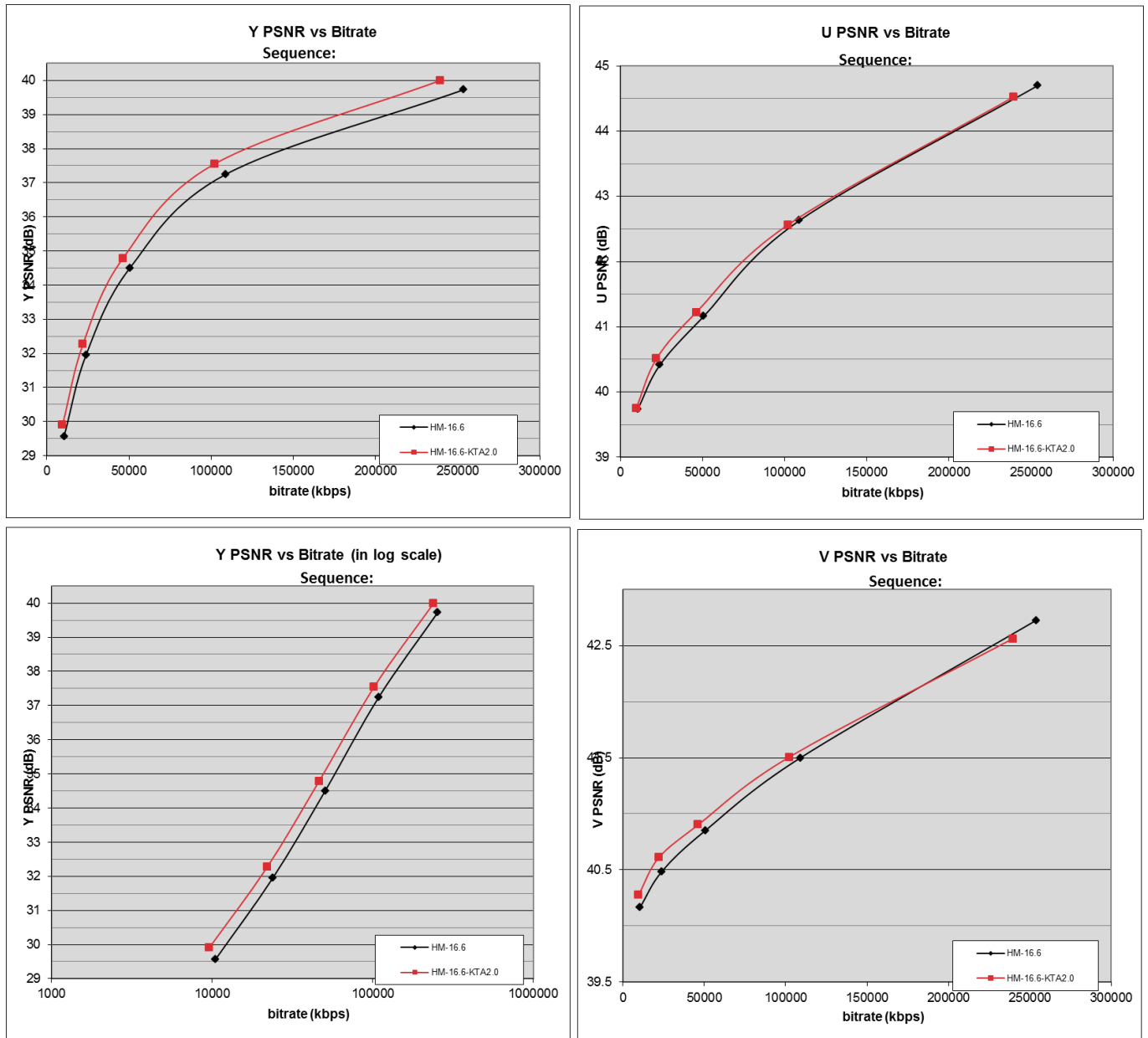


Figure 29: RD curves, random access mode, FreeSardines1_3840x2160_120_10b_709_420

This sequence contains motions which give hard times to the inter frame tools since the water texture is highly deformable. This results in block artifacts visible from QP27 in Figure 30. One can notice that the blur introduced by the severe degradations tends to reduce bloc artifacts at QP42 compared to QP32 for instance.

For this sequence, the artifacts become visible at QP27 in video mode. Some artifacts can be visible from QP22 in still picture viewing mode.

As for the p60 version of this sequence, the blocking artifacts lead to high temporal flickering in video mode, which becomes quite noticeable from QP=32. Temporal flickering appears both with RA and LDB coding structures.

QP22

QP27

QP32

QP37

QP42



Figure 30: Snapshot POC #1 Random Access at different QP.



Figure 31: POC #1 QP32, differences between HM16.6 and KTA2.0

1.2.9 Rowing2_3840x2160p_120_10_709_420

This sequence also contains highly deformable and moving water texture.

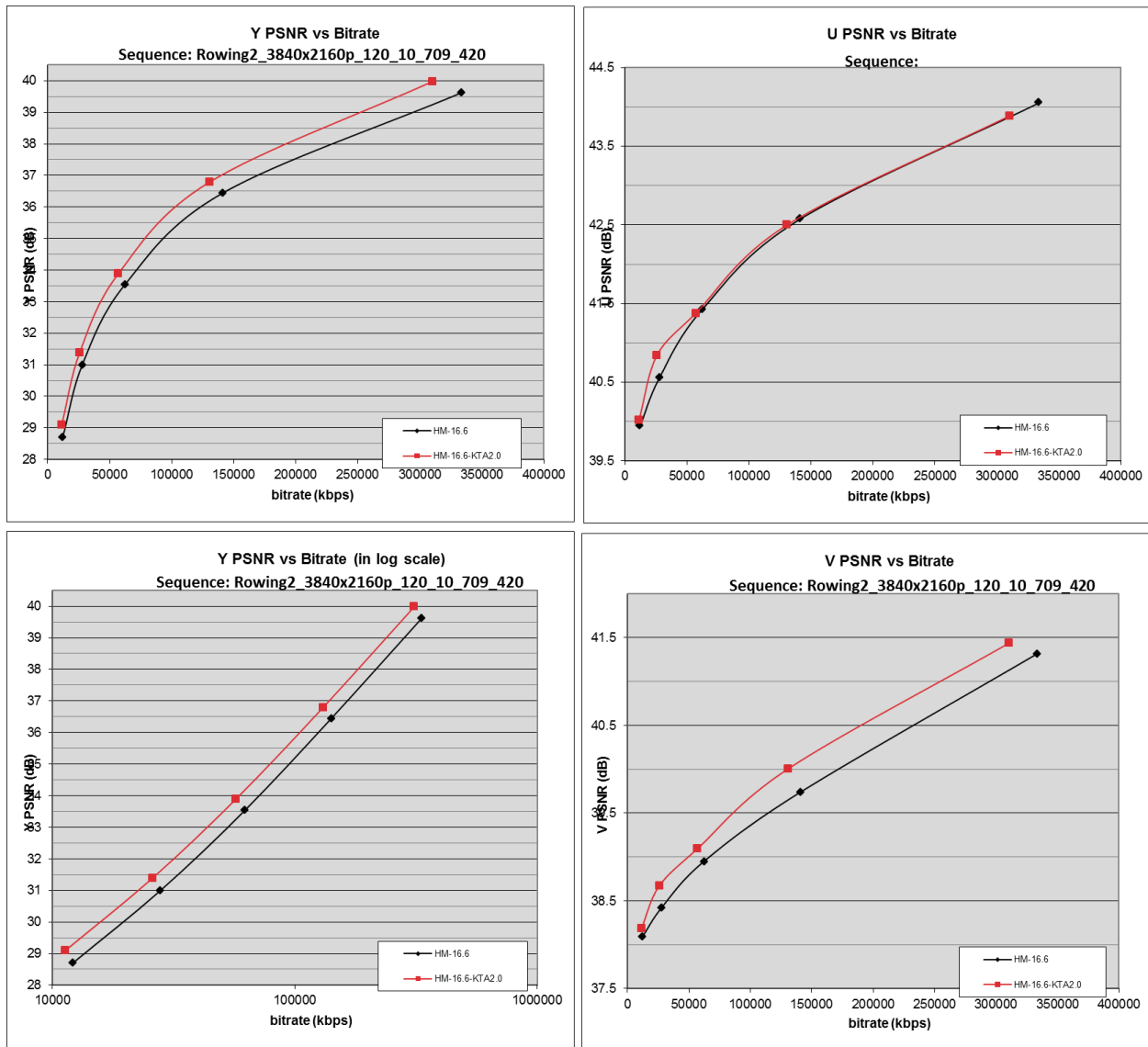


Figure 32: RD curves, random access mode, Rowing2_3840x2160_120_10b_709_420

This sequence contains a lot of highly dynamic moving texture. The water around rows is subject to blocking artifacts as well as ringing artifacts. These artifacts are clearly visible from QP 32 in Figure 33. This leads to blinking like artifacts in temporal viewing conditions.

QP27



QP32



QP37



QP42



Figure 33: Snapshot POC #42 Random Access at different QP

Again, KTA2 shows better results at same QP (37 in Figure 34) and similar (lower) bitrate. Some ringing artifacts are smoothed.

HM16.6



KTA2.0



Figure 34: POC #42 QP37, differences between HM16.6 and KTA2.0

1.2.10 AerialCrowd_3840x2160_30_10b_709_420

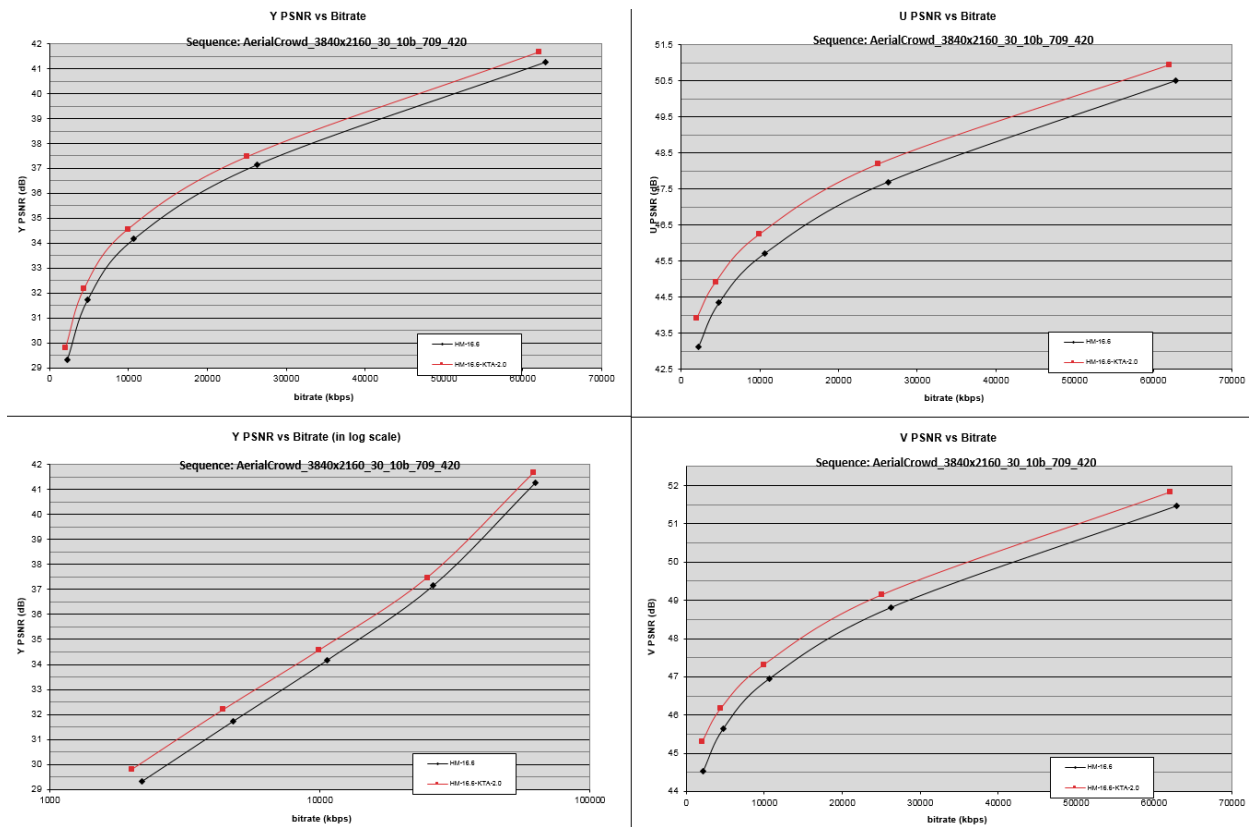


Figure 35: RD curves, random access mode, AerialCrowd_3840x2160_30_10b_709_420

This sequence shows a wide angle view on a place with walking pedestrians. Classical artifacts become visible at QP32.



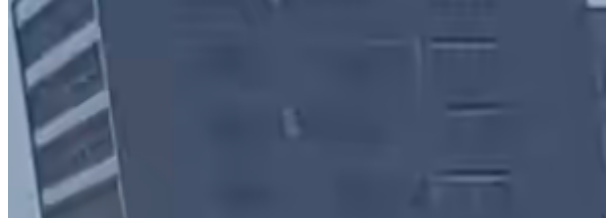
QP22



QP27



QP32



QP37



QP42

Figure 36: Snapshot POC #12 Random Access at different QP

1.2.11 BridgeViewTraffic_3840x2160_60_10b_709_420

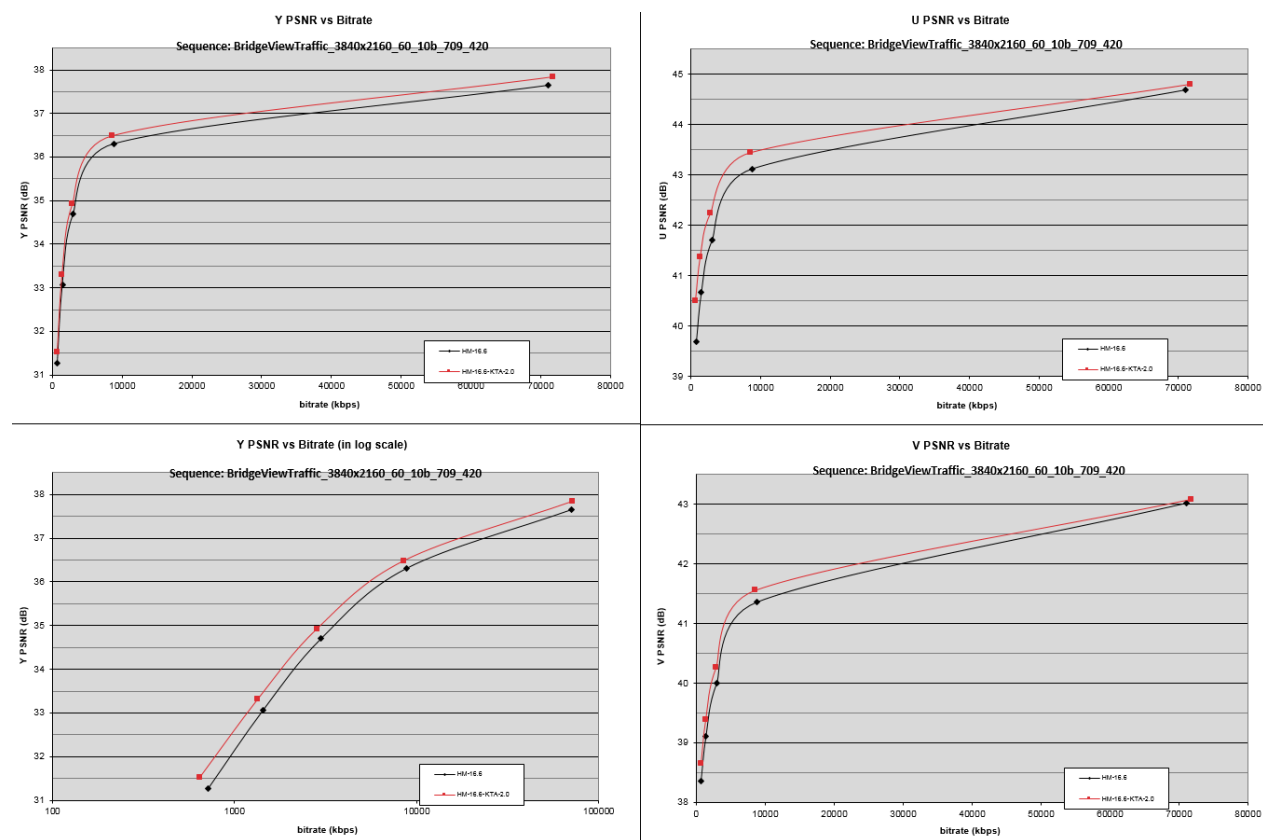


Figure 37: RD curves, random access mode, BridgeViewTraffic_3840x2160_60_10b_709_420

This sequence contains more noise compared to AerialCrowd. Together with the other 4K sequences, they raise the question of whether defining a fixed set of QP like in previous Common Test Conditions or adapt QPs depending on the sequence. Indeed, QP22 implies coding the noise for those sequences, which leads to poorly distributed RD points and non-precise BD-rate calculation.

1.2.12 DaylightRoad_3840x2160_60_10b_709_420

Again, the distribution of QPs is not adequate in Figure 38. The RD curve for the Y channel without QP22 is drawn in Figure 39.

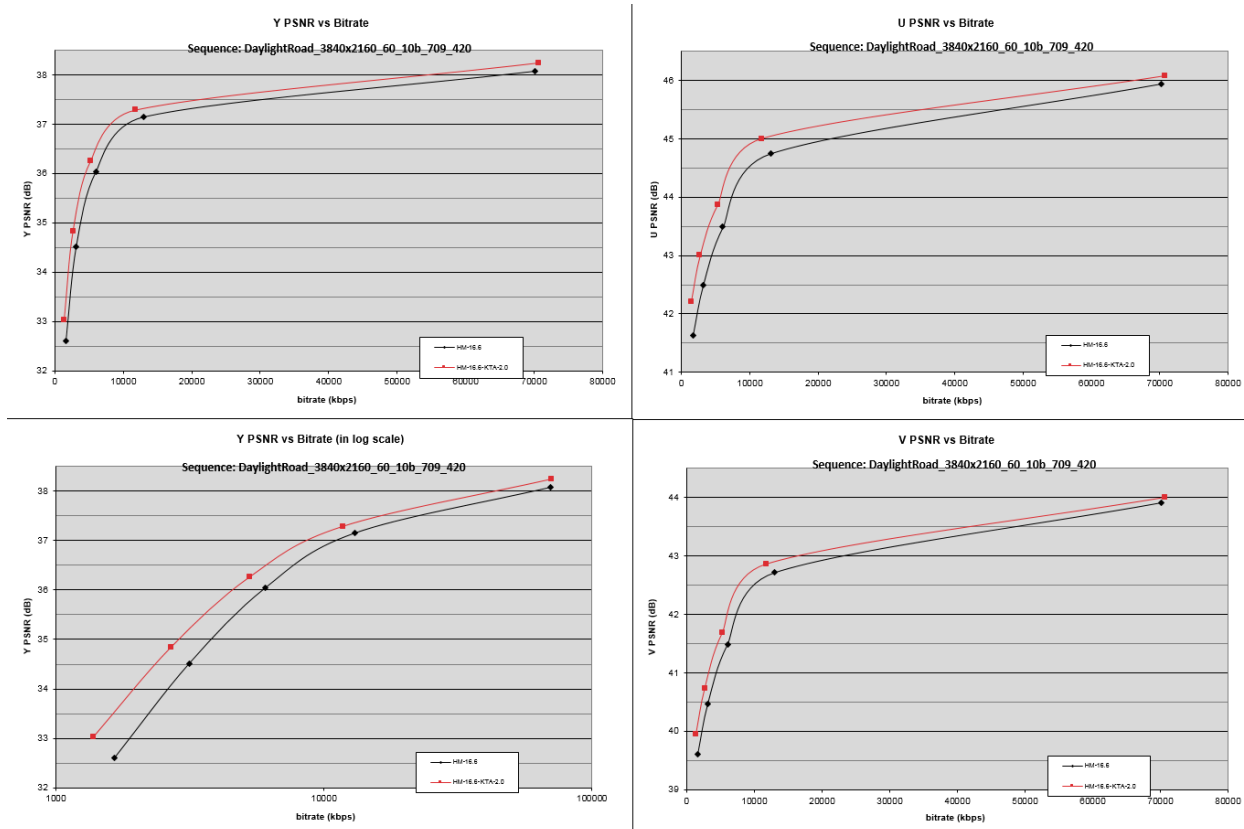


Figure 38: RD curves, random access mode, DaylightRoad_3840x2160_60_10b_709_420

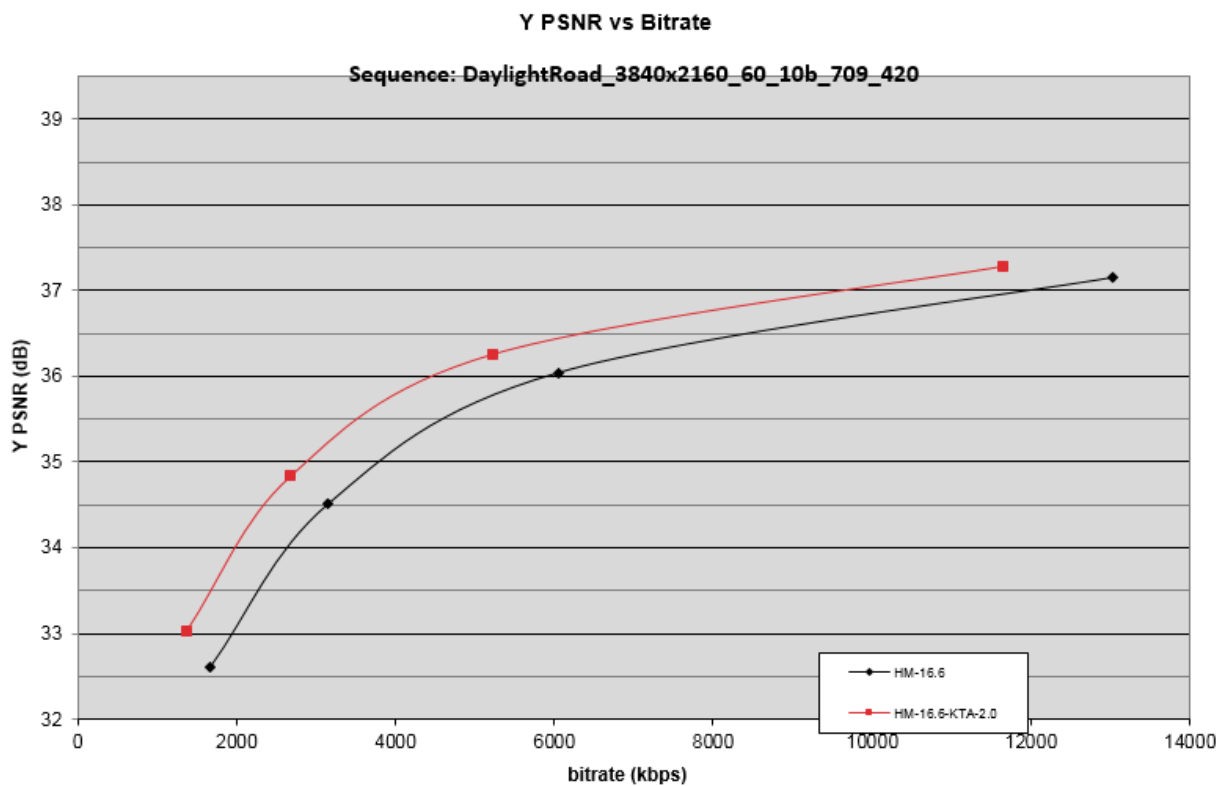


Figure 39: RD curve for Y channel when removing QP22

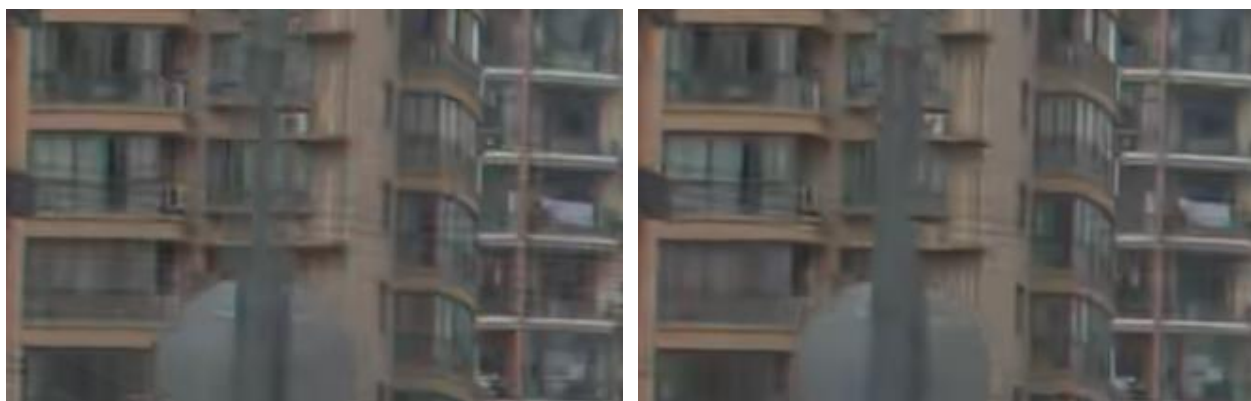


Figure 40: Snapshot POC #209 Random Access at QP 37. Left: HM16.6, right: KTA2.0

1.2.13 NightRoad_3840x2160_60_10b_709_420

Noisy sequence, filmed by night. Forward motion due to the moving car. Encoder still coding a lot of noise at QP 22, as for DailyRoad sequence

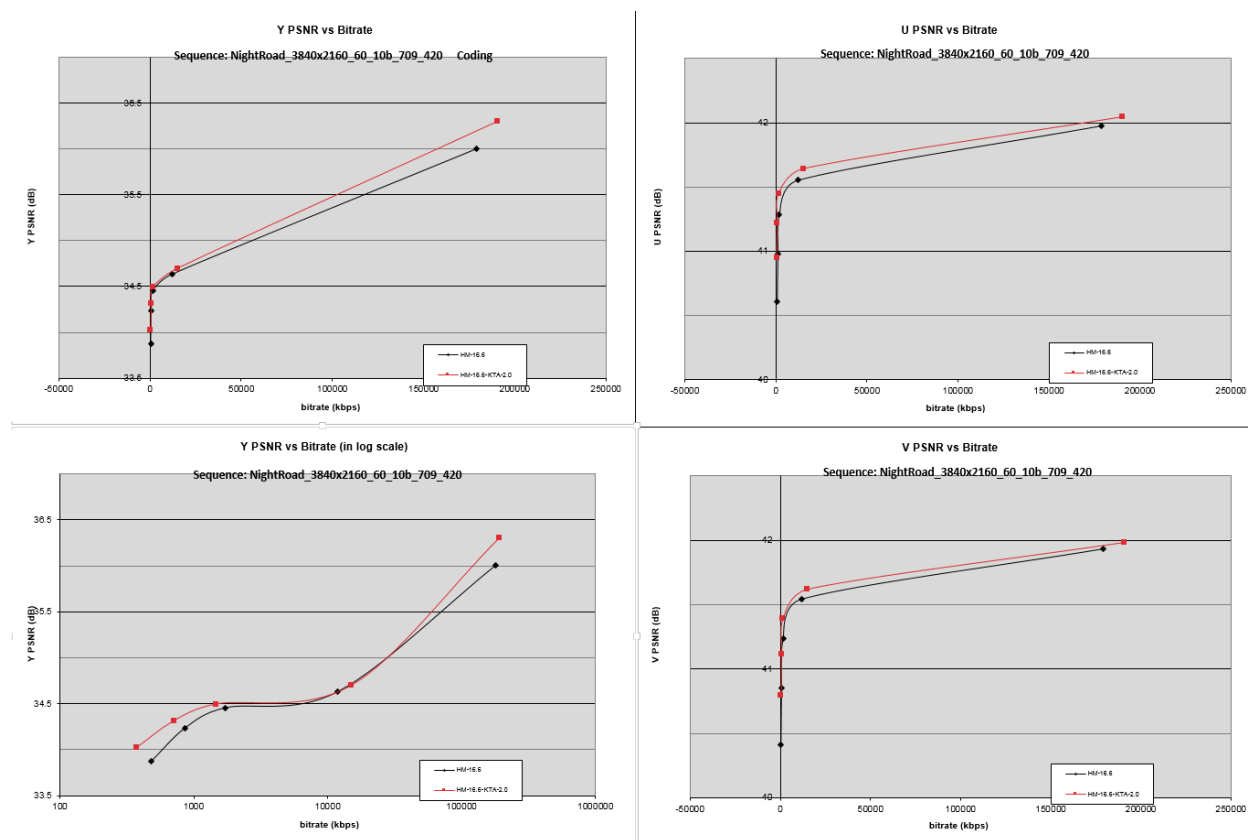


Figure 41: RD curves, random access mode, NightRoad_3840x2160_60_10b_709_420

Frame #6 B2, block and chroma artifacts



source



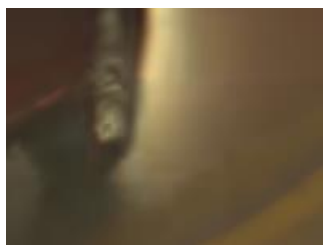
QP27



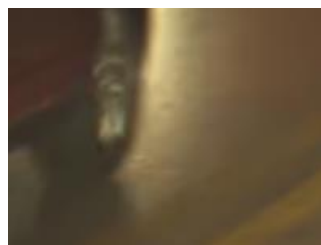
QP32



QP37



QP37
KTA



QP32
KTA

1.2.14 Square_3840x2160_60_10b_709_420

Strange chroma artifacts, noisy sequence.

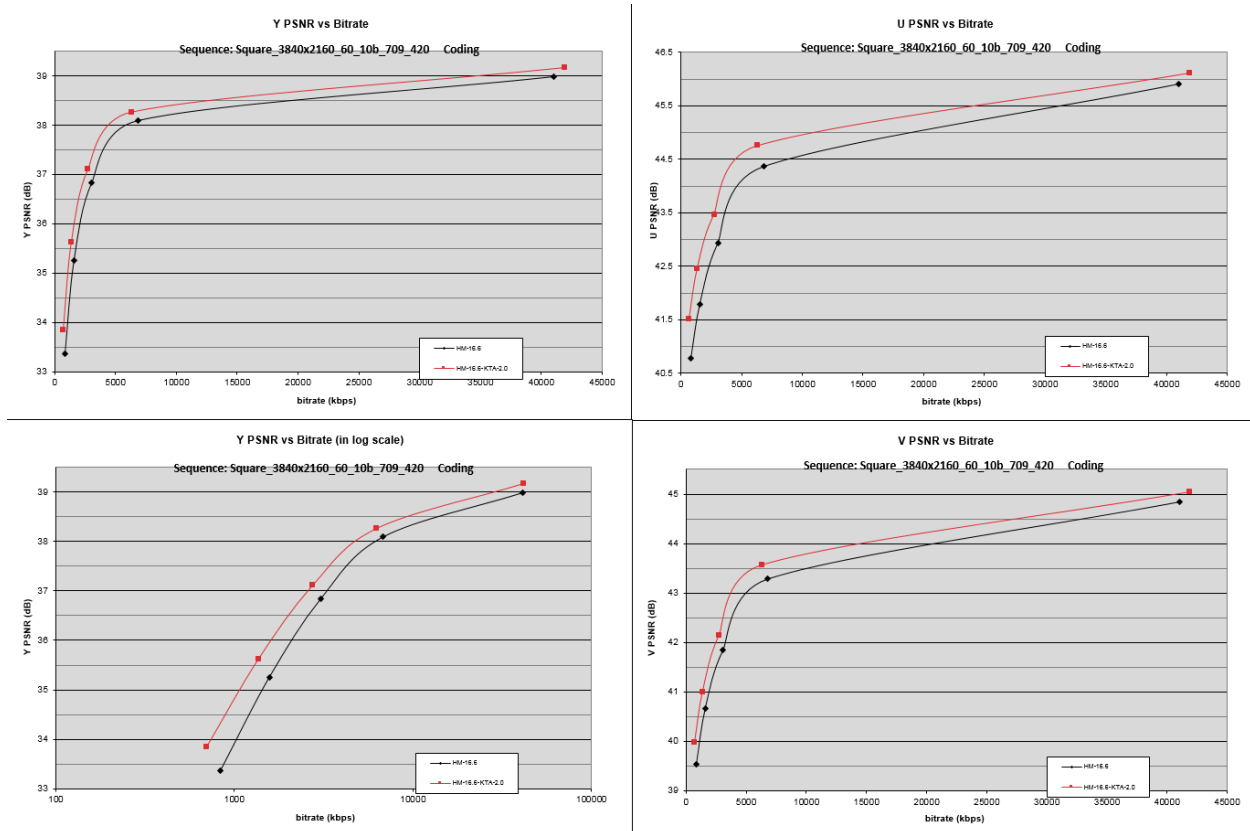


Figure 42: RD curves, random access mode, Square_3840x2160_60_10b_709_420

Frame # 284, B1: Block artifacts



source



QP27



QP32



QP37



QP37
KTA



QP32
KTA

1.2.15 Metro_3840x2160_60_10b_709_420

Noisy sequence, strange colors at the edges. Stationary camera, people walking.

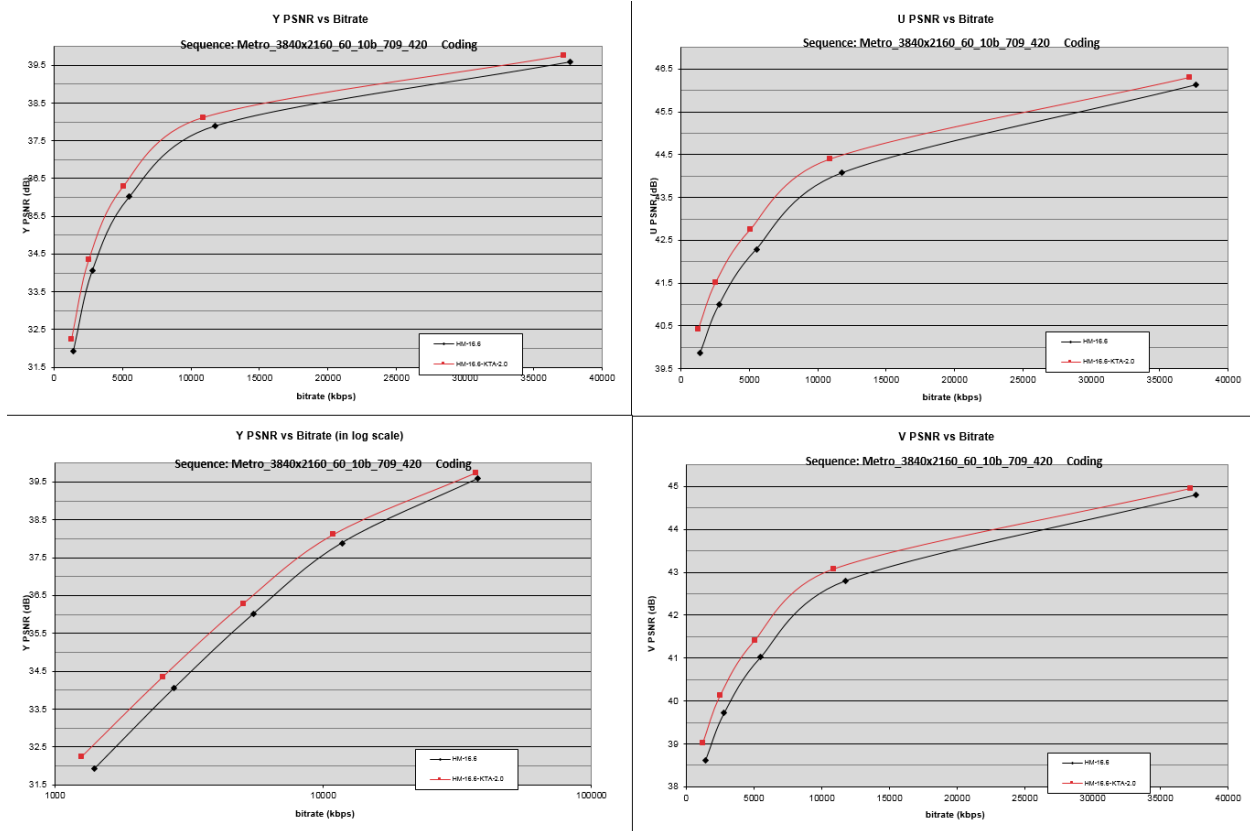


Figure 43: RD curves, random access mode, Metro_3840x2160_60_10b_709_420

Frame #115, B3 : Block artifacts



source



QP32



QP37



QP32
KTA



QP37
KTA

1.2.16 CStoreWalking_720x960_30_300

This sequence aims at representing a classical video shot with a smartphone in vertical. The sequence is less blurry than CStoreGoods and classical blocking and ringing artifacts are present from QP32

For HM16.6, the break point is around QP32

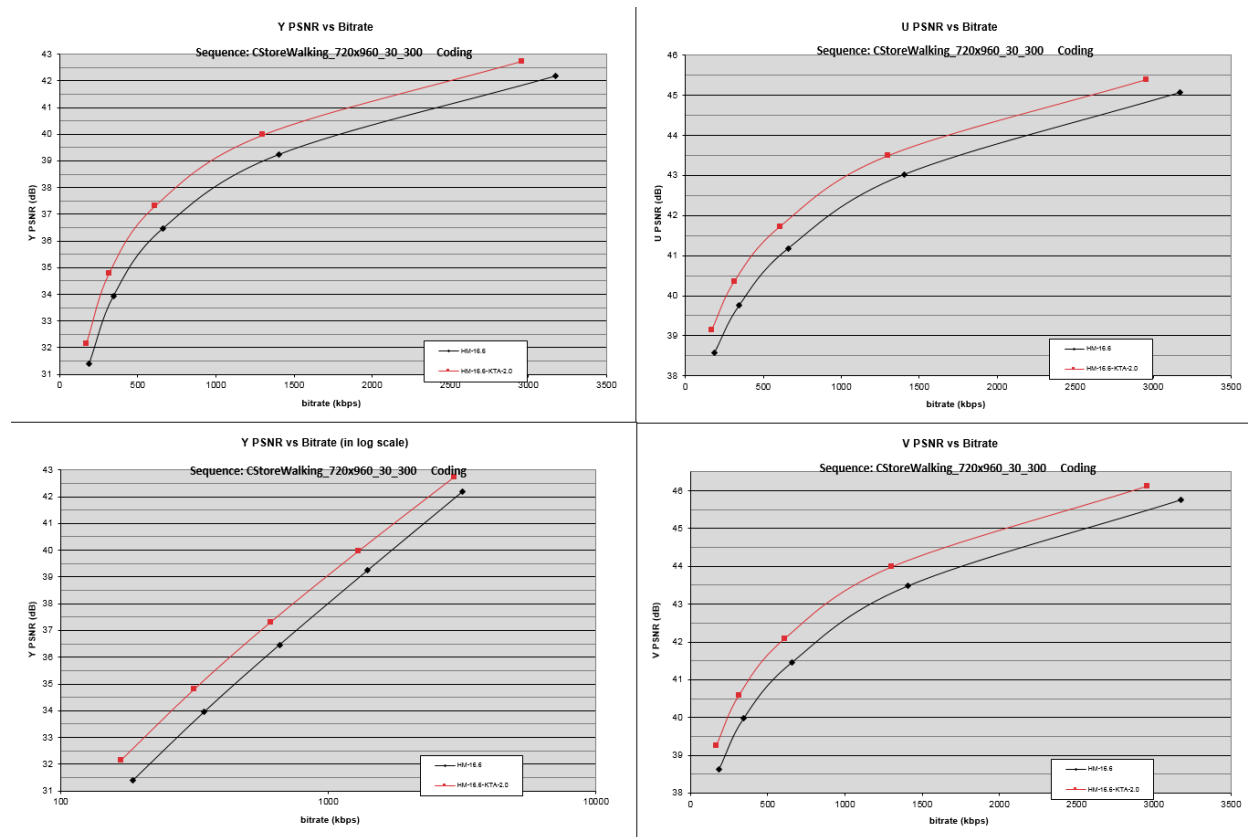


Figure 44: RD curves, random access mode, CStoreWalking_720x960_30_300



QP32

QP37

QP42

Figure 45: POC #152

One can notice strong artifacts at QP 37 and 42. These artifacts are starting to be annoying at QP32 in frame-by-frame viewing.



source

HM16.6

KTA2.0

1.2.17 DrivingRecorder1_720x960_30_300

This sequence, in vertical mode, contains a global motion caused by the moving car from which the scene is shot.

For this sequence, the break point in terms of visual quality with HM-16.6 is located between QP27 and QP32.

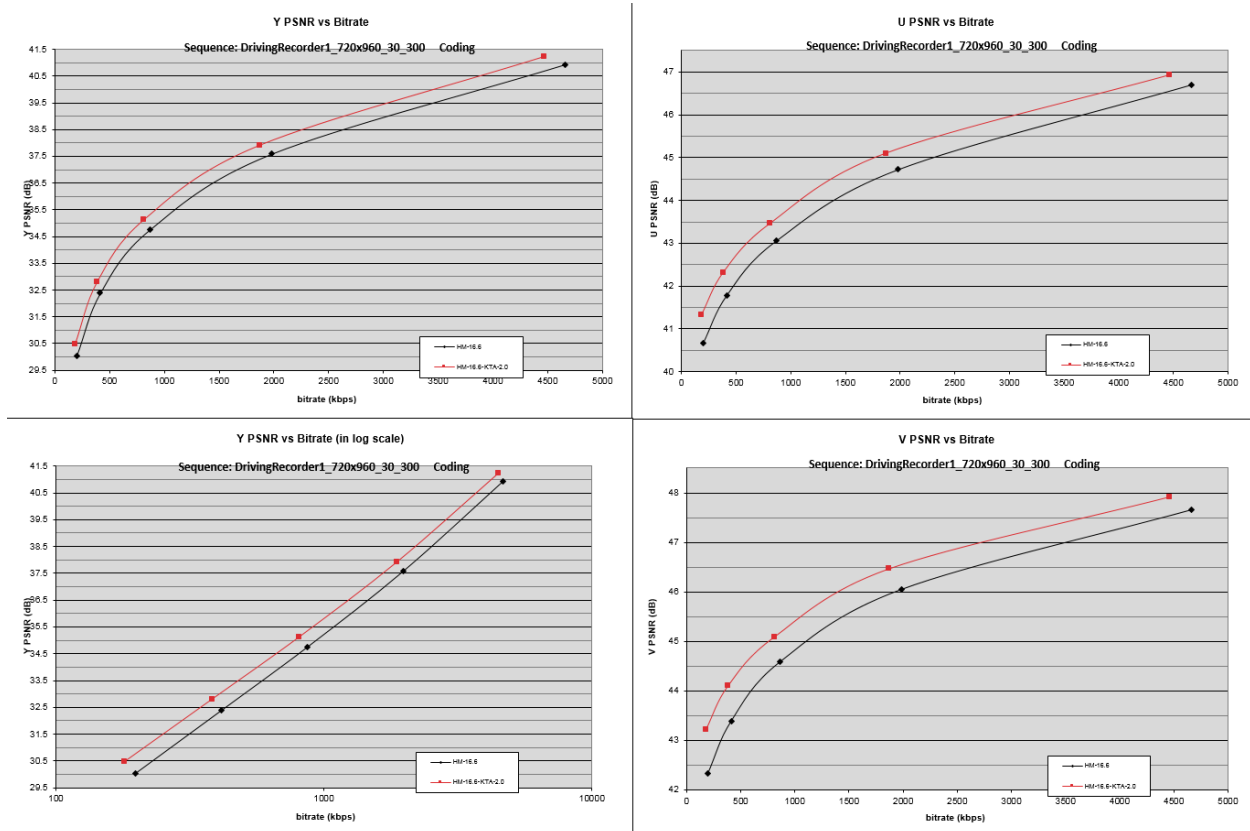


Figure 46: RD curves, random access mode, DrivingRecorder1_720x960_30_300

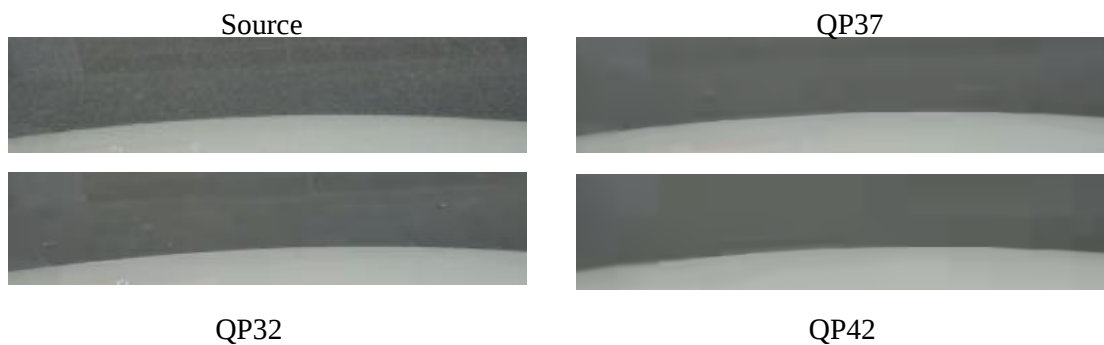


Figure 47: POC #0



Source

QP32
Figure 48: POC #258, frame B2

QP37

QP42

KTA2.0: 382.76kbps

HM16.6: 413.97kbps



Source

HM16.6

KTA2.0

Figure 49: POC #258, frame B2

1.2.18 DrivingRecorder2_720x960_30_300

Same conclusions go for this other cut of the sequence DrivingRecorder. Shadow moving from the road to the car and reflections on the windshield. The texture on the road fades from QP32 and block and contour artifacts appear and become very annoying at QP37.

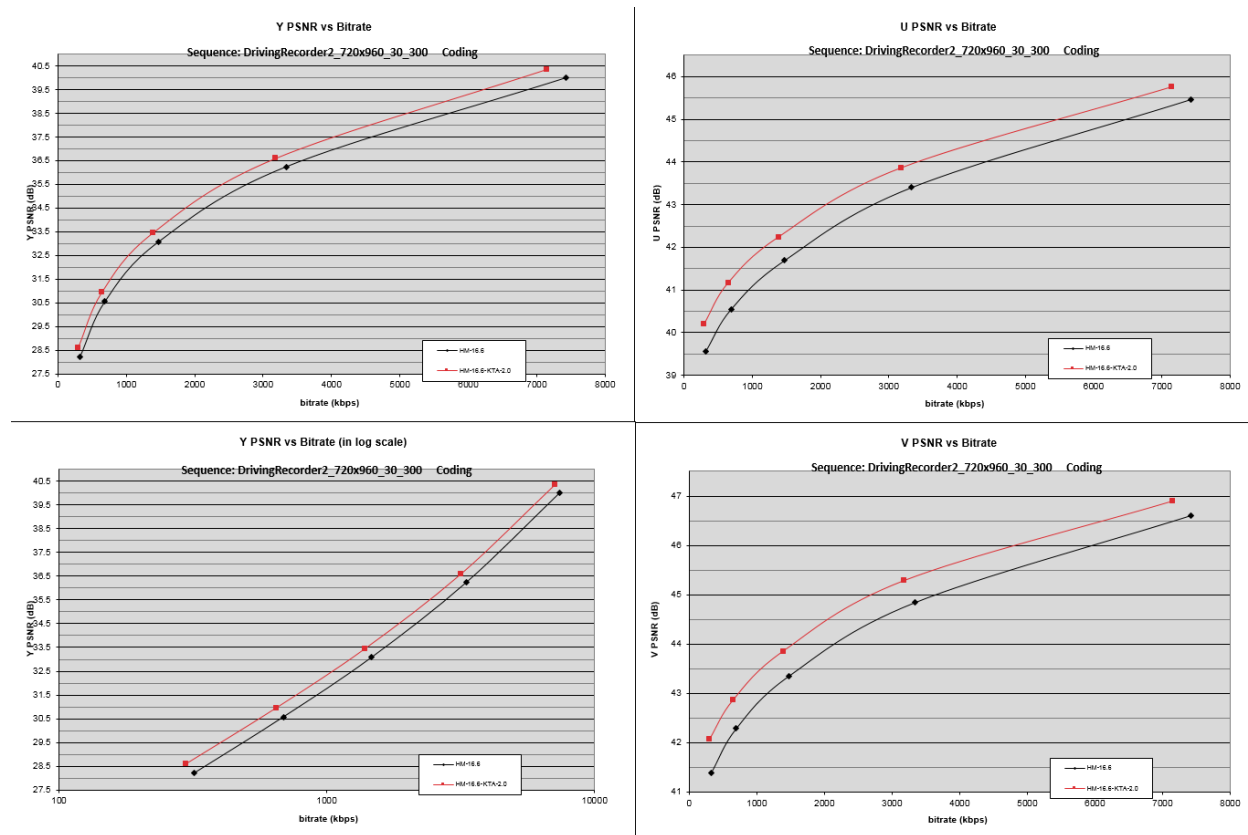


Figure 50: RD curves, random access mode, DrivingRecorder1_720x960_30_300

Frame #133, B2: Blocking artefact on the shadow



source



QP37



QP27



QP37
KTA



QP32



QP32
KTA

1.2.19 LakeWalking_720x960_30_300

This sequence is also representative of the use of smartphones to shoot movies. The poor quality of the capture in terms of handling the camera may result in masking some artifacts. In the middle of the sequence, it is interesting to see that the rotation is way more annoying than the coding artifact that appear around QP 32 and QP37. Change of illumination sometimes.

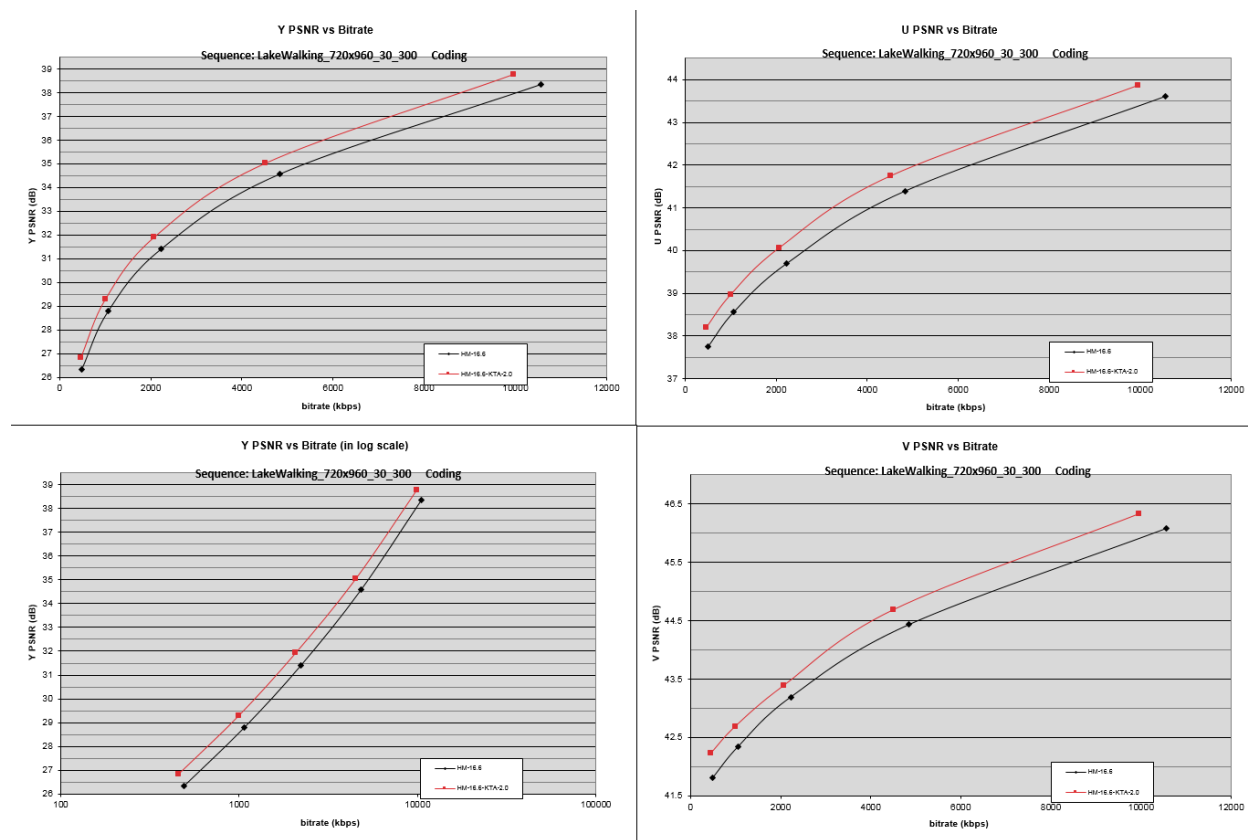


Figure 51: RD curves, random access mode, LakeWalking_720x960_30_300

Frame #54, B2: details, colors plus flickering



source



QP27



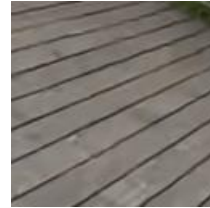
QP32



QP37



QP37
KTA



QP32
KTA

1.2.20 CStoreGoods_720x1280_30_300

This sequence aims at representing a classical video shot with a smartphone in vertical and with a poor quality. The motion introduces an important blur on the foreground which is a supermarket shelf. The texture activity and the motion mask the artifacts on the foreground. The artifacts are more visible on the background which is less impacted by the blur.

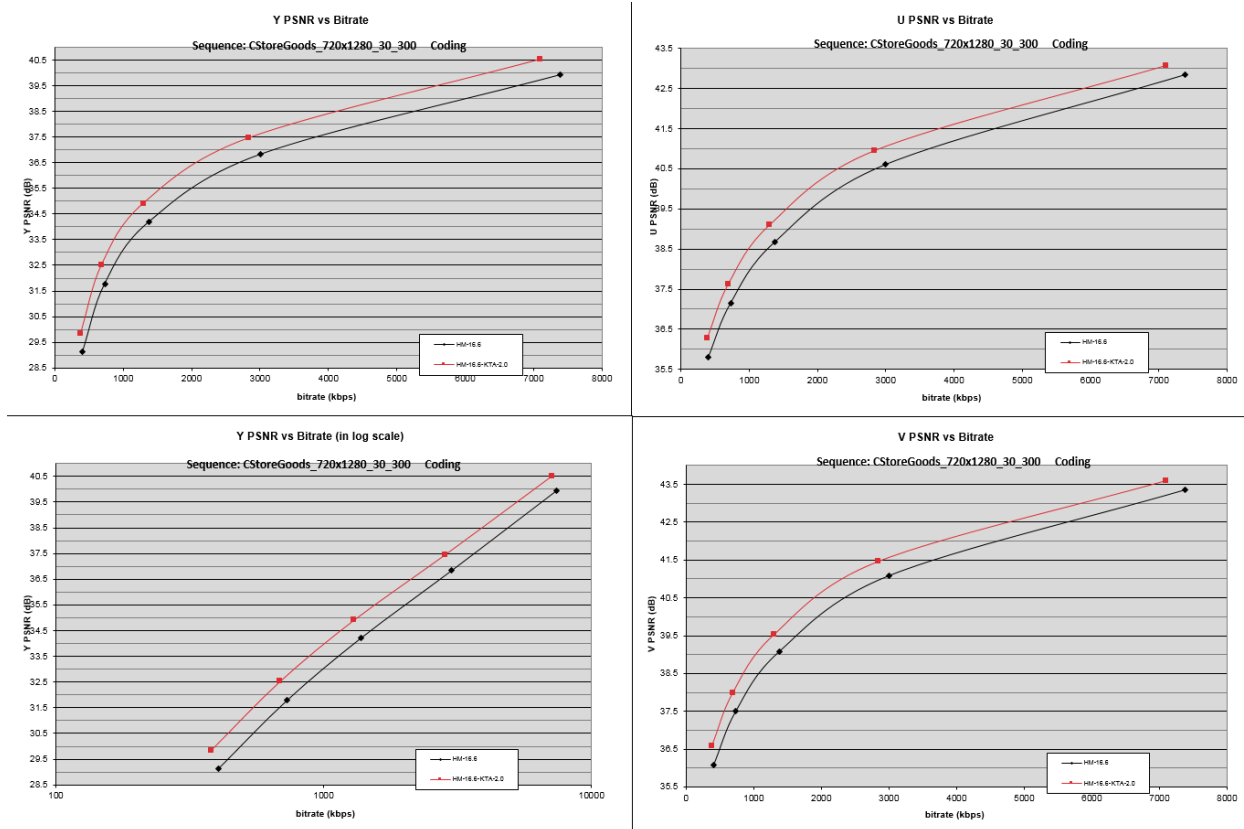


Figure 52: RD curves, random access mode, CStoreGoods_720x1280_30_300

POC #0, I frame



Figure 53: HM166, Random access conditions

Visible artifacts on edges are present from QP32. The text shows that the quality of the source content masks a lot of them.

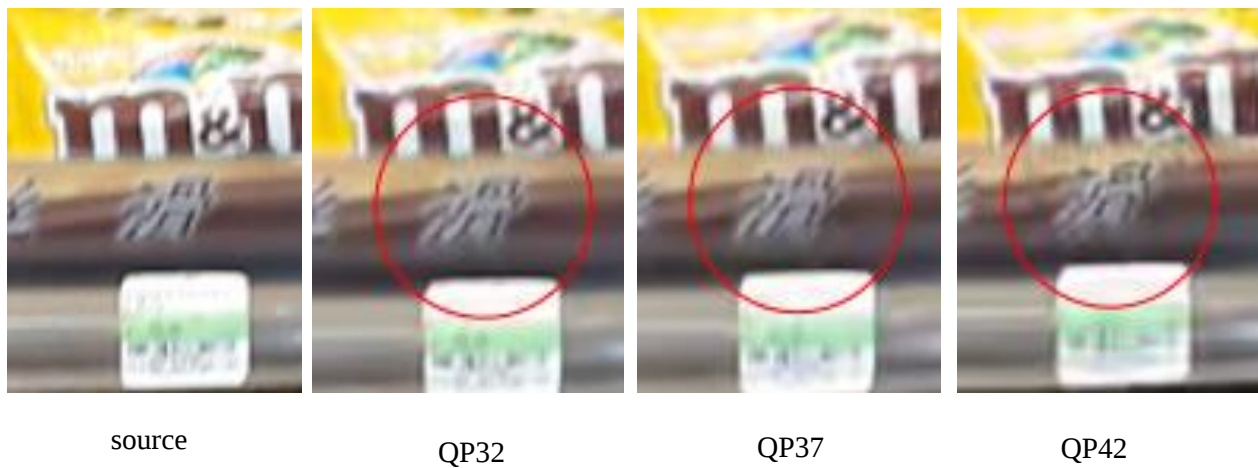
Comparison HM16.6 – KTA2 at QP37

Bitrate HM 16.6: 730.85kbps

Bitrate KTA 2.0: 687.22kbps



The artifacts are different. The text in the top-left region has more contrast with KTA2.



POC #4, B1

Some ringing artifacts appear from QP37



Figure 54: frame #140, B1

The background is impacted “classically”: blocking artifacts appear and the texture vanishes from QP37.

1.2.21 ParkSunny_720x1280_30_300

Vertical video, panning motion. Some change of illumination.

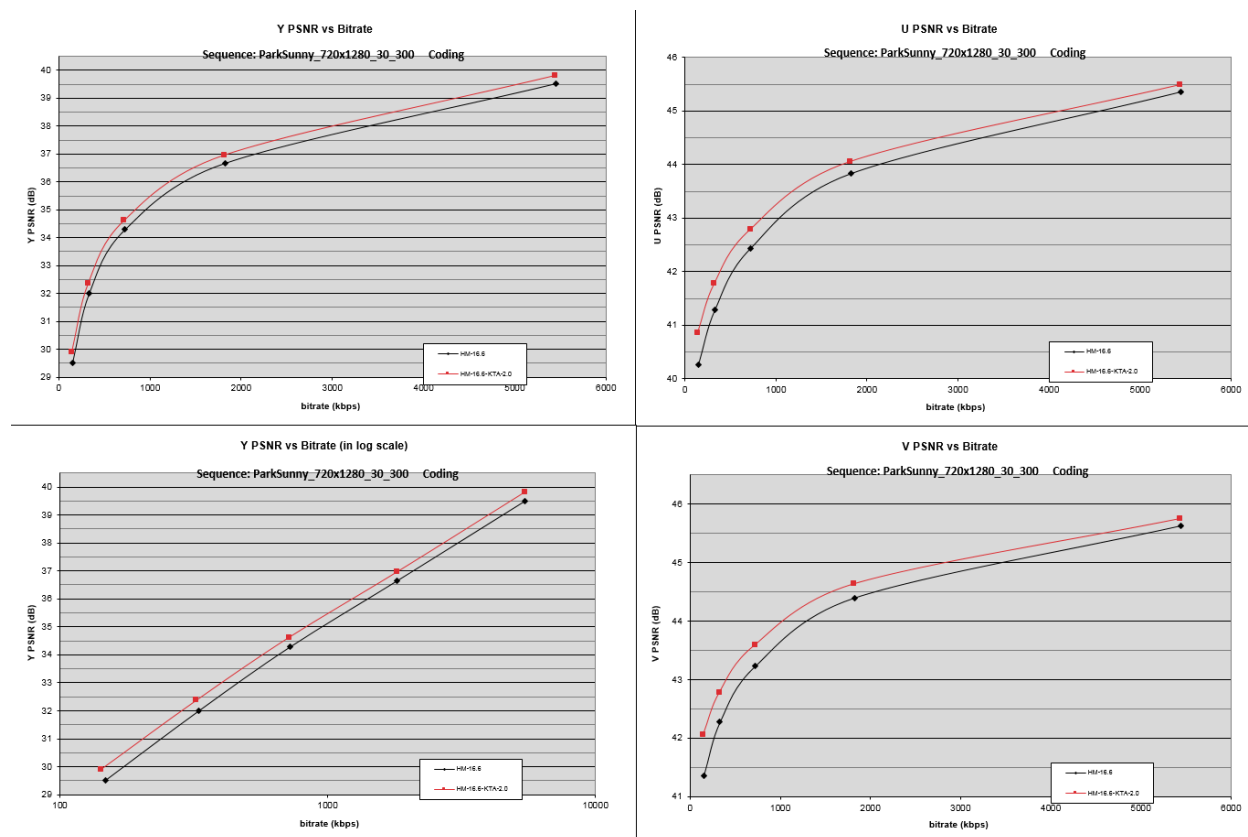
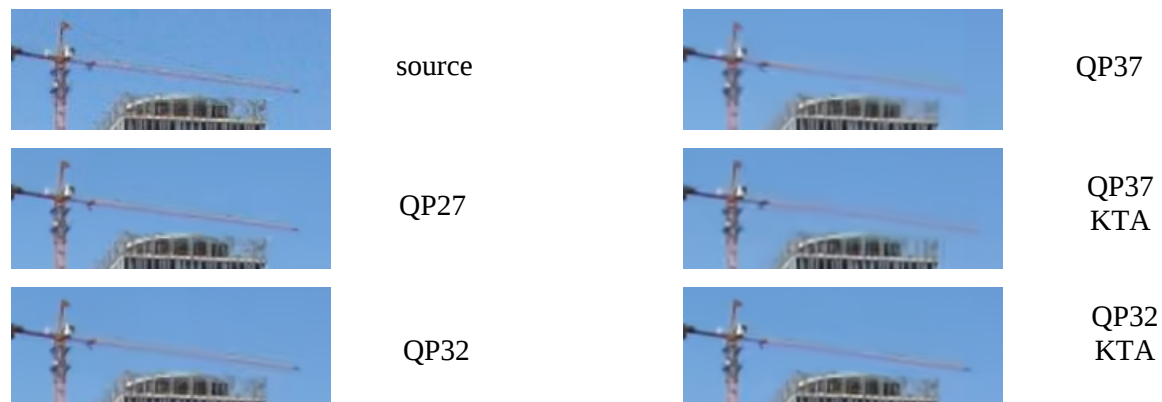


Figure 55: RD curves, random access mode, ParkSunny_720x1280_30_300

Frame #255, B3: loss of details and ringing artifacts



1.2.22 ParkWalking_720x1280_30_300

Vertical video, not uniform motion. Some change of illumination.

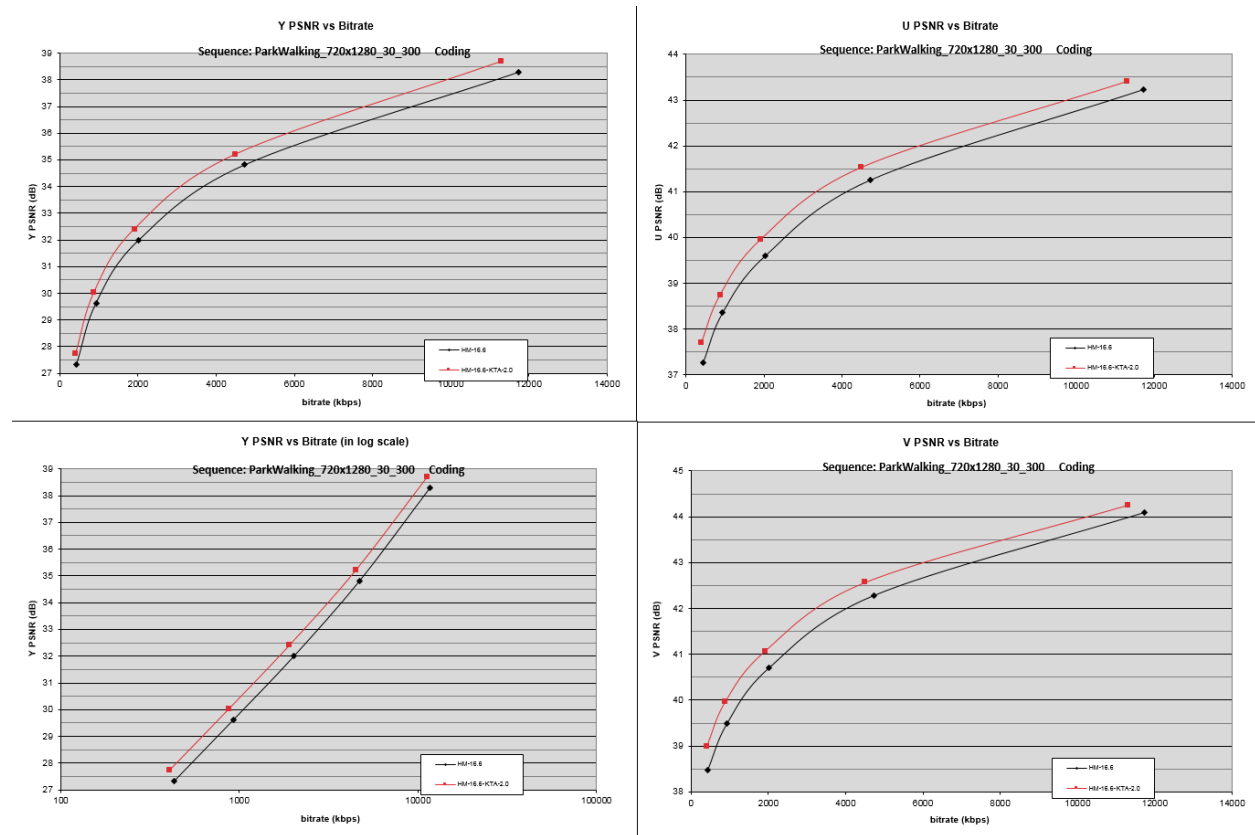
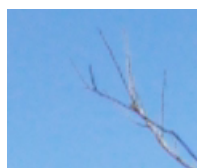
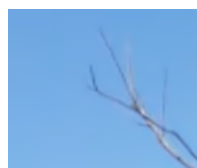


Figure 56: RD curves, random access mode, ParkWalking_720x1280_30_300

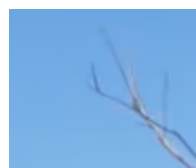
Frame #220, B1: loss of details



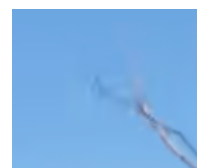
source



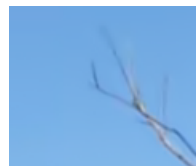
QP27



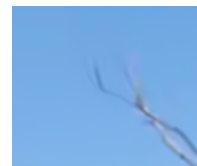
QP32



QP37



QP32
KTA



QP37
KTA

3 Conclusion

In this document, the encoding results of test sequences proposed by B-Com and Huawei test sequence was reported for developing future video coding technologies. The set provided by B-Com contains high quality and low noise 4K sequences. Regarding the interest of 100 and 120p content, it is difficult to draw conclusion since 50p and 60p sequences are different shots and not derived from the high frame rate version. Highly dynamic textures in FreeSardines could be a good candidate to push the new standard to deal with complicated content. We suggest to keep at least one vertical video from Huawei because of its obvious link to new video content. CStoreWalking seems representative regarding handheld camera motion and noise. We also suggest to select QPs per sequence if noisy sequences are selected. For instance, QP22 does not seem to be necessary for noisy 4K sequences. Finally, Technicolor thanks B-Com and Huawei for providing the valuable test sequences.

4 Reference

- [1] TD 212 R1 (WP 3/16), “Future video coding: BoG report on test sequence selection”, ITU-T, Study Group 16, Question 6, Geneva, October 2015
- [2] FFmpeg, <https://www.ffmpeg.org/>
- [3] <ftp://ftp.iient.rwth-aachen.de/testsequences/candidates/>
- [4] https://hevc.hhi.fraunhofer.de/svn/svn_HEVCSoftware/tags/HM-16.6/
- [5] https://vceg.hhi.fraunhofer.de/svn/svn_HMJEMSoftware/tags/HM-16.6-KTA-2.0/

5 Patent rights declaration(s)

Technicolor does not have any current or pending patent rights relating to the technology described in this contribution.