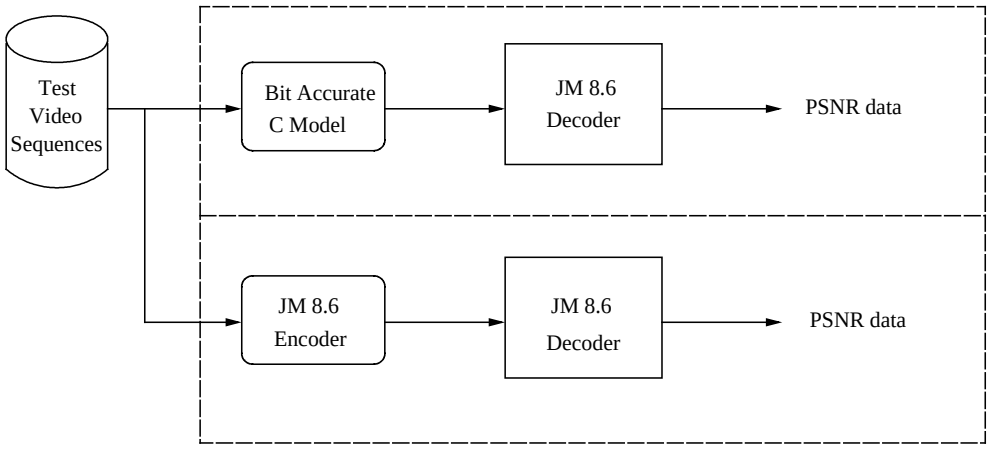
1 Introduction

This document discusses the performance of the H264-E core when compared with the JM 8.6 H.264 software reference model.

The picture below illustrates the testing environment used for the comparison.



Each video sequence is encoded by the H264-E C model as well as the JM 8.6 H.264 software encoder reference model. The resulting bitstreams are decoded by the JM 8.6 H.264 software decoder. File size and PSNR information is then recorded and reported.

The subsequent sections describe the testing procedure in greater detail and report the result.

2 Software Used in the Comparison

The H264-E C model used was the bit accurate C model of the Ocean Logic core, version v1.51. This software accurately models the external behaviour of hardware in the core.

The H.264 reference model used was the version JM 8.6 downloaded from:
http://iphome.hhi.de/suehring/tml/index.htm

3 The sequences used in the test

The following sequences were used for the test in this document.

Sequence name	Frame size	Num of frames	File size (bytes)
Mobile	352 x 288	300	45,619,200
Tempete	352 x 288	260	39,536,640
Tennis	720 x 480	300	155,520,000

Table 1 The sequences used in the test.

All the sequences are in YUV 4:2:0 format.

Figure 1 First frame of the "mobile" sequence.

Figure 2 First frame of the "Tempete" sequence.

Figure 3 First frame of the "Tennis" sequence.

4 Testing methodology

All the frames of the sequences listed are encoded using both encoders. Only the first frame is encoded as an "I" frame. The file size reported includes the complete encoded sequence, including any headers and the first "I" frame. A single reference frame is used.

During the tests, in the JM 8.6 software, all the inter-search partitions are activated (16x16, 16x8, 8x16, 8x8, 8x4, 4x8 and 4x4), rd optimization is off and the normal (non Hadamard) SAD is used.

Tests are conducted with various quantization values, with and without deblocking filter.

The resulting bitstreams are decoded using the reference software decoder. The PSNR and file size is recorded and reported.

5 Test results

The test results are listed in the tables and graphs below. File sizes are in bytes and PSNR in dB. Also uses PSNR/bitsize graphs.

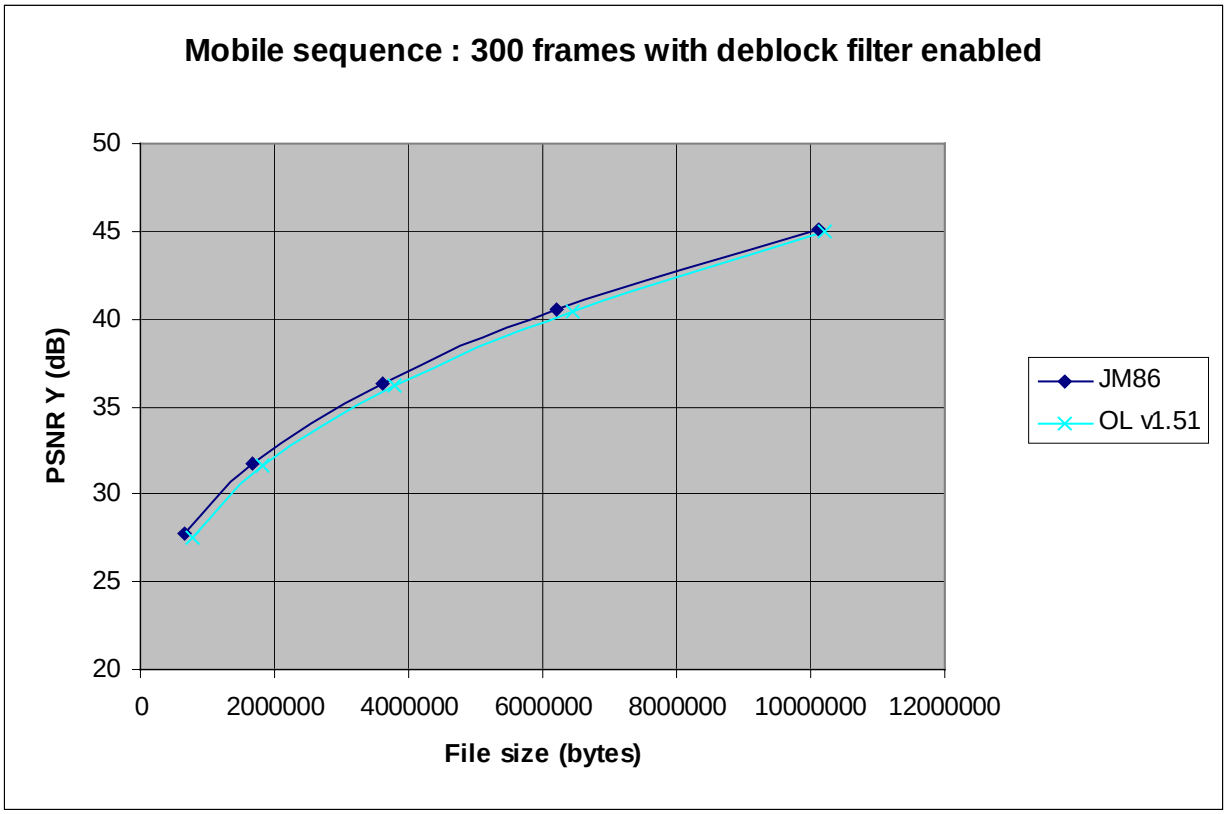
5.1 The Mobile sequence

Qp	PSNR Y	PSNR U	PSNR V	File Size
15	45.06	45.59	45.62	10,125,619
20	40.49	41.45	41.44	6,222,168
25	36.29	37.78	37.69	3,608,602
30	31.71	34.8	34.62	1,665,529
35	27.79	32.34	32.02	655,538

Table 2 JM 8.6 figures for the Mobile sequence with deblocking filter enabled.

Qp	PSNR Y	PSNR U	PSNR V	File Size
15	44.991	45.586	45.619	10209725
20	40.426	41.444	41.426	6437865
25	36.206	37.738	37.665	3785829
30	31.651	34.768	34.594	1817413
35	27.535	32.311	31.984	761852

Table 3 Ocean Logic core figures for the Mobile sequence with deblocking filter enabled.

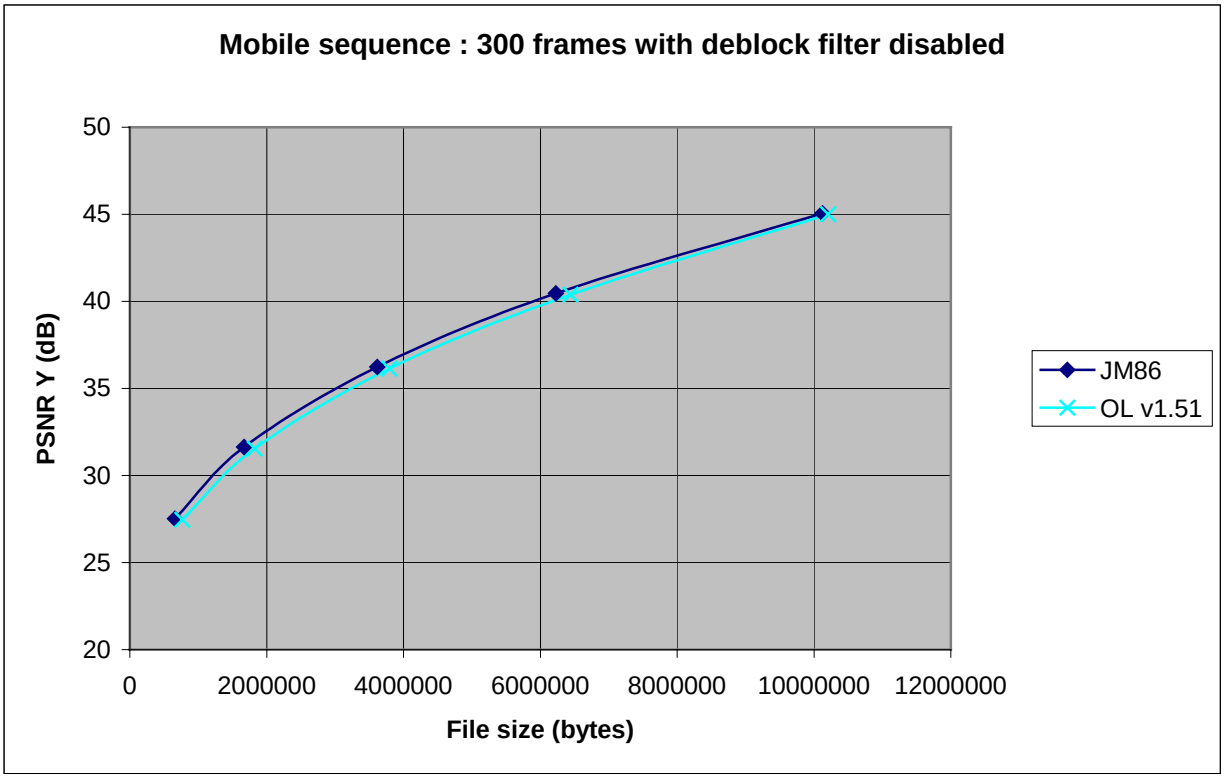


Qp	PSNR Y	PSNR U	PSNR V	File Size
15	45.062	45.591	45.623	10,125,736
20	40.451	41.461	41.45	6,228,176
25	36.227	37.807	37.712	3,614,870
30	31.63	34.826	34.634	1,670,053
35	27.516	32.323	32.016	657,534

Table 4 JM 8.6 figures for the Mobile sequence with deblocking filter disabled.

Qp	PSNR Y	PSNR U	PSNR V	File Size
15	44.991	45.586	45.619	10209836
20	40.393	41.443	41.434	6439912
25	36.135	37.767	37.684	3792762
30	31.553	34.797	34.599	1826485
35	27.46	32.313	31.984	766506

Table 5 Ocean Logic core figures for the Mobile sequence with deblocking filter disabled.



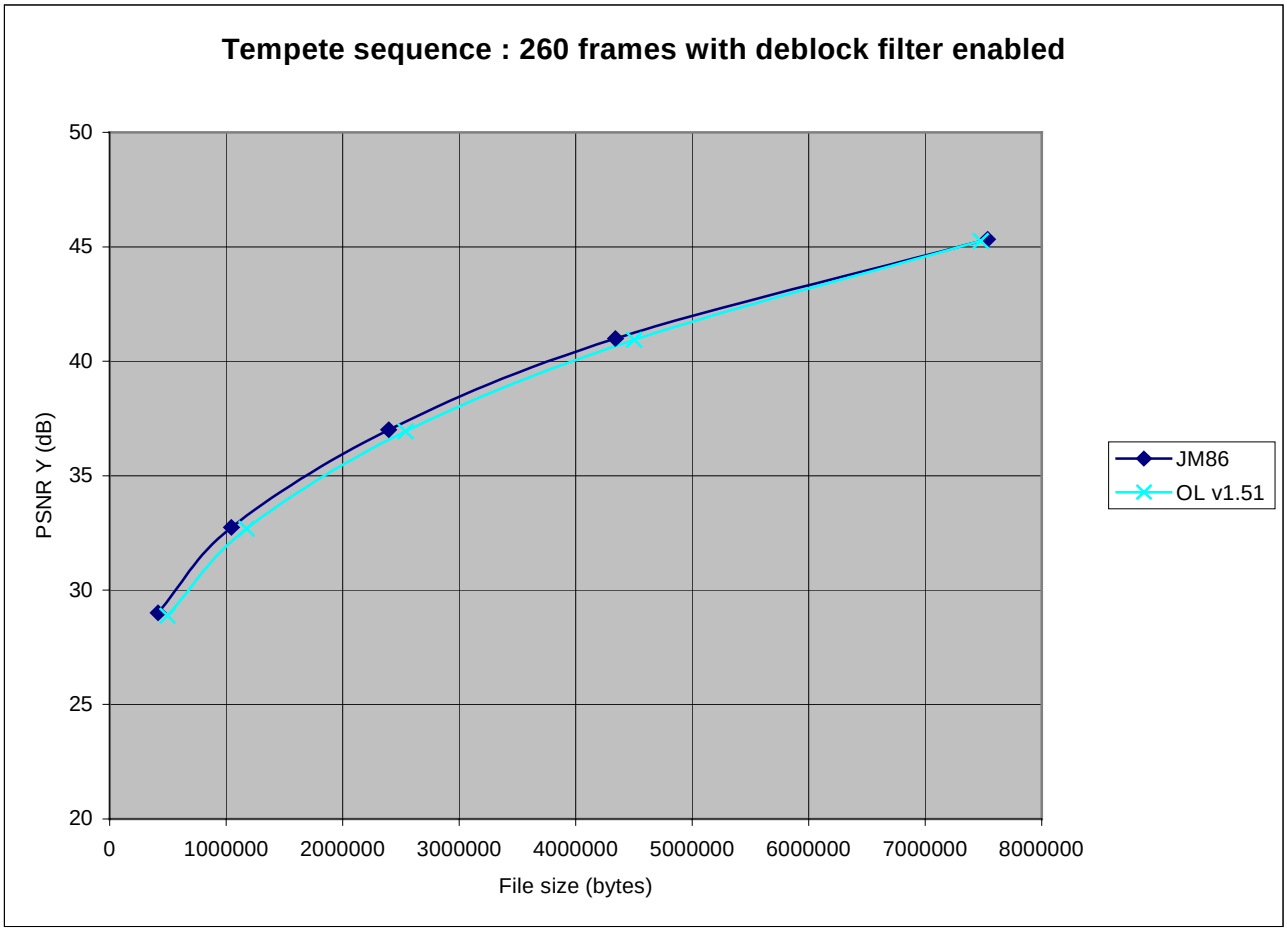
5.2The Tempete sequence

Qp	PSNR Y	PSNR U	PSNR V	File Size
15	45.33	45.9	46.11	7,536,602
20	41	42.02	42.72	4,343,383
25	37.02	38.76	40.07	2,397,909
30	32.74	36.33	38.1	1,045,410
35	29	34.39	36.43	414,960

Table 6 JM 8.6 figures for the Tempete sequence with deblocking filter enabled.

Qp	PSNR Y	PSNR U	PSNR V	Filesize
15	45.265	45.951	46.193	7477209
20	40.947	42.042	42.781	4502343
25	36.947	38.759	40.082	2540170
30	32.684	36.309	38.094	1175428
35	28.877	34.347	36.404	496892

Table 7 8 Ocean Logic core figures for the Tempete sequence with deblocking filter enabled.

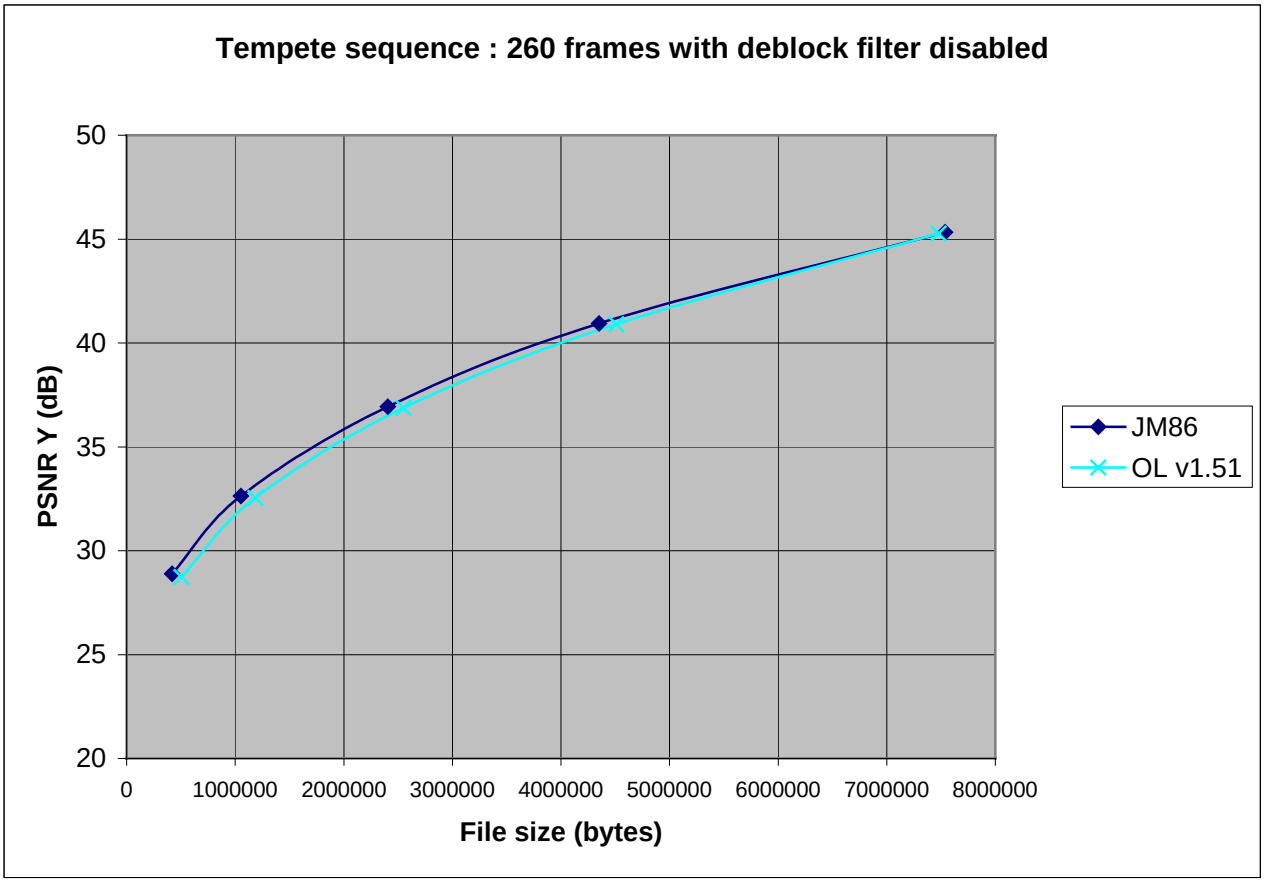


Qp	PSNR Y	PSNR U	PSNR V	File Size
15	45.327	45.897	46.112	7,536,704
20	40.947	42.013	42.679	4,350,291
25	36.937	38.757	39.988	2,405,596
30	32.628	36.292	37.978	1,052,044
35	28.89	34.299	36.304	419,850

Table 9 JM 8.6 figures for the Tempete sequence with deblocking filter disabled.

Qp	PSNR Y	PSNR U	PSNR V	File Size
15	45.265	45.951	46.193	7477296
20	40.909	42.058	42.78	4510059
25	36.868	38.772	40.049	2549262
30	32.549	36.273	38.026	1183653
35	28.737	34.265	36.332	503588

Table 10 Ocean Logic core figures for the Tempete sequence with deblocking filter disabled.



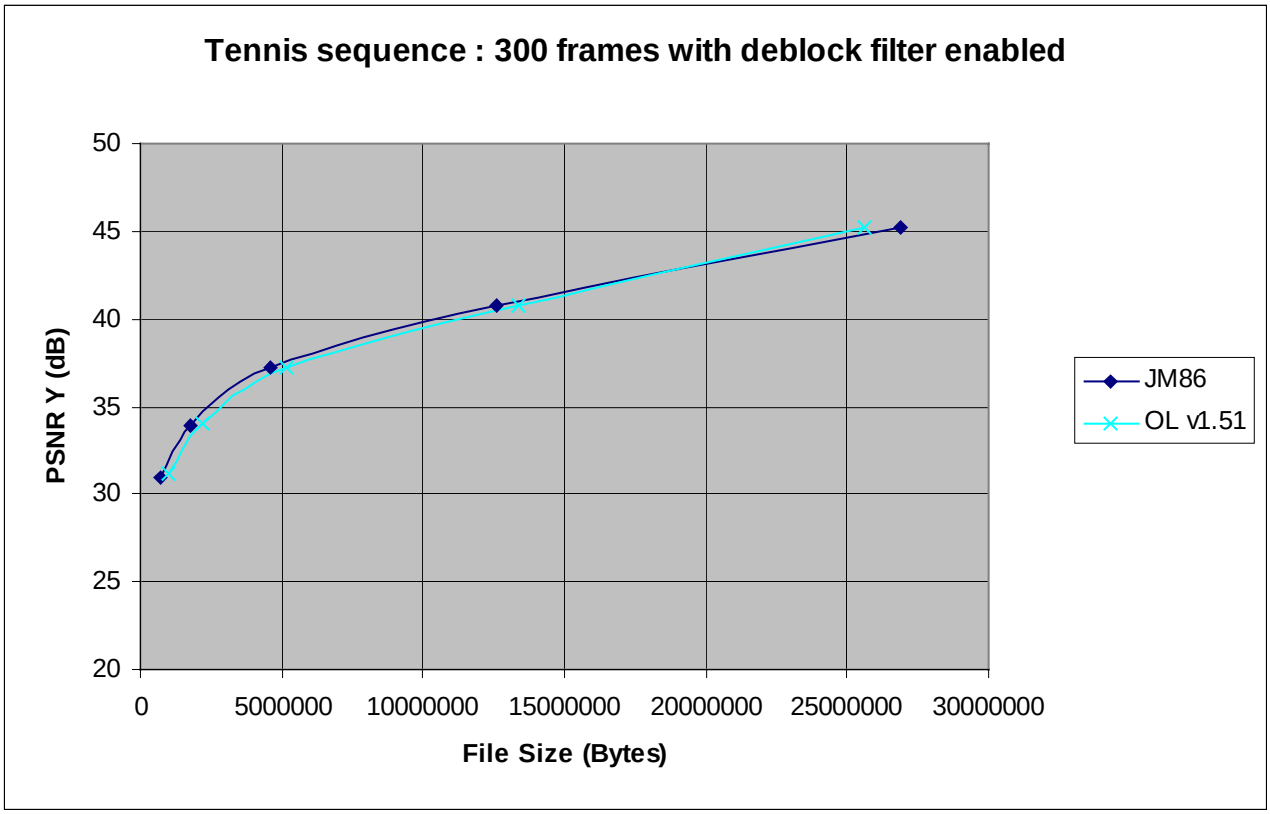
5.3 The tennis sequence

Qp	PSNR Y	PSNR U	PSNR V	File Size
15	45.213	46.405	46.992	26,855,030
20	40.812	43.849	44.506	12,577,321
25	37.214	41.657	41.701	4,581,896
30	33.953	39.856	39.525	1,749,375
35	30.936	38.24	37.56	710,320

Table 11 JM 8.6 figures for the Tennis sequence with deblocking filter enabled.

Qp	PSNR Y	PSNR U	PSNR V	File Size
15	45.199	46.641	47.478	25580914
20	40.811	43.898	44.589	13375825
25	37.182	41.651	41.754	5169702
30	34.064	39.889	39.538	2196327
35	31.133	38.348	37.73	998286

Table 12 Ocean Logic core figures for the Tennis sequence with deblocking filter enabled.

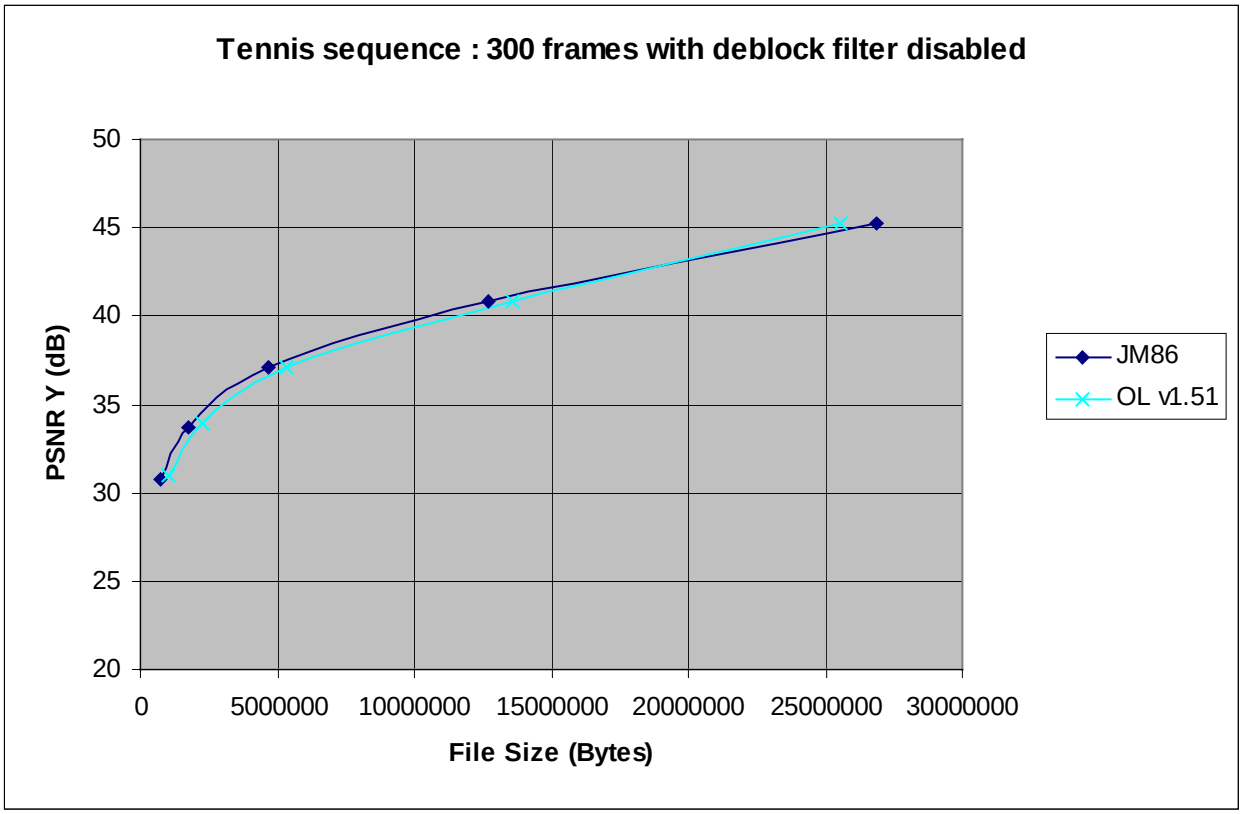


Qp	PSNR Y	PSNR U	PSNR V	File Size
15	45.213	46.405	46.992	26,855,138
20	40.804	43.759	44.338	12,717,310
25	37.115	41.576	41.605	4,683,891
30	33.745	39.715	39.367	1,786,854
35	30.712	38.062	37.399	731,041

Table 13 JM 8.6 figures for the Tennis sequence with deblocking filter disabled.

Qp	PSNR Y	PSNR U	PSNR V	File Size
15	45.199	46.641	47.478	25581040
20	40.846	43.847	44.493	13565541
25	37.086	41.624	41.697	5318030
30	33.876	39.784	39.452	2247988
35	30.971	38.206	37.565	1043761

Table 14 Ocean Logic core figures for the Tennis sequence with deblocking filter disabled.



6 Summary

The result of the testing shows that the H264-E real time baseline encoder closely and consistently matches the performances of the reference software model over a wide range of sequences and bitrates.

This in turn demonstrates the quality of the core design and its capability to operate in both high quality/high bitrate environments as well as low bitrate/wireless environments.

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