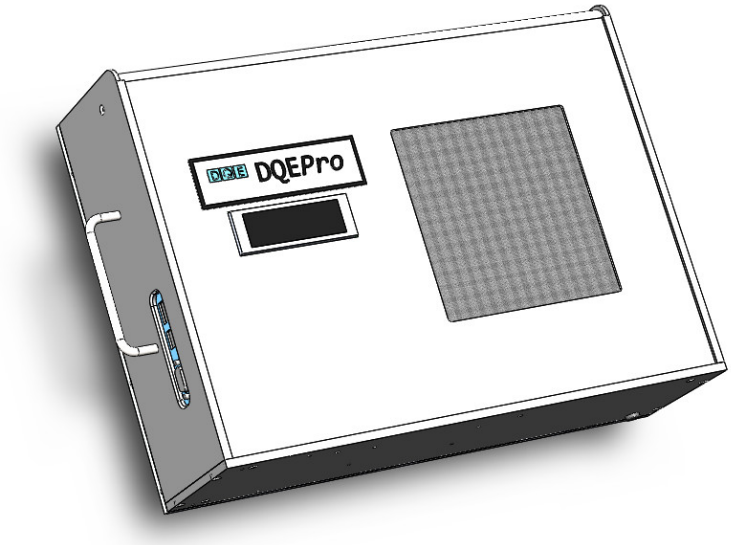
DQE*Pro*

Dynamic (Fluoroscopic) DQE Sample Report

- Clinical-environment test



DQE Instruments Inc., London, Ontario, Canada N6G 4X8
www.dqeinstruments.com

This report summarizes the analysis of a new CsI-based flat-panel detector in a clinical environment. The dynamic DQE is evaluated operating the detector at 30 frames/sec pulsed fluoroscopy using an RQA-5 (70 kV) spectrum. The assessment was completed in 20 min and required the acquisition of five image sequences (5.5 to 13 sec each) corresponding to a total of approximately 1000 images that were exported in tiff format. The scatter-rejection grid was not in place.

1. Both x and y presampling MTF curves show excellent spatial resolution appropriate for 2x2 binning of detector elements. The MTF 50%, 10% and 5% frequencies were 0.9, 1.9 and 2.2 cycles/mm in both x and y directions.
2. The temporal NPS is nearly flat with temporal frequencies, and the temporal autocovariance function is a single sharp peak with very small tails. This indicates very little lag between frames. The dynamic DQE correction factor was 1.03, corresponding to a correction of only 3%.
3. The two-dimensional NPS shows smooth circular symmetry with no unexpected noise structure.
4. The zero-frequency DQE value is approximately 0.82.
5. System gain is 3.2 pixel value / incident x-ray quantum.
6. The exposure waveform report shows near-uniform exposure pulses at 30 /sec.

DQE Report

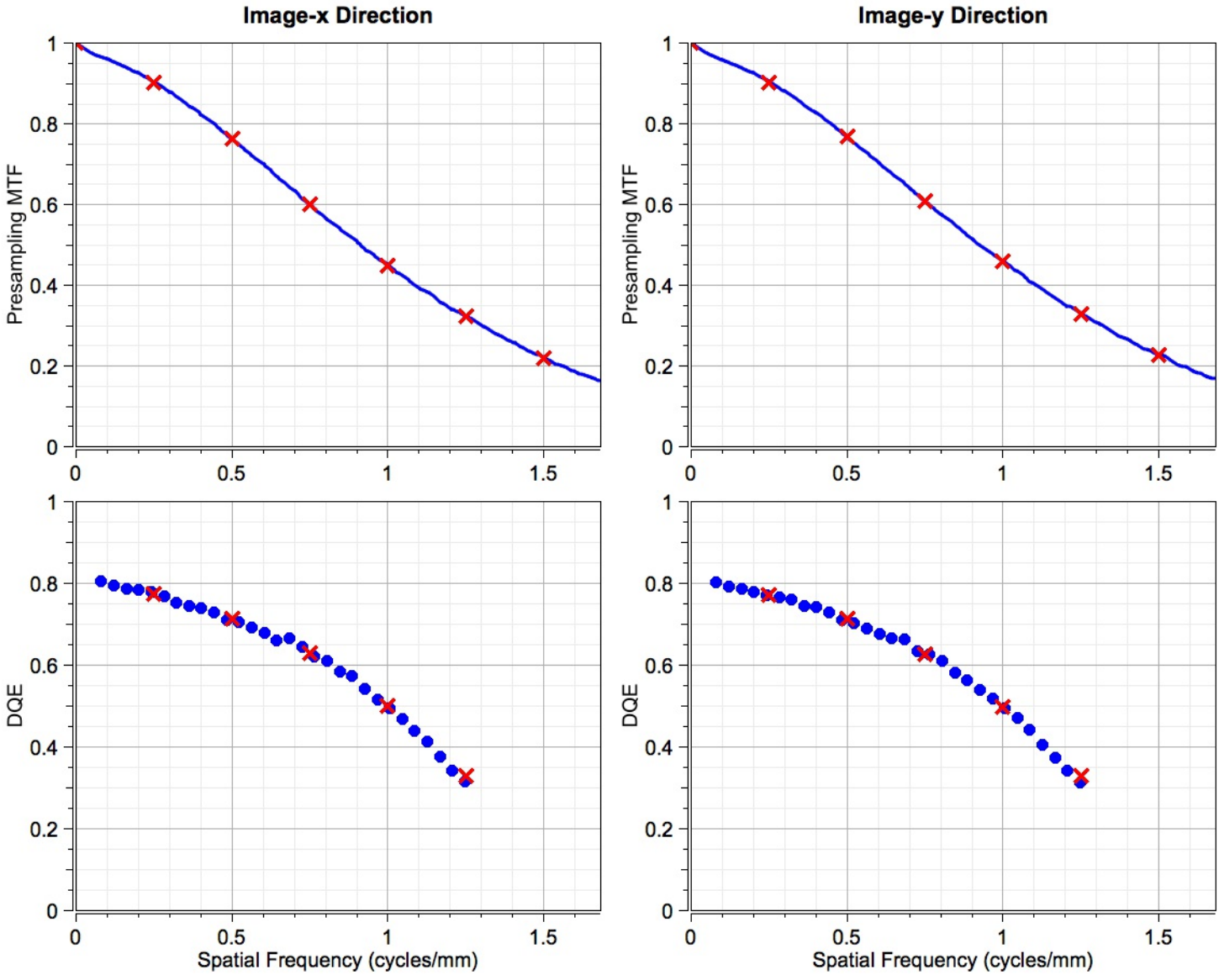
20150116-121856

Study comment: Sample study
Study date-time: Fri 16 Jan 2015 12:18:56
Grid:
X-ray spectrum: Dynamic, RQA-5 (70 kV)
Set technique: 70 kV, 200 mA
Incident image-plane exposure, air KERMA: 0.061 mR, 0.54 uGy
Half-value layer: 7.1 mmAl
Q_o: 2.64e+08 q/mm2/R, 3.02e+10 q/mm2/Gy
Pixel size in image plane, x y: 388 x 388 um (measured by DQEPro)
Average dark and open image pixel values: 1162.4 8408.4
Average system gain: 0.4469 DV/(q/mm2); 118195 DV/mR; 2.96 DV/q
Dynamic DQE correction factor: 0.97

Warnings were generated that may affect accuracy of results. Please see Message Summary report for details.

Approximate MTF and DQE Values:

cy/mm	x-MTF	x-DQE	cy/mm	y-MTF	y-DQE
0.00	1.00		0.00	1.00	
0.25	0.90	0.77	0.25	0.90	0.77
0.50	0.76	0.71	0.50	0.77	0.71
0.75	0.60	0.63	0.75	0.61	0.63
1.00	0.45	0.50	1.00	0.46	0.50
1.25	0.32	0.33	1.25	0.33	0.33
1.50	0.22		1.50	0.23	



Presampling x-MTF Report

DQEPro 4.2.0 123456
DQE Instruments
Fri 16 Jan 2015

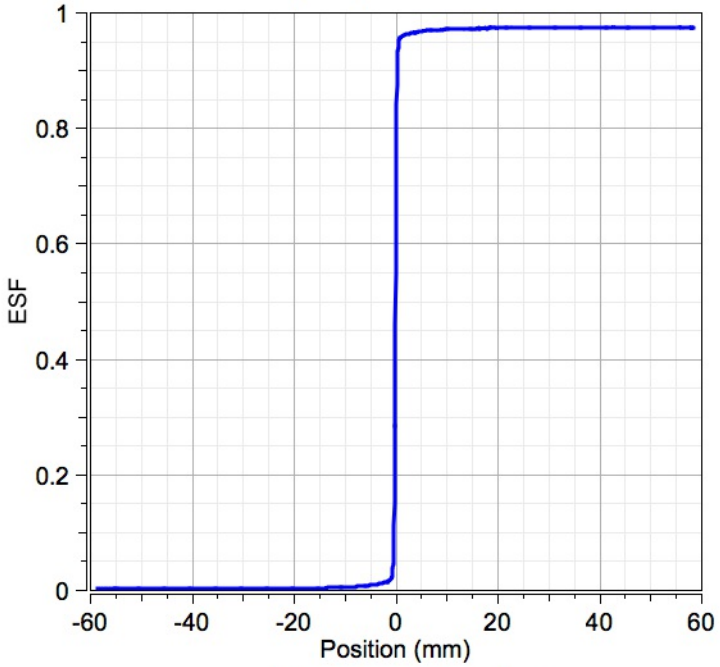
20150116-121856

Study comment: Sample study
Study date-time: Fri 16 Jan 2015 12:18:56
X-ray spectrum: Dynamic, RQA-5 (70 kV)
Incident image-plane exposure: 0.061 mR, 0.54 uGy
Window width: 100 mm
Pixel size in image plane: 388 um (measured by DQEPro)
Sampling cut-off frequency: 1.3 cycles/mm
MTF 50%, 10% and 5% frequencies: 0.9 1.9 2.2 cycles/mm

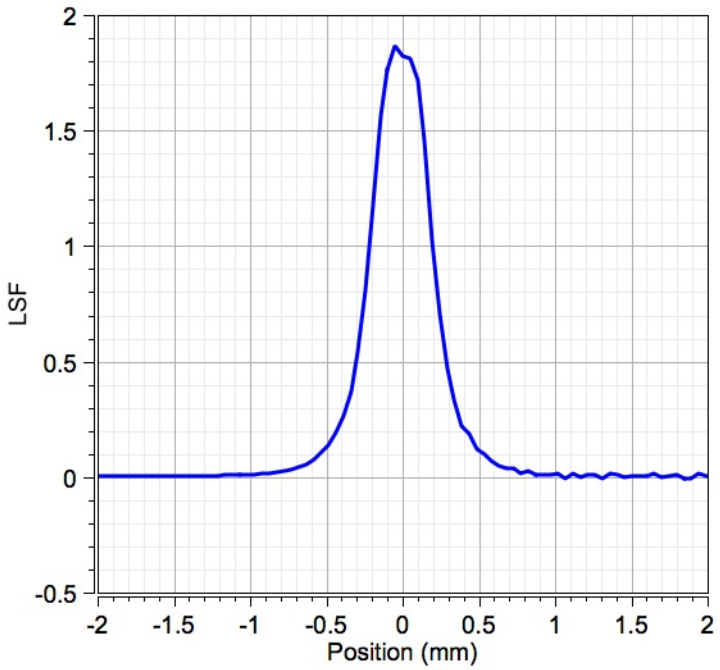
Approximate MTF Values:

cycles/mm	MTF
0.00	1.00
0.25	0.90
0.50	0.76
0.75	0.60
1.00	0.45
1.25	0.32
1.50	0.22
1.75	0.14
2.00	0.08
2.25	0.04
2.50	0.01
2.75	0.01
3.00	0.03

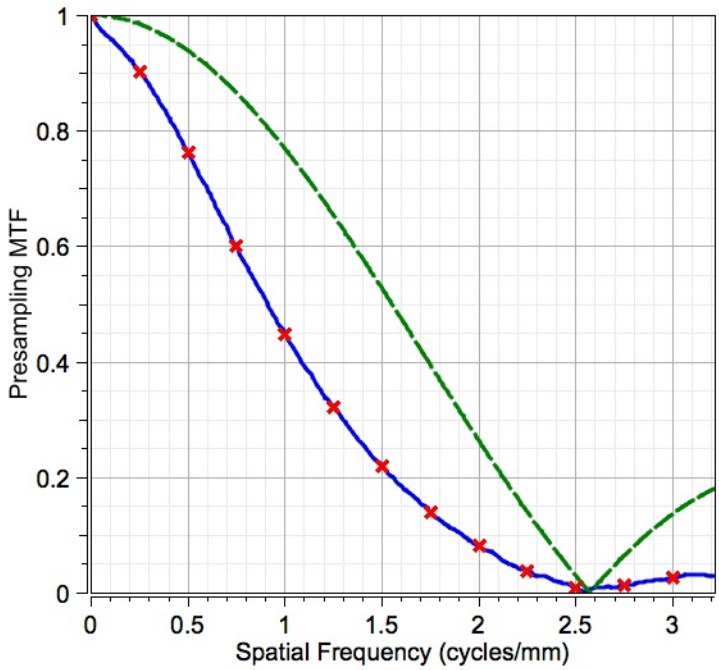
Edge-Spread Function



Line-Spread Function



Modulation Transfer Function



Presampling y-MTF Report

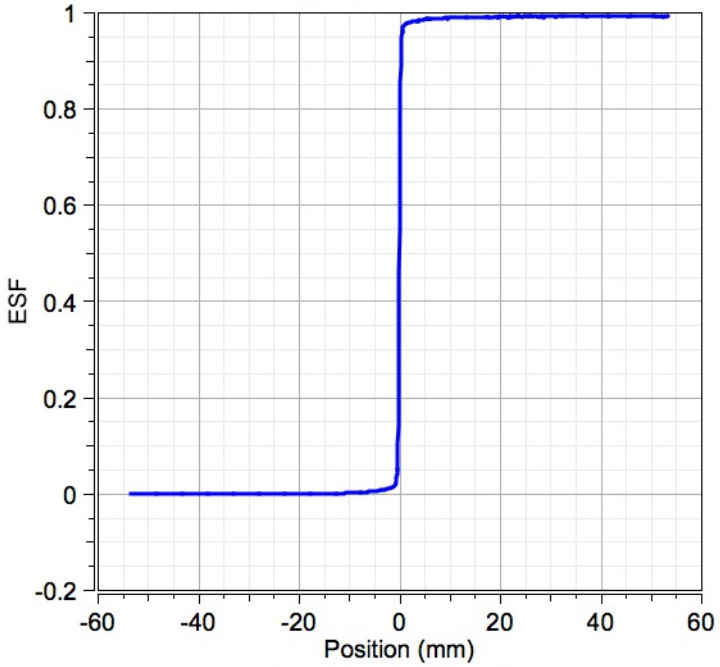
20150116-121856

Study comment: Sample study
Study date-time: Fri 16 Jan 2015 12:18:56
X-ray spectrum: Dynamic, RQA-5 (70 kV)
Incident image-plane exposure: 0.061 mR, 0.54 uGy
Window width: 100 mm
Pixel size in image plane: 388 um (measured by DQEPro)
Sampling cut-off frequency: 1.3 cycles/mm
MTF 50%, 10% and 5% frequencies: 0.9 1.9 2.2 cycles/mm

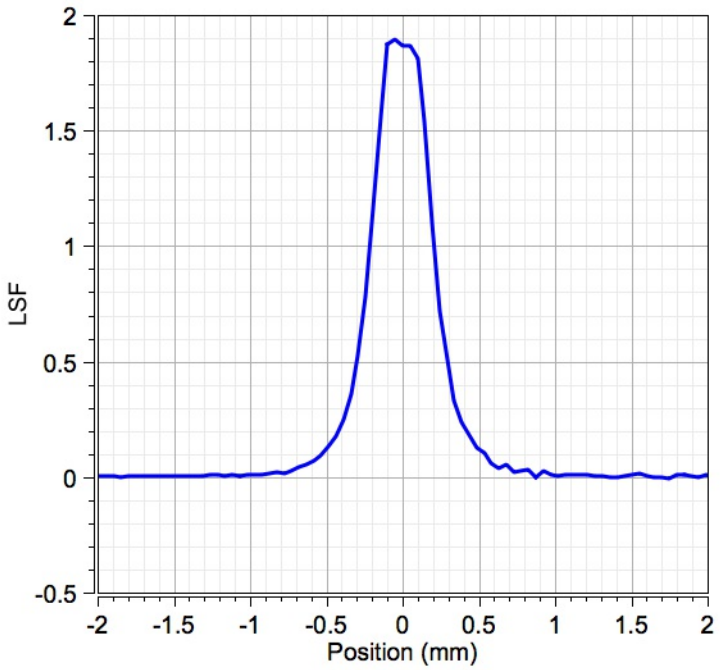
Approximate MTF Values:

cycles/mm	MTF
0.00	1.00
0.25	0.90
0.50	0.77
0.75	0.61
1.00	0.46
1.25	0.33
1.50	0.23
1.75	0.15
2.00	0.09
2.25	0.04
2.50	0.01
2.75	0.02
3.00	0.03

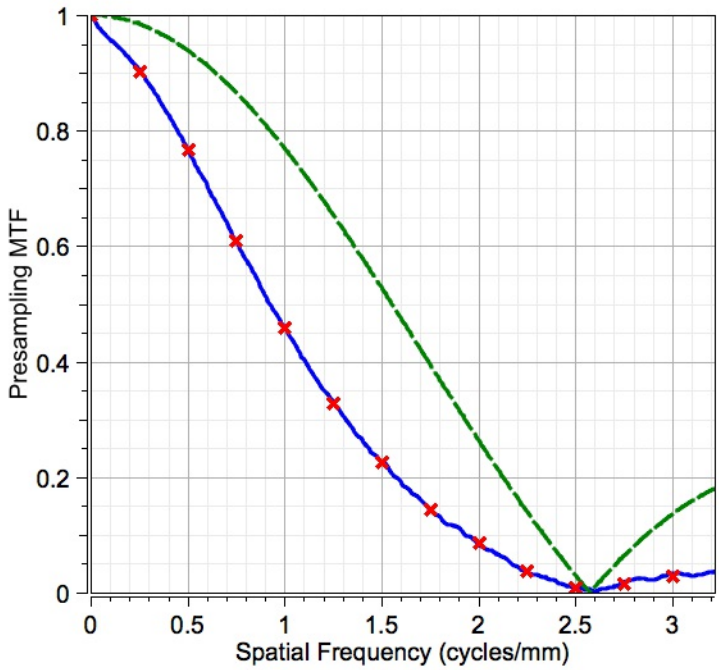
Edge-Spread Function



Line-Spread Function



Modulation Transfer Function



Wiener NPS Report

DQEPro 4.2.0 123456
DQE Instruments
Fri 16 Jan 2015

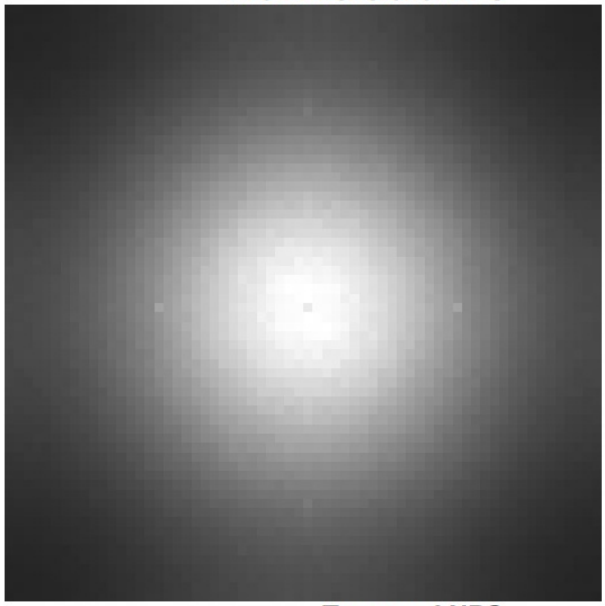
20150116-121856

Study comment: Sample study
Study date-time: Fri 16 Jan 2015 12:18:56
X-ray spectrum: Dynamic, RQA-5 (70 kV)
Incident image-plane exposure: 0.061 mR, 0.54 uGy
Pixel size in image plane: 388 x 388 um (measured by DQEPro)
Average dark and open pixel values: 1162.4 8408.4
Average dark-subtracted open pixel value: 7245.9
Lag fraction (approximate): 0.07
Lag fraction estimate assumes single-exponential lag only.
Dynamic NPS zero value: 1.01
Dynamic NPS quantum-correction factor: 1.03

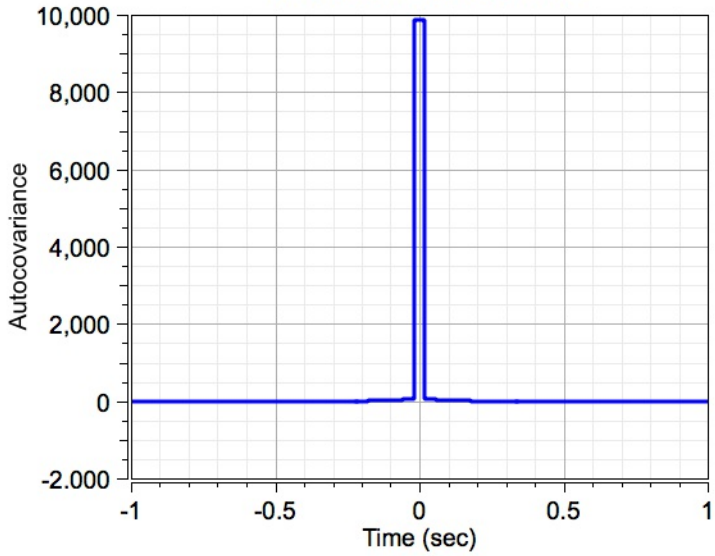
Normalized NPS has been corrected for lag and scaled by (incident-q/mm2) / (mean-pixel-value)^2 such that an ideal detector has unity NPS.

In the NPS plots below, blue markers indicate total image noise while green markers indicate detector readout noise. Images are quantum-noise limited only when readout noise is a small fraction of total image noise.

Two-Dimensional NPS



Temporal Autocovariance



Temporal NPS

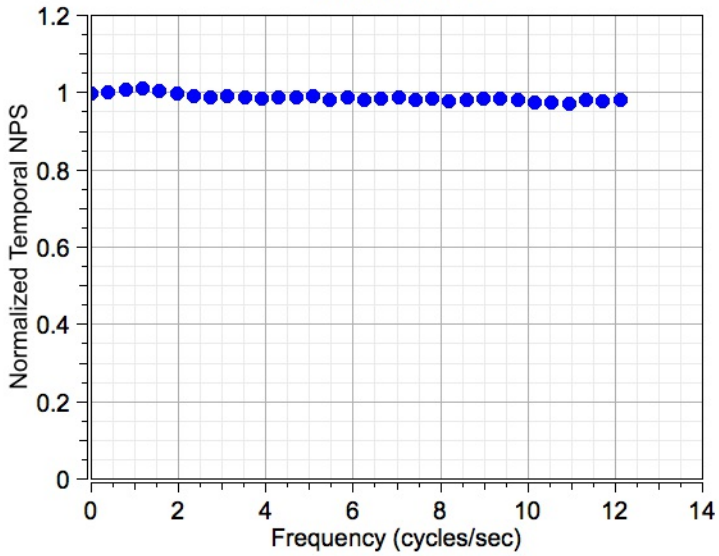


Image-x Direction

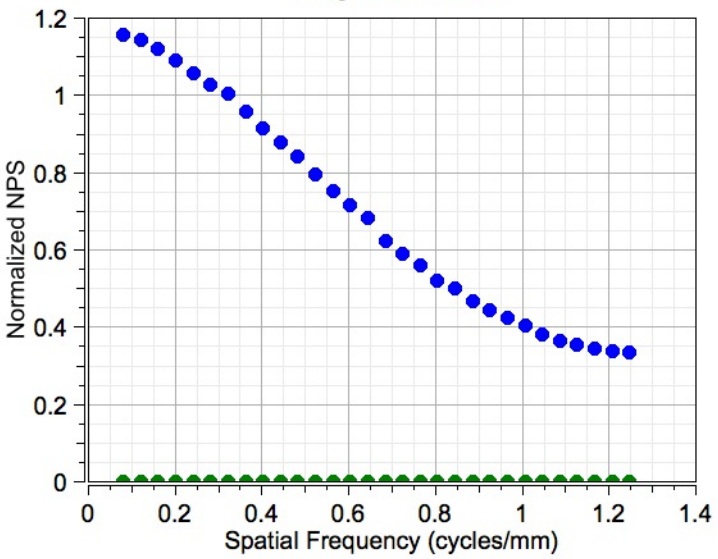
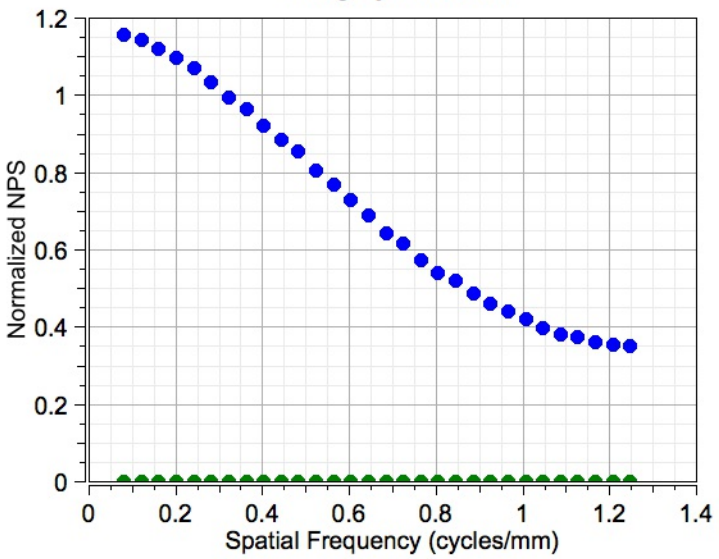


Image-y Direction



Waveform Report

DQEPro 4.2.0 123456
DQE Instruments
Fri 16 Jan 2015

20150116-121856

Data folder: /Users/DQE/data

These waveforms show relative x-ray intensity profiles measured by DQEPro for each exposure. Green line segments correspond to identified exposure pulses. Leading and trailing baselines are shown as dark blue segments. The first pulse should start at 0 sec. Ensure pulses are correctly identified and free of undesirable artifacts that may indicate problems with the x-ray generator or tube. Double-click on any waveform to open a review window.

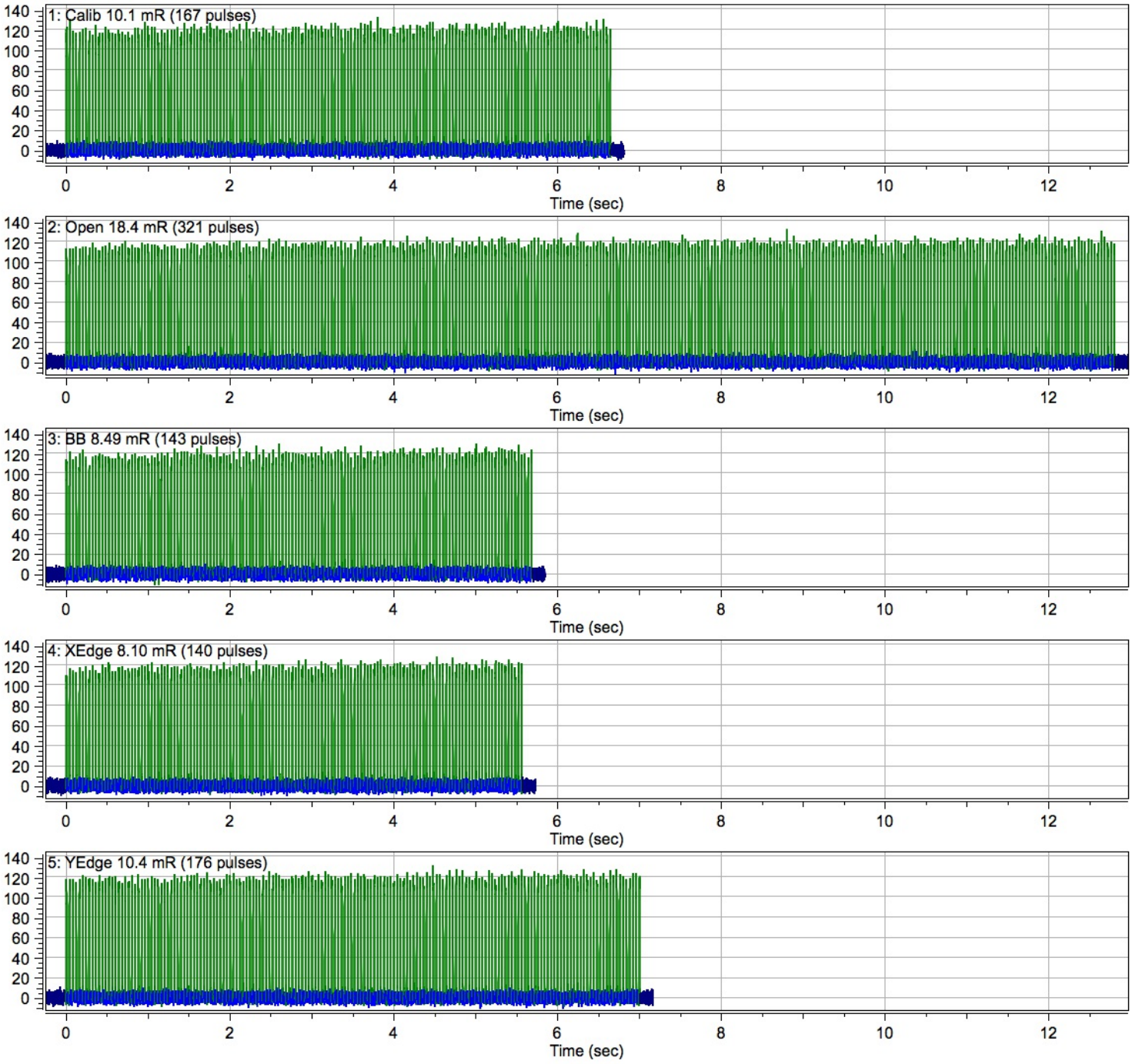
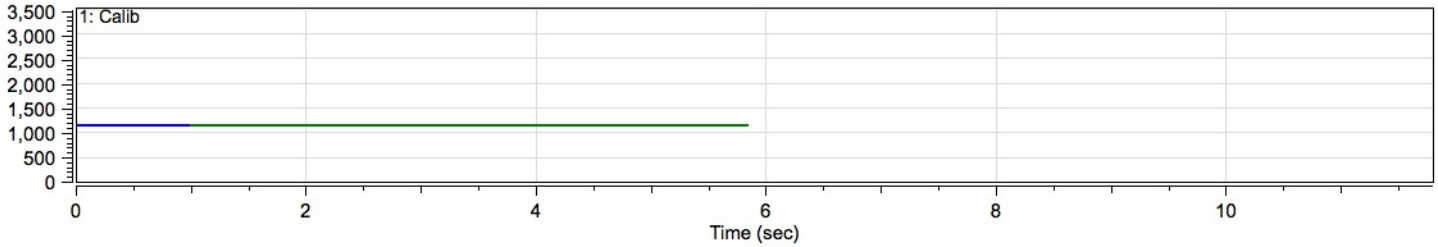


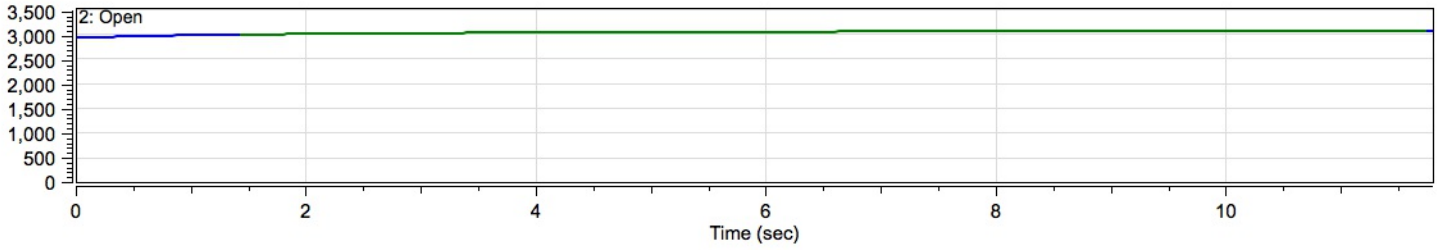
Image Waveform Report

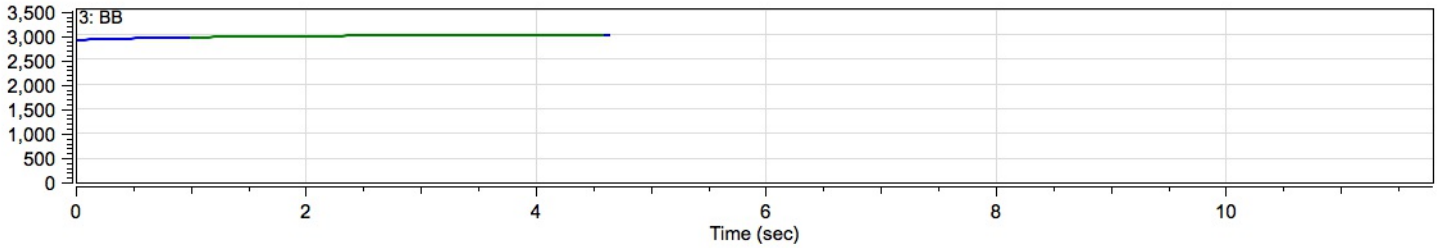
DQEPro 4.2.0 123456
DQE Instruments
Fri 16 Jan 2015

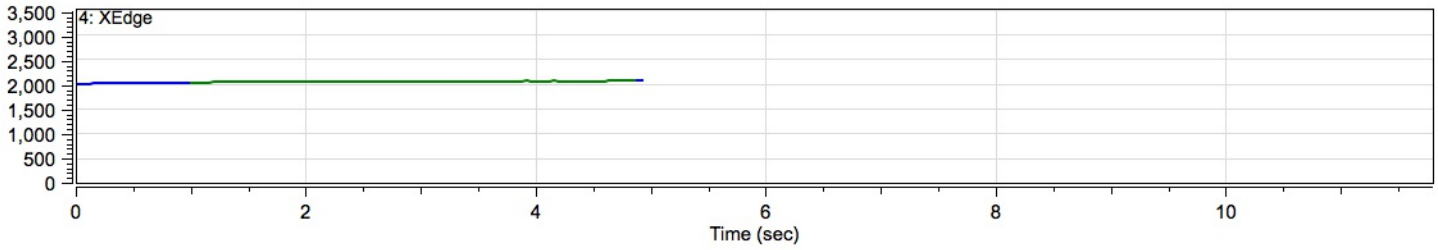
20150116-121856

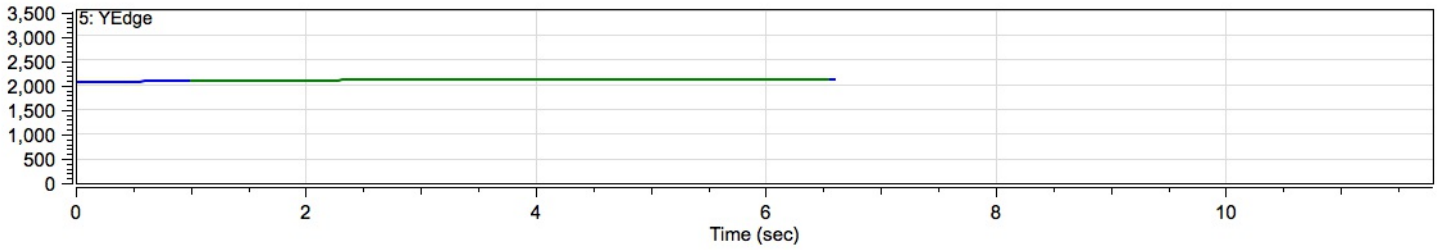
These waveforms show average pixel-value profiles in the acquired images for each exposure. Green line segments correspond to images selected for the dynamic analysis. The number of images used with Calib and Open type exposures will be the largest possible power of two. Double-click on any plot to open a review window.











DQE instruments

Defects Report

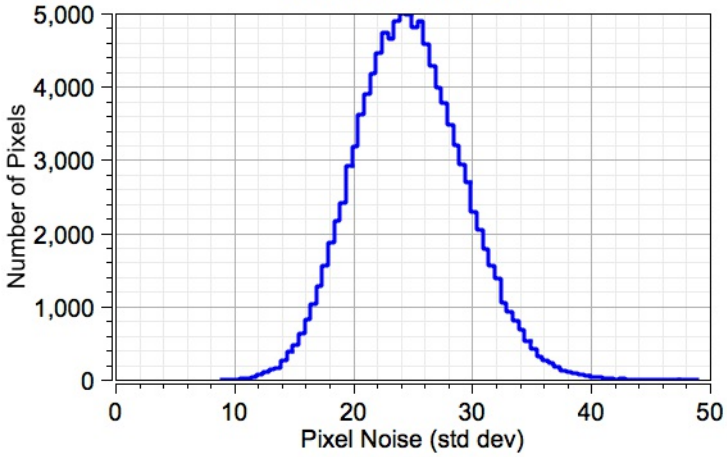
DQEPro 4.2.0 123456
DQE Instruments
Fri 16 Jan 2015

20150116-121856

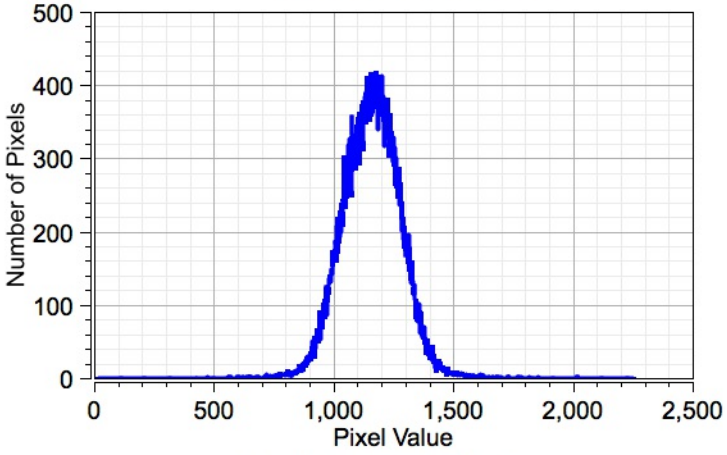
Detector:
Detector SN:
Study comment: Sample study
Study date-time: Fri 16 Jan 2015 12:18:56
Potential defects include real defects and pixels obscured from x-ray beam.
Number (fraction) of potential defects in ROI: 0 of 113569 (0.0E+00)
Number (fraction) of zero dark pixels in ROI: 0 of 113569 (0.00)
Number of unconnected potential defects in ROI: 0

Potential-Defect Size Histogram

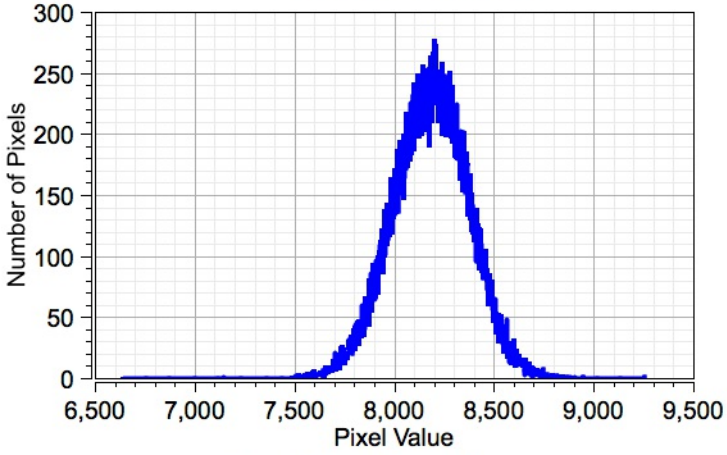
Pixel-Noise Histogram



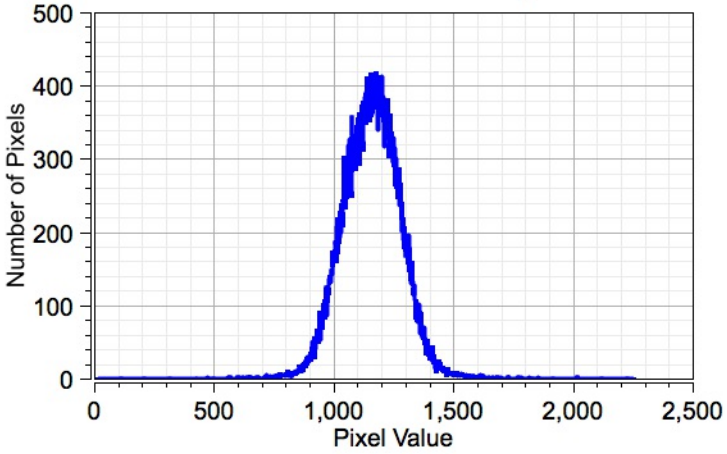
Raw Dark Histogram



Raw Open Histogram



Good-Pixel Dark Histogram



Good-Pixel Open Histogram