ANSI N42.55 test results for Default System system using Example X-ray source source

Example Data
PDF generated 2020-08-24 at 16:58
Analyzed using Glover ANSI N42.55 Python code (version 0.13)

Main test object images:

    example_images/N4255_1.tif

    example_images/N4255_2.tif

    example_images/N4255_3.tif

    example_images/N4255_4.tif

Image extent image:

    example_images/N4255_5.tif

Noise images:

    example_images/N4255_1_blank.tif

    example_images/N4255_2_blank.tif

    example_images/N4255_3_blank.tif

    example_images/N4255_4_blank.tif

    example_images/N4255_5_blank.tif

ANSI N42.55 test results

Metric name	Metric Value	Min. Performance Req.
Test 1: Penetration	None mm♣	≥ 6 mm
Test 2: Organic Material Detection	-1.1♣	≥ 2.0
Test 3: Spatial Resolution		
MTF20x	1.45 lp/mm ± 0.05 lp/mm†	≥ 0.5 lp/mm
Test 4: Dynamic Range	254.6 ± 21.9†	≥ 150
Test 5: Noise		
NEQx at 1 lp/mm	295,089 ± 15,693†	≥ 22,500
NEQy at 1 lp/mm	311,106 ± 11,337†	≥ 22,500
Test 6: Flatness of field	0.991 ± 0.00†	≥ 0.5
Test 7: Image extent	1 mm♣	≤ 10 mm
Test 8: Image area	2876 by 2350 pixels	≥ 1000 by 1000 pixels
Test 9: Aspect Ratio	0.021 ± 0.001†	≤ 0.05

† These values represent the mean and one-sigma uncertainty in the quantity of interest. In some cases, the metric mean must be two sigma away from the min performance requirement in order to pass. See IEEE/ANSI N42.55 for full details.

♣ These tests do not have uncertainty values defined in the standard.

Cropped and Rotated Images

Orientation 1

Orientation 2

Orientation 3
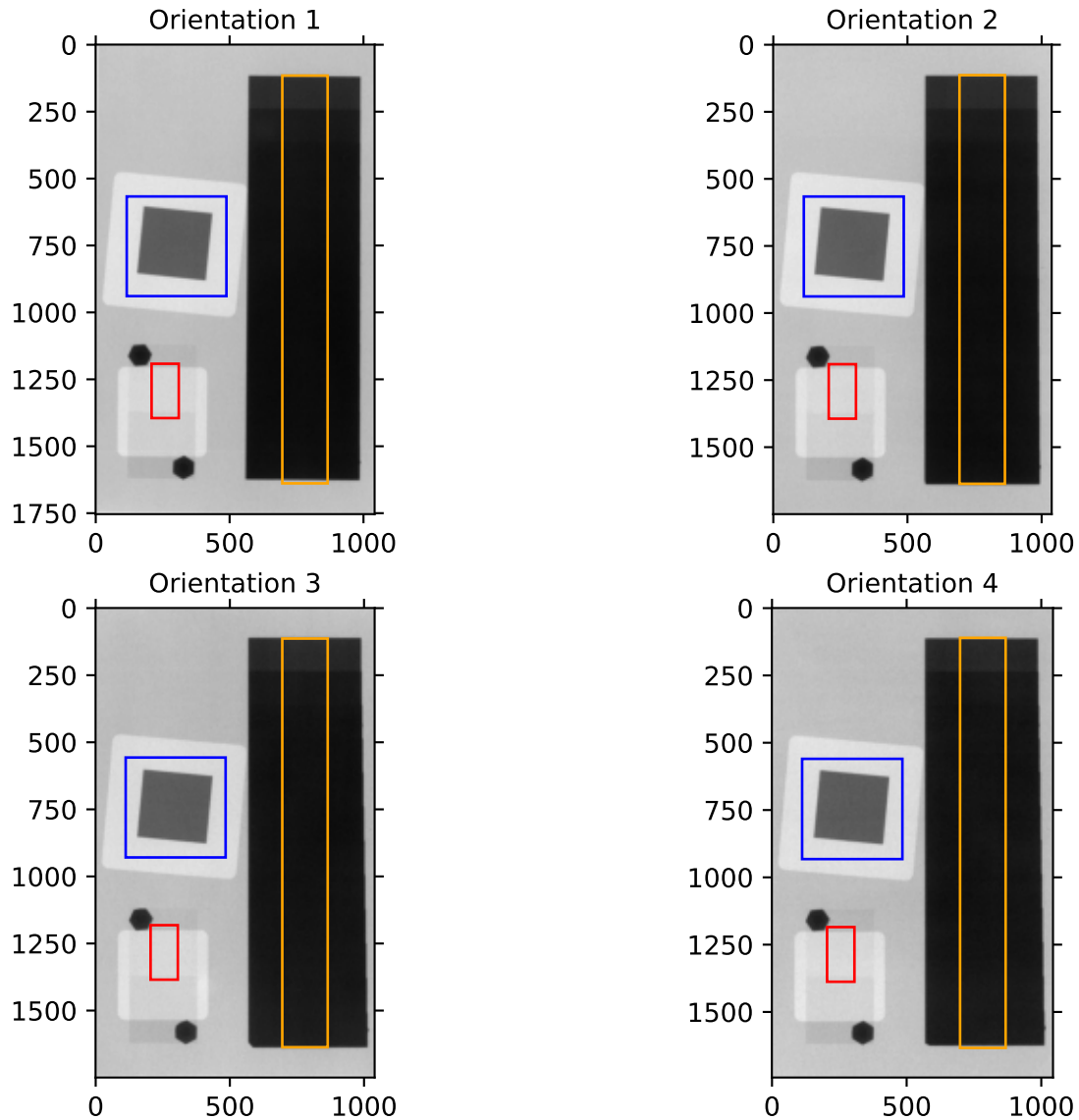
Orientation 4

Image 1 is shown in its original orientation. The other three images have been rotated to be in the same orientation as image 1. Images 2, 3 and 4 were originally in an orientation that was rotated by 90, 180 and 270 degrees clockwise compared with image 1. This convention is continued throughout the document.

Colored boxes have been drawn around important regions of the image.
The blue ROI should surround the Pb foil test piece, leaving some room on all sides of it.
The red ROI should be placed on the POM test piece, between the two bolts.
The orange ROI should span the middle portion of the steel step wedge, running the entire vertical length of the image.

Test 1: Steel penetration (None mm)
boundary images shown below
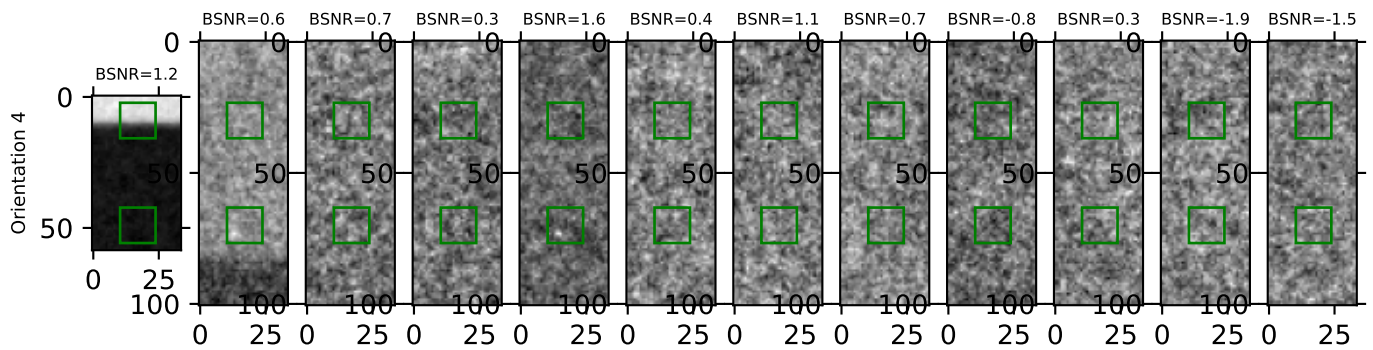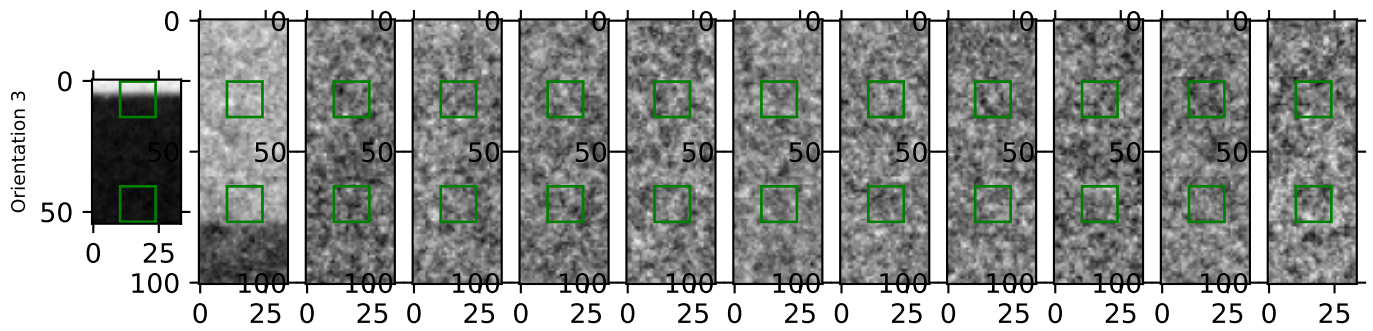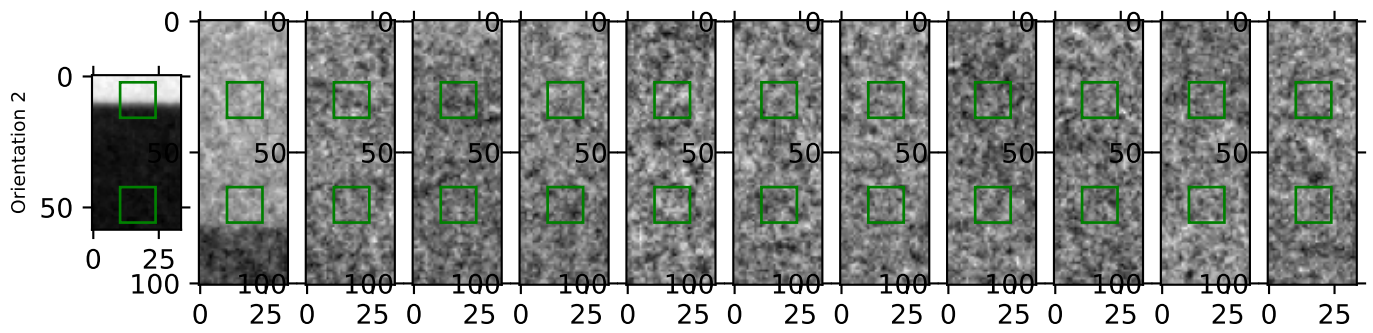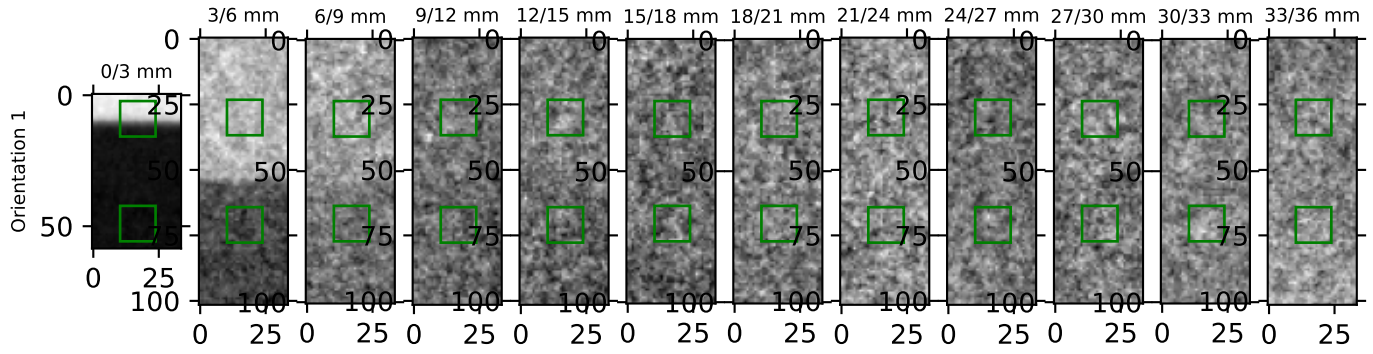
Test 2: Organic Detection (-1.1)

Bound. sig.=-0.000
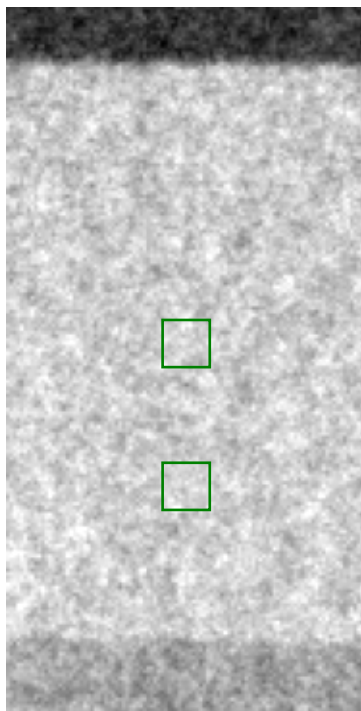
Bound. sig.=-0.002

BSNR: -1.1

Ave sig -0.002
Stdev 0.001
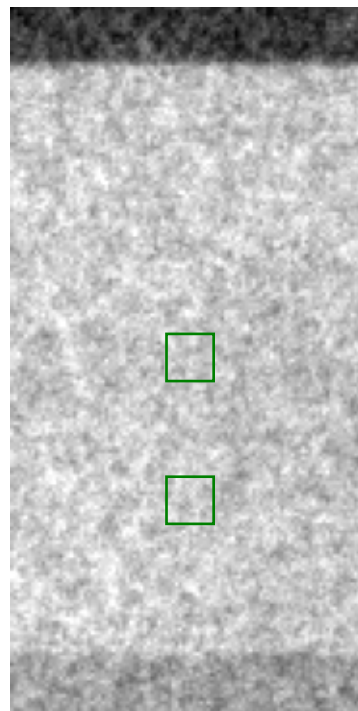
Bound. sig.=-0.001
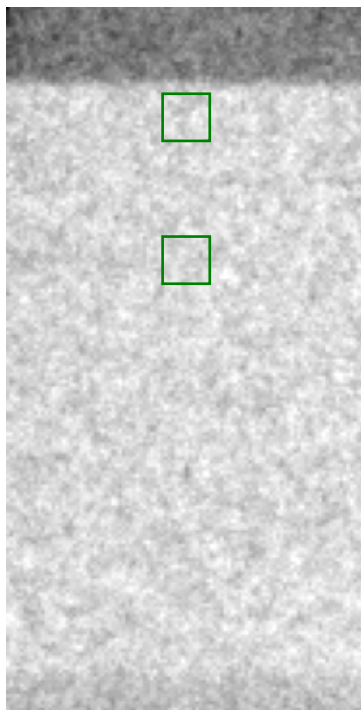
Bound. sig.=-0.003
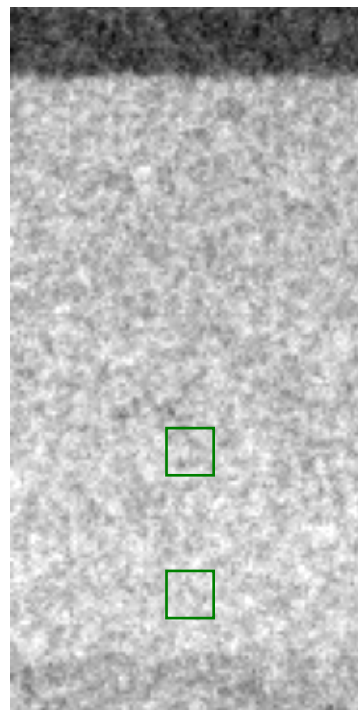
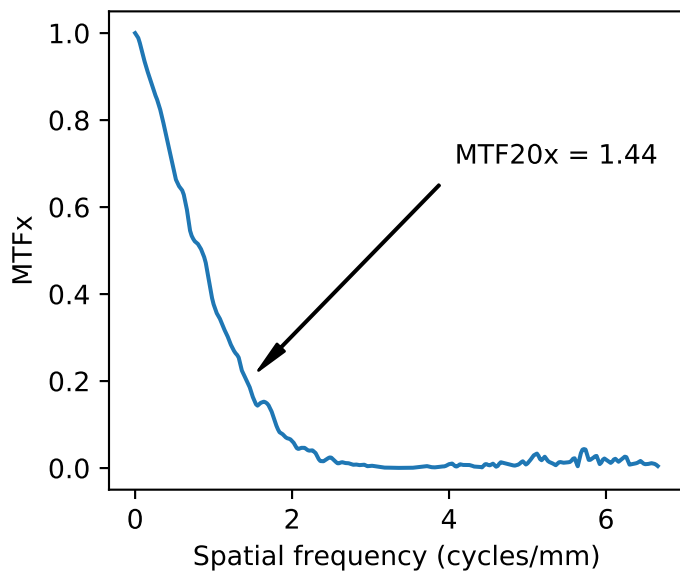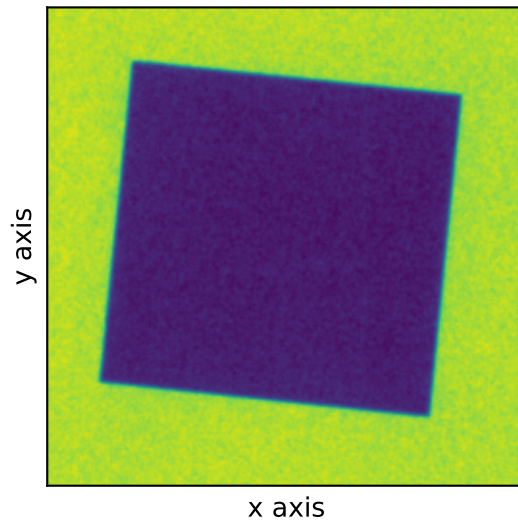# Test 3: Spatial Resolution
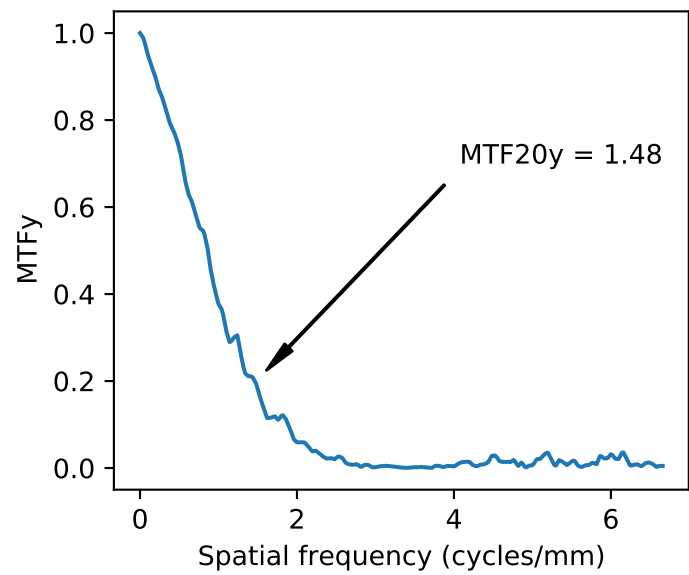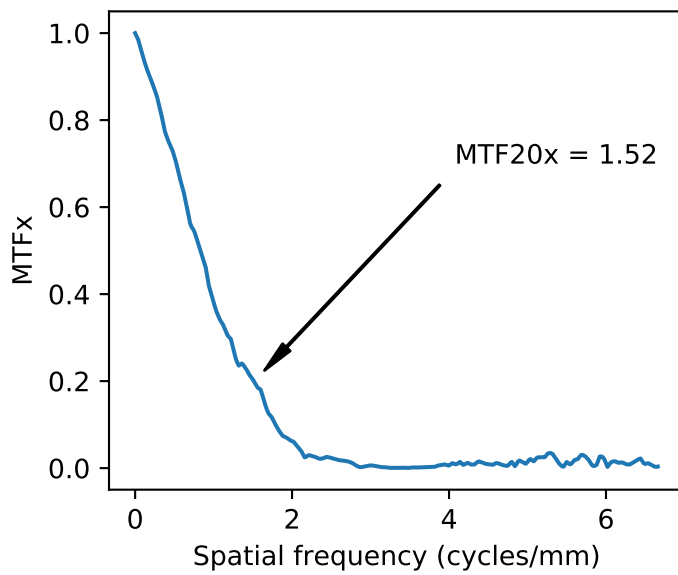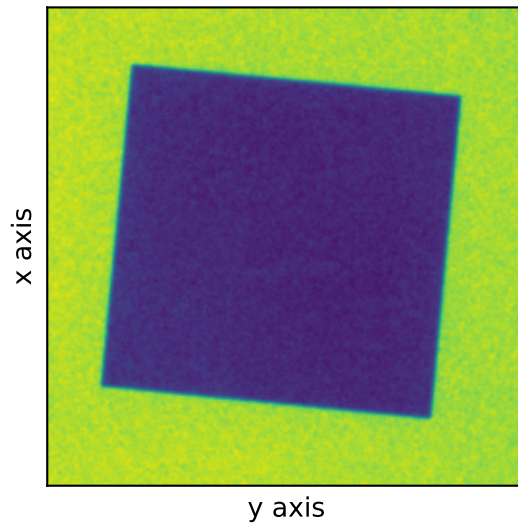## MTF20x = 1.45
MTF20y = 1.44

Orientation 1
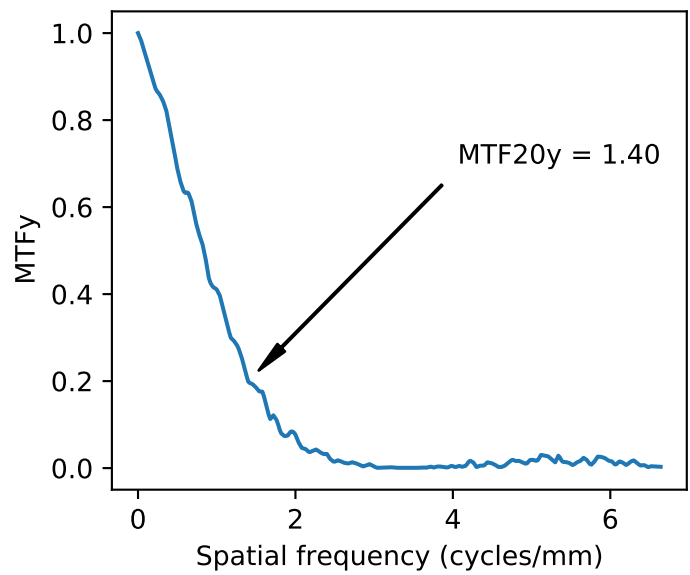
Test 3: Spatial Resolution
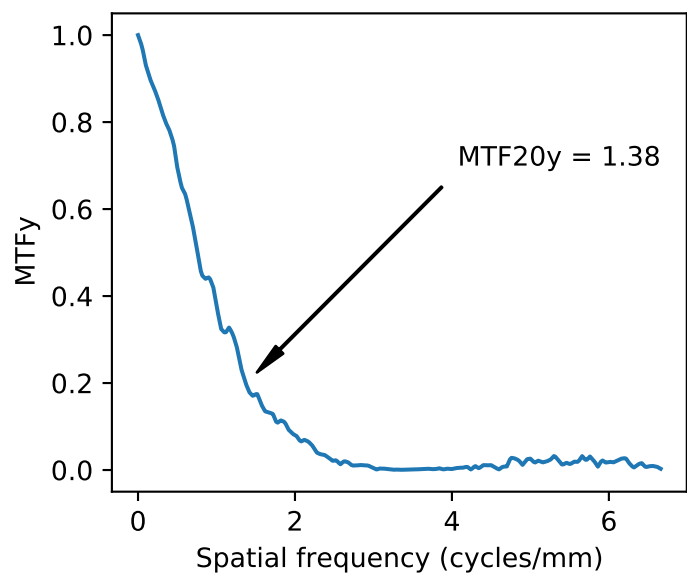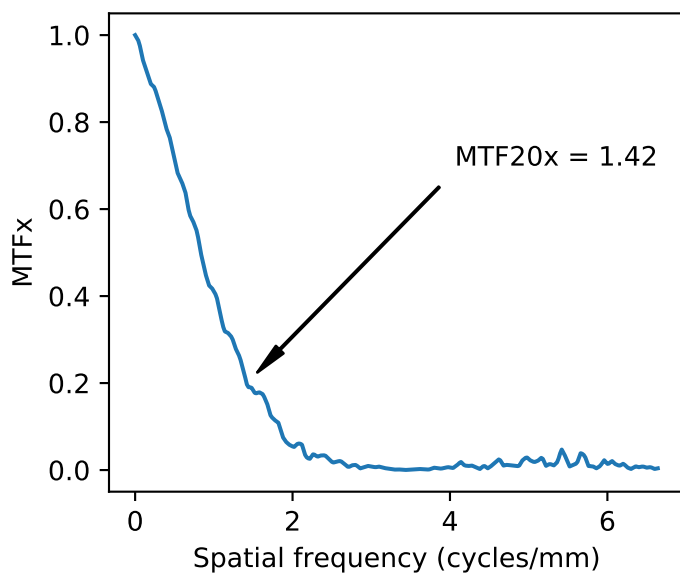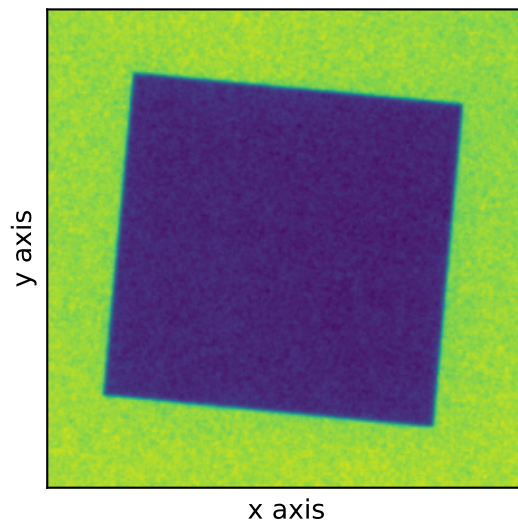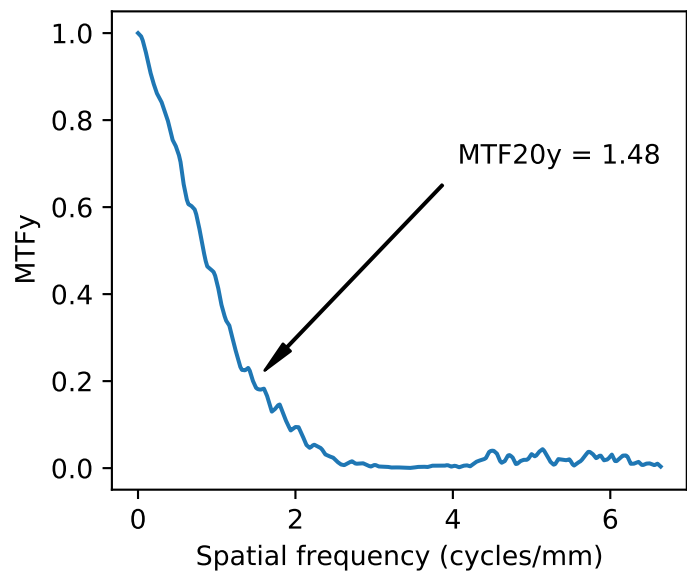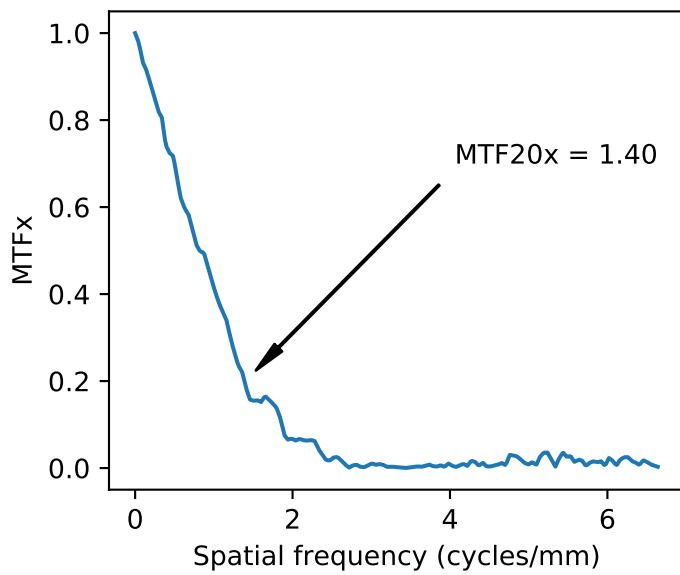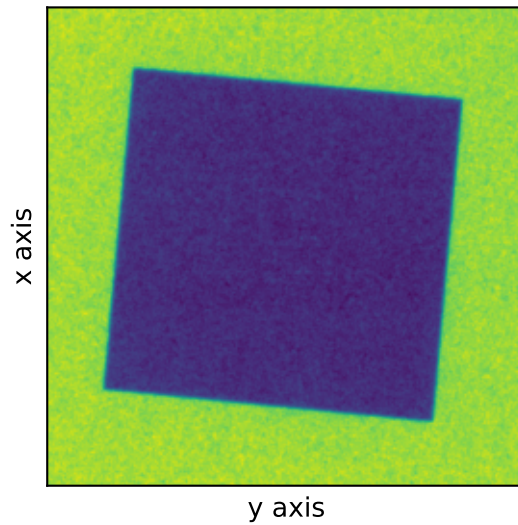## MTF20x = 1.45
MTF20y = 1.44

Orientation 2

MTF20x = 1.52

MTF20y = 1.48

Test 3: Spatial Resolution
MTF20x = 1.45
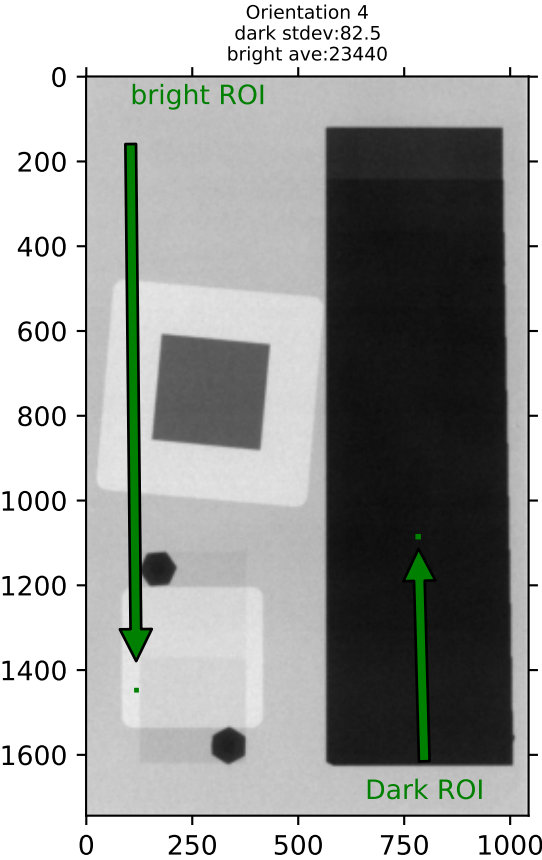MTF20y = 1.44

Orientation 3

Test 3: Spatial Resolution
MTF20x = 1.45
MTF20y = 1.44

Orientation 4

Test 4: Dynamic Range (254.6)

Orientation 1
dark stdev:109.1
bright ave:26890

bright ROI

Dark ROI

Orientation 2
dark stdev:112.9
bright ave:25197

bright ROI

Dark ROI

Orientation 3
dark stdev:91.9
bright ave:24397

bright ROI

Dark ROI

Orientation 4
dark stdev:82.5
bright ave:23440

bright ROI

Dark ROI
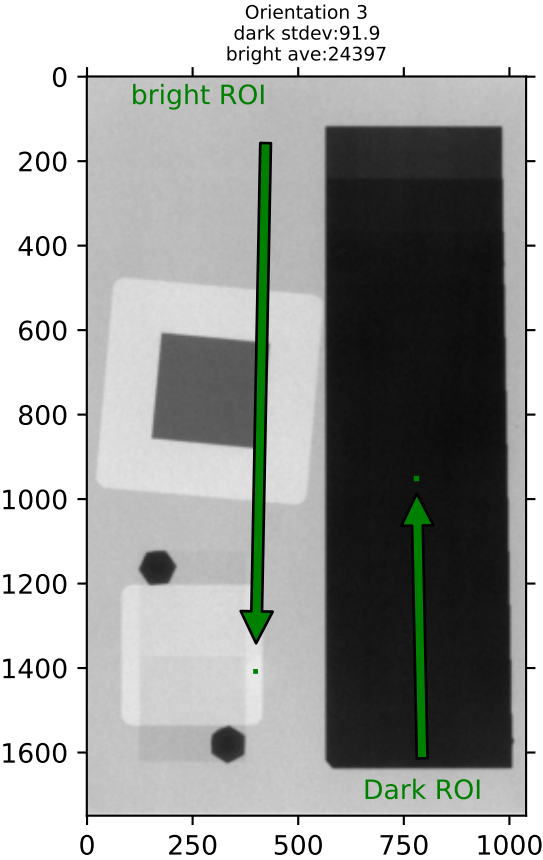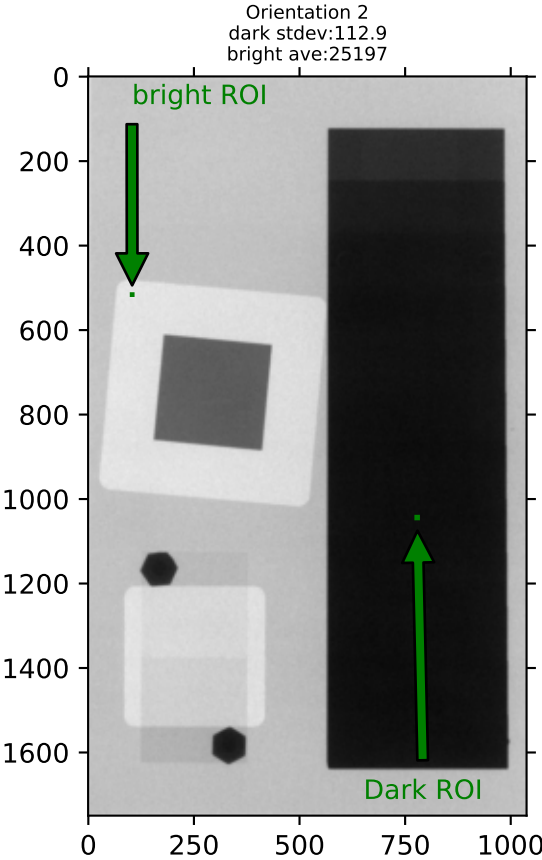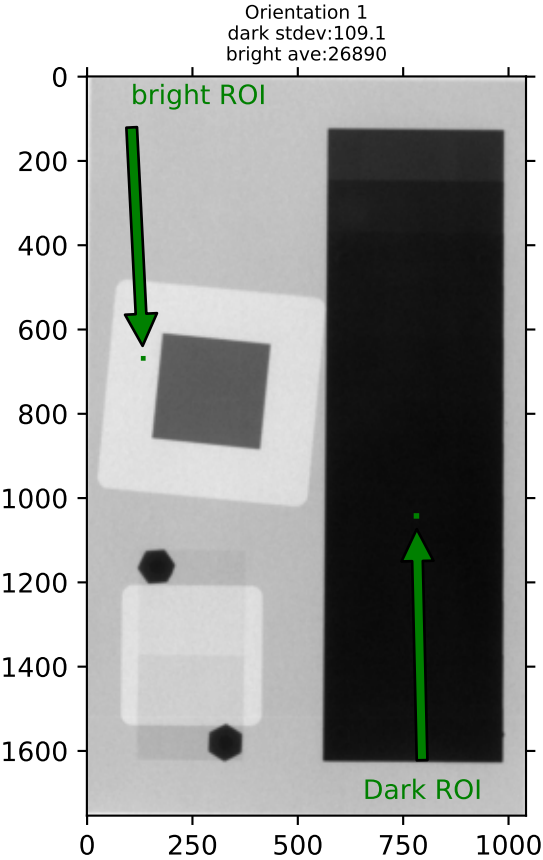
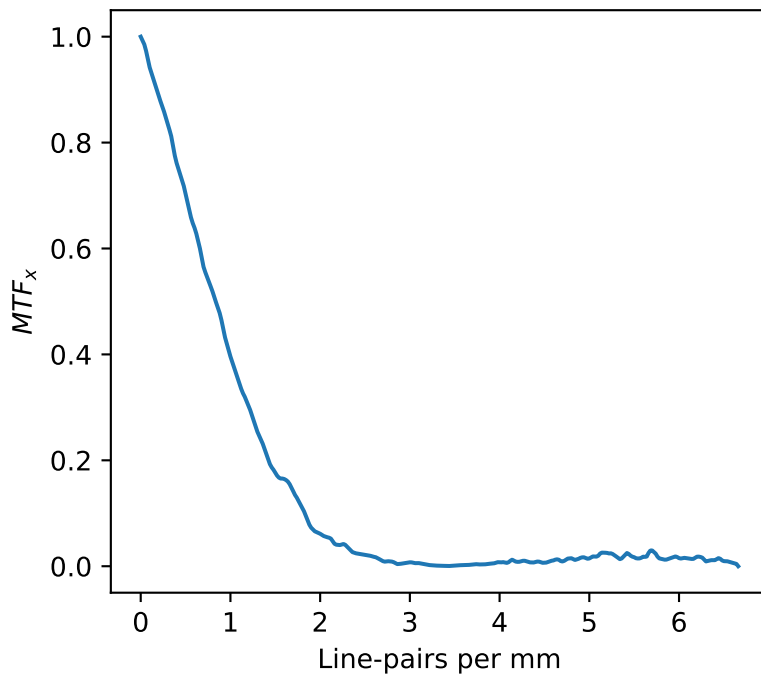# Test 5: Noise (NEQ_x at 1 lp/mm: 295,089)

$$NEQ = \frac{S_{out}^2 MTF^2}{NPS}$$

NPS_x (at 1 lp/mm) = 360.4

MTF_x (at 1 lp/mm) = 0.396

S_{out} (at 1 lp/mm) = 26,034

NEQ_x (at 1 lp/mm) = 295,089 ± 15,693
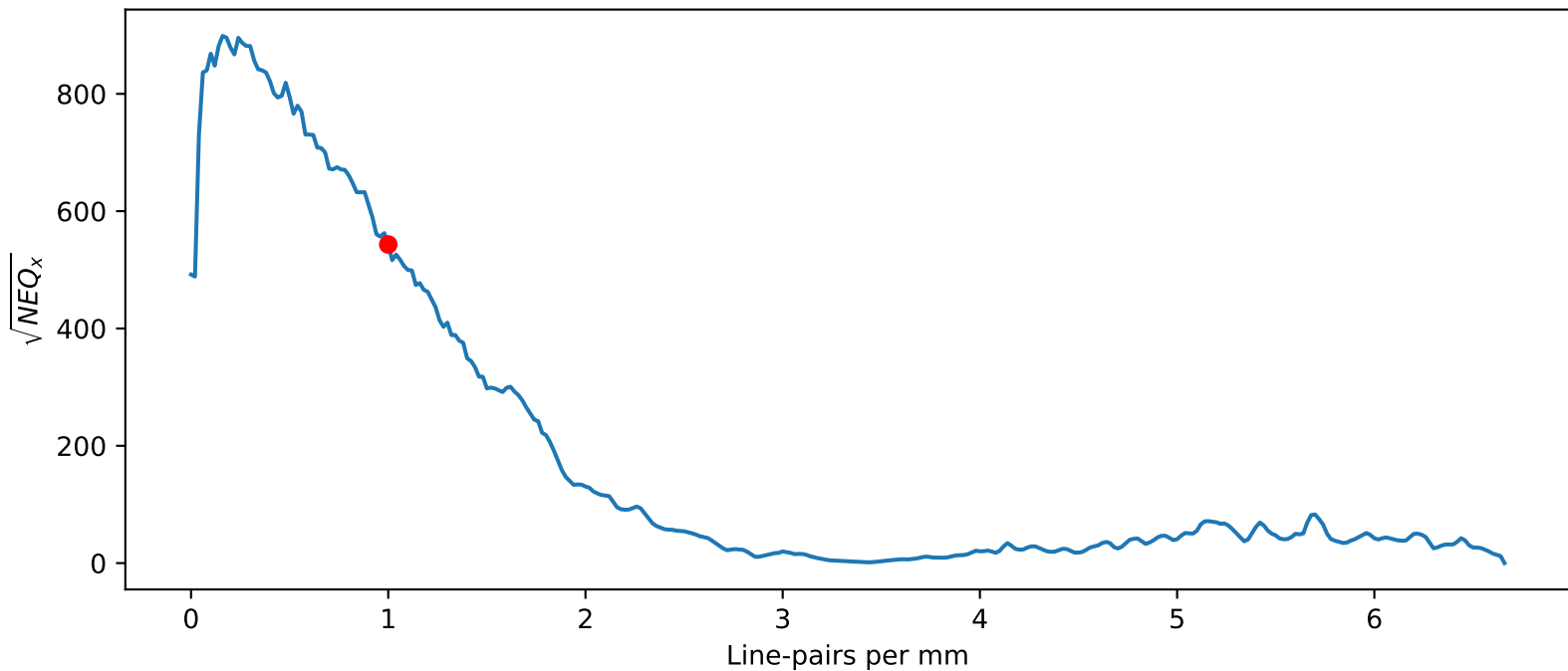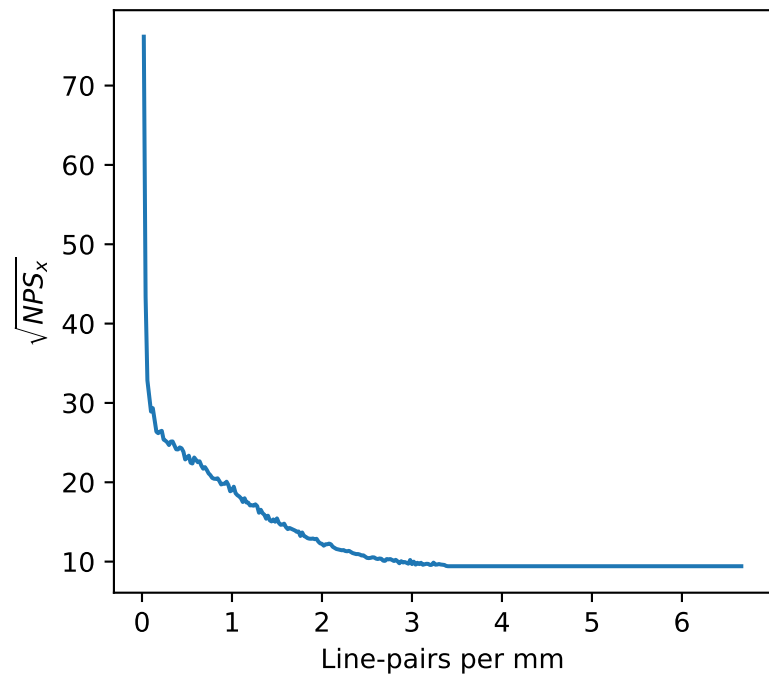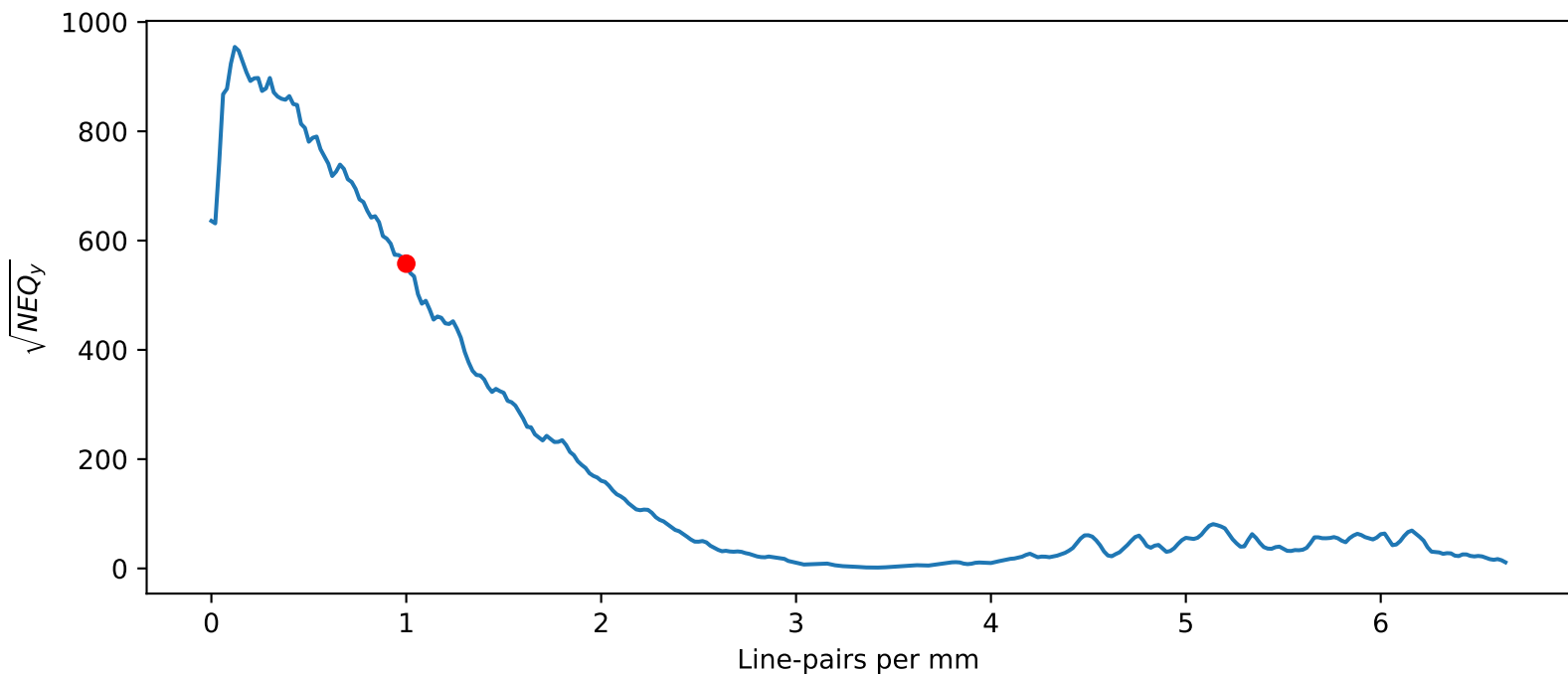
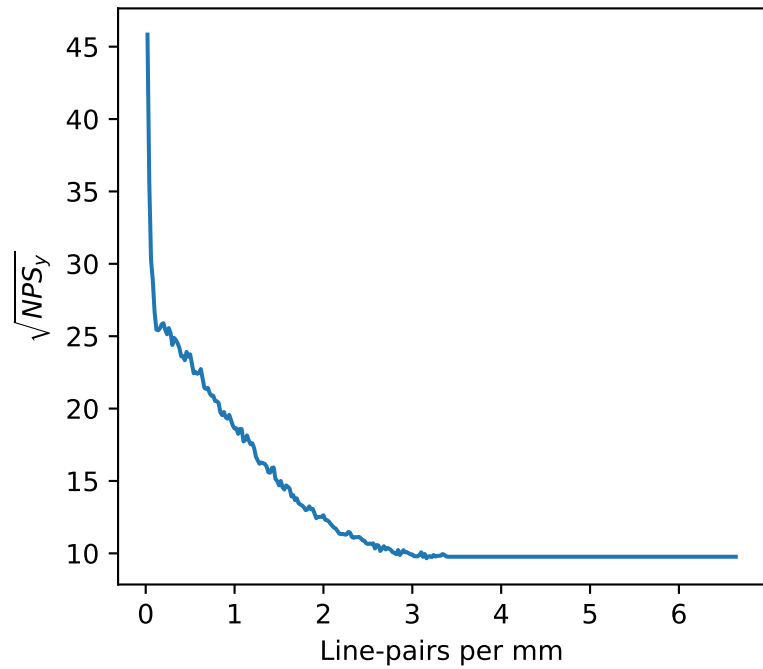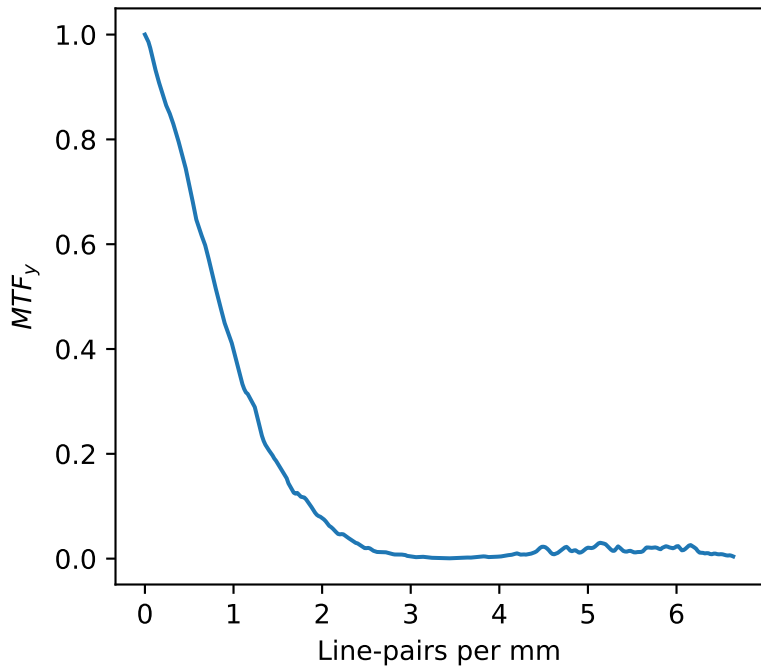# Test 5: Noise (NEQ_y at 1 lp/mm: 311,106)

$$NEQ = \frac{S_{out}^2 MTF^2}{NPS}$$
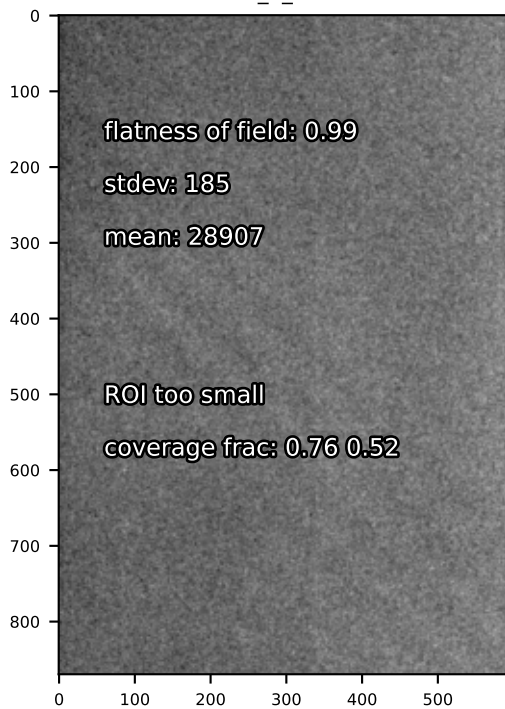
NPS_y (at 1 lp/mm) = 346.6

MTF_y (at 1 lp/mm) = 0.398

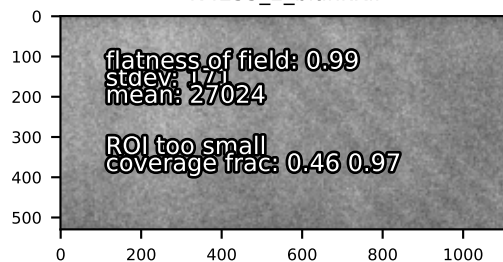S_{out} (at 1 lp/mm) = 26,034

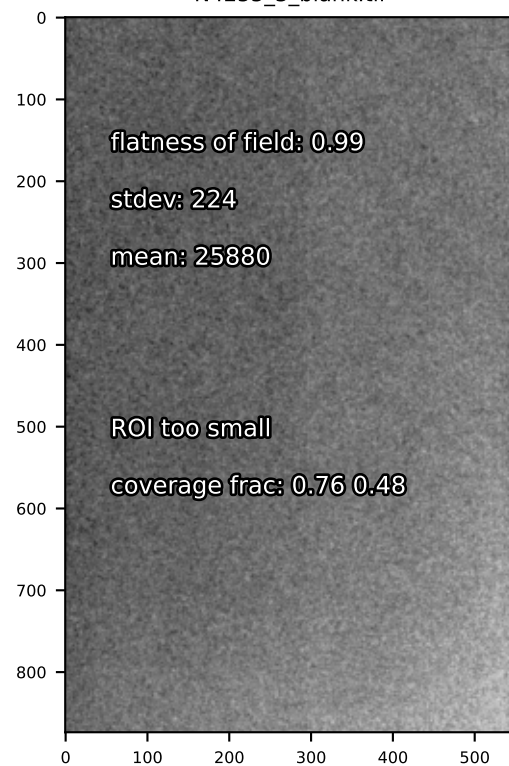NEQ_y (at 1 lp/mm) = 311,106 $\pm$ 11,337

Test 6: Flatness of Field (0.99)

N4255_1_blank.tif

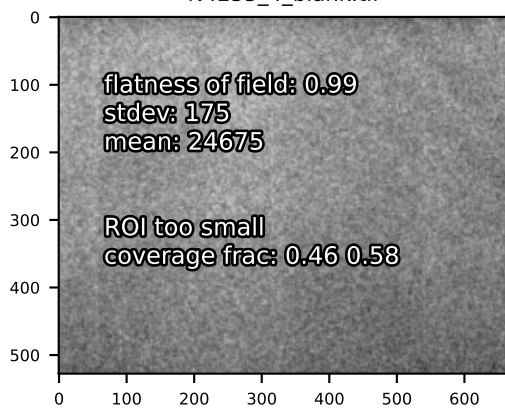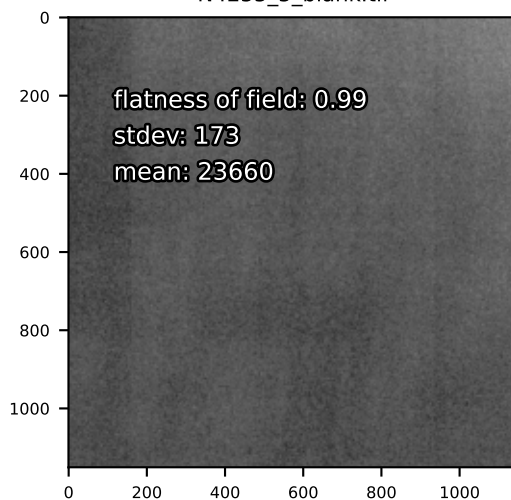flatness of field: 0.99

stdev: 185

mean: 28907

ROI too small

coverage frac: 0.76 0.52

N4255_2_blank.tif

flatness of field: 0.99
stdev: 171
mean: 27024

ROI too small
coverage frac: 0.46 0.97

N4255_3_blank.tif

flatness of field: 0.99

stdev: 224

mean: 25880

ROI too small

coverage frac: 0.76 0.48

N4255_4_blank.tif

flatness of field: 0.99
stdev: 175
mean: 24675

ROI too small
coverage frac: 0.46 0.58

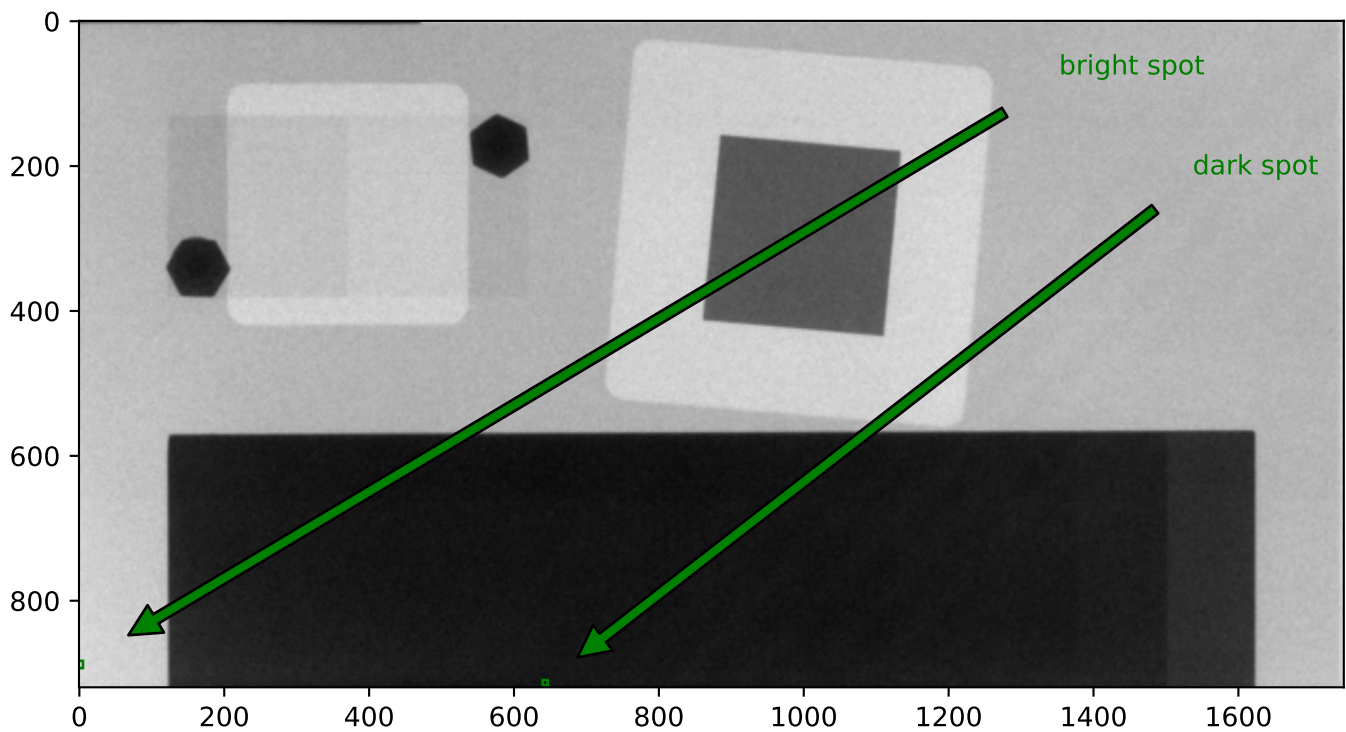## N4255_5_blank.tif

flatness of field: 0.99
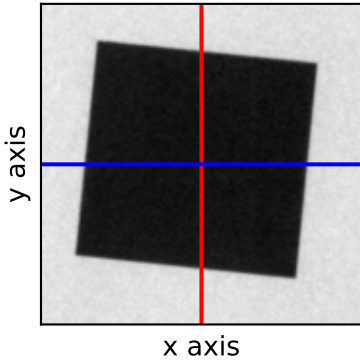stdev: 173
mean: 23660

Test 7: Image Extent (1.0 mm)

distance 1 mm   dynamic range 208.9
distance 5 mm   dynamic range 204.2
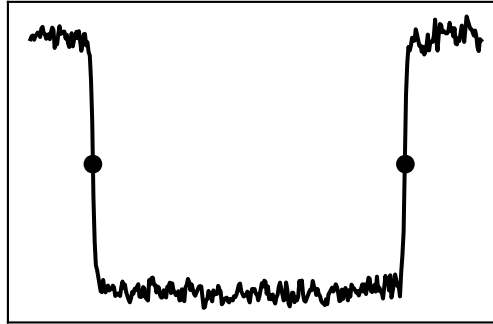distance 10 mm   dynamic range 206.7

Test 9: Aspect Ratio (0.021)

Image 1 Aspect Ratio: 0.021

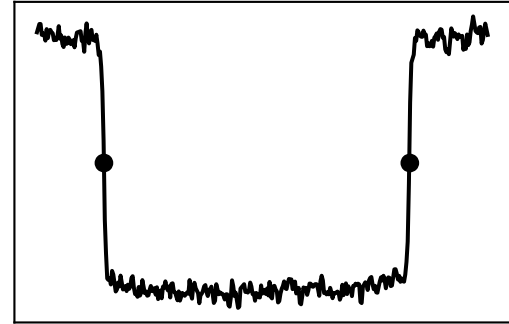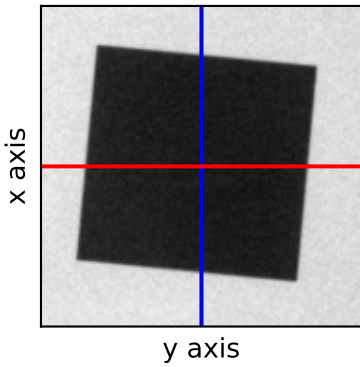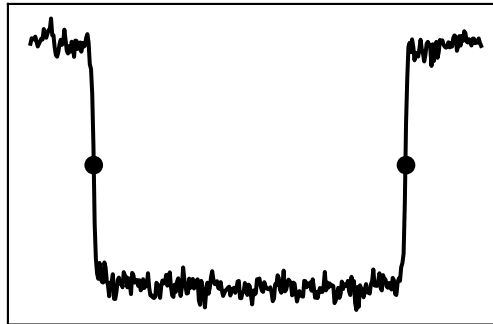pixel values along blue line

pixel values along red line

Image 2 Aspect Ratio: 0.021

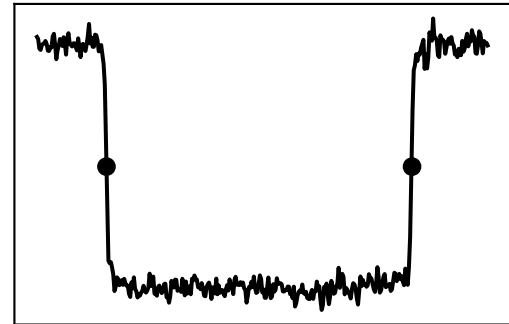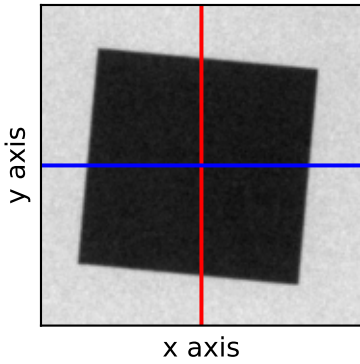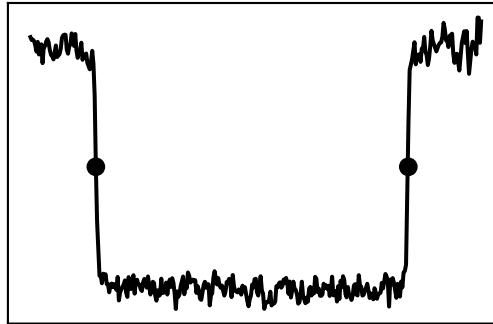

pixel values along blue line

pixel values along red line

Image 3 Aspect Ratio: 0.021

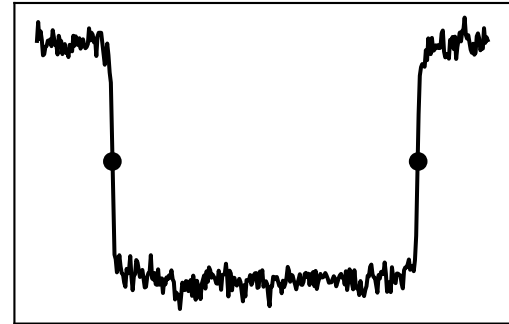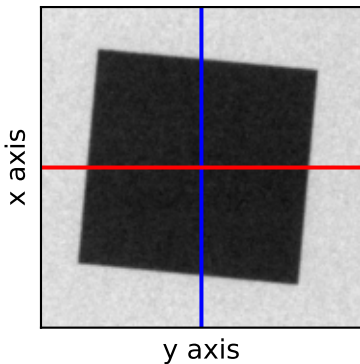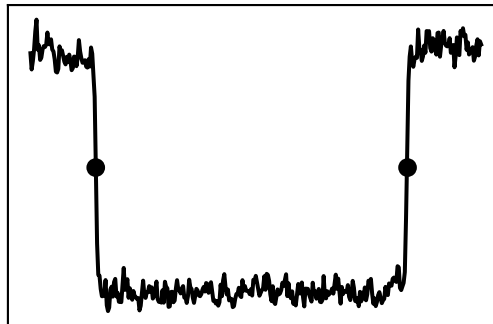pixel values along blue line

pixel values along red line

Image 4 Aspect Ratio: 0.020

pixel values along blue line

pixel values along red line