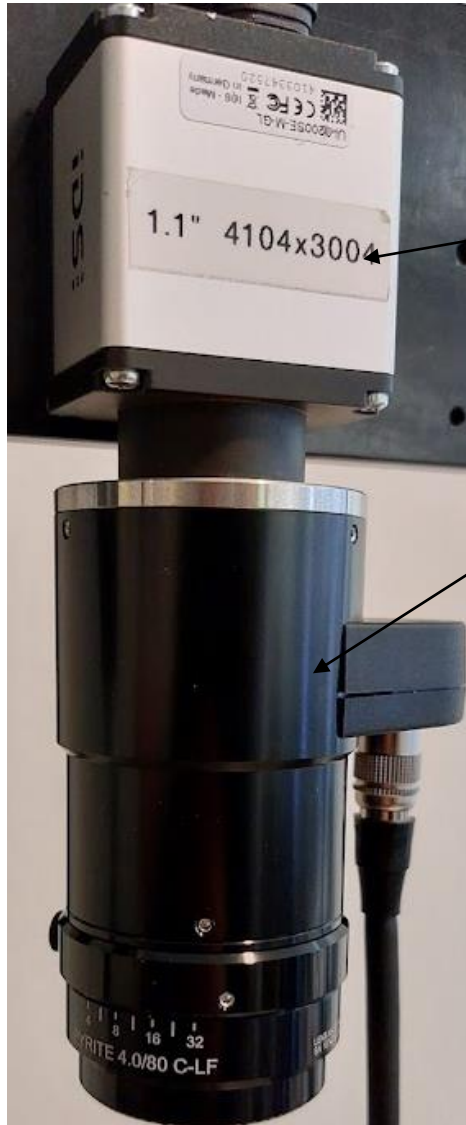


**Schneider Kreuznach PYRITE 4.0-80 C-LF-SD
with EL-16-40-TC-VIS-5D**

Summary

- Almost Nyquist limited performance in the center for short WDs
- Resolution drops towards large WDs
- Good correlation with the MTFs on the datasheet
- Very good mono- and polychromatic performances
- Significant coma in Horizontal optical axis at F/4, slightly better at F/5.6

Test setup



Camera:

1.1" (IDS UI-3200SE-M)
4104x3006 pixels, 3.45 μm px

Lens:

PYRITE 4.0-80 C-LF-SD
with EL-16-40-TC-VIS-5D embedded

F/#

4-32

Driver:

Optotune Lens Driver 4

Target:

Transparent USAF target

Light:

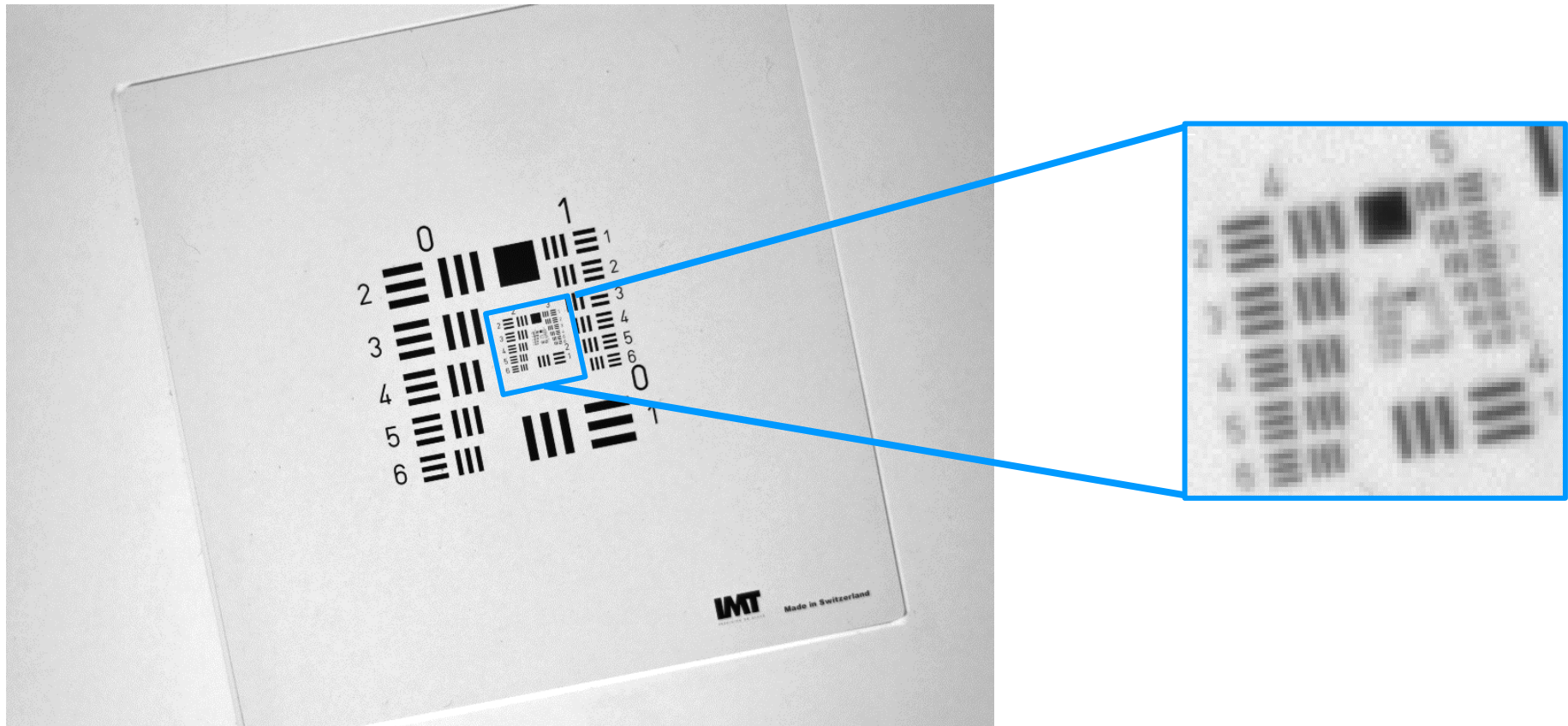
White backlight

Optical axis:

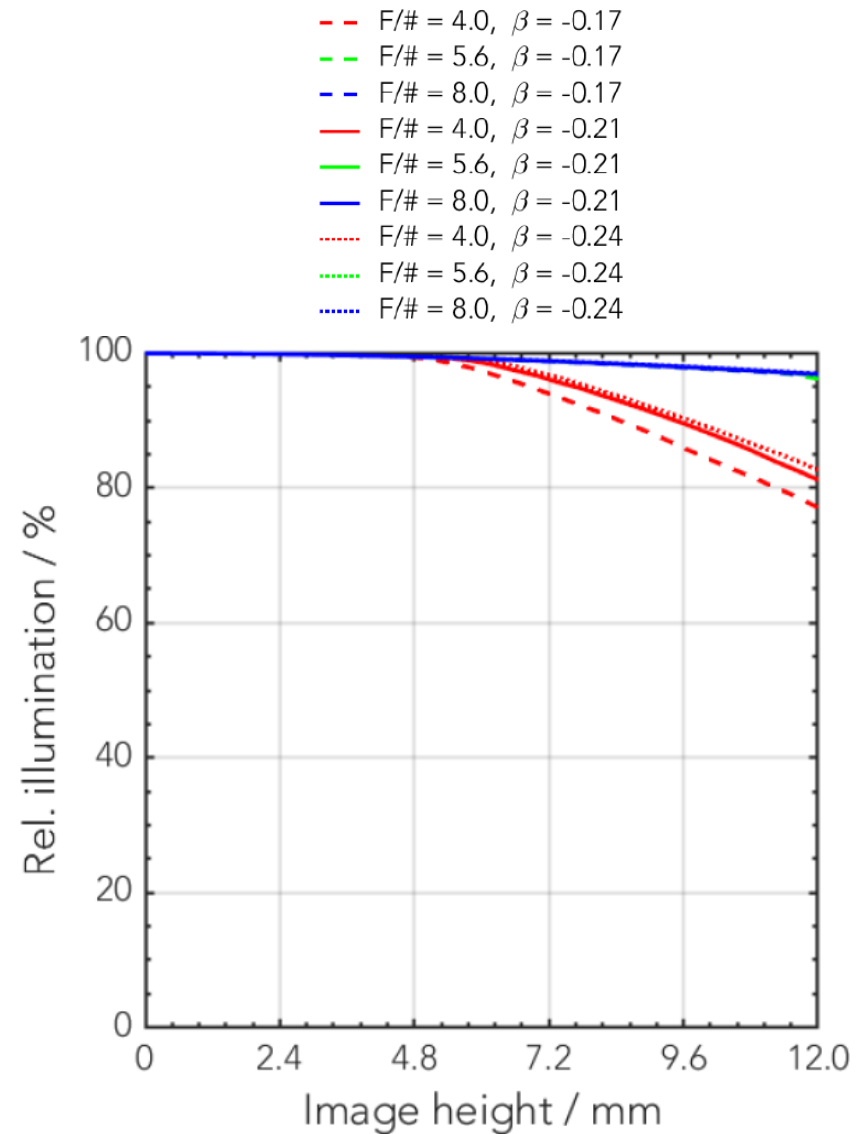
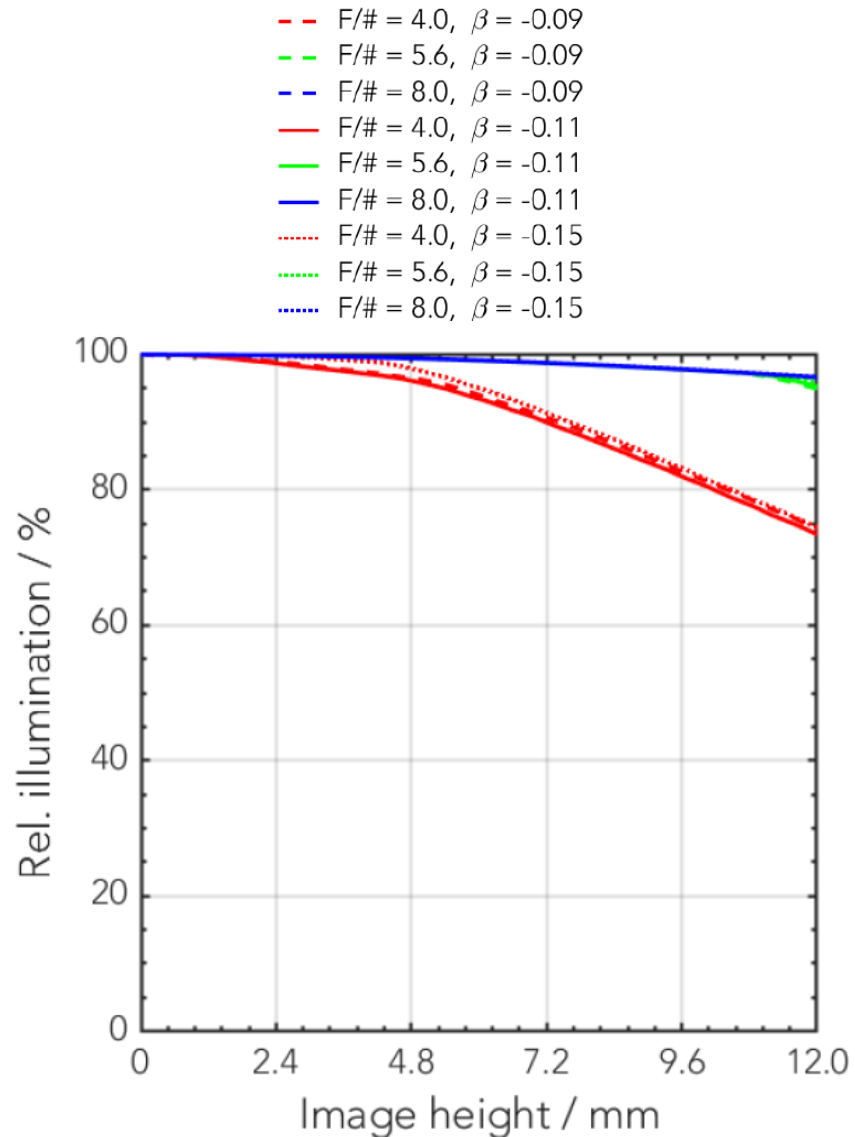
Vertical

Method for image evaluation

- After acquisition, images are zoomed in to show resolution limited element



Relative illumination plots (β = magnification)



0 dpt, 640 mm WD F#/4

Camera

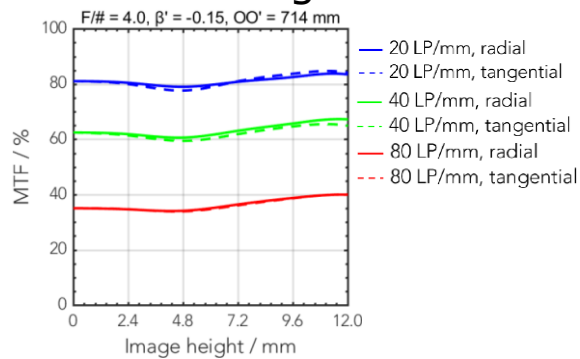
Sensor size = 4104x3006 pixels

Nyquist limit = 144 lp/mm

Pixel size = 3.45 μm

Light

White background illumination



USAF element:

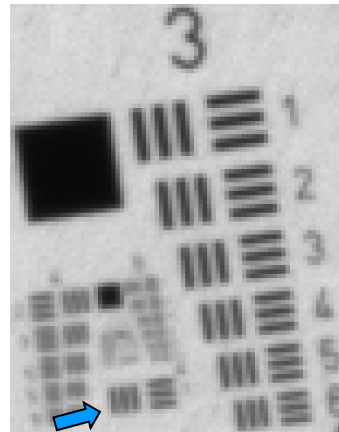
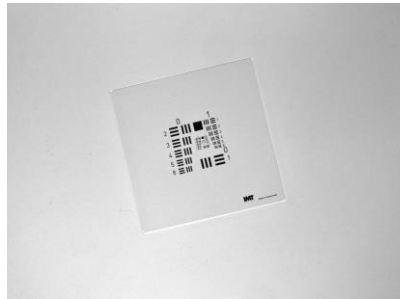
Line width (μm):

Lp/mm (object):

Magnification:

Lp/mm (image):

Center



4/1

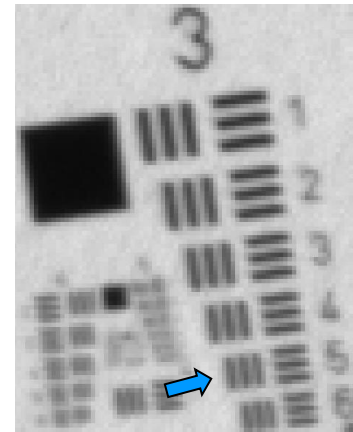
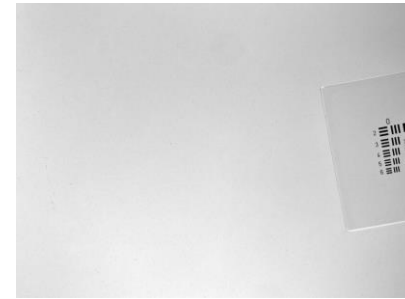
31.25

16

0.139

115

Edge



3/5

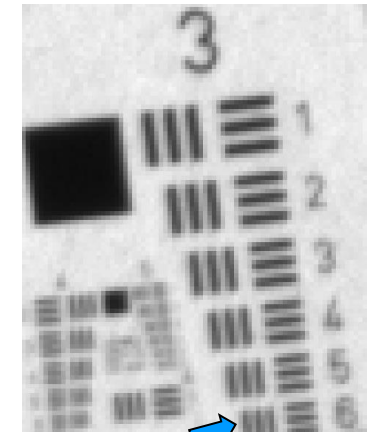
39.37

13

0.139

91

Corner



3/6

35.08

14

0.139

102

-0.73 dpt, 870 mm WD F#/4

Camera

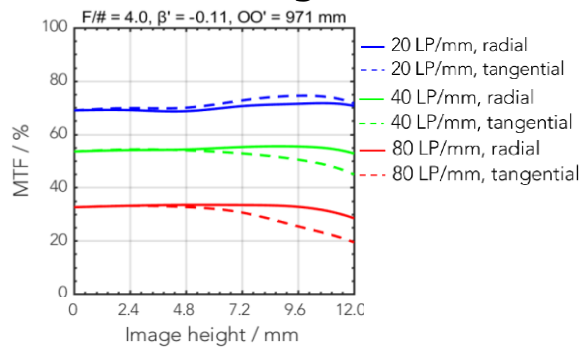
Sensor size = 4104x3006 pixels

Nyquist limit = 144 lp/mm

Pixel size = 3.45 μm

Light

White background illumination



USAF element:

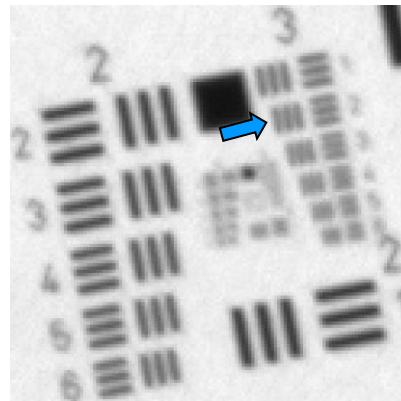
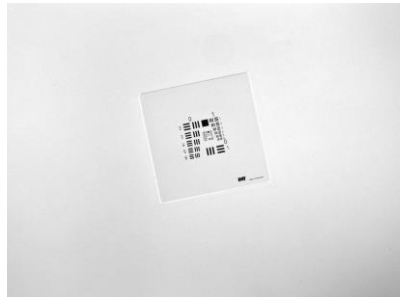
Line width (μm):

Lp/mm (object):

Magnification:

Lp/mm (image):

Center



3/2

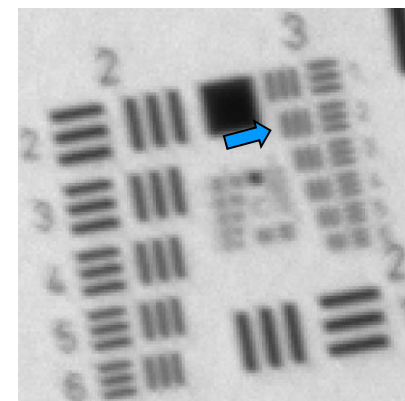
55.68

9

0.104

87

Edge



3/2

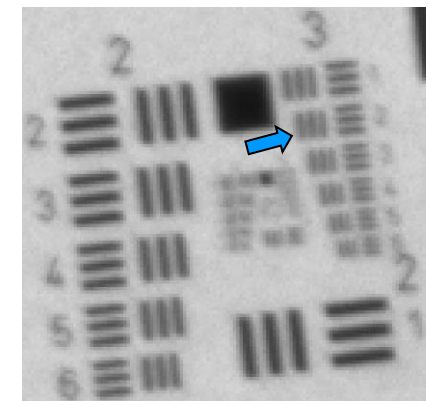
55.68

9

0.104

87

Corner



3/2

55.68

9

0.104

87

2.75 dpt, 310 mm WD F#/4

Camera

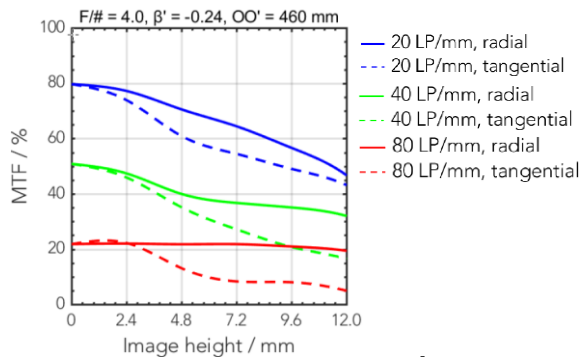
Sensor size = 4104x3006 pixels

Nyquist limit = 144 lp/mm

Pixel size = 3.45 μm

Light

White background illumination



USAF element:

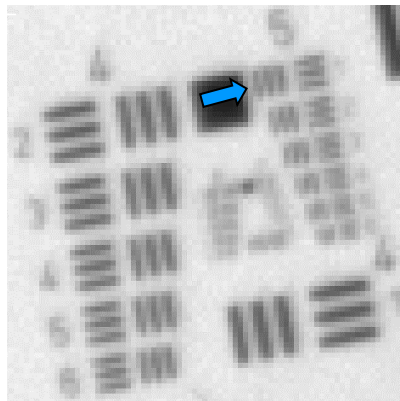
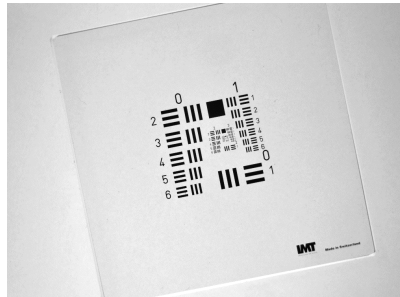
Line width (μm):

Lp/mm (object):

Magnification:

Lp/mm (image):

Center



5/1

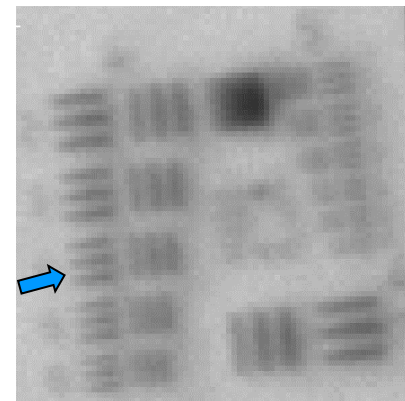
15.63

32

0.256

125

Edge



4/4

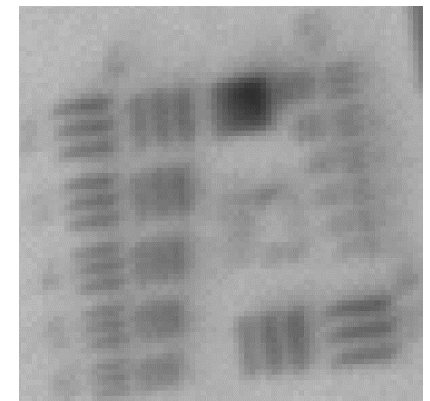
22.1

23

0.256

89

Corner



4/4

22.1

23

0.256

89

2.75 dpt, 310 mm WD F#/5.6

Camera

Sensor size = 4104x3006 pixels

Nyquist limit = 144 lp/mm

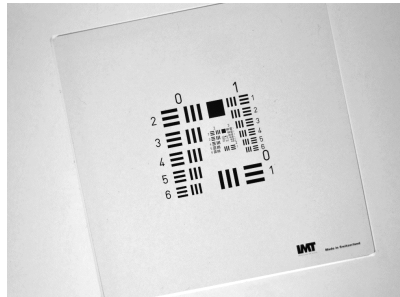
Pixel size = 3.45 μm

Light

White background illumination

- 20 LP/mm, radial
- - - 20 LP/mm, tangential
- 40 LP/mm, radial
- - - 40 LP/mm, tangential
- 80 LP/mm, radial
- - - 80 LP/mm, tangential

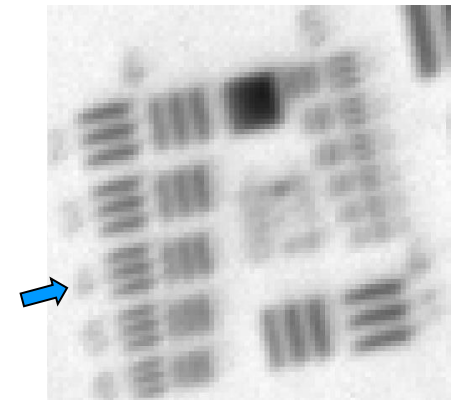
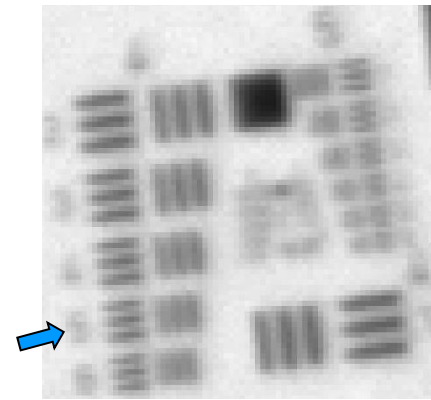
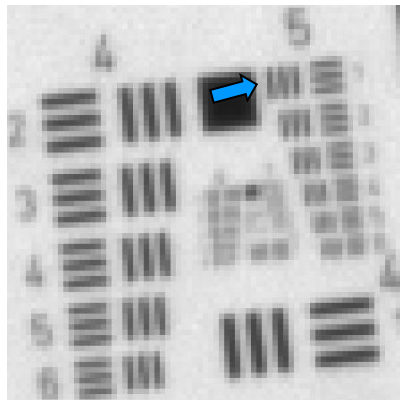
Center



Edge



Corner

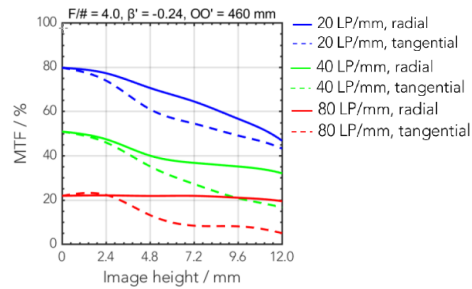


USAF element: 5/1
Line width (μm): 15.63
Lp/mm (object): 32
Magnification: 0.256
Lp/mm (image): 125

4/5
19.69
25
0.256
99

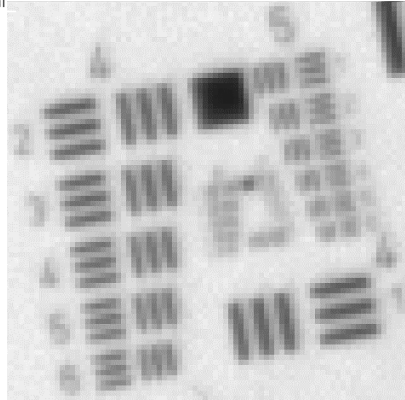
4/4
22.1
23
0.256
89

Comparison: Vertical Optical axis @ 310 mm WD, F#/4 vs. F#/5.6

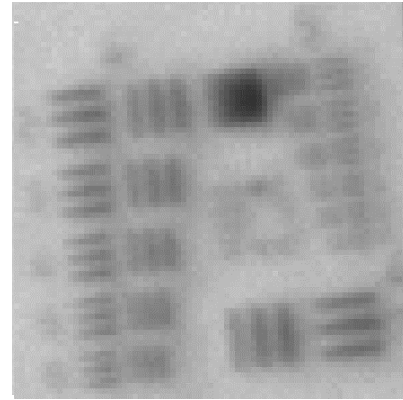


F#/4

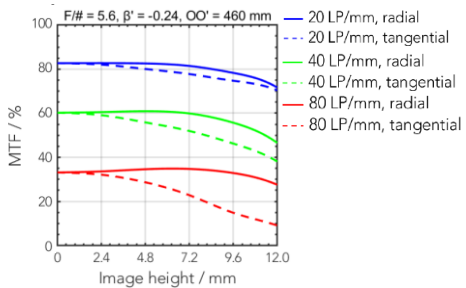
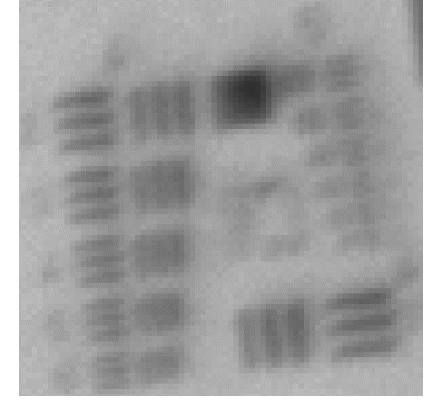
Center



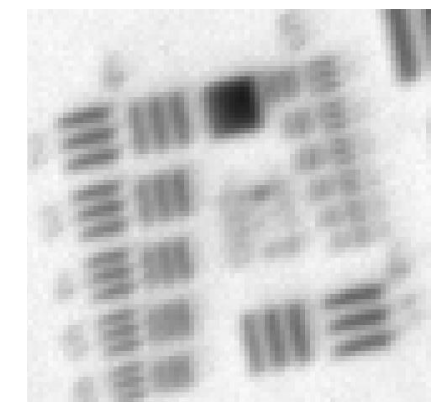
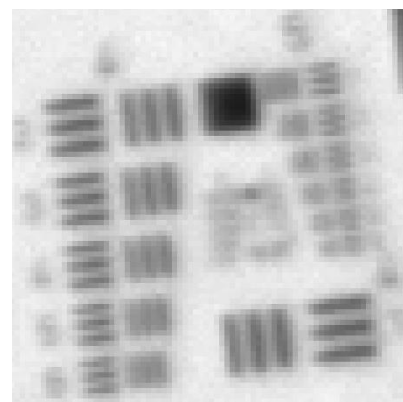
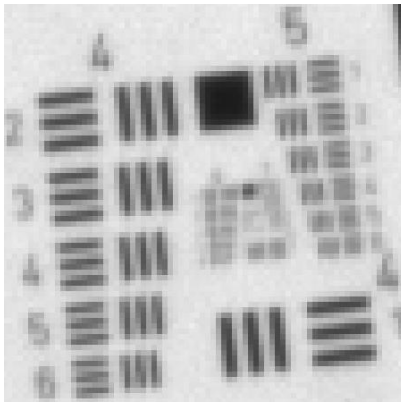
Edge



Corner



F#/5.6



Horizontal Optical Axis, @-0.73 dpt, 870 mm WD, F# /4 Strong Coma

Camera

Sensor size = 4104x3006 pixels
Nyquist limit = 144 lp/mm
Pixel size = 3.45 μ m

Light

White background illumination

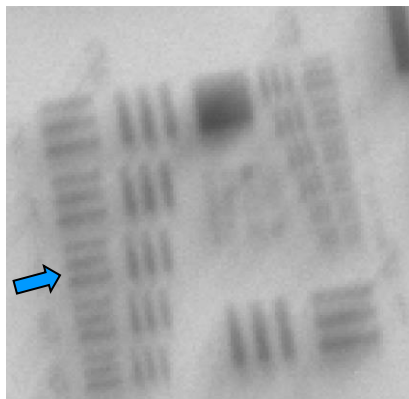
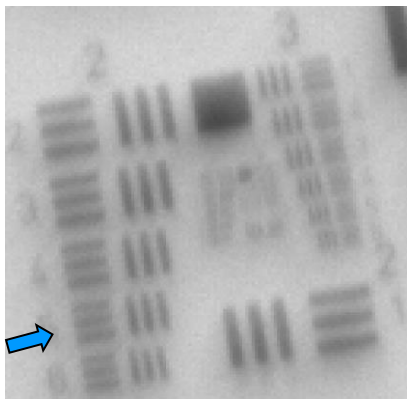
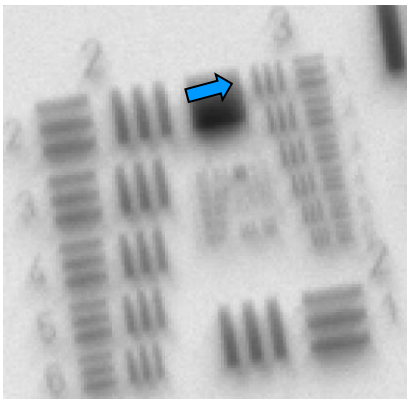
Center



Edge



Corner



USAF element: 3/1
Line width (μ m): 62.5
Lp/mm (object): 8
Magnification: 0.104
Lp/mm (image): 77

2/5
78.75
6
0.104
61

2/4
88.39
6
0.104
55

Horizontal Optical Axis, @-0.73 dpt, 870 mm WD, F#/5.6

Better contrast

Camera

Sensor size = 4104x3006 pixels

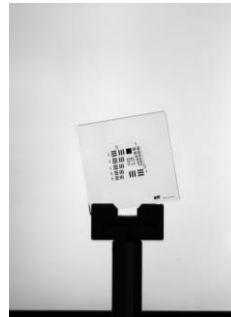
Nyquist limit = 144 lp/mm

Pixel size = 3.45 μm

Light

White background illumination

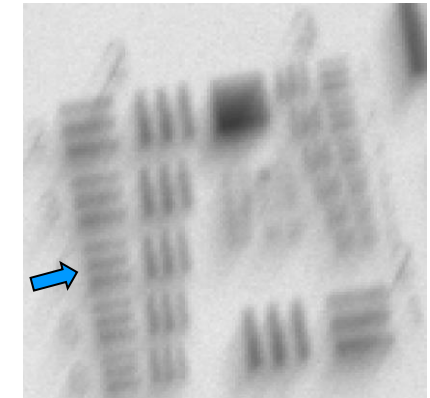
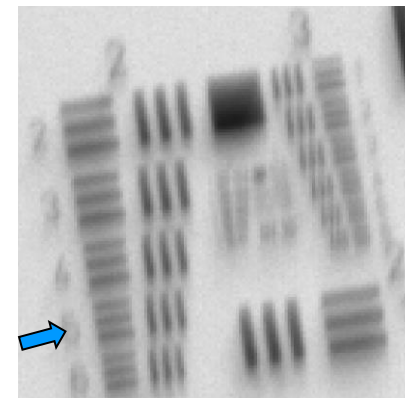
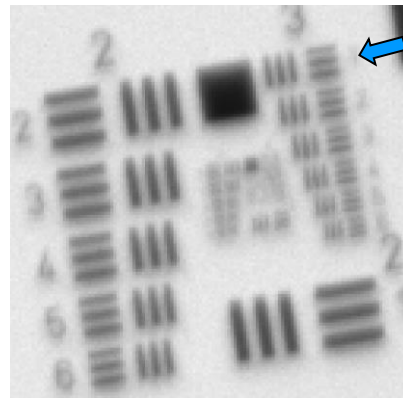
Center



Edge



Corner



USAF element: 3/1
Line width (μm): 62.5
Lp/mm (object): 8
Magnification: 0.104
Lp/mm (image): 77

2/5
78.75
6
0.104
61

2/4
88.39
6
0.104
55

Comparison: Vertical vs. Horizontal Optical axis

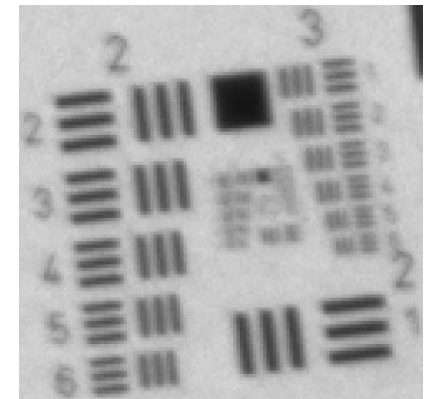
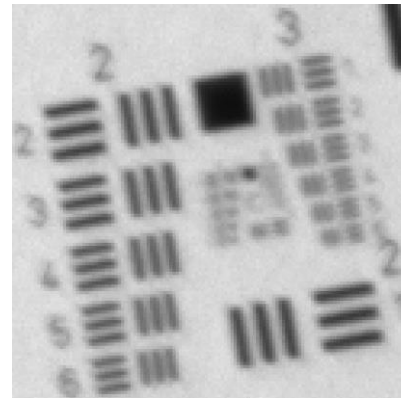
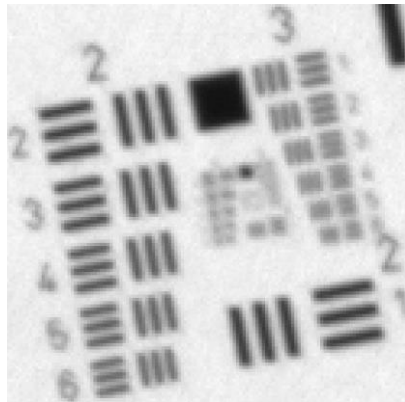
@ 870 mm WD, F#/4

Center

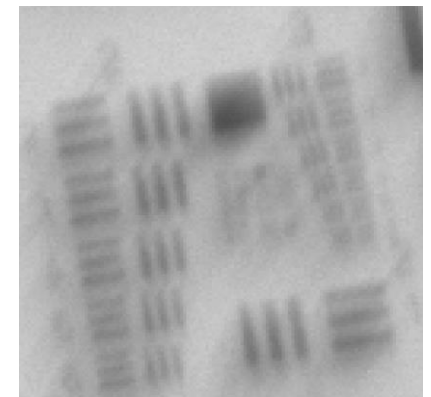
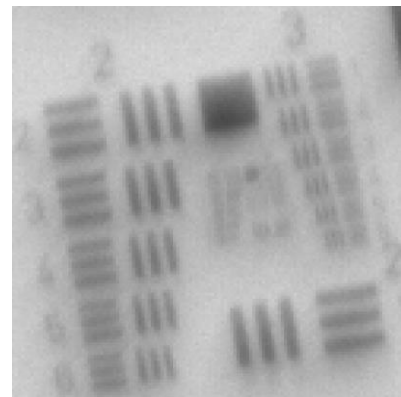
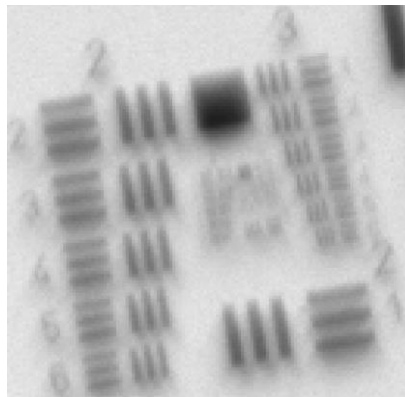
Edge

Corner

Vertical



Horizontal



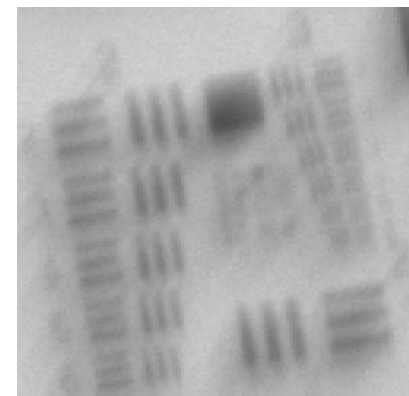
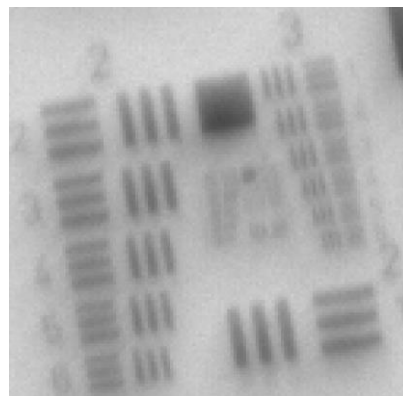
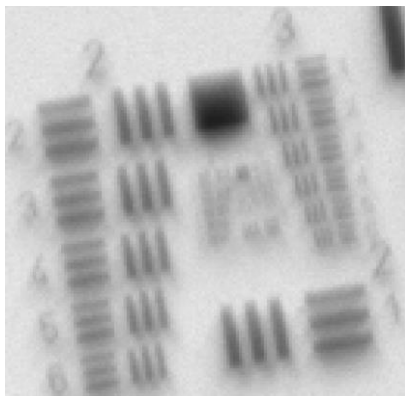
Comparison: Horizontal Optical axis @ 870 mm WD, F#/4 vs. F#/5.6

Center

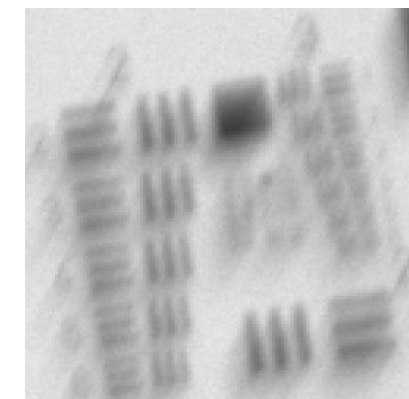
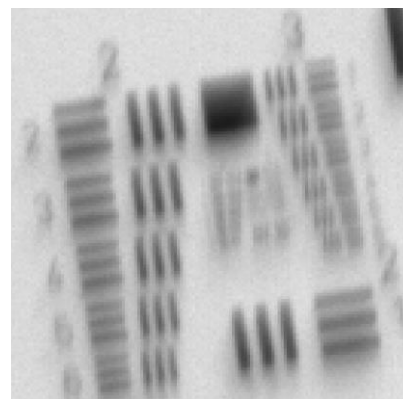
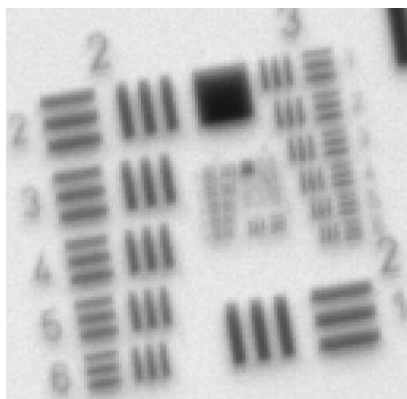
Edge

Corner

F#/4



F#/5.6



0 dpt, 640 mm WD F#/4

Camera

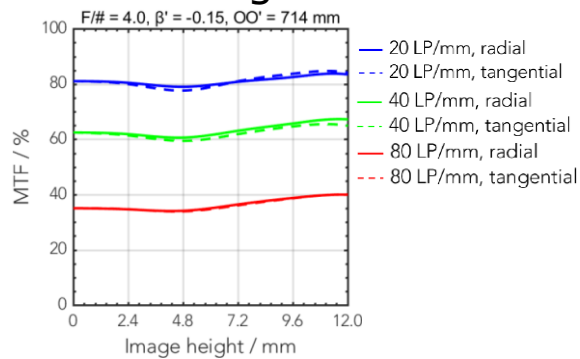
Sensor size = 4104x3006 pixels

Nyquist limit = 144 lp/mm

Pixel size = 3.45 μm

Light

Red background illumination



USAF element:

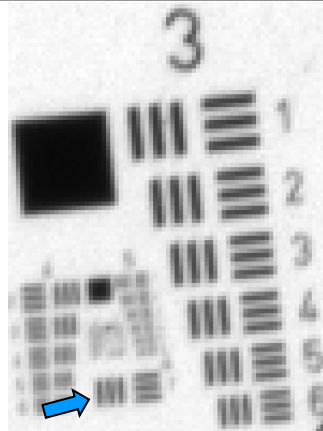
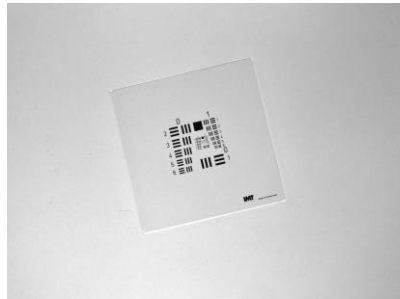
Line width (μm):

Lp/mm (object):

Magnification:

Lp/mm (image):

Center



4/1

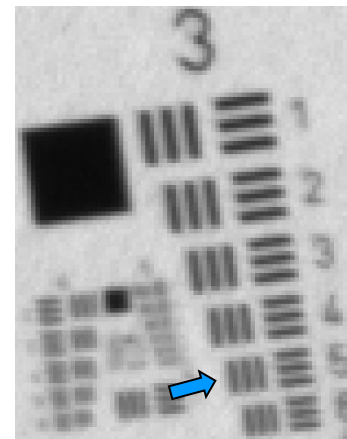
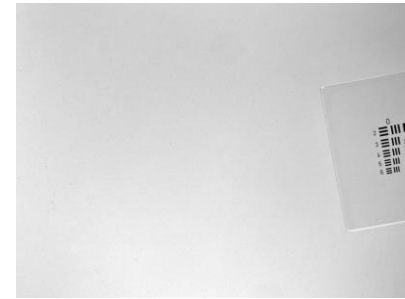
31.25

16

0.139

115

Edge



3/5

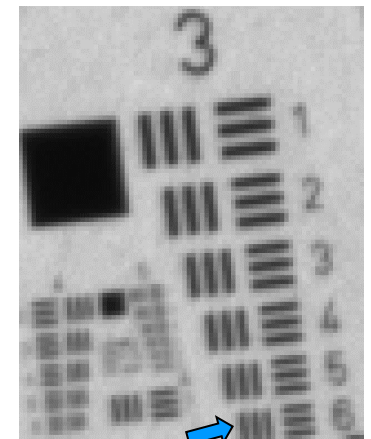
39.37

13

0.139

91

Corner



3/6

35.08

14

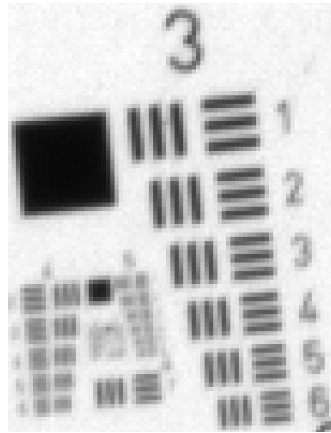
0.139

102

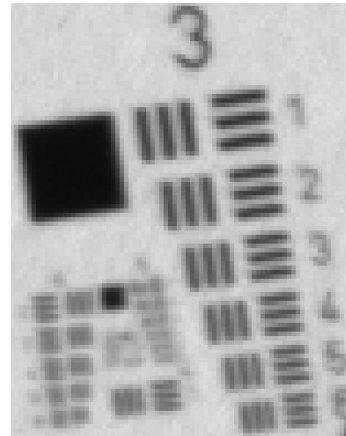
Comparison Red vs. White light

Red

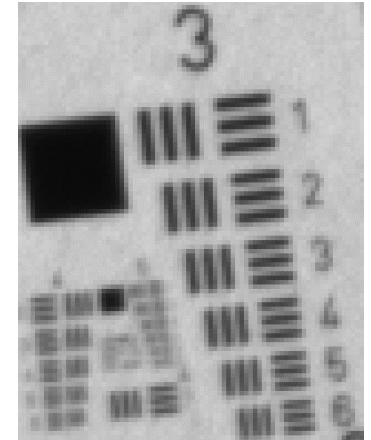
Center



Edge



Corner



White

