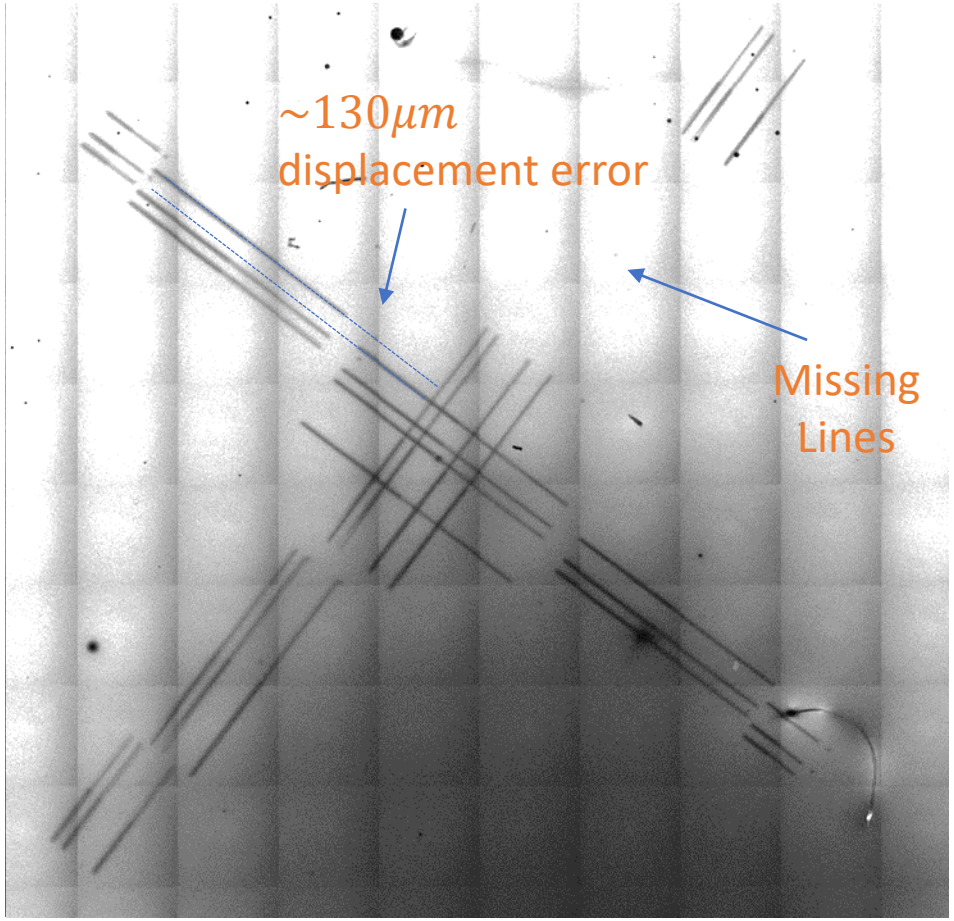
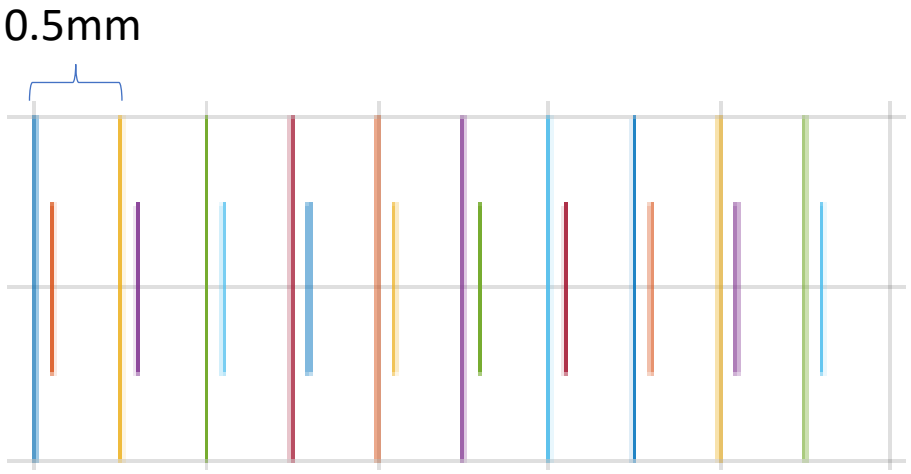
Photobleached Line Repeatability

Current Issues



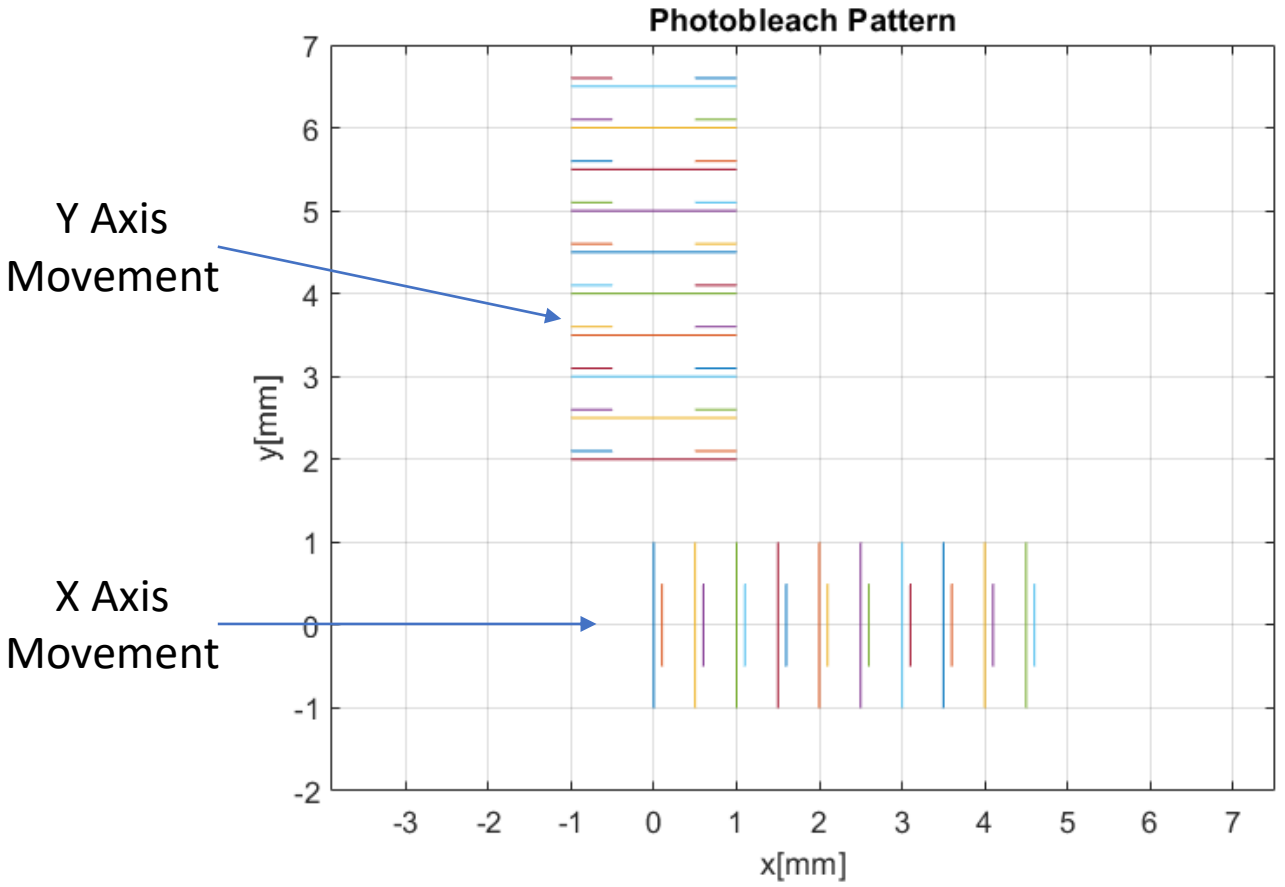
Calibration Pattern – X Galvo

- We photobleach the pattern on the right.
- Long lines are used for calibration
- Short lines used to identify which motor is being calibrated.
- Stage moves 0.5mm between photobleaching consecutive long lines.
- By comparing requested movement to measured photobleach lines we can calibrate motor units to physical units.



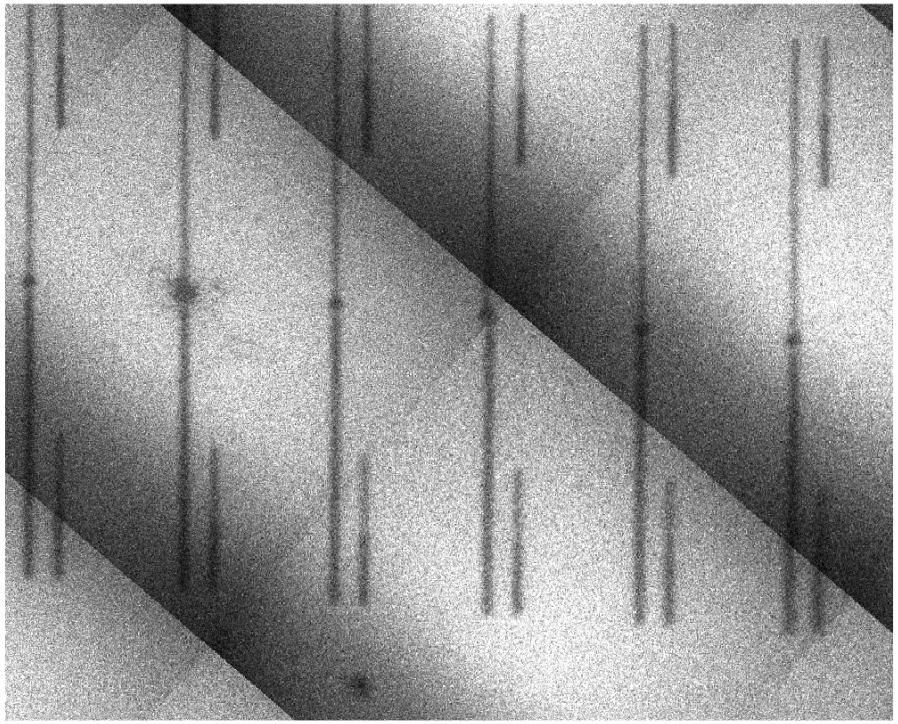
scanTarget_StageCalibration.m

Calibration Pattern – Overall



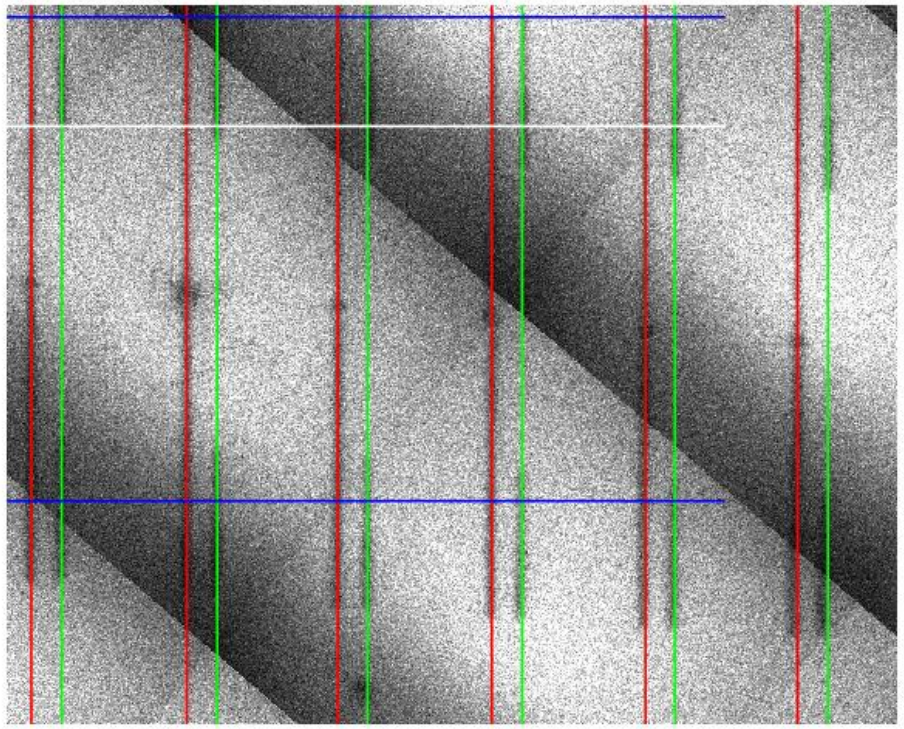
scanTarget_StageCalibration.m

Calibration Results



Hopefully, motor translated
0.5mm (by design)

Second Line in FOV
0.1mm (Galvo Calibrated)

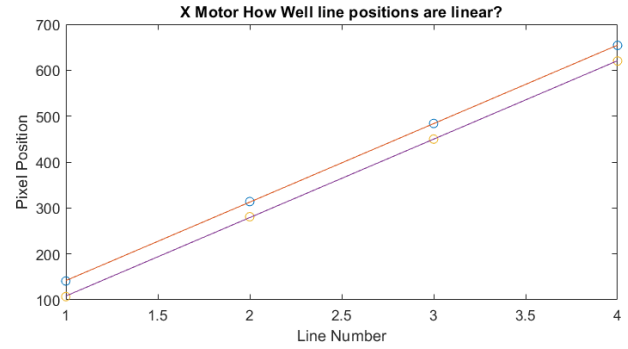


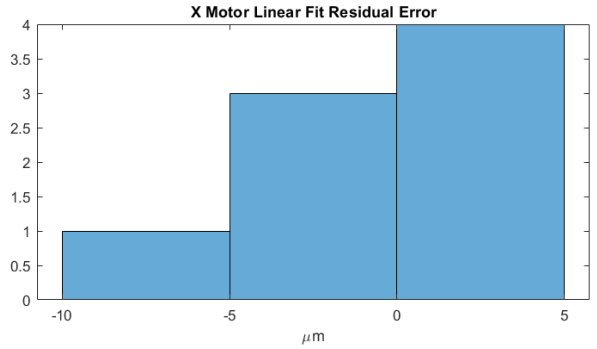
findMotorScaleCalibration.m

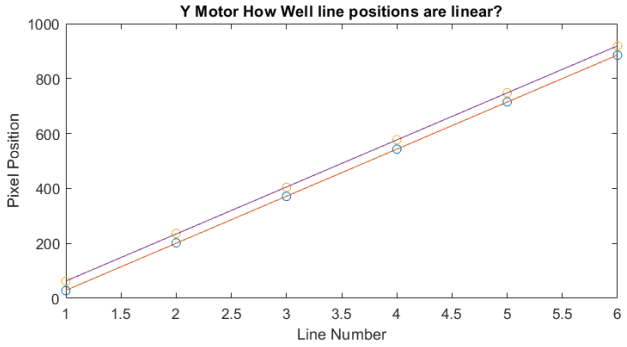
Linear Fit & Residual

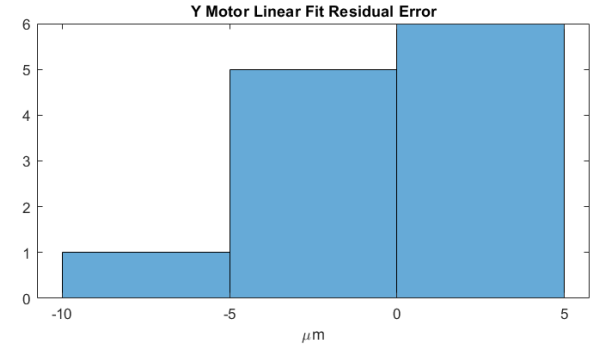
Very good linear fit, residuals are within motor spec (see next slide)

Script outputs recommended calibration









findMotorScaleCalibration.m

Motorized Stage Specks (Z825B)

Specification	Value
Travel Range	25 mm (0.98")
Backlash	<8 µm
Bidirectional Repeatability	<1.5 µm
Home Location Accuracy	±1.0 µm
Homing Repeatability	±1.0 µm
Vertical Load Capacity	4.5 kg (Max)
Horizontal Load Capacity	9 kg (Max)
Vertical Load Capacity[a]	<4.0 kg
Horizontal Load Capacity[a]	<7.5 kg
Velocity[b]	2.6 mm/s (Max)
Acceleration	4 mm/s^2 (Max)
Absolute On-axis Accuracy	130 µm
Percentage Accuracy	0.52% (Max)
Phase to Phase Resistance	33.0 Ω (Max)
Phase to Phase Inductance	0.6 mH (Max)
Motor Type[c]	6 VDC Servo
Minimum Achievable Incremental Movement	0.05 µm
Minimum Repeatable Incremental Movement	0.2 µm
Mounting Barrel	Ø3/8" (9.525 mm)
Weight	0.134 kg

a. Recommended
b. The nominal motor drive voltage is 6 V. Voltages up to 12 V can be used with pulse width modulation (PWM) controlled outputs.
c. At 2.6 mm/s velocity ripple and distortion of the acceleration/deceleration profile may occur. For improved control, the maximum velocity should be limited to 2.3 mm/s.

Calibration Stability

- A few runs of the script:

X Motor: Distance Between Large Lines is **5.0622** X Distance Between Large Line to Small Line.

We would like this ratio to be Please correct mmToDeviceUnits from 34304.141 to NEW VALUE: **34731.036**

Y Motor: Distance Between Large Lines is **5.0877** X Distance Between Large Line to Small Line.

We would like this ratio to be Please correct mmToDeviceUnits from 34304.141 to NEW VALUE: **34905.797**

X Motor: Distance Between Large Lines is **5.0294** X Distance Between Large Line to Small Line.

We would like this ratio to be Please correct mmToDeviceUnits from 34304.141 to NEW VALUE: **34505.93**

Y Motor: Distance Between Large Lines is **5.0794** X Distance Between Large Line to Small Line.

We would like this ratio to be Please correct mmToDeviceUnits from 34304.141 to NEW VALUE: **34849.227**

X Motor: Distance Between Large Lines is **5.0421** X Distance Between Large Line to Small Line.

We would like this ratio to be Please correct mmToDeviceUnits from 34304.141 to NEW VALUE: **34592.839**

Y Motor: Distance Between Large Lines is **5.0770** X Distance Between Large Line to Small Line.

We would like this ratio to be Please correct mmToDeviceUnits from 34304.141 to NEW VALUE: **34832.678**

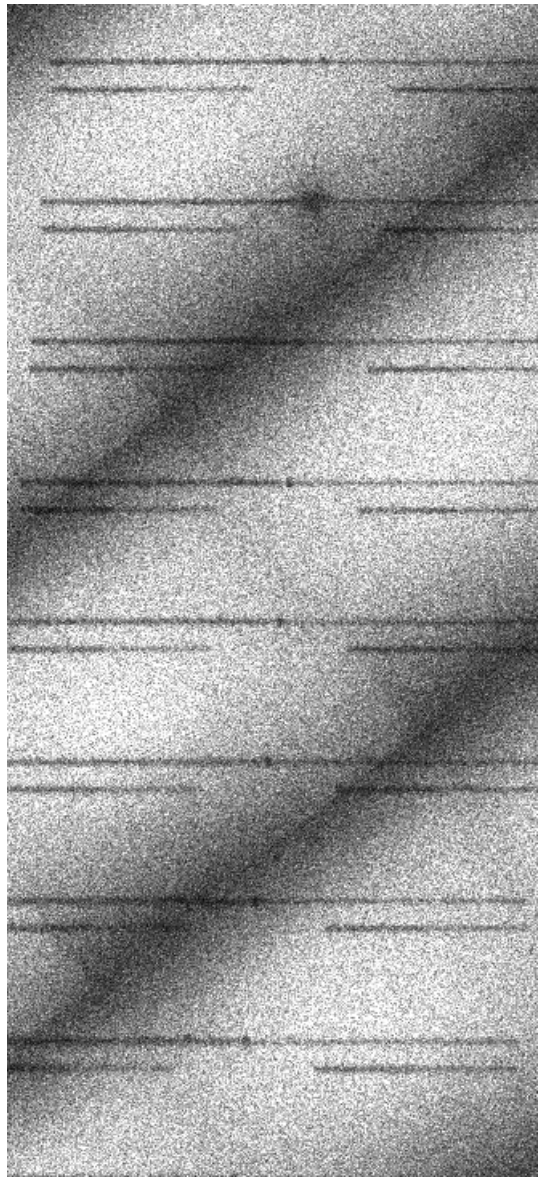
Script Error: 0.1% to 0.3%

findMotorScaleCalibration.m

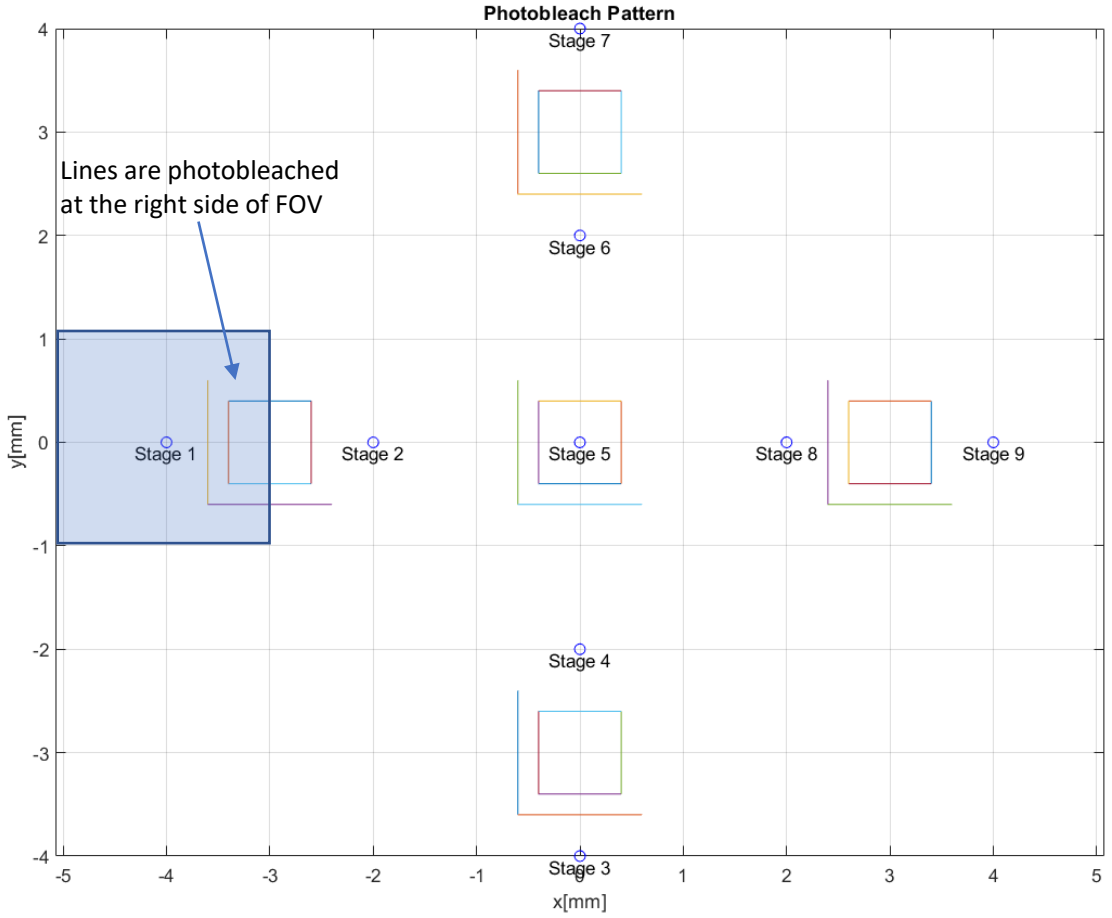
After Calibration

- New Calibration Values
  - X Galvo, 1 mm in device units: 34609.935
  - Y Galvo, 1 mm in device units: 34862.567

- 500 micron galvo movement is:
  - 500.5 microns (X Galvo)
  - 505.2 microns (Y Galvo)

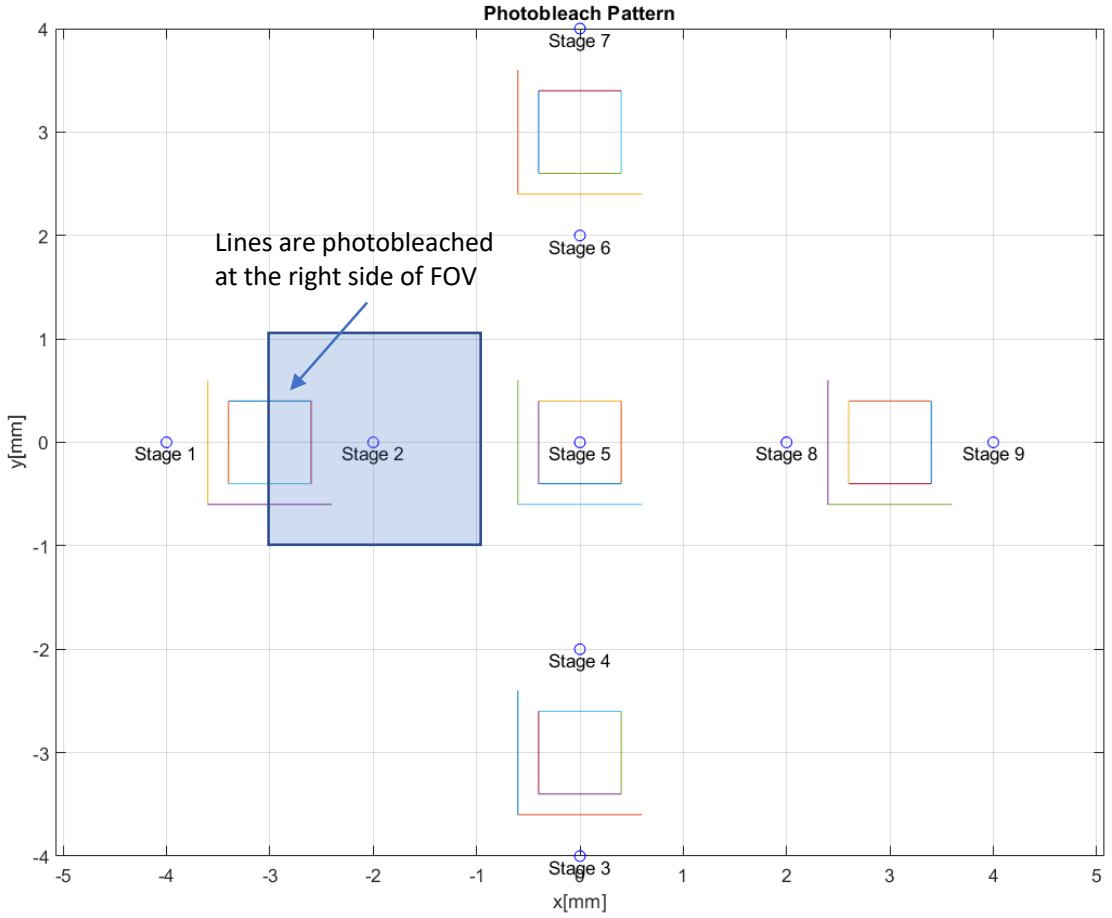


2nd Motor Calibration: Stage & FOV Repeatability



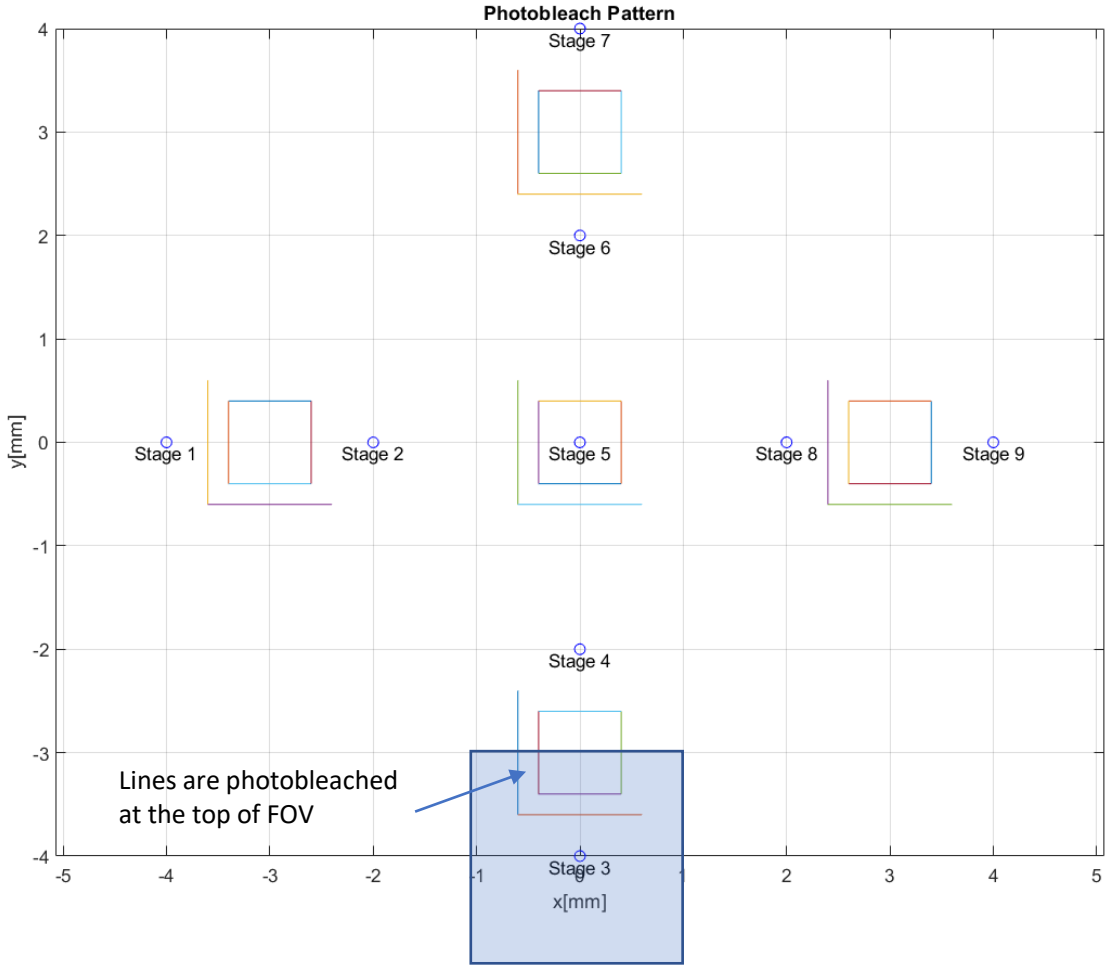
scanTarget_StageRepeatability.m

2nd Motor Calibration: Stage & FOV Repeatability



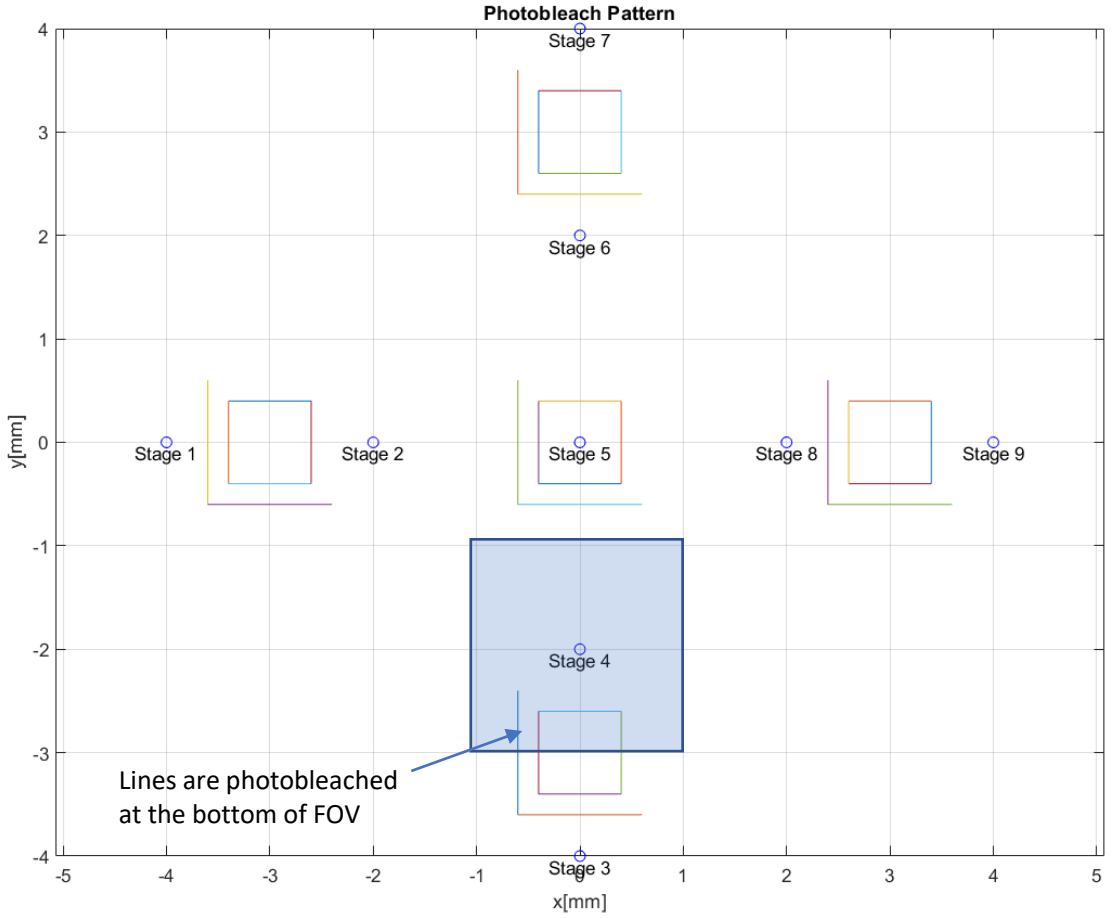
scanTarget_StageRepeatability.m

2nd Motor Calibration: Stage & FOV Repeatability



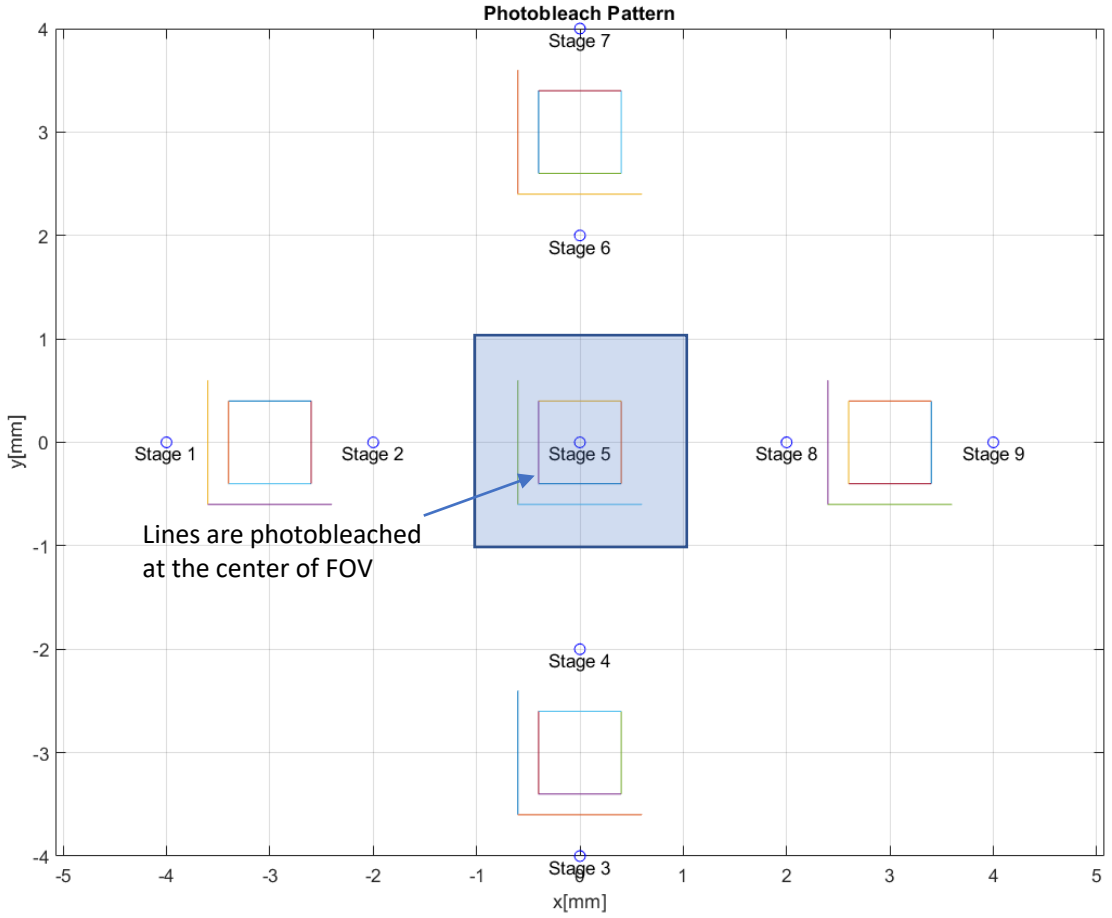
scanTarget_StageRepeatability.m

2nd Motor Calibration: Stage & FOV Repeatability



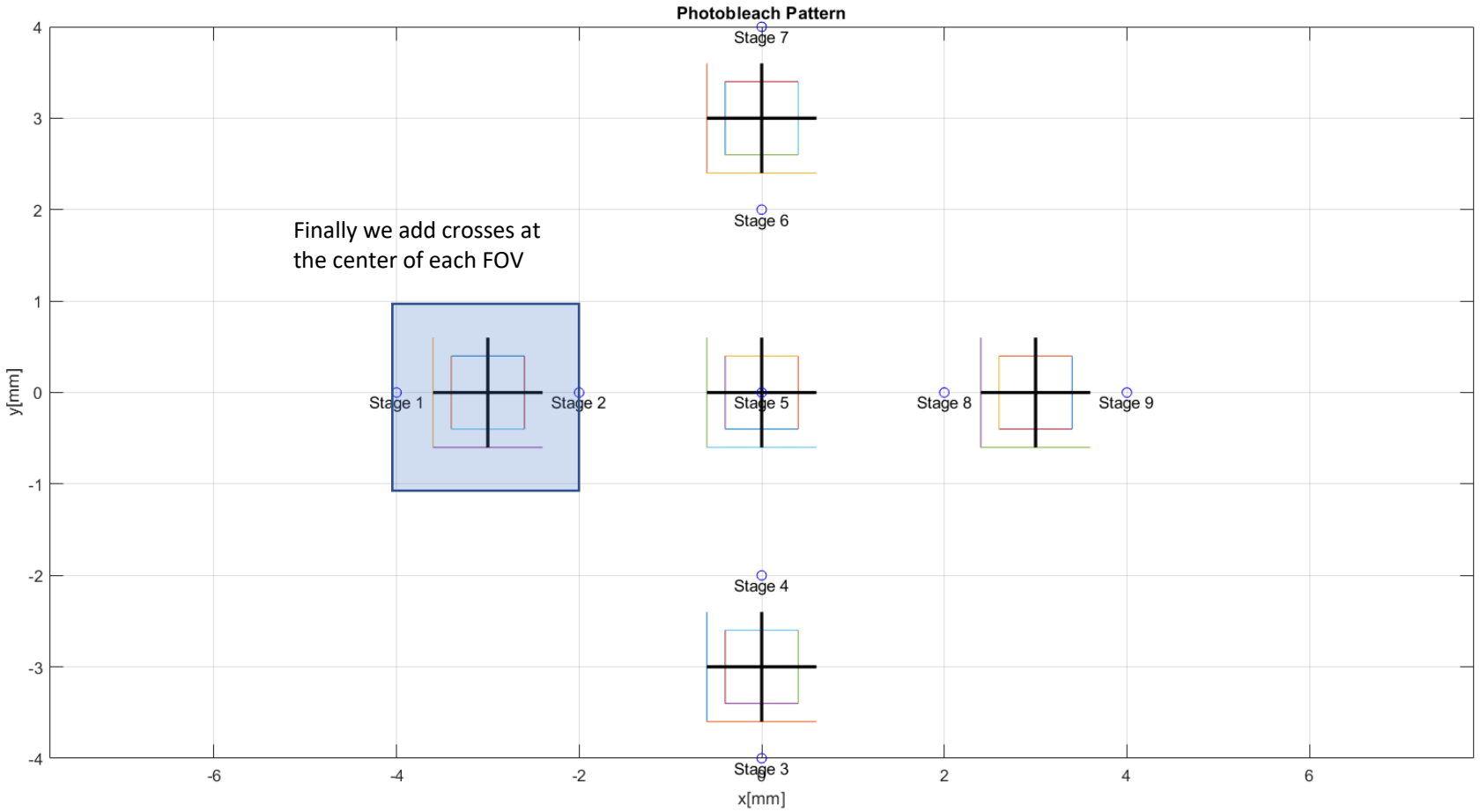
scanTarget_StageRepeatability.m

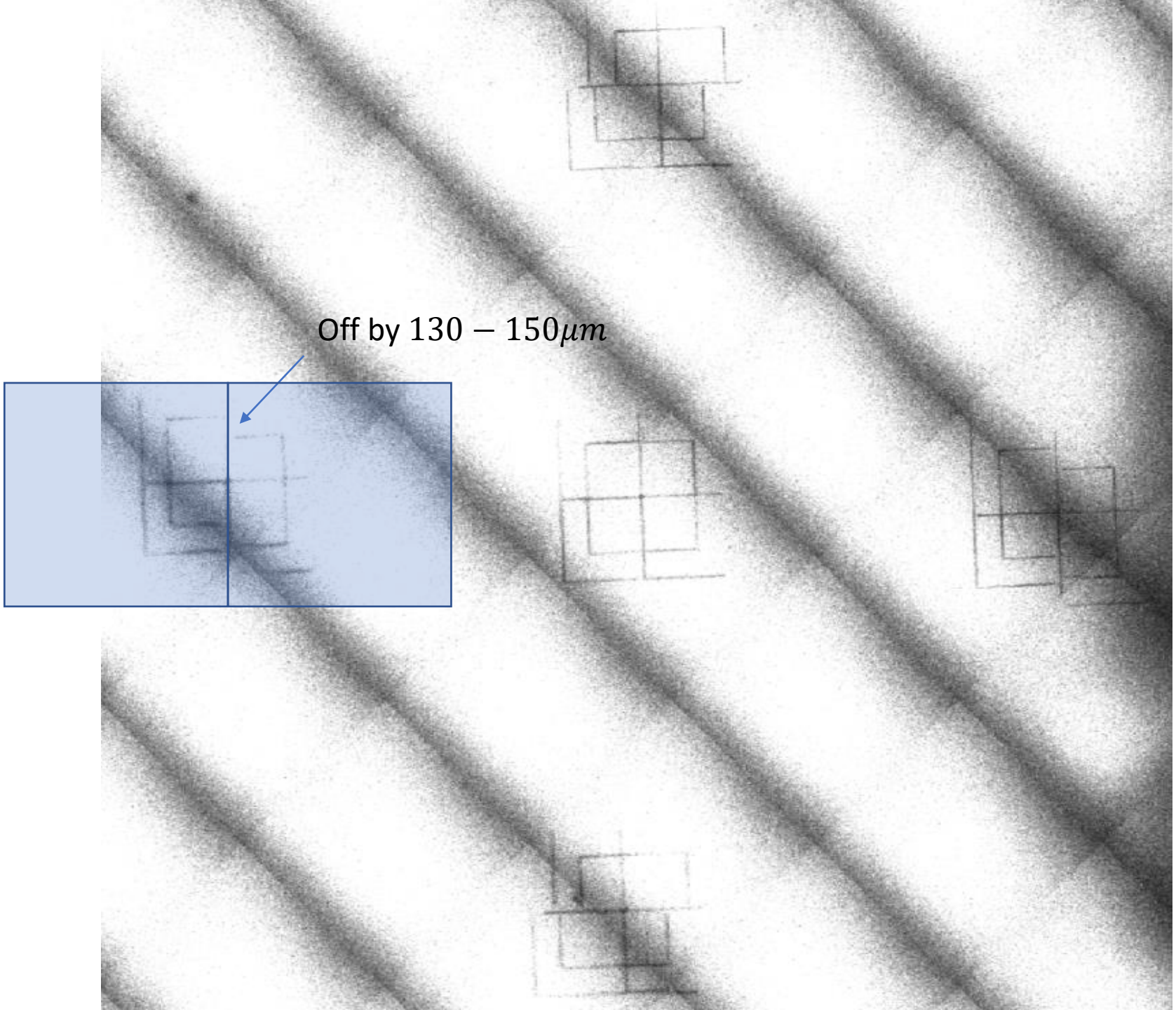
2nd Motor Calibration: Stage & FOV Repeatability

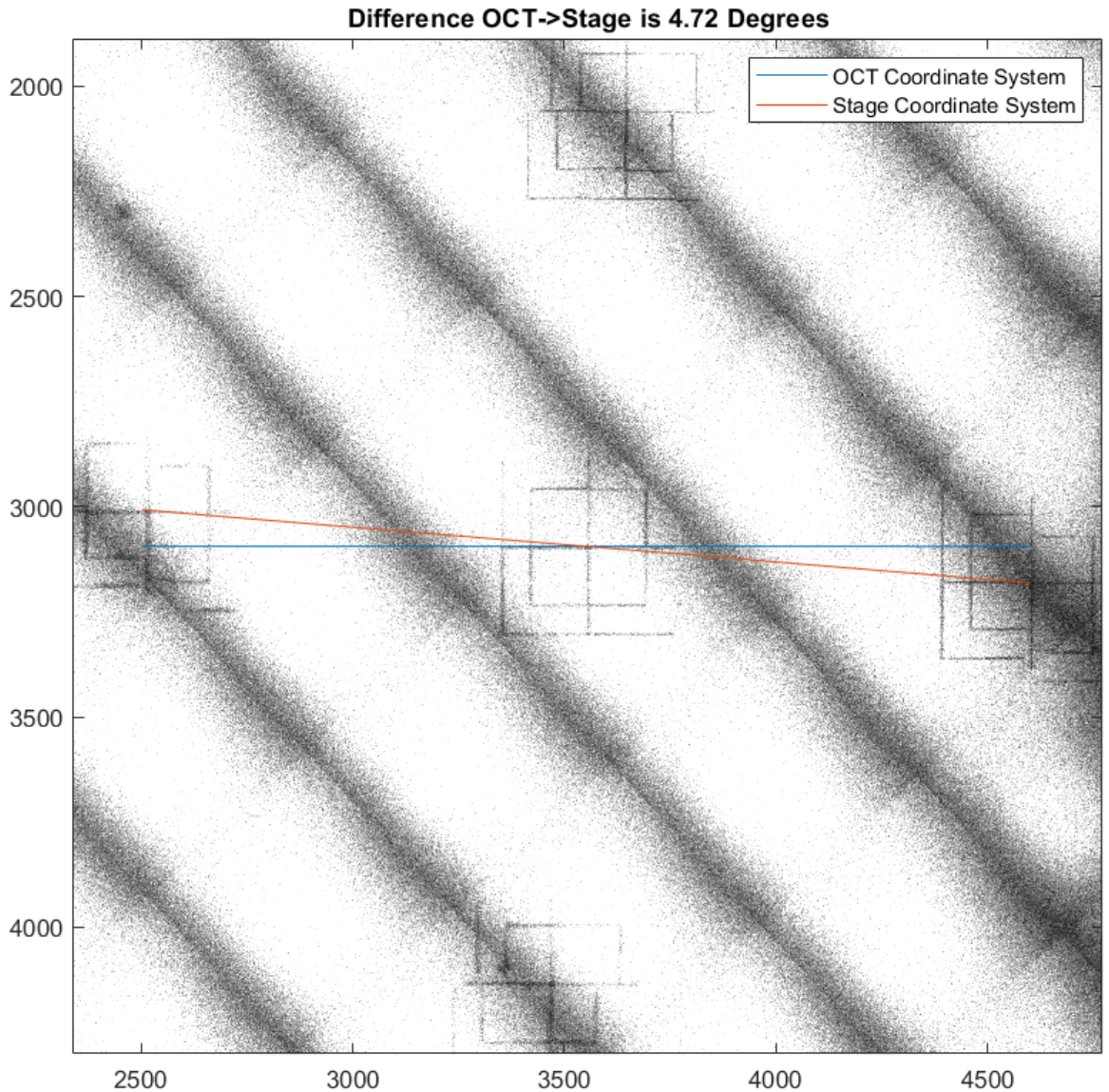


scanTarget_StageRepeatability.m

2nd Motor Calibration: Stage & FOV Repeatability

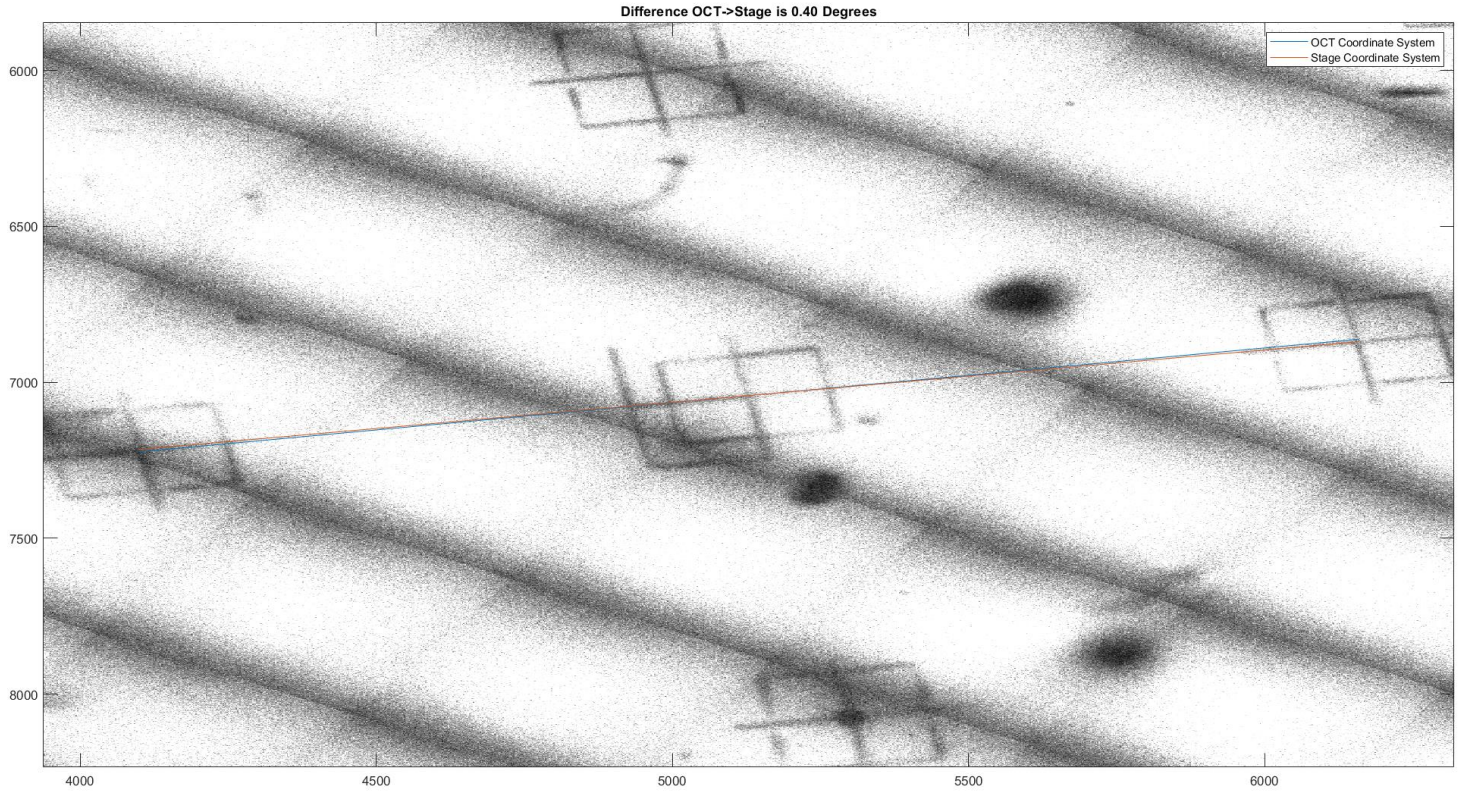



Off by $130 - 150\mu m$



findMotorAngleCalibration.m

After Rotation Alignment



findMotorAngleCalibration.m