

This is a description of how to calibrate the FZP scanner of fLOMNI

Remember to do all modifications for both directions x and y!

1. Align fLOMNI without the FZP scanner. This implies disabling the FZP scanner completely. To do so, in OrchestraHMI edit the parameters of the FZP scanner as follows.

(a) Module PID_i_FZP: Set Param FAST_FZP_PID_LOOP(0) to 2. Then the FZP will just remain

statically centered to the capacitive sensor position in closed loop.

(b) Module PID_i: Set Param FAST_FZP_PID_LOOP(0) to 0. If this is negative, the FZP scanner will move ahead in a point-by-point scan by that amount.

(c) Module PID_i: Set Param FAST_FZP_PID_LOOP(5) to 0. If this is larger than zero the sample stage motion is stopped if the position is reached by the FZP scanner (which is the case when the scanner is not active). Zero means thus full compensation by the sample stage.

In this state the setup can be aligned, and the affine matrix for ptychography can be found. This refers then purely to the alignment of the interferometer and X-ray detector.

2. In the next step we perform a scan (with a small beam and small range) such that only the FZP scanner is used and the sample stage will not move.

Before we start ensure that the Correction Matrix for the capacitive sensors is cleared.

To do this change the parameters of the fLOMNI control loop as follows:

(a) Module AnalogInput_6259: Set parameter MatrixCorr to 1 0 0 1

(b) Module PID_j_fzp: Set Param FAST_FZP_PID_LOOP(0) to 1 to re-activate the FZP scanner.

(c) Module PID_i: Set Param FAST_FZP_PID_LOOP(5) to 10, so up to 10 volts output of the fast PID is accepted before starting a movement of the sample stage.

(d) Module PID_i: Param FAST_FZP_PID_LOOP(4) 0

(e) Module PID_i: Param FAST_FZP_PID_LOOP(6) 1

with d and e it will now stabilize the sample stage position at zero

(f) Module PID_i: Param FAST_FZP_PID_LOOP(0) remains 0 (no move ahead in a scan)

With these settings perform a scan. Use a field of view matching the range of the FZP scanner. Watch the sample stage position in Orchestra to ensure it does not change!

A good range should be 2.8 microns in x and 1.8 microns in y.

Reconstruct this scan with Michal's position refinement code and ask for an update of the FZP matrix. This can then be put into the AnalogInput_6259 module.

I guess one has to have the matrix found for the interferometer in the reconstruction code, such that the new matrix of the FZP scanner will adjust the coordinate system of the FZP scanner to the system of the

interferometer. Later these positions are used together and should match in direction.

3. Back to default operating values:

(a) Module PID_i: Set Param FAST_FZP_PID_LOOP(0) to -0.5, for up to 0.5 microns move ahead in a scan.

All other parameters are already as supposed to be.

Default values for the sample stage pid, fast FZP parameter are "-0.5,0,0,0,0.1,0.5,0"

Default values for the fzp pid, fast FZP parameter are "1,0.0001,0.1,-4,0,0,0"