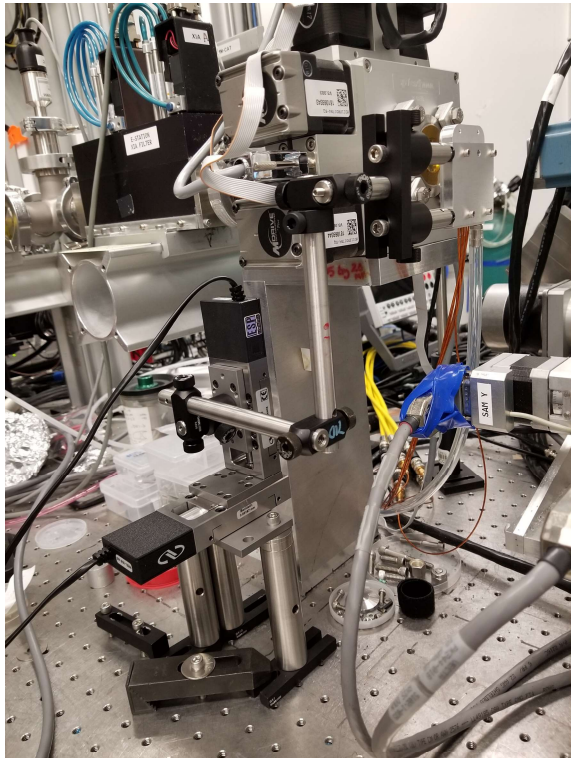
Problem with new diamond BPM with N2 environment

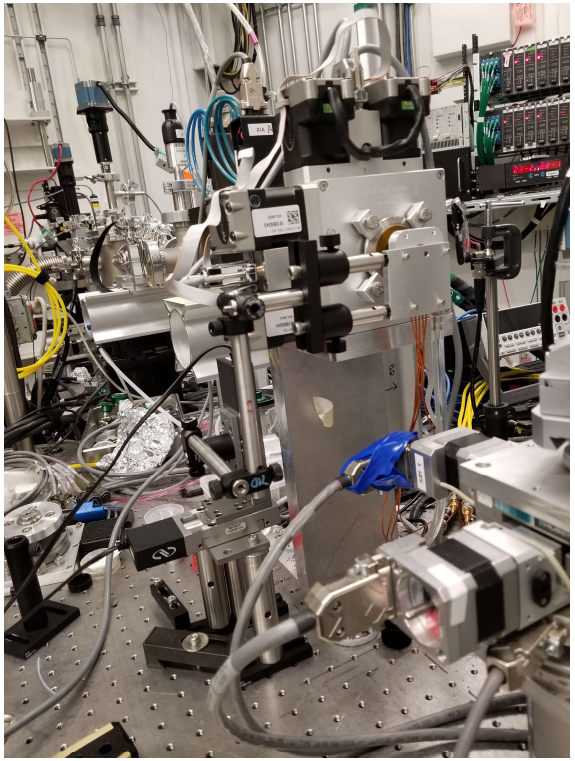
Eric Dufresne, APS/XSD 8/26/2021

Background

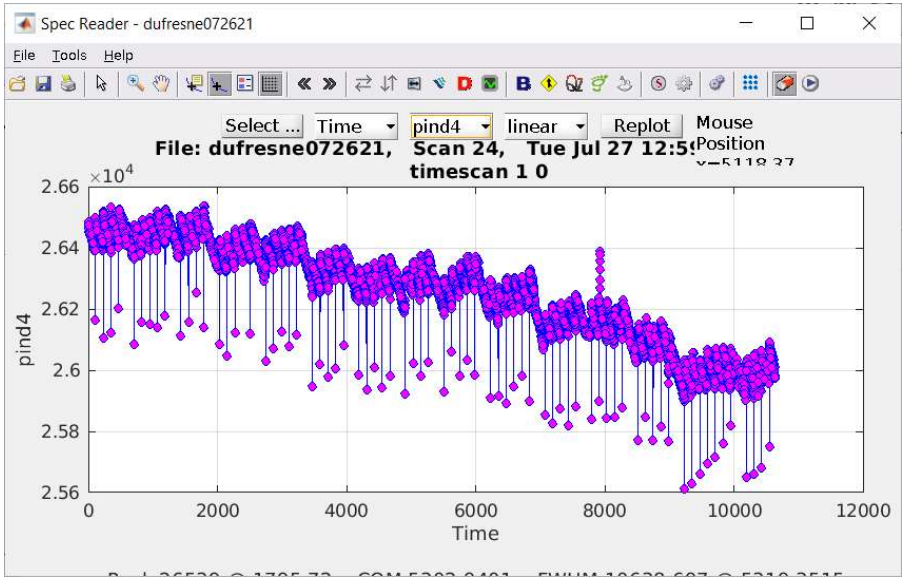
- Procured a stand-alone Sydor Quadrant Diamond BPM for monitoring the flux and beam position of my coherent beam on 8ID-E.
- Model M402 sealed with Kapton windows in inert atmosphere (N2, He).
- Decided on Al electrodes with SiO2 oxide layer to protect the electrodes. Diamond is 50 microns thick. They make 30 microns too.
- Sydor Advanced Electrometer for signal conditioning and EPICS server

Mechanical mount

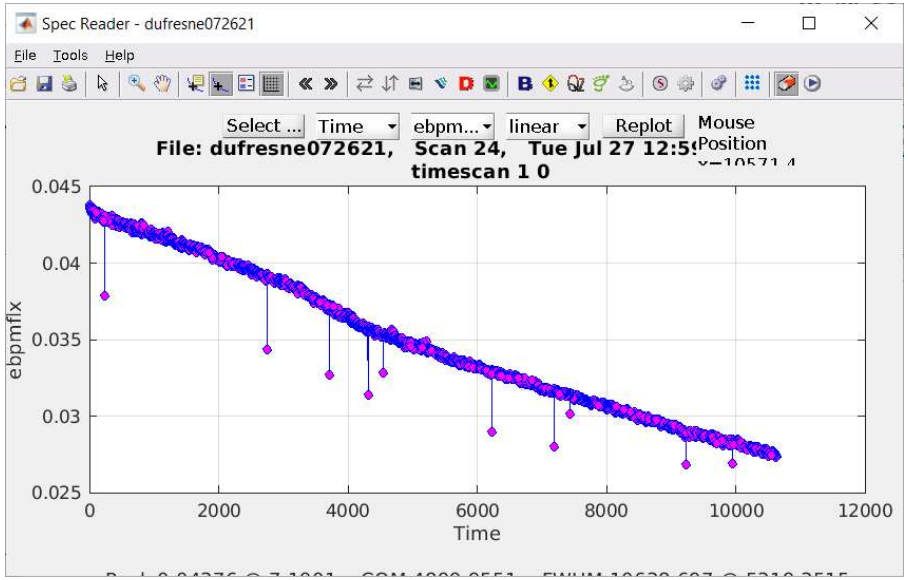




Time series, 7/27/21 pin diode vs total BPM current

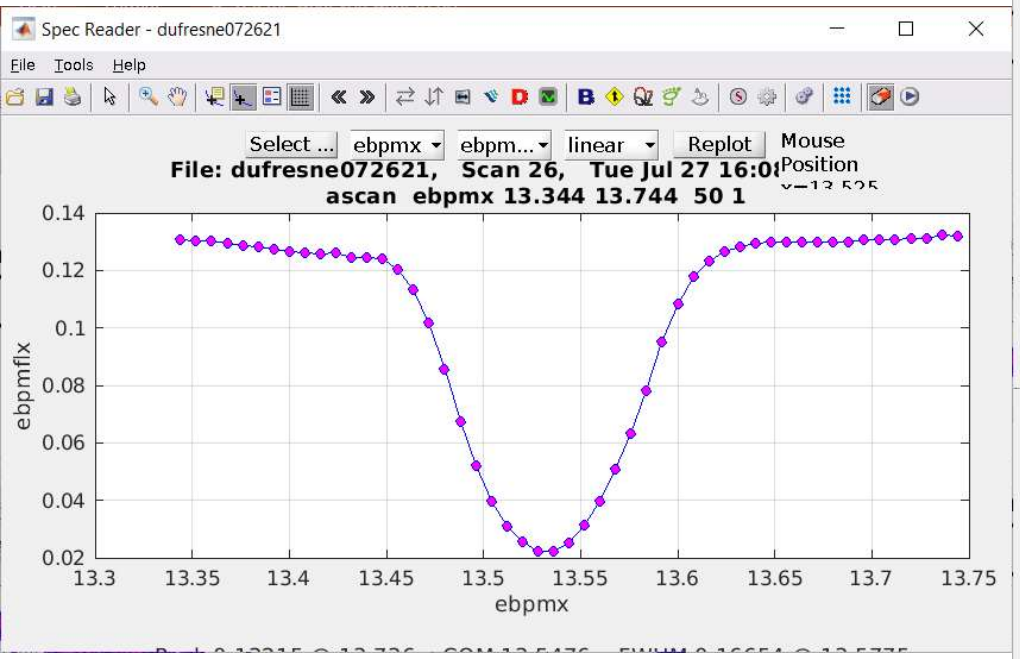


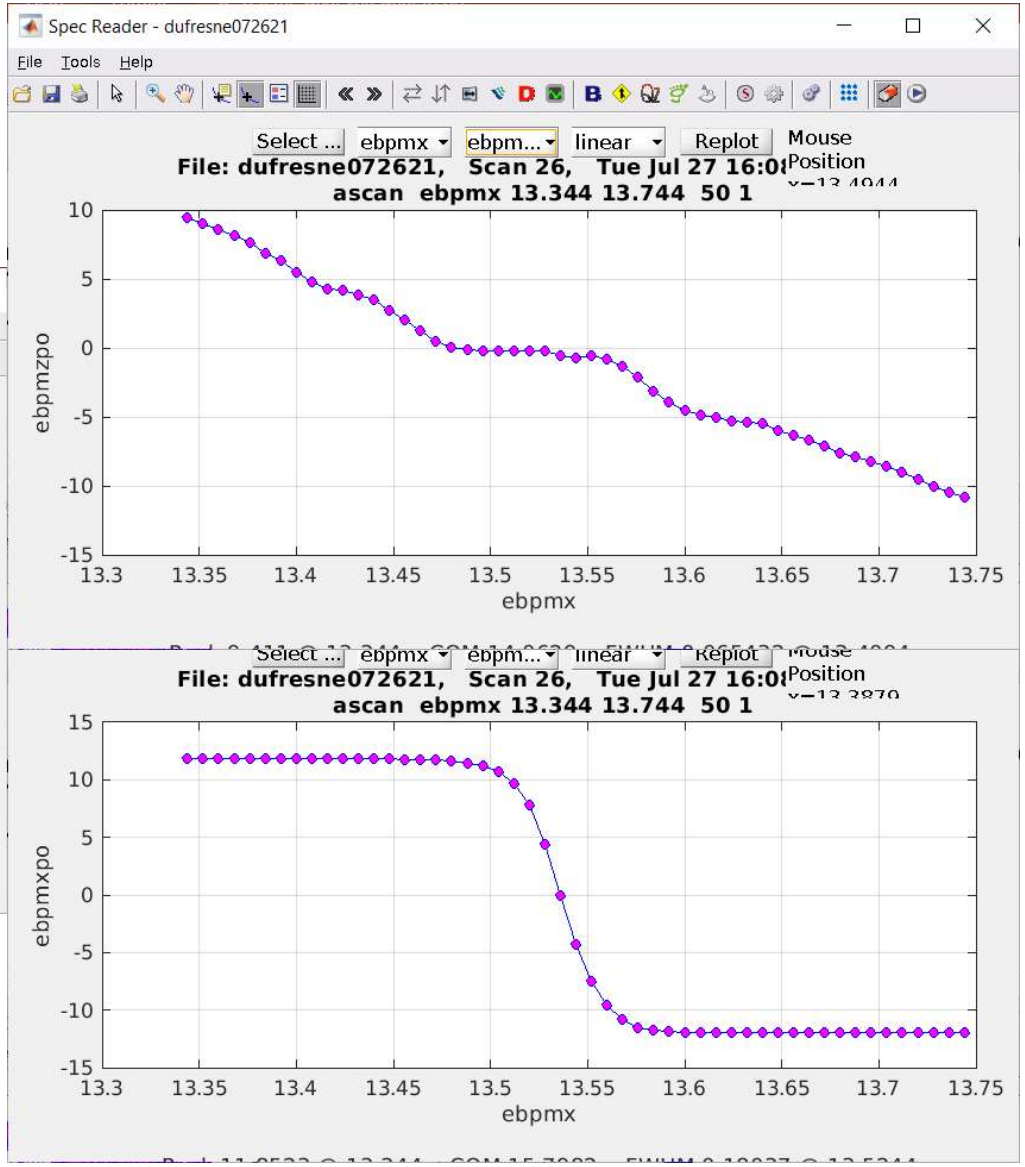
PIN diode dark count is ~500 cts/s, so signals
Varies from (2.65-2.6)/2.65 or < 2%



Very large BPM total current variations?
Current in microamps

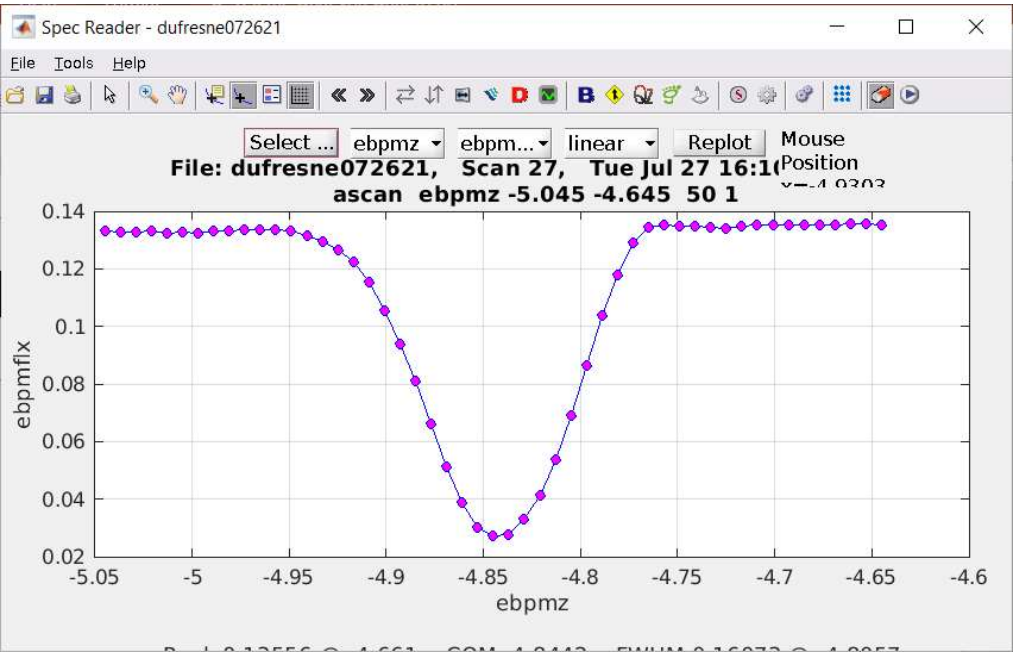
X calibration

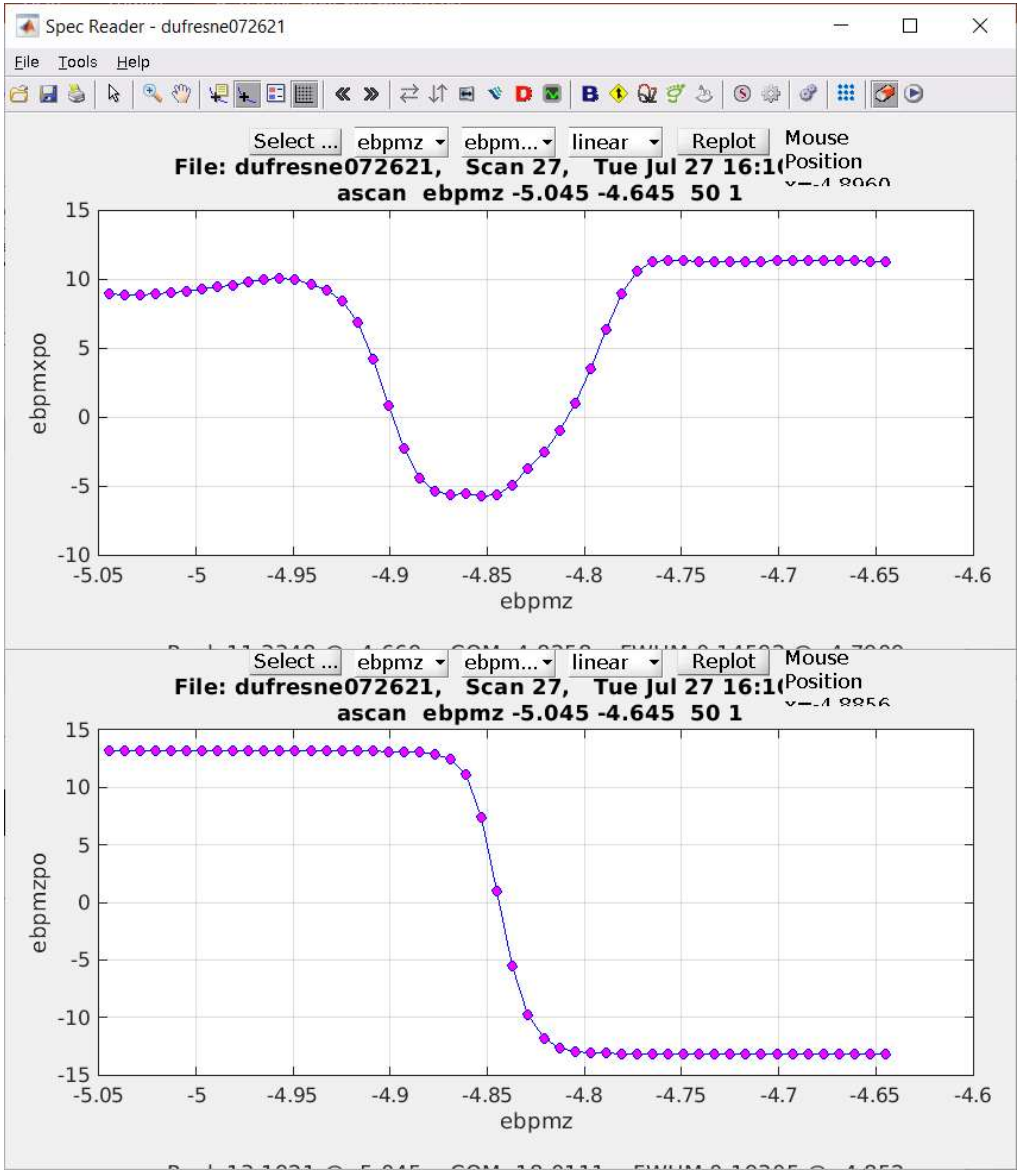




Ebpmx in mm. Large drop of flux at center?
Ebpmxpo is position scaled from bpm ratio in Micron. Something odd with ebpmzpo but could be large motion.

Z or vertical calibration

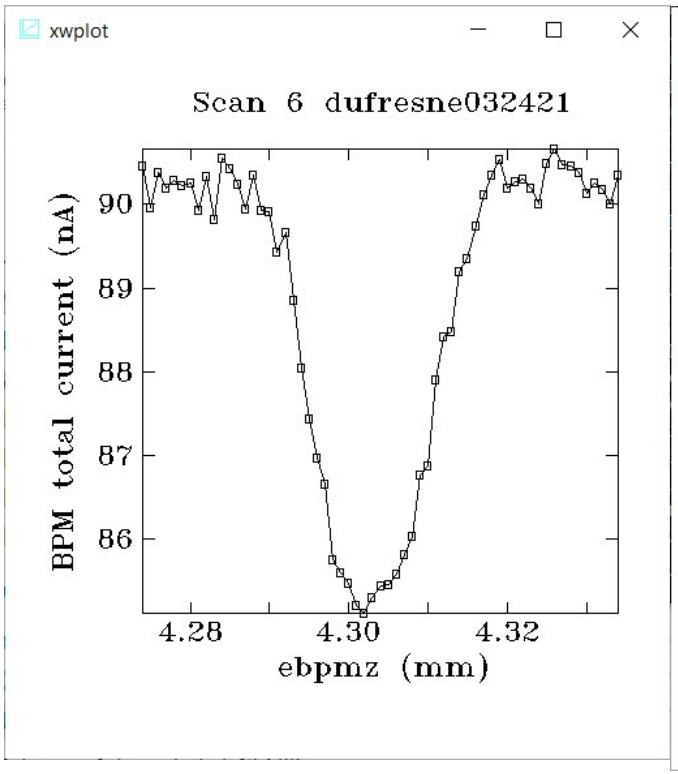


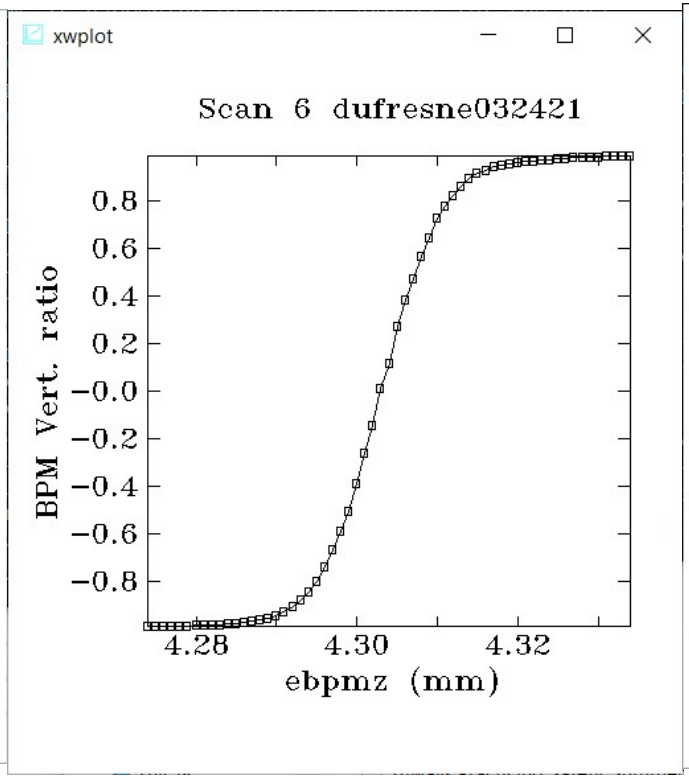


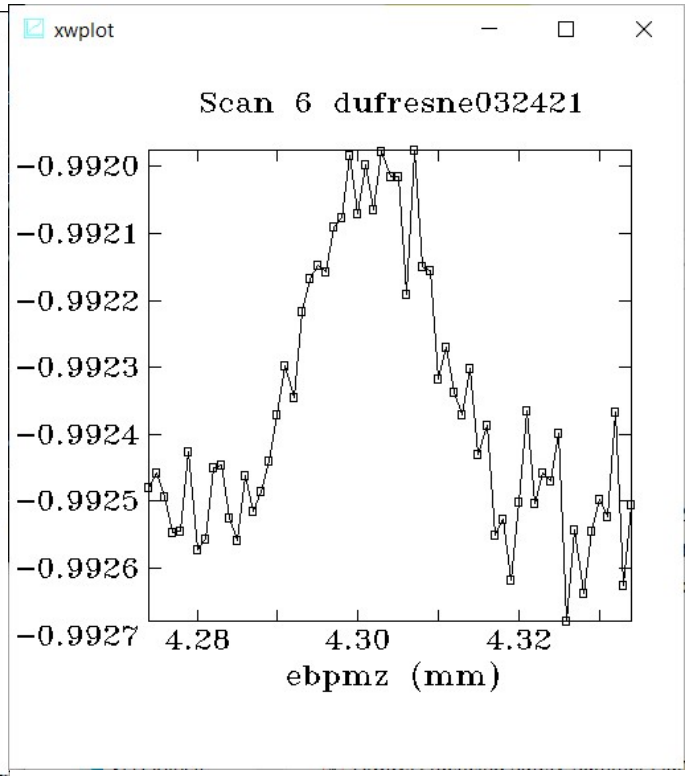
After looking more closely

- Next slide shows the total current had a little dip in March 2021 that I never noticed until now.
- The ratio behaves as expected i.e. vertical ratio varies with vertical position while the horizontal ratio is flat.

2021-1 March 24







Beamline IOC/electrometer

- I’ve also had to restart the electrometer multiple times so I find I have a problem with stability too.

Summary

- Although the calibration scans in both X and Z are making sense, one finds a large drop of total intensity in the center of the diode, about 100 um wide.
- This is something that got worse since March.
- BPM operated at 10V, about 10^10 ph/s x-rays with 7350 eV, focus

downstream of BPM, about 20 cm. Beamsize around 20 um at the diode.