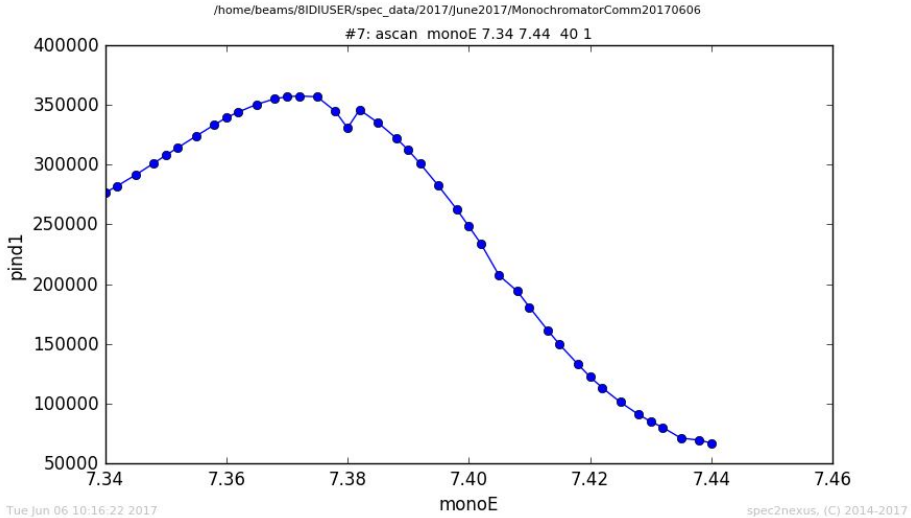
June 5, 2017

Created new 8-ID-E user with folder for WA-XPCS
Spec file is lineup170606.spec
Loaded macro for moving mono called move_diam.mac in conf.mac and edited conf.mac and ccd_settings.do for the 2017-2 run

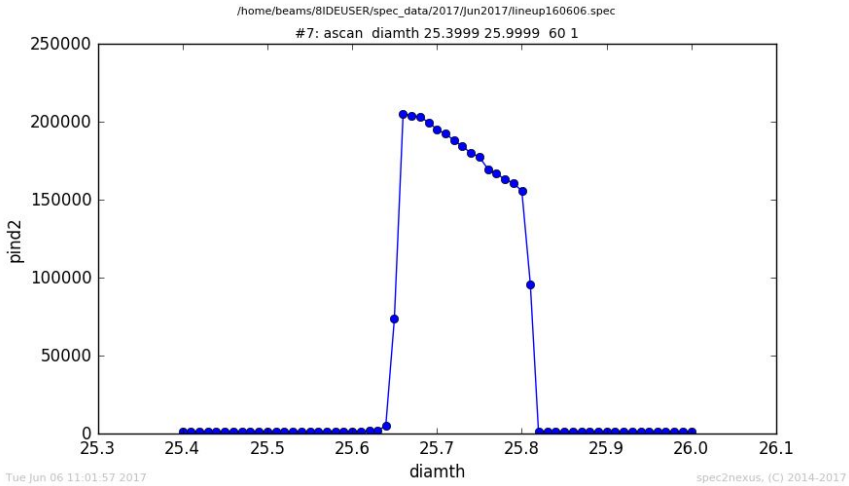
June 6, 2017

9h10 am Cleaned se2 horizontal blades with acetone, isopropanol and a cotton swab. Hardly changed the look. Suresh says I need to take the slit apart and clean it with a green scrubbing pad.
Vacuum on turbo with G isolated was $4x10^{-7}$ mbar. Started pumping both flight paths. Everything is pumping nicely.

Suresh aligned 8-ID with 2 UA at 17.68 mm gaps. We went slightly lower in energy this time to avoid a glitch on the energy scan of 8-ID at 7.38 keV.

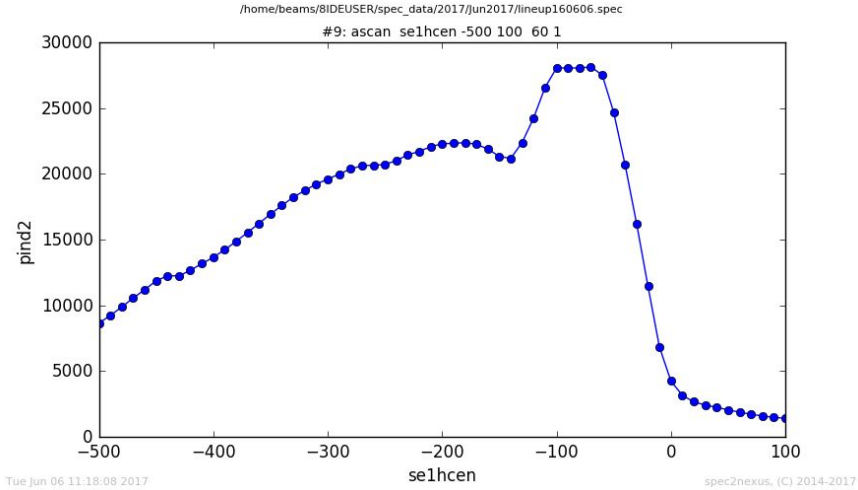


#2 lup diamchi -.04 .04 40 1 move to peak, but made mistake at move to -.52, way off
#3 lup diamth -.02 .02 40 1 (junk)
#4 lup diamchi -.04 .04 40 1 (repeat) moved to -.051.
#5 lup diamth -.04 .04 80 1 move to CEN
#6 lup diamth -.04 .04 80 1 with se1hgap =5000
#7 lup diamth -.3 .3 60 1 with se1hgap = 10000um. This scan is narrower than before. 0.16 deg. In June 2016, it was 0.24 deg. 10mm/2/1m=5mrad or ~0.3 deg, assuming lever arm from D mono is 1 m.

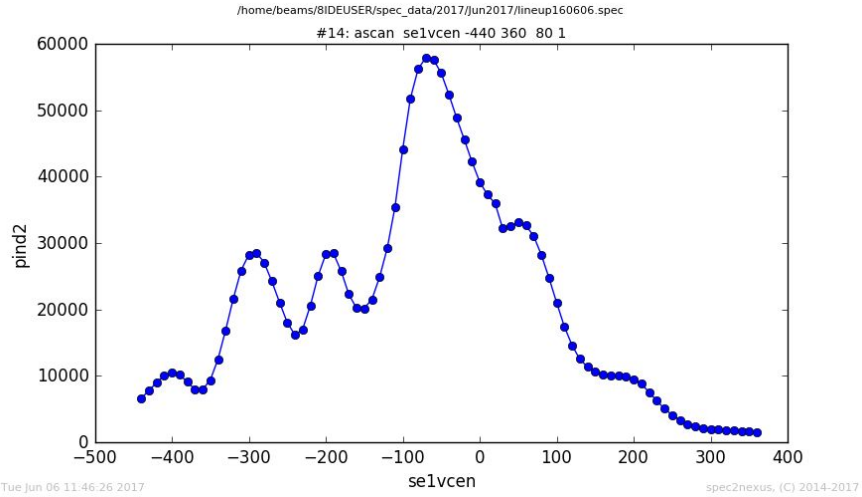


#8 lup diamth -.02 .02 40 1 go to peak

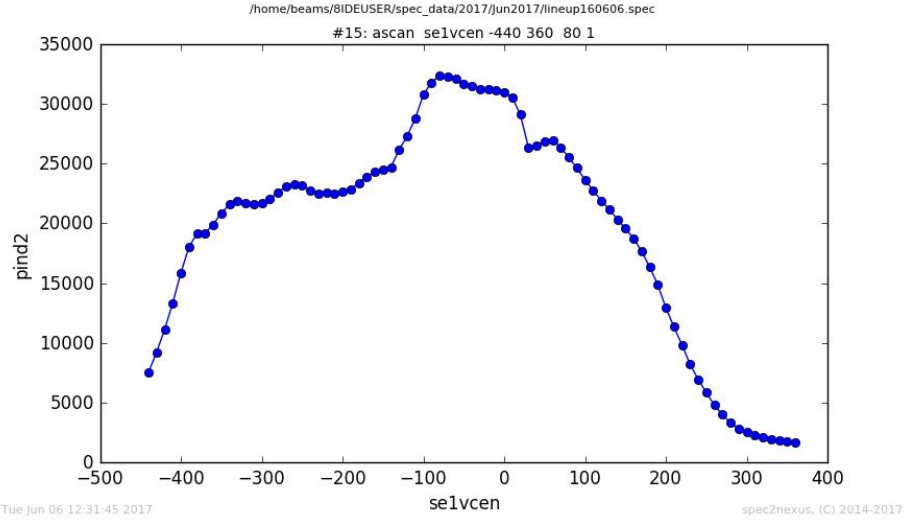
#9 lup se1hcen -300 300 60 1 with se1hgap=50. One strange scan?? Stay at -200.



#10 se1hgap -20 10 30 1 starting with a nominal 10 um opening. Zeroed at 2 um.
flux pind2 132677-1034
Amps_per_Volt(pind2) = 0.0001 A/V, CtpV = 100000, Length = 0.0400 cm, Element = Si
Ephot = 7413 eV, Si Elength = 0.0056 cm 131643 cps is a current of 13.2677 Amps
4.02e+11 photons per second This is consistent with March 7, 2017, in paper log book p2.
#11 lup diamth -0.02 .02 40 1, looks good
#12 lup se1vgap -20 10 30 1 zero is great, return to 150 um.
#13 lup se1vcen -400 400 80 1, was at -33um, decide to go to **-40**.
#14 lup se1vcen -400 400 80 1 with se1vgap=50, some crazy looking beam consistent with 8-ID-I measurements last weekend.



Working with Suresh in 8-ID-I around noon, we made the same scan and it looked very similar.
We decided to move the mirror up by 0.5 mm, so mirror table was at 0.5 mm, now trying at 1 mm.
We moved the mirror by 1 mm. Table 2 is now 1.5 mm.
#15 lup se1vcen -400 400 80 1 with se1vgap=50 (after mirror move)



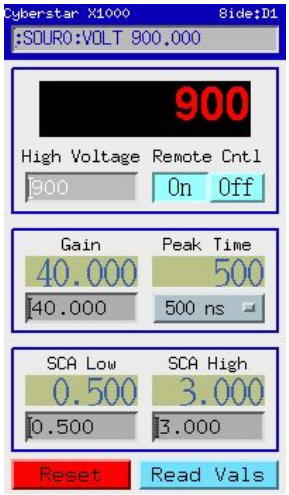
Go to -50 um. Flux is down. 88672 instead of 132700 cps.
#16 check zero again of se1vgap. Fine.
#17 lup diamth -0.02 .02 40 1 (looks good)
flux pind2 88490-1030 is **2.67e+11** photons per second

N.B. **The Steve Ross's clock/CCD shutter module was off**, so the shutter wasn't working.
This is a 1U module under the NIMBIN below the 8ID-E ioc. I turned it on.
Something is still off with the attenuation? Att is set at 16 and stucked.
The module above the NIMBIN near the 8ID-E IOC was also disabled and this controls the second filter unit for att from 16-31. The **module above** the NIMBIN needs to be **ON**.
The filter unit called **XIA S1** is **controlled by the black XIA NIM** module with att 0-15.

The filter unit called **XIA S2** is **controlled by the blue XIA NIM** module needed with att 16-31.
Still having issues with **s8idigui** in movie mode. Batches are fine. I restarted it and it now seems to be reliable.
Still missing something. The counters are not read in the time scan?
Spoke to Suresh and the new version of spec rolled out by Jeff during the May shutdown has a problem with ccdc not being read. Suresh fixed it by changing the soft link of fourc8IDE to /home/beams/**S8SPEC**/spec/install/**spec_6.03.11_ce67_x64/bin/**fourc8IDE
Now everything works.
Newfile is **lineup160606a.spec**

#5 lup lensx -2 2 40 1 CEN at -10.45, but slight dip. We operate at -10.
#6 lup lensz -1 1 80 1 moved to CEN=**8.35595 mm**
#7 lup lenspit -1 1 40 1 with si1vgap=150 um. Leave as is.
Moved to through hole.
#8,9 garbage **#10** lup lensx -1 1 80 .5
#11 lup lensz -1 1 80 .5

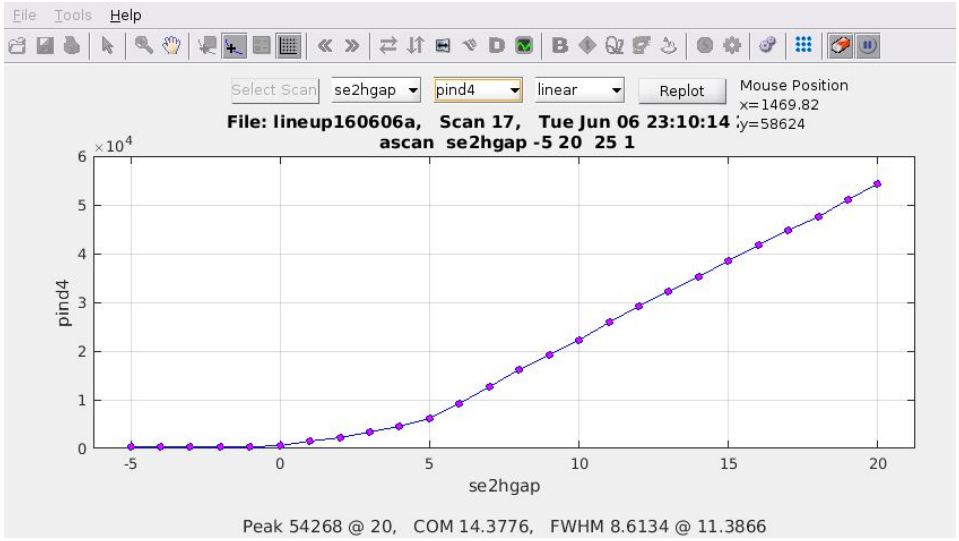
Useful positions: lens out lensx=-6.61250 lensz=8.3348mm
Lens in: lensx=-10 lensz=8.35595 mm
Flux pind3 72823-838 (2.2 e+11 ph/s at 100uA/V)
Flux pind2 82974-1034 (2.5e+11 ph/s at 100 uA/V)
Set up Oxford Cyberstar settings as http://8id.xray.aps.anl.gov/elog/8-ID/477



Pin at samx=samy=0 samz=20.29mm. See p26 of Mar. 2017 log book

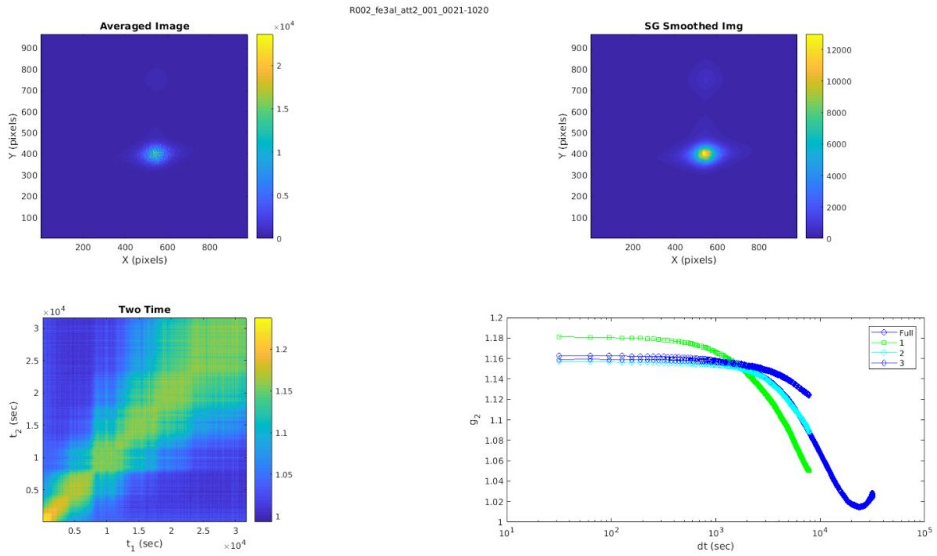
Aligned table te2 with x-ray eye. All worked well. Put pind4 at the end of Kapton window.
Aligned se2vcen scan 12-13. Moved to CEN and repeated.
Cheched se2vgap scan #14. Zero is still good. Back at 50 um.
Aligned se2hcen #15. Is off some because of cleaning (likely). Moved to 50, repeat in scan **16**.
Doing this scan with narrower se1hgap 100um. Typically do it with wider 275 um slit opening.
Nice scan. Moved to CEN

#17 lup se2hgap -15 10 25 1 Still crappy looking as before. See below. Zeroed at 3 um.
#18 redo last scan after zeroing

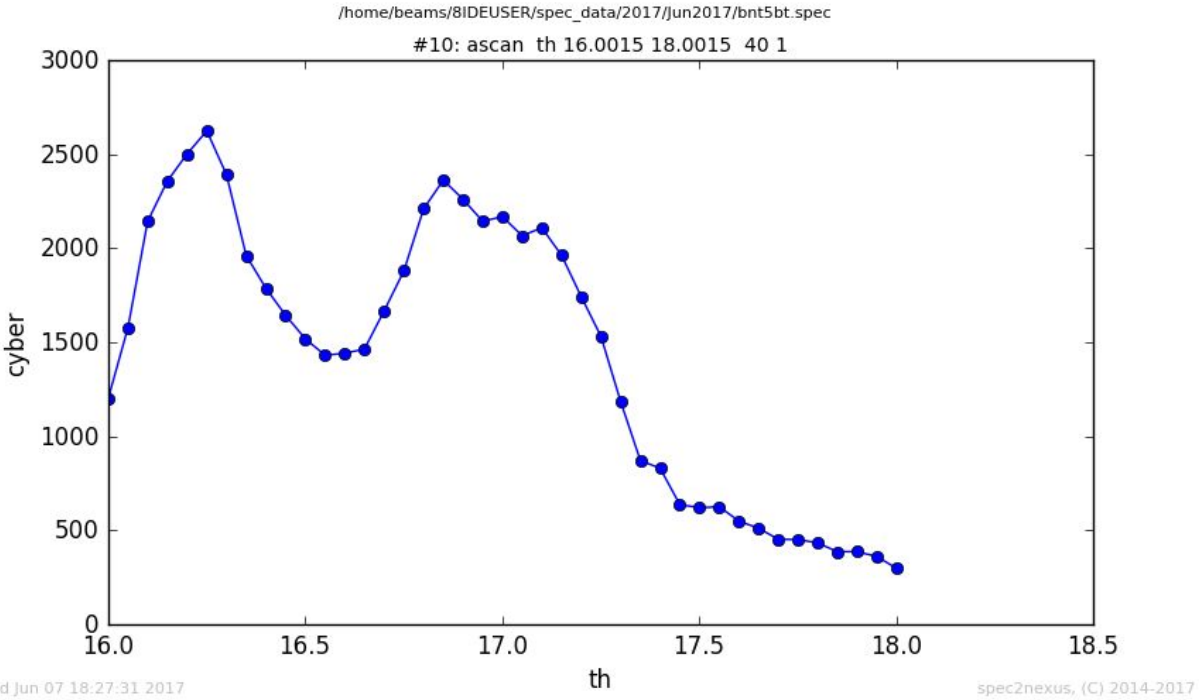


Opened up **se1vgap=150, se1hgap 275um**
Scan #19 lup te2_z -0.04 0.04 40 1 after moving up 22 um. Still not enough. Moved an addition 20 um. Repeated #20, move to CEN.
#21 lup **se2vgap** -60 60 60 1 typical looking, **stay at 50 um.** (~4% cut of coh. flux)
flux pind4 66391-410
Amps_per_Volt(pind4) = 1e-06 A/V, CtpV = 100000
Length = 0.0400 cm, Element = Si, Ephot = 7412 eV, Si Elength = 0.0055 cm
65981 cps is a current of 0.066391 Amps
2.01e+09 ph/s
Lineup telescope crosshair on pin.
Mounted Fe3Al, at samx=-2, samy = -1, samz = 19.94, th=18.093, tth 29.253, chi =-90.5
#22 lup th -.5 .5 40 1 aligned.
#23 lup tth -0.5 .5 40 1. Looks good enough let's put CCD in.
Beam on CCD**,** problem with TV mode on 8idigui.
Intermittent stop of focus mode? Could be matlab problem? **Suresh fixed it. CCD needs to be in Continuous mode for TV instead of Multiple mode (for batches)**.
Took first data set R001_fe3al_att2_001 ccdtimescan 20 300 1 0.5
Started overnight scan #26-27

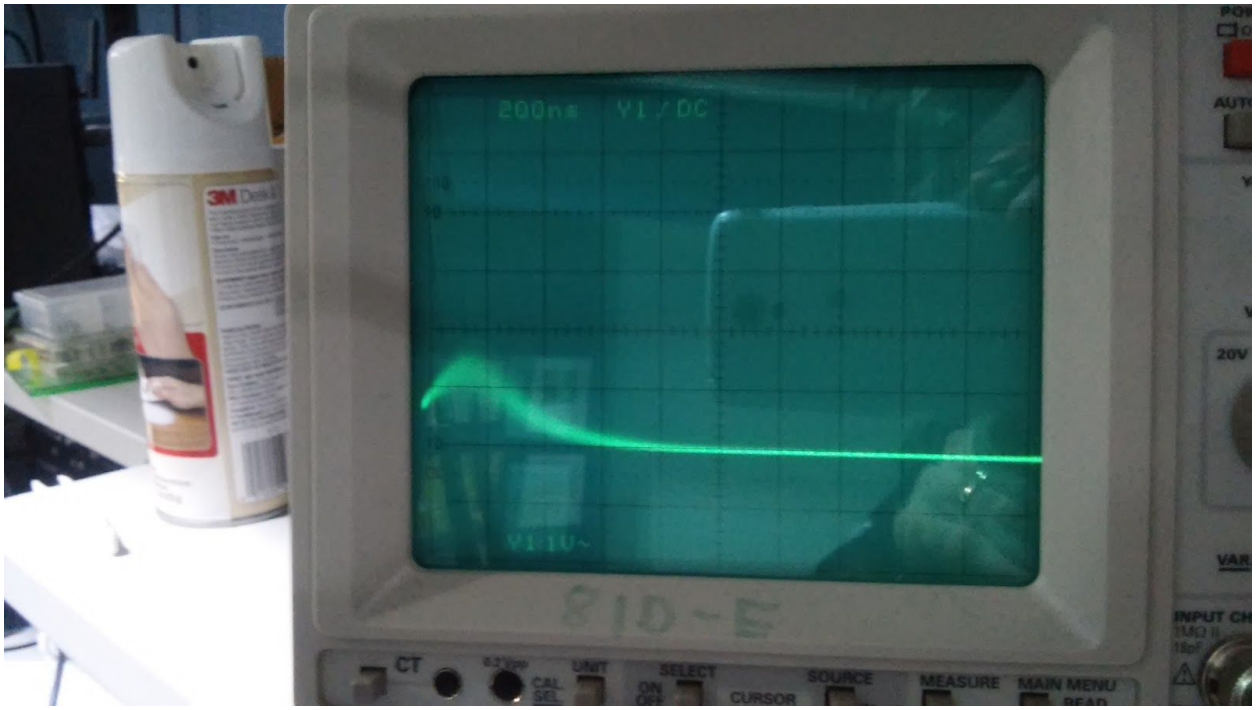
R002_fe3al_att2_001
ccdtimescan 20 1000 1 0.5 30 Should run for 8 hours or so
Finished Wed Jun 07 09:41:55 2017
TwoTime plot shown below (about 16% contrast)



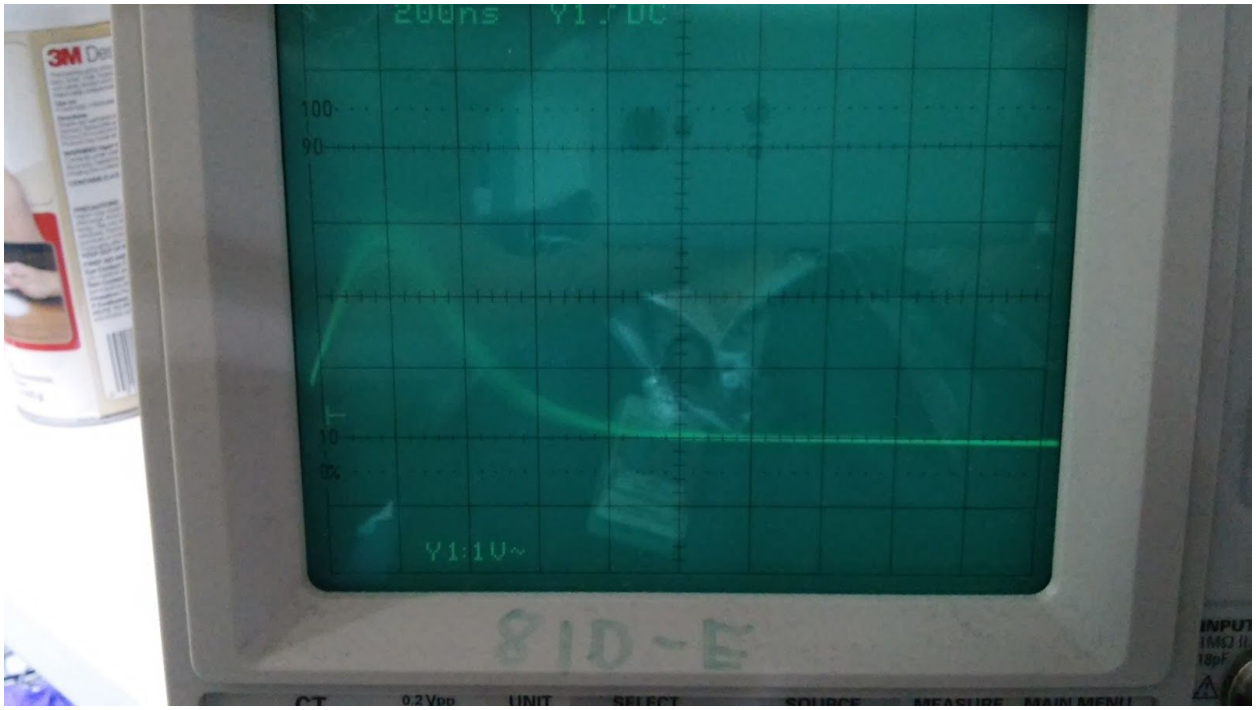
In the afternoon of June 7, we moved to the BNT5BT sample, with a surface normal of (001). We easily found the (002) peak at the correct Bragg angle, but we got fooled with the high energy second harmonics signal so after setting the SCAN Upper Discriminator window to 2 from 3 V, the double peak in the image below disappeared. This is taken near the 001 location.



The next three images show how we observed harmonics contamination.

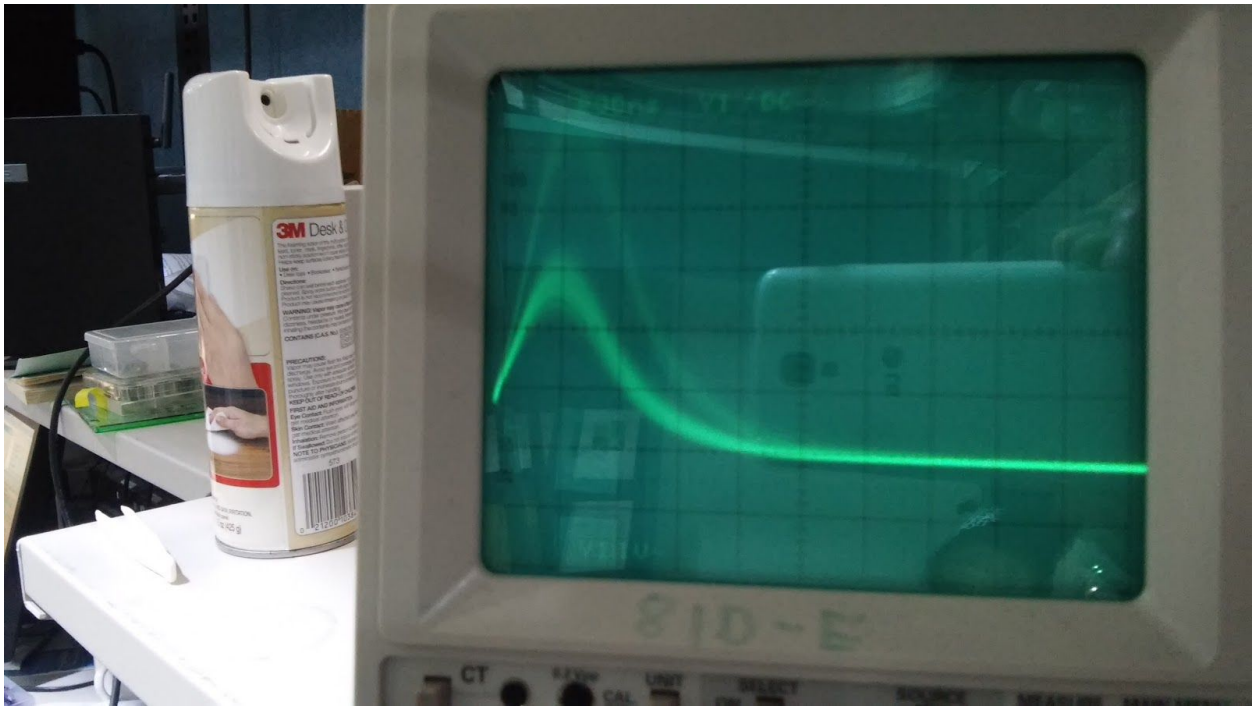


(above) An image of the scope of a strong diffraction peak where 7.35 keV is the sole energy diffracted. The peak height ranges between 1-1.5 V.



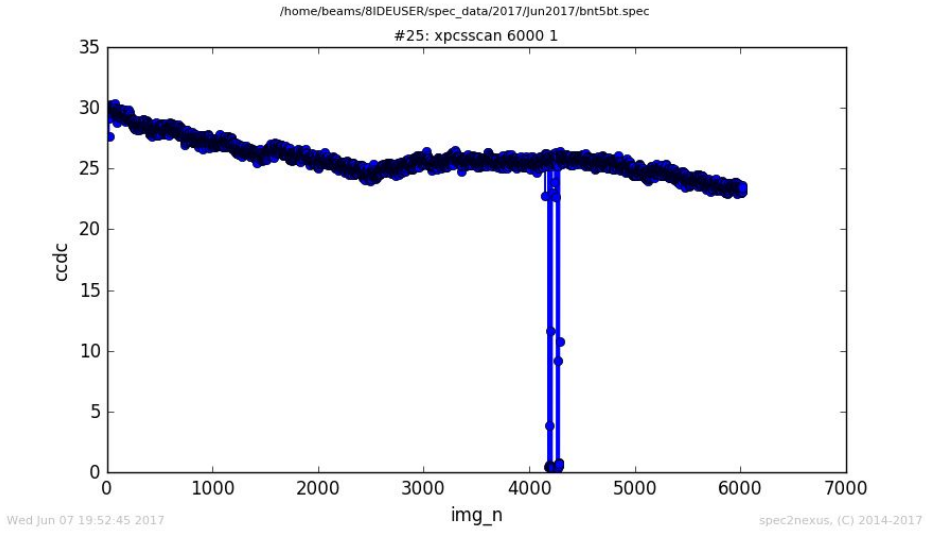
(above) The image of the scope of a weak diffraction peak where 14.7 keV is the primary energy diffracted. The peak height ranges between 2.5-3 V. The count rates were not to high so there is no pileup. The amplifier is the same for all 3 images. The 2nd harmonics caused

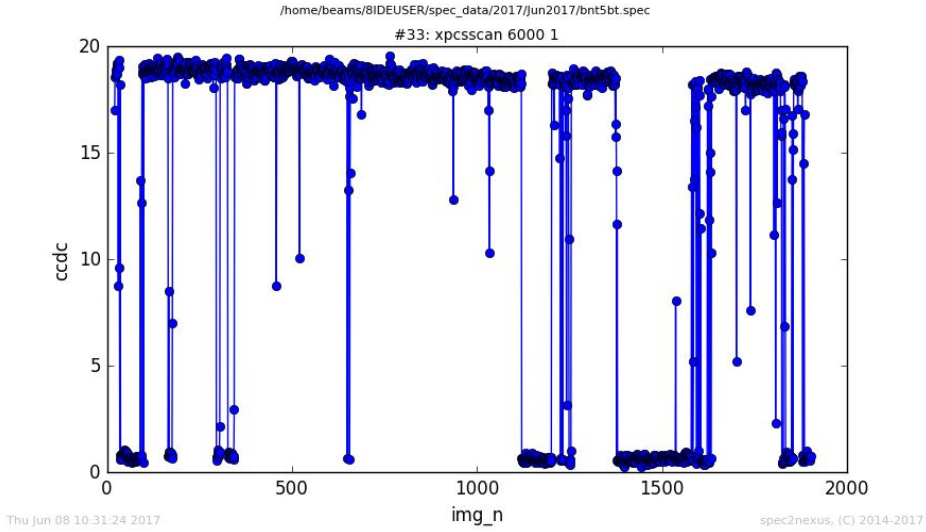
problems in our search for a very weak reflection as it would get counted in the fundamental energy SCA window which had been set to wide.



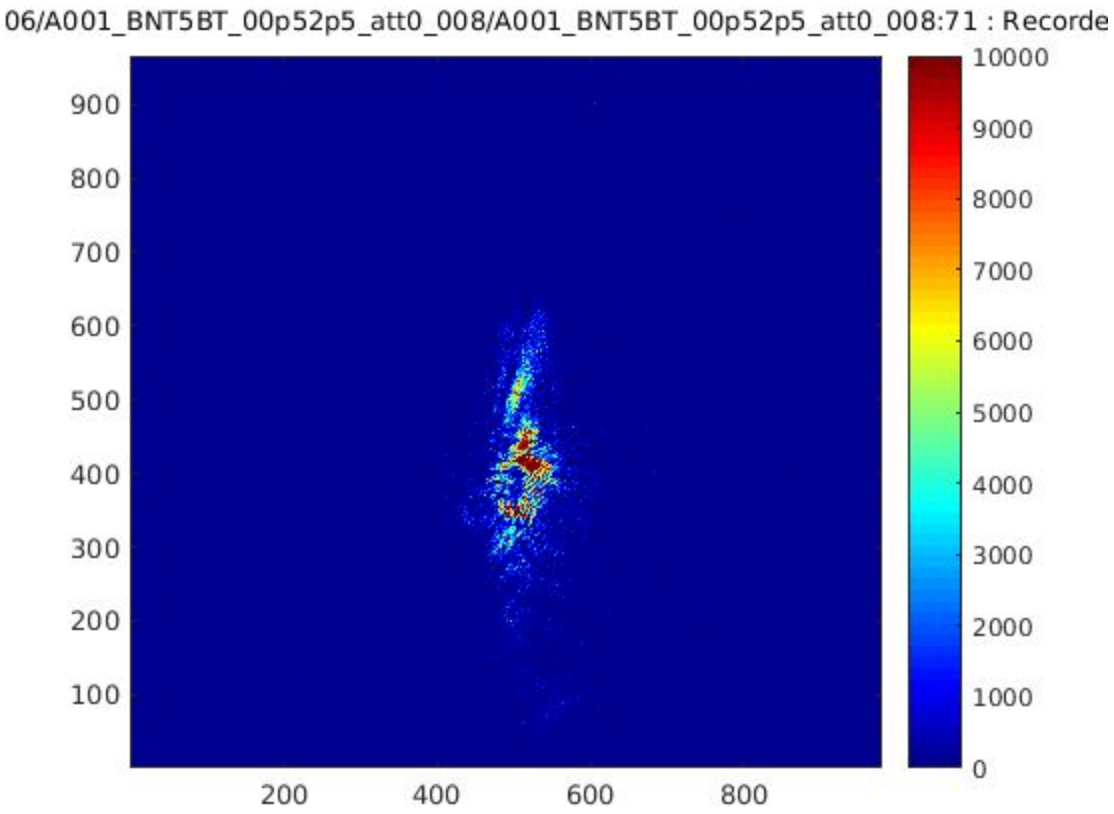
(above) The image of the scope of a weak diffraction peak where 14.7 keV and higher energies are diffracted.

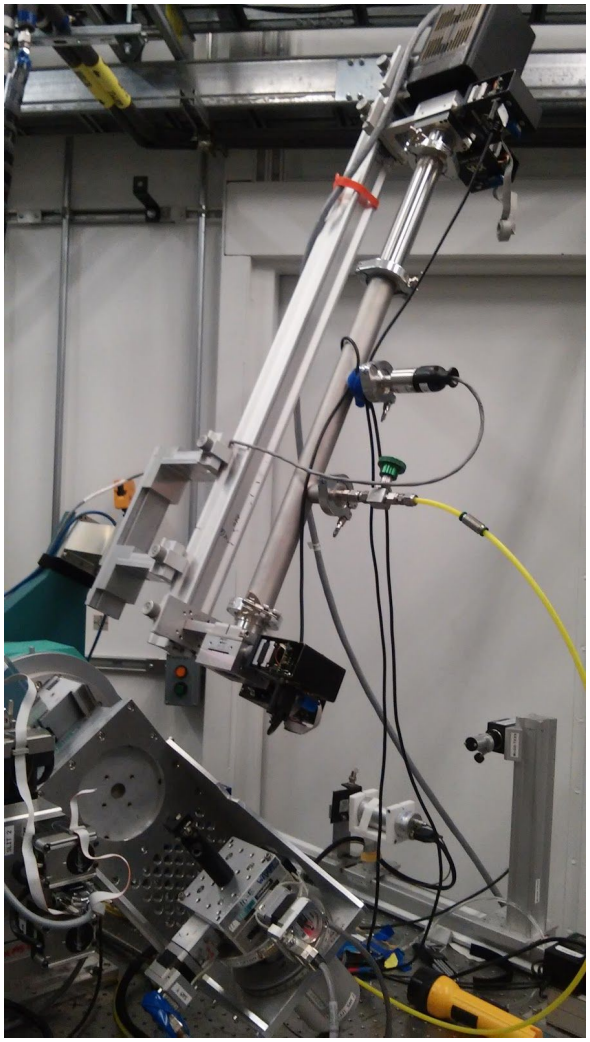
Qian and Qingteng took XPCS time scan on the 002 overnight. The shutter is not working again correctly.
See scan 25 and 33 below. The problem is getting worse, starting from scan 25, 27,29,31,33.





We used fourc8IDE to find a reflection (0 0.5 2.5) on BNT5BT single crystal with a (0 0 1) surface normal. We could find the (0 0 2), but never found the (0 0 1). Not clear why.
Got nice CDI speckle on the (0 0.5 2.5).


06/A001_BNT5BT_00p52p5_att0_008/A001_BNT5BT_00p52p5_att0_008:71 : Recorde
900
800
700
600
500
400
300
200
100
200
400
600
800
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0



Cool diffractometer picture on 0 0.5 2.5 BNT5BT peak. All angle are off zero, including phi and chi.

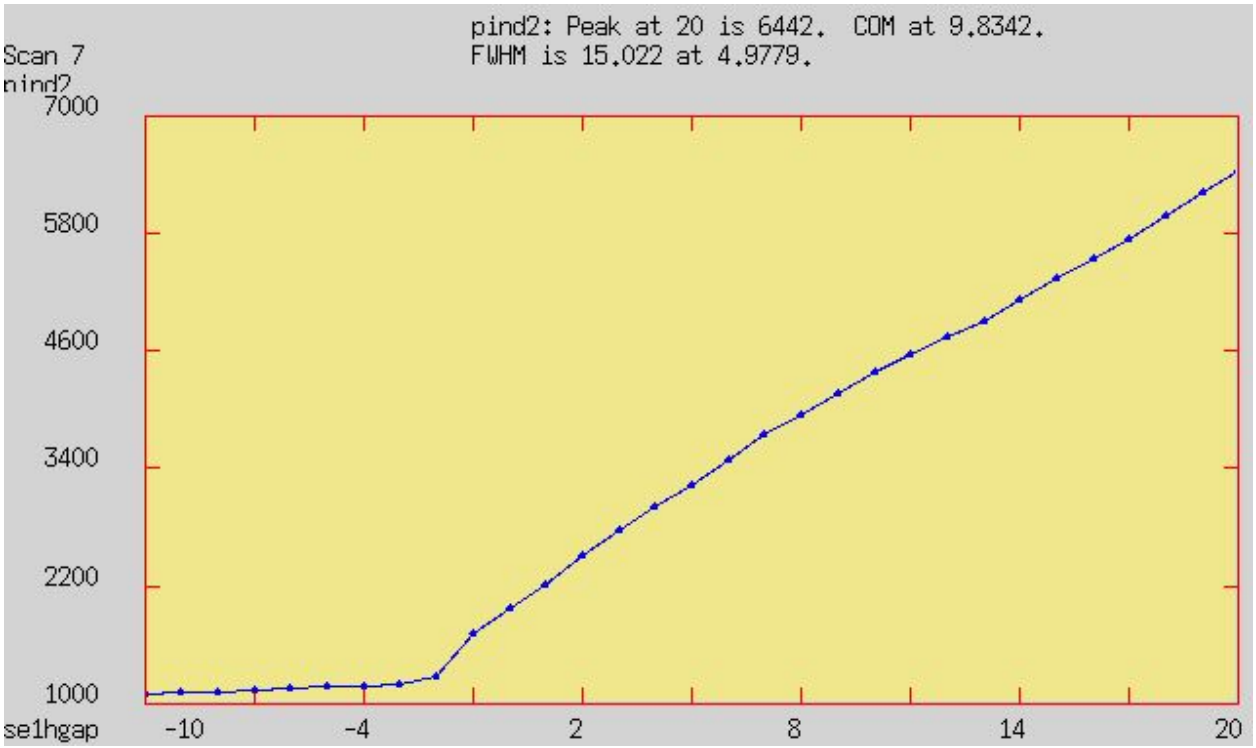
6/20/2017 Alignment for Prof. Wang, China

Lineup for Prof. Wang's group from Zeijang China Zeijang Univ. Three students led by Qing Yu. Decided to use 8ID-I reflectivity set up for low glass temperature experiment.

Could not easily diagnose the shutter problem but instead borrow 8-ID-G shutter for two weeks.

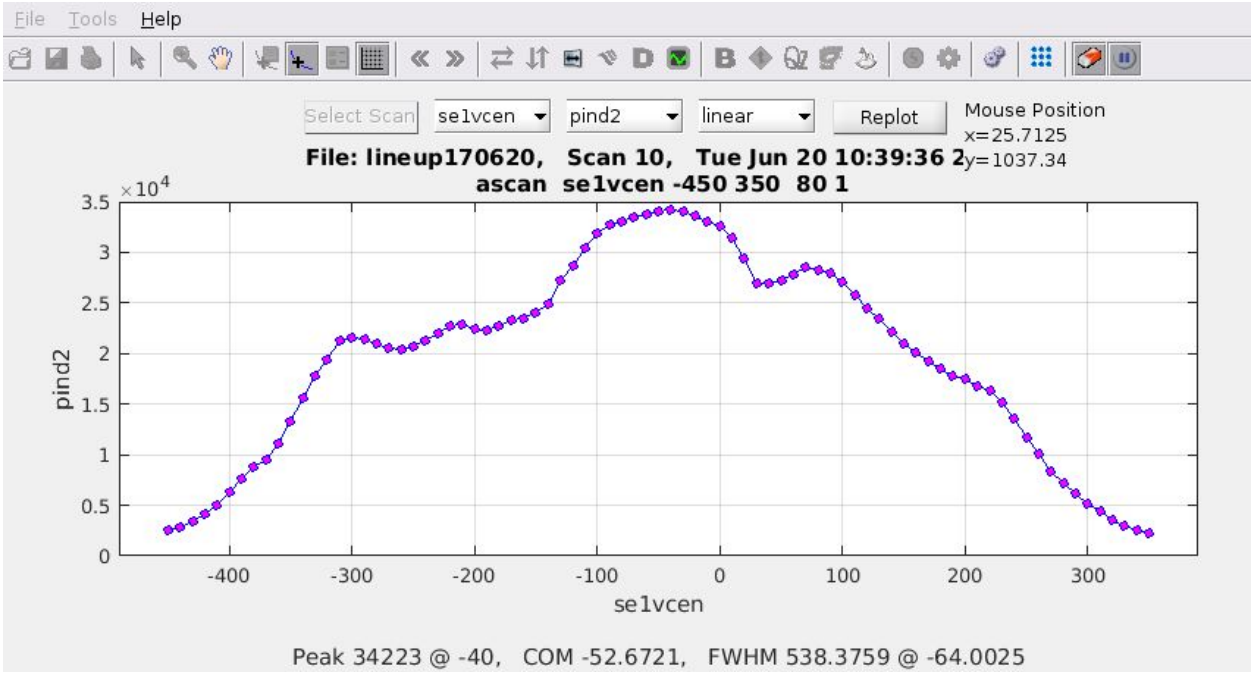
Last week I removed **sg1** references in macros and spec motors. I also removed **pind1z**.
File lineup170620
#2 lup diamchi -.04 0.04 40 1 looks good
#3 lup diamth -.04 0.04 80 1 move to peak
flux pind2 53361-1028, **1.6e+11 ph/s** at 100 uA/V
#4 lup diamchi -.04 0.04 40 looks still fine

#5 lup diamth -.02 .02 40 1 move to peak. flux pind2 79137-1028 **2.38e+11 ph/s**
#6 lup se1vgap -20 10 30 1 starting from vgap=10. Zeroed at 1um. Set **se1vgap =150** um
#7 lup se1hgap -20 10 30 1 starting with hgap=10. Zeroed at -2. Set **se1hgap=275** um.



#8 lup diamth -.02 .02 40 1 flux pind2 78371-1028 **2.36e+11 ph/s** at 100 uA/V

Flux in 8-ID-E is lower than on 6/6/2017.
#9 lup diamth -.02 0.02 40 1 flux pind2 90215-1028 **2.72e+11 ph/s**@100 uA/V
OK I am consistent actually with new mirror spot flux of **scan 17** on June 6.
#10 lup se1vcen -400 400 80 1 with se1vgap=50um



Compares to June 6 vertical profile. Not identical though. Returned se1vgap 150.
#11 lup lensx -1 1 50 1 moved to CEN
#12 lup lensz lensz -1 1 80 .5, moved to CEN
Go to X-ray eye alignment of table 2. Lined up on pin and also took 2 pictures of the monobeam with very large se1 slit opening.
Notice pin not centered with chi (+/- 7 deg) and phi (+/- 5 deg) motions.
Check dials on samx and samy. Samx was off per **page 130** of June 2015. Reset as before.

Aligned beam with X-ray eye on PIN. Not a good technique. **It took way too long**, 3 hours.
It is still poorly done but should be OK for this experiment.
Aligning se2 now
#13 lup se2hcen -300 300 60 1 with big se1hgap. Redid in scan 14 wider, and moved to CEN.
#15 lup se2hgap -20 20 40 1, same ugly shape, zero at 0.5. Maybe less ugly.
#17, 18 lup se2vcen -300 300 60 1 (scan 18 with 10 uA/V) moved to CEN
#19 lup se2vgap -20 10 30 with starting gap 10. Zero is good
#20 lup lensx -2 2 40 0.5 on lens at -10 mm. Dip at -10.3 mm **Stay at -10 mm.**
#21 lup lensz -.5 .5 40 1 go to CEN
flux pind3 66379-862 **2e+11 ph/s** at 100 uA/V
#22 lup te2_z -.05 0.05 50 1 went to flat top away from left slope
#23 lup se2vgap -60 60 60 1 zero looks good, leave **se2vgap =50**.
flux pind4 72957-547 **2.21e+09 ph/s** at 1uA/V -flux OK
Align telescopes on pin and mounted t Fe3Al.
#24, 25 lup th -.5 .5 40 1 on Fe3Al with cyberstar. Nice looking peak
#26 lup tth -0.5 0.5 50 1 Go to CEN scan 25-26 were with att 5.

Started batch called fe3al-062017.do, saving files in qingyu1706

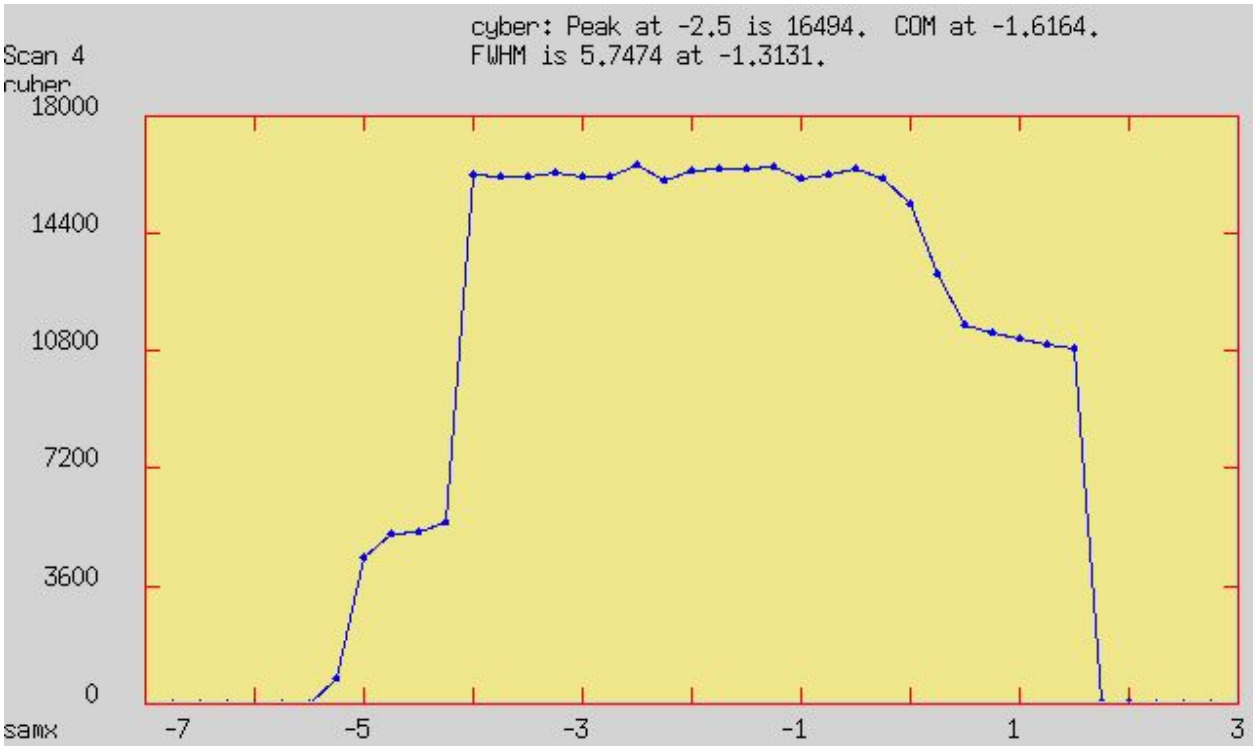
Noted an error on start up.
Error on epics_put("0MinY"): Not connected.
Error on epics_put("0SizeY"): Not connected.
Error on epics_put("0MinX"): Not connected.
Error on epics_put("0SizeX"): Not connected.
Error didn't repeat again on second run R002.

Results looks good. Contrast from multitau=13% quite flat over 300 files so 1000s
See Scan 28 and 30 R001, R002 (fe3_al_att1)

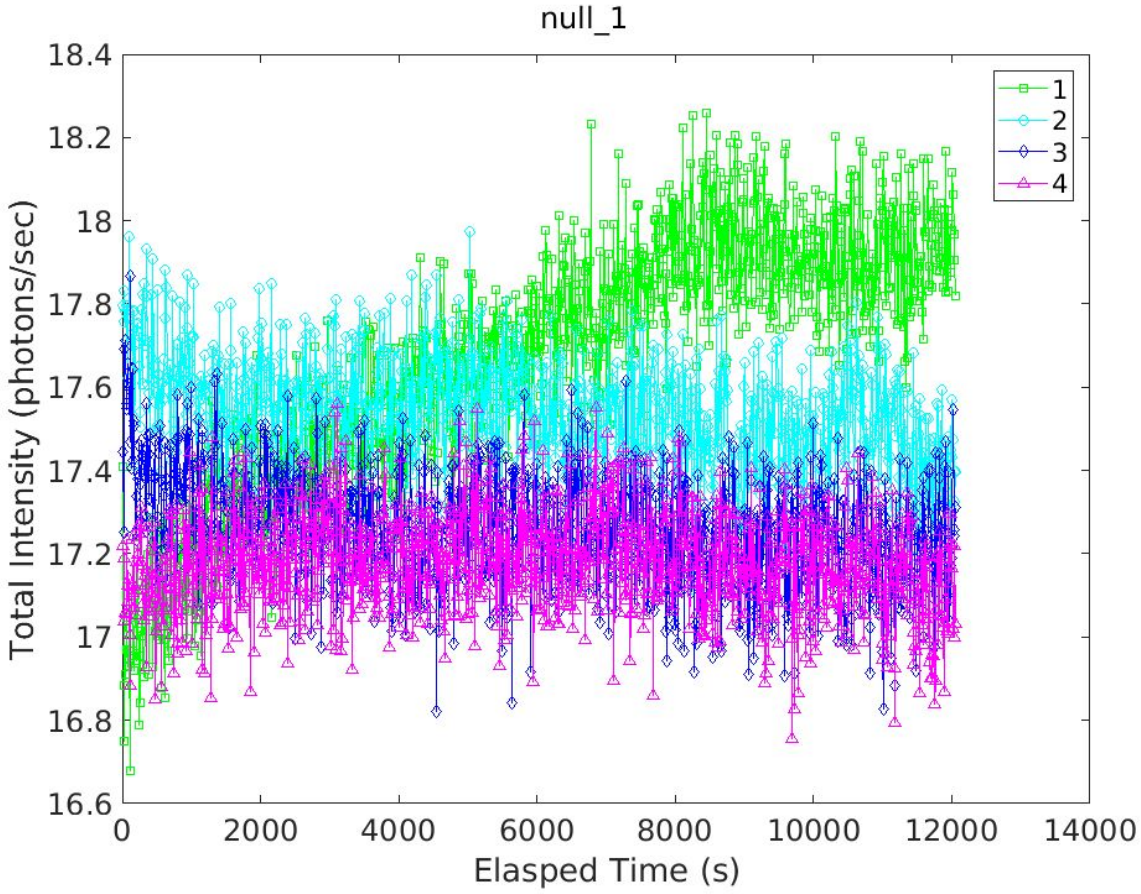
Mounting oven now, reflectivity set up from 8-ID-I. Beamline at roughly **7.36 keV.**
Need to zero tth later.
Connected water, lakeshore/peltier (see updated elog 390).
All is working. Mounted cyber.

Spec error???
22.FOURC8IDE> umvr tth 15
Error reading "8idd:m1.VERS": Not connected (0.5s).
Retry 1 on "8idd:m1.VERS" ...
Error reading "8idd:m1.VERS": Invalid element count requested.
Error reading "8ide:m5.VERS": Not connected (0.5s).
Retry 1 on "8ide:m5.VERS" ...
Error reading "8ide:m5.VERS": Invalid element count requested.

Newfile: lineup170620a
#2 lup tth -.1 .1 40 1 (mistake on scan 1)
#3 lup tth -.05 0.05 40 1 for the book. Set tth 0
#4 lup samx -5 5 40 1 edge at -4.15 and 1.6 mm Go to **-1.5 mm**

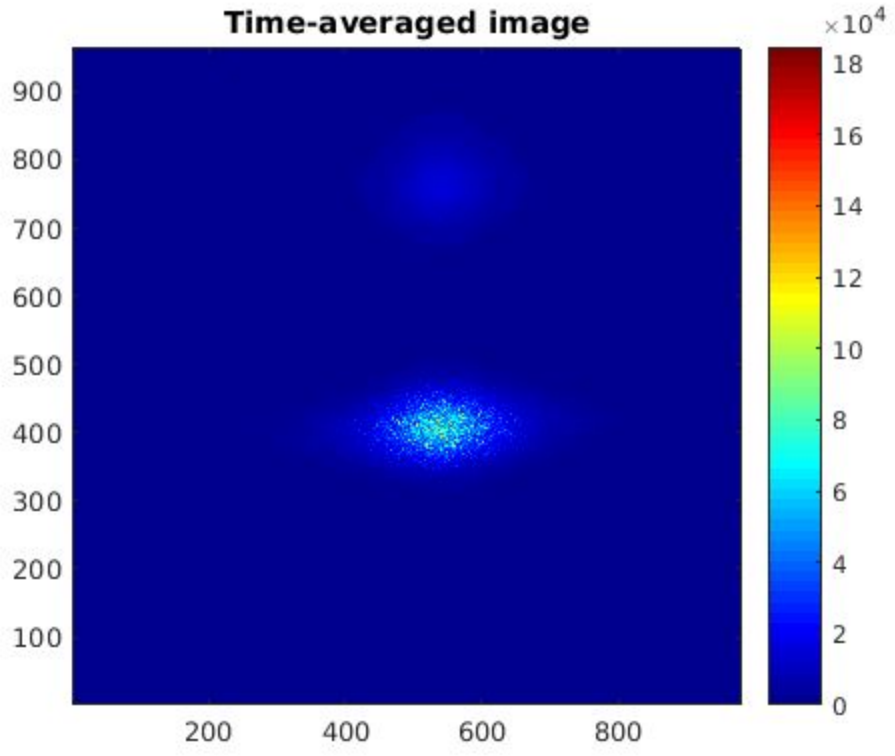


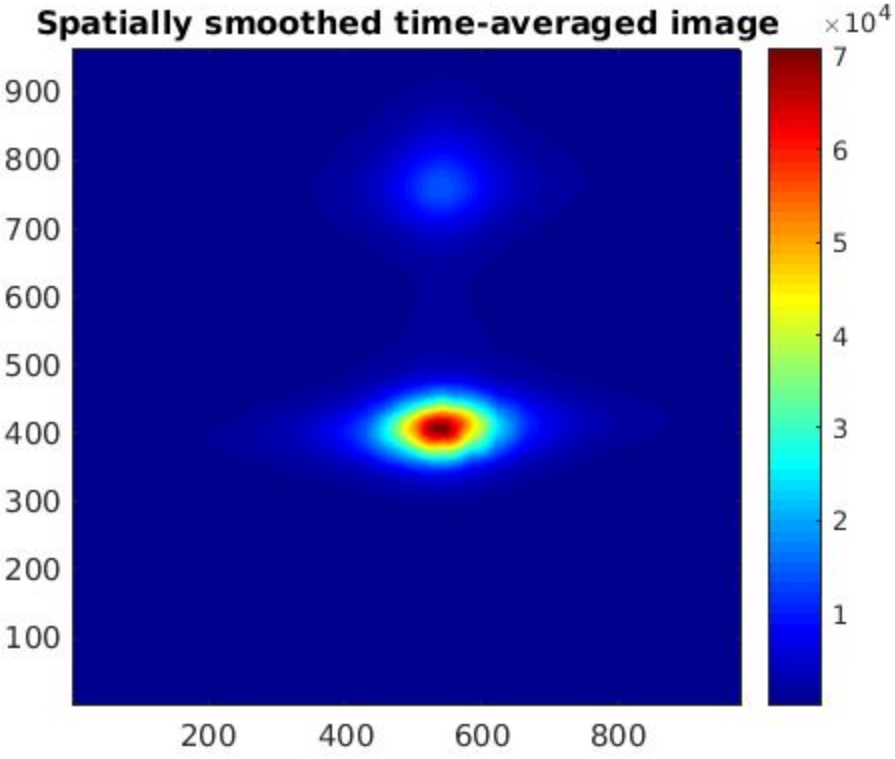
6/21/2017 8-ID-G shutter seems to work well

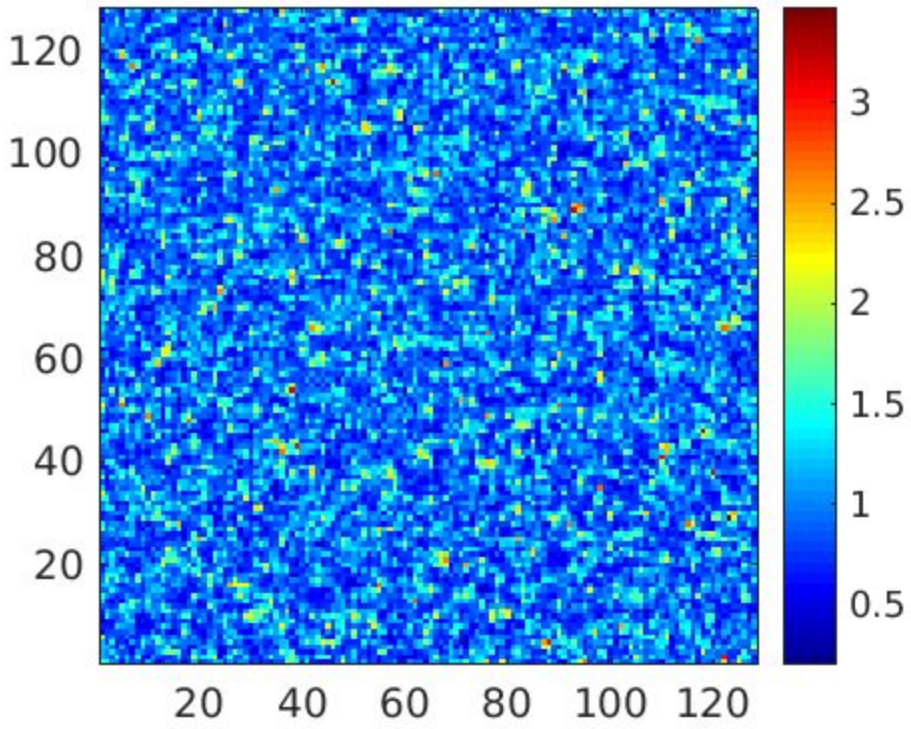


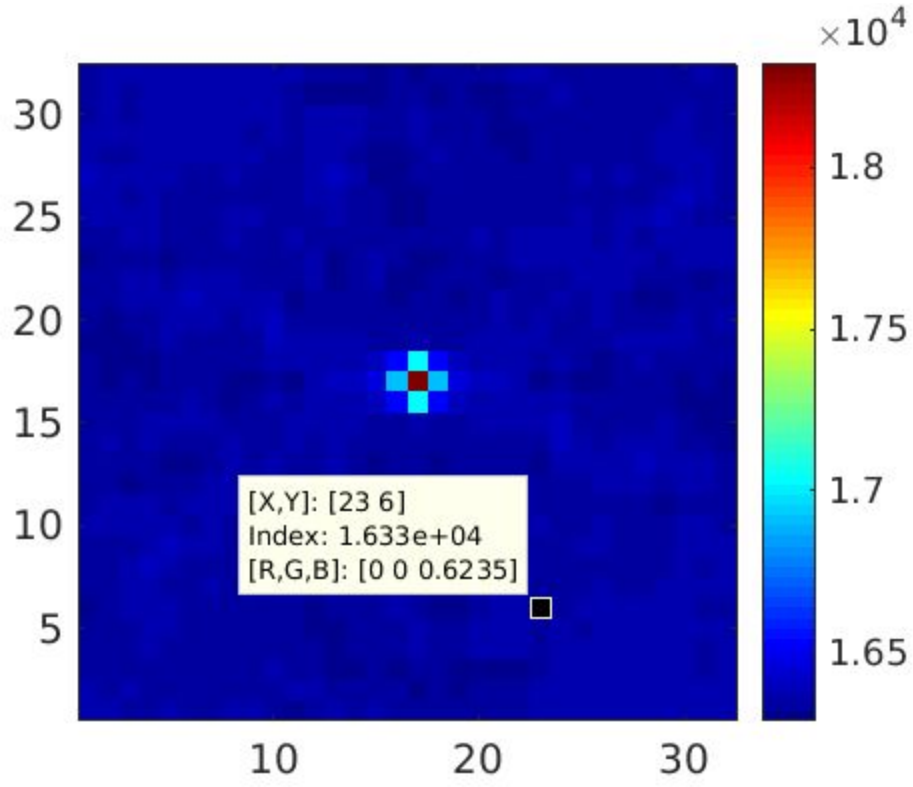
Above figure: 4 CCD average intensities, 3 hours each so 12 hours of data from the CCD. Note the 8-ID-G shutter is working well, no dip on the ccdc count. Data is R003-R006.

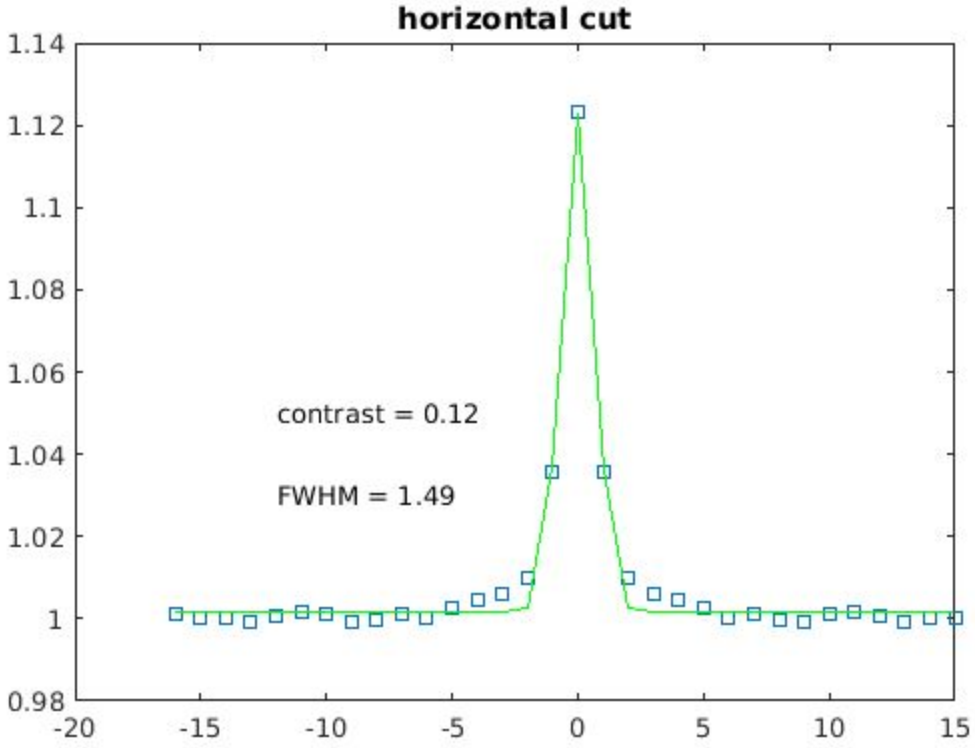
6/21/2017 Useful Code development: Spatial autocorrelation function of Fe3Al data

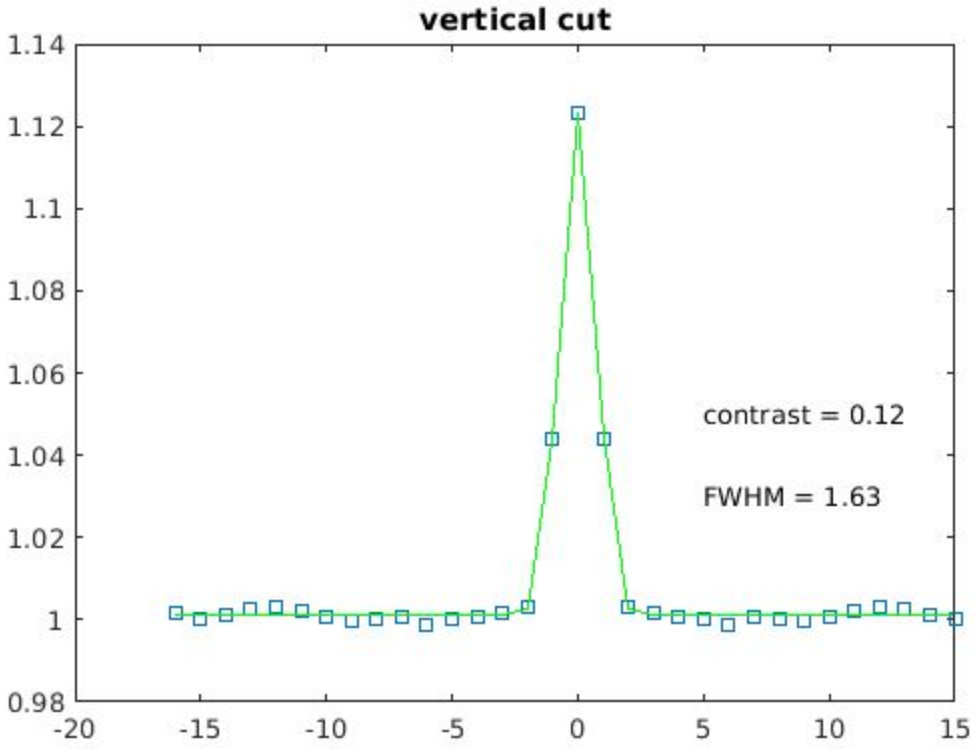

Time-averaged image
×10^4
18
16
14
12
10
8
6
4
2
0
900
800
700
600
500
400
300
200
100
200
400
600
800


Spatially smoothed time-averaged image
×10^4
7
6
5
4
3
2
1
900
800
700
600
500
400
300
200
100
200
400
600
800

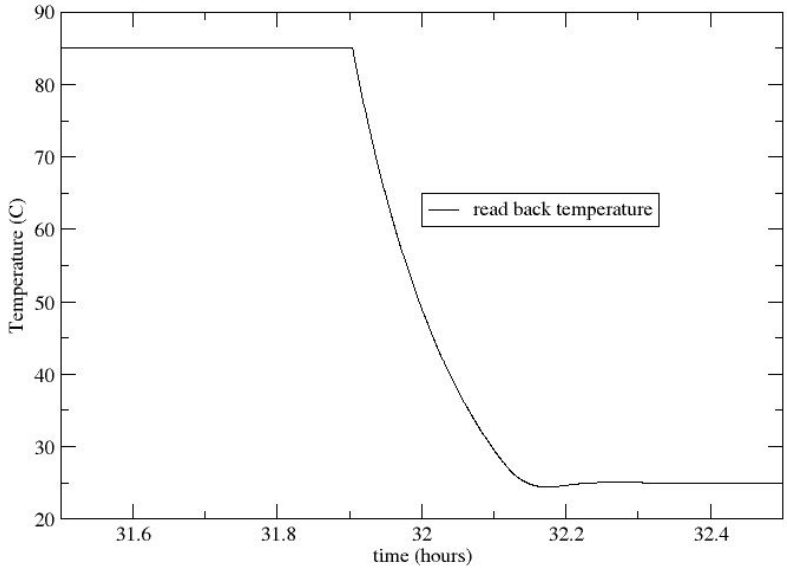

120
100
80
60
40
20
20
40
60
80
100
120
3
2.5
2
1.5
1
0.5


×10^4
30
25
20
15
10
5
10
20
30
1.8
1.75
1.7
1.65
[X,Y]: [23 6]
Index: 1.633e+04
[R,G,B]: [0 0 0.6235]

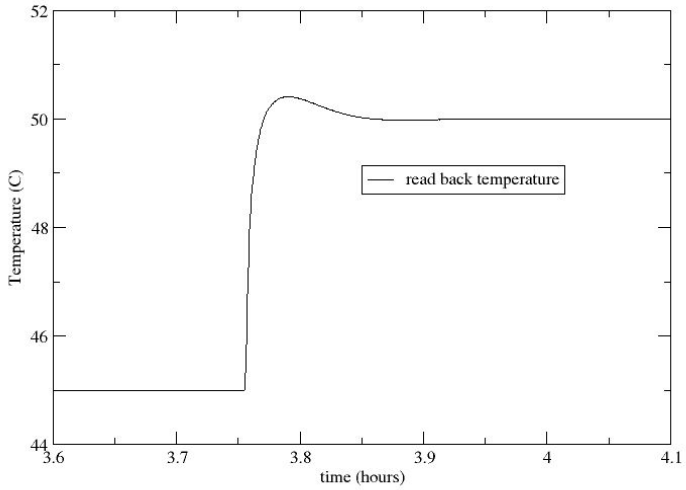

horizontal cut
contrast = 0.12
FWHM = 1.49
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
-20
-15
-10
-5
0
5
10
15

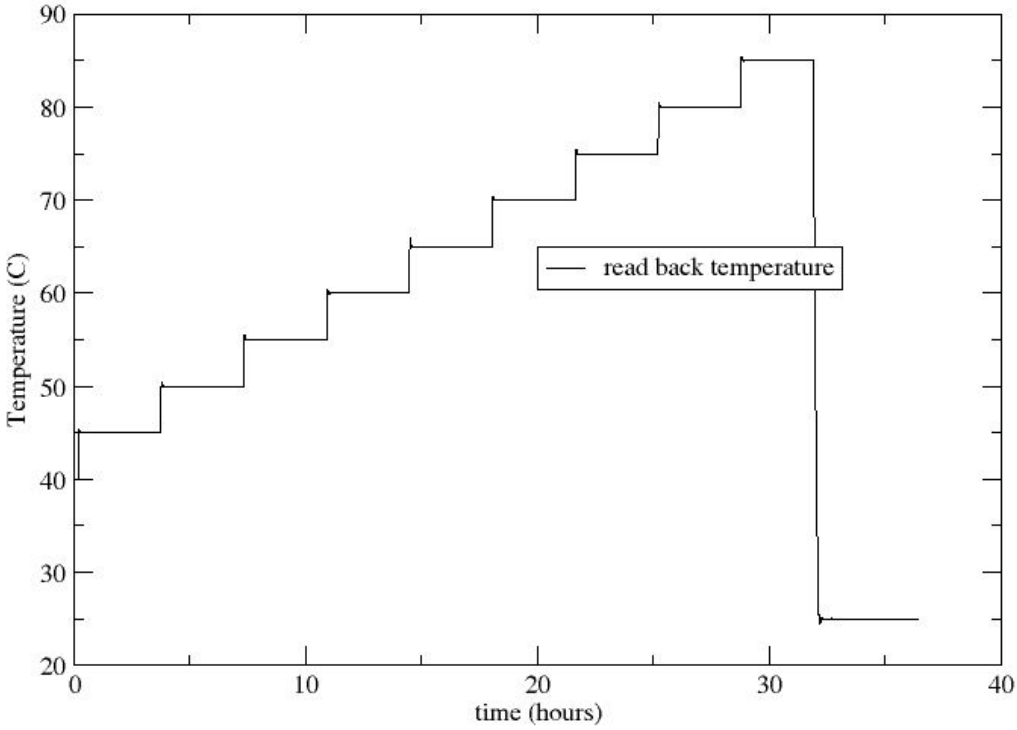

vertical cut
contrast = 0.12
FWHM = 1.63
1.14
1.12
1.1
1.08
1.06
1.04
1.02
1
0.98
-20
-15
-10
-5
0
5
10
15

Qing Yu's experiment worked well over the weekend. She collected data on three samples and the data looked good. I plotted the reflectivity set up temperature performance below from the last 38 hours.



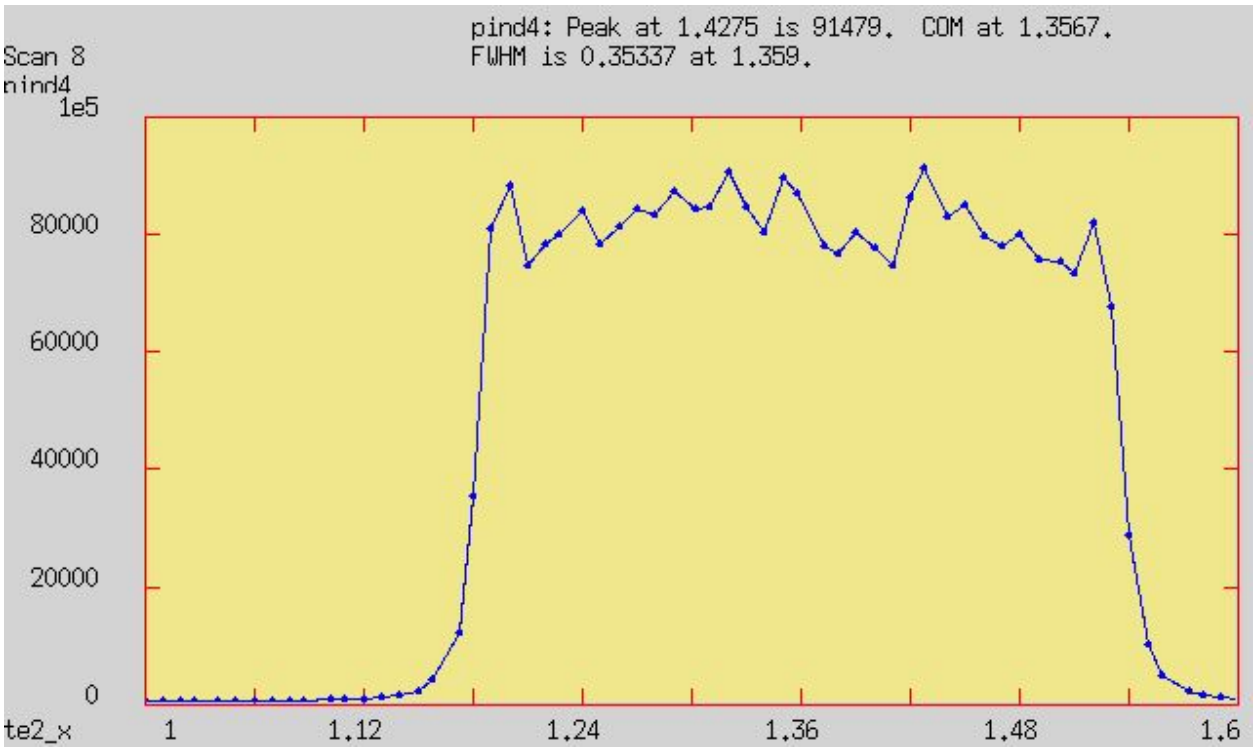
It can cool from 85 to 25 C in a little **over 0.3 hours**. A heating curve from 45 to 50 C is shown below. It stabilizes in about **0.2** hours, with an overshoot of 0.4 deg C which is typical as shown below except for one 0.9 deg overshoot event.




90
80
70
60
50
40
30
20
Temperature (C)
0
10
20
30
40
time (hours)
read back temperature

6/28/2017 Prof. Kukreja, Experiment alignment

After alignment in 8-ID-I, we have flux
flux pind2 94040-1028, 2.84e+11 photons per second
#2 lup diamth moved on point left of peak
#3 lup diamchi -.04 .04 40 1 moved to CEN
flux pind2 101182-1028 **3.06e+11** ph/s
Lined up on se1 slit with existing gap of **275** um (H) x **150** um (V)
Leave lens where it is and see flux on pind4 after **se2**
#4 lup te2_z -.1 .1 50 1 moved to CEN, was off.
#5 lup te2_z -.05 .05 50 1 leave as is. At 34.7 mm beam moved up by **32.5** um.
#6 lup te2_x -.2 .2 40 1 beam off was at 1.48, move to 1.4 and rescan
#7 lup te2_x -.2 .2 40 1
#8 lup te2_x -.4 .2 60 1 moved to CEN



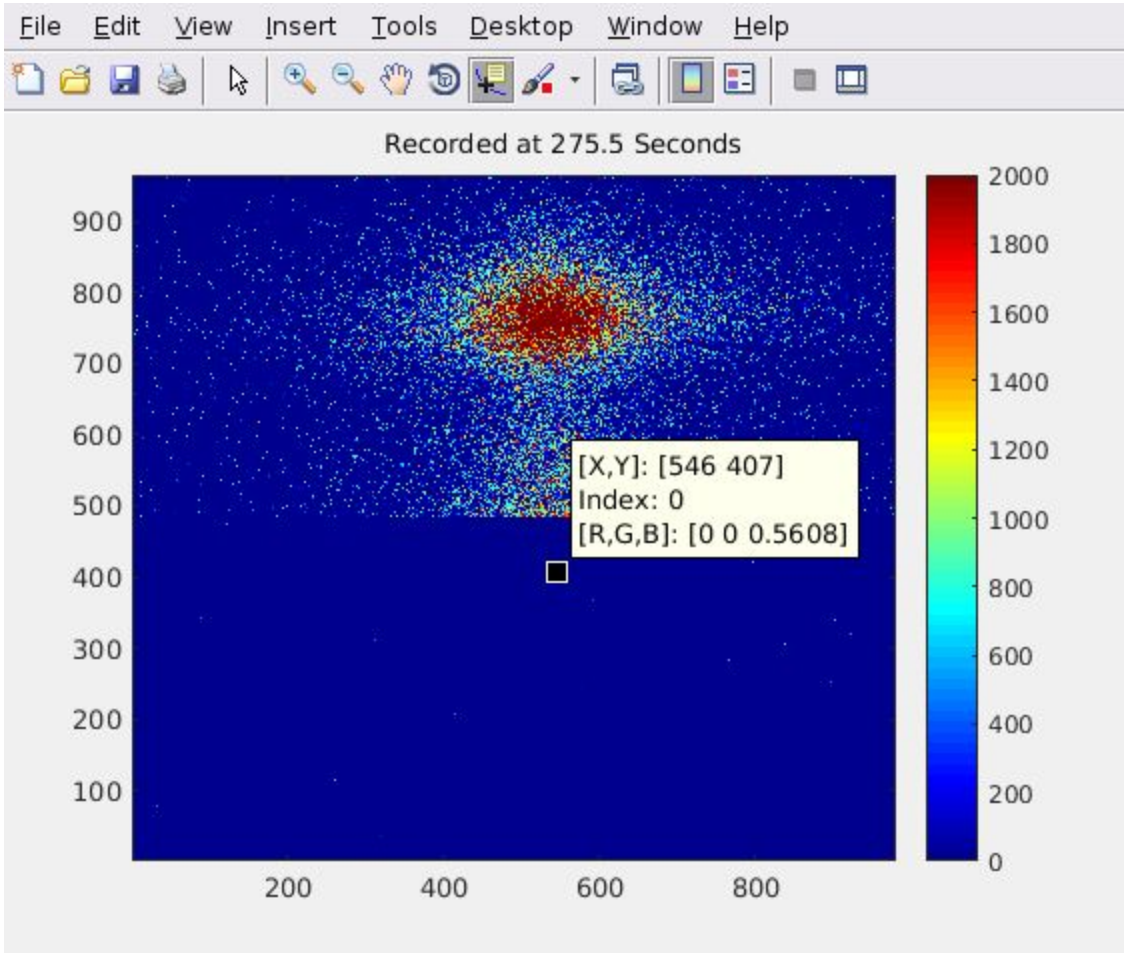
#9 lup te2_z -.05 .05 50 1 leave as is FWHM is 51 um, beam feels wider than it should be
Top 20 um trapezoid each side 15 um.
#10 go back to pind3 lup lensz -.5 .5 50 1 move to CEN, moving up 8 ums.
flux pind3 71302-936 **2.15e+11** ph/s
#11 lup te2_z -.05 .05 50 1 moved to CEN 10 um up
flux pind4 76628-453 **2.32e+09** ph/s
print_samxyz (new shell script)

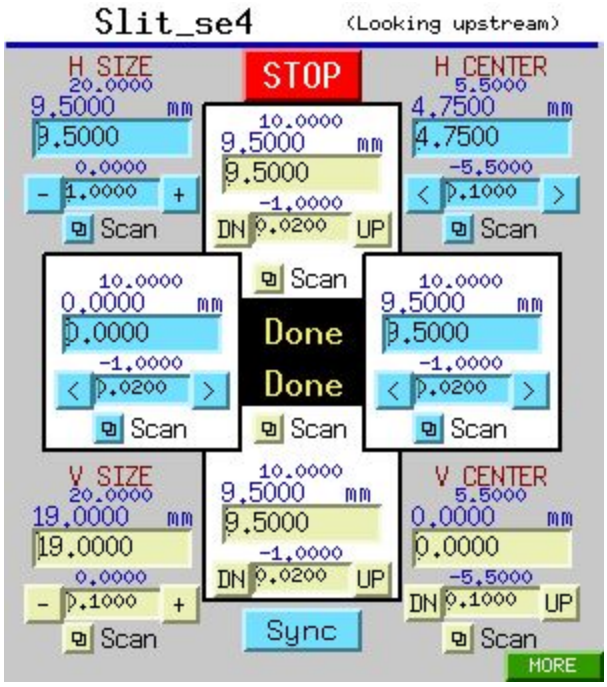
8ide:m1.RBV	-2
8ide:m2.RBV	-0.38
8ide:m29.RBV	3.706

Loaded Fe3Al sample. Speckle is there at old location from file lineup170620.

	th	tth
User		
Current	18.63000	29.28850

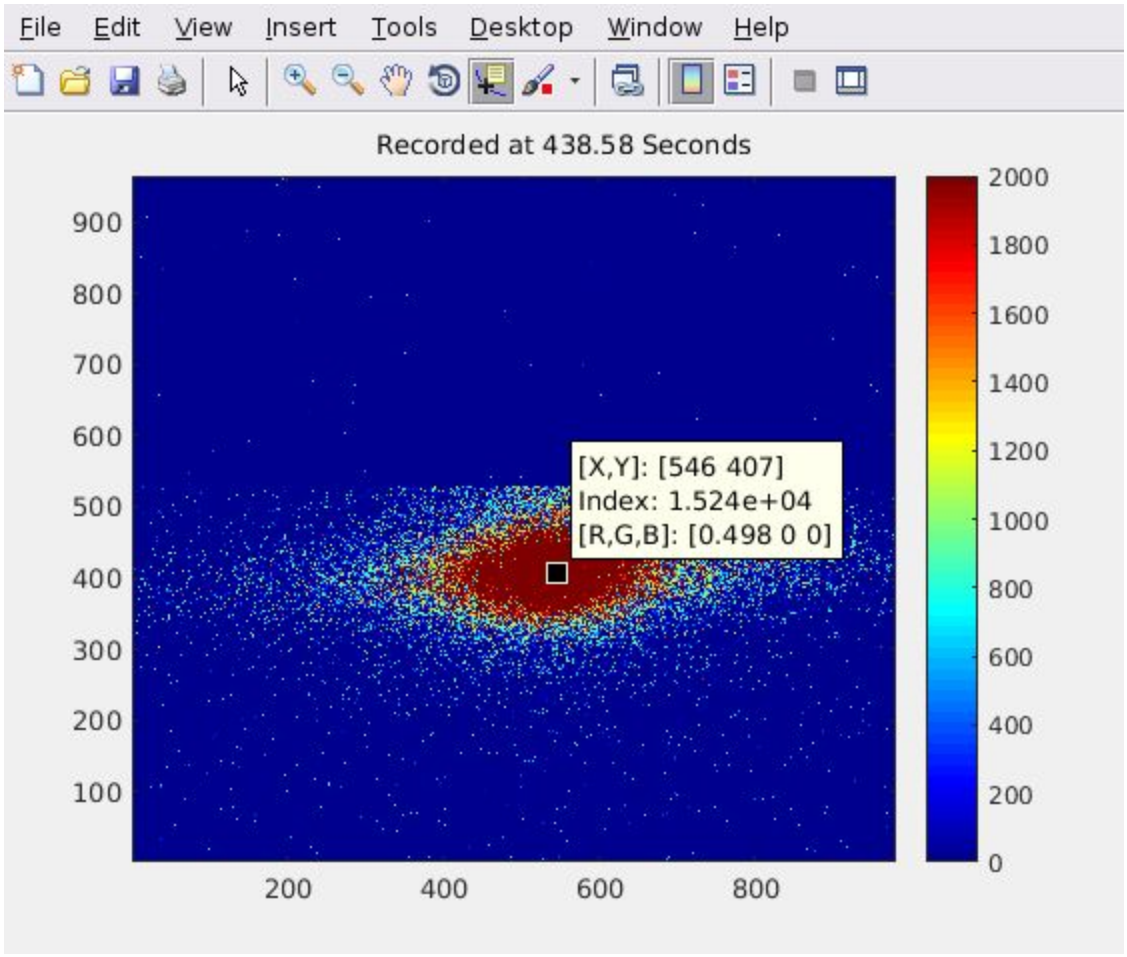
	samx	samy	samz
User			
Current	-2.00000	-1.00000	20.24000





Moved tth +0.25 deg moves peak from X=546 to X=297 pixel on 8idigui for CCD. Timing with CCD is fine.

The image below is blocking the satellite peak with se4 Hor. Right to 1 mm, while left at 9.5mm


File Edit View Insert Tools Desktop Window Help
Recorded at 438.58 Seconds
[X,Y]: [546 407]
Index: 1.524e+04
[R,G,B]: [0.498 0 0]
900
800
700
600
500
400
300
200
100
200
400
600
800
2000
1800
1600
1400
1200
1000
800
600
400
200
0

Aug 1, 2017 Devin Cela experiment, UCSD

Using 8-ID-G shutter again
Scan 2-3 were garbage as diamx was out of the beam.
#4 diamchi moved to CEN
#5 diamth moved one point on left of peak
#6 diamchi repeat
flux pind2 96548-1036
Amps_per_Volt(pind2) = 0.0001 A/V
95512 cps is a current of 9.6548 Amps
2.91e+11 ph/s, consistent with Kukreja's experiment
#7 ascan se1vgap -10 10 20 1 zeroed at -1. Repeat in **#8**, looks good
Leave se1hgap as is, looks reasonably opened.

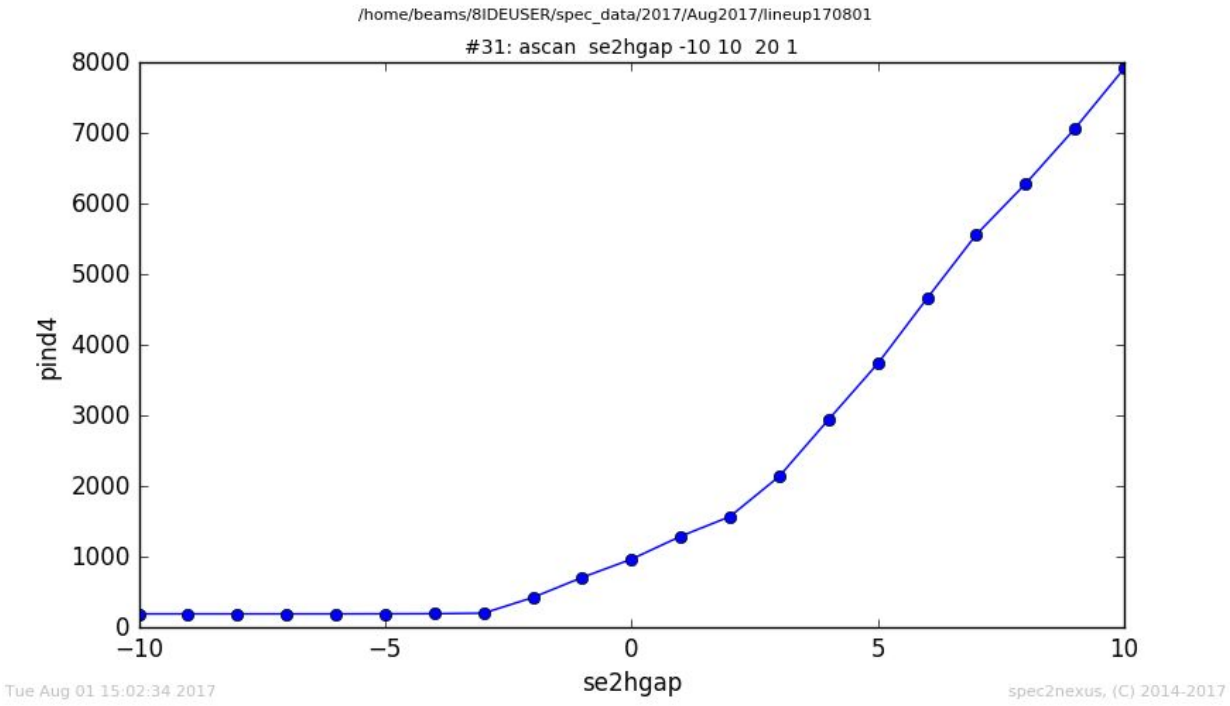
Cannot find beam on pind3? Quick look with pind4 on exit flight path.
lensx = -10 lens in

Center shutter in beam - scans 14 and 15

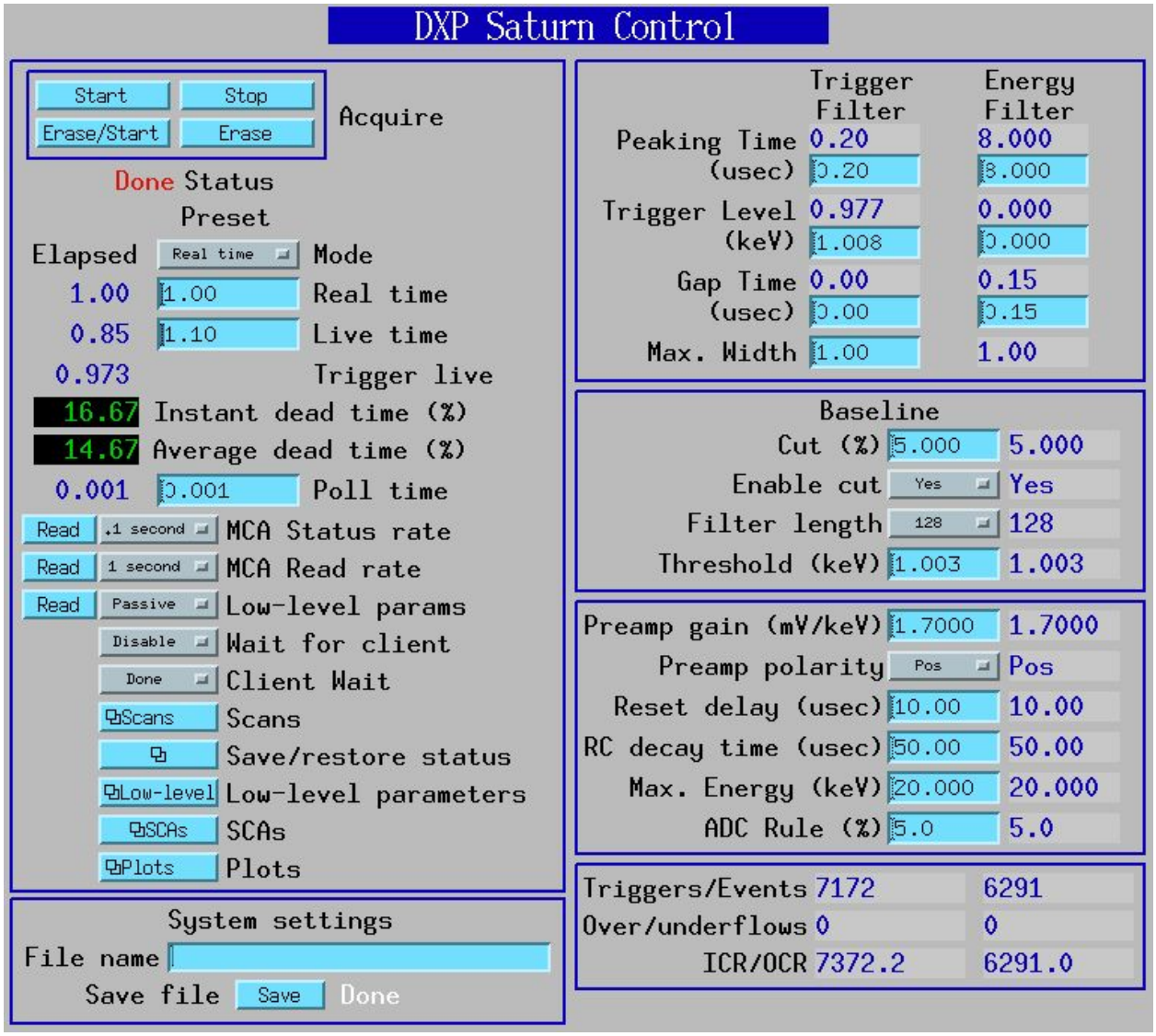
Check lensz on thru hole - #16
Check lenspit on top edge of thru hole
Check lensx on thru hole #18 - -6,545
Check lensyaw - can only see aperturing from thru hole on one side of lensyaw scan. Is lensyaw moving correctly? Decide to leave where is and go to lens at lensx = -10

Check centering of se2 slits
Se2vgap set to 50 um and vertically centered on beam (#25)
Pin aligned in focused beam with pin positions on page 4
#26 te2_x scan with pind4, go to 1..31 mm
#27 te2_x scan after moving to center
#28 te2_z scan, moved to CEN, repeated in #29
#30 te2_x scan a little wider
Alec and I installed the long-nose Vortex SDD inside 8-ID-E
Password is on p73 of my note book

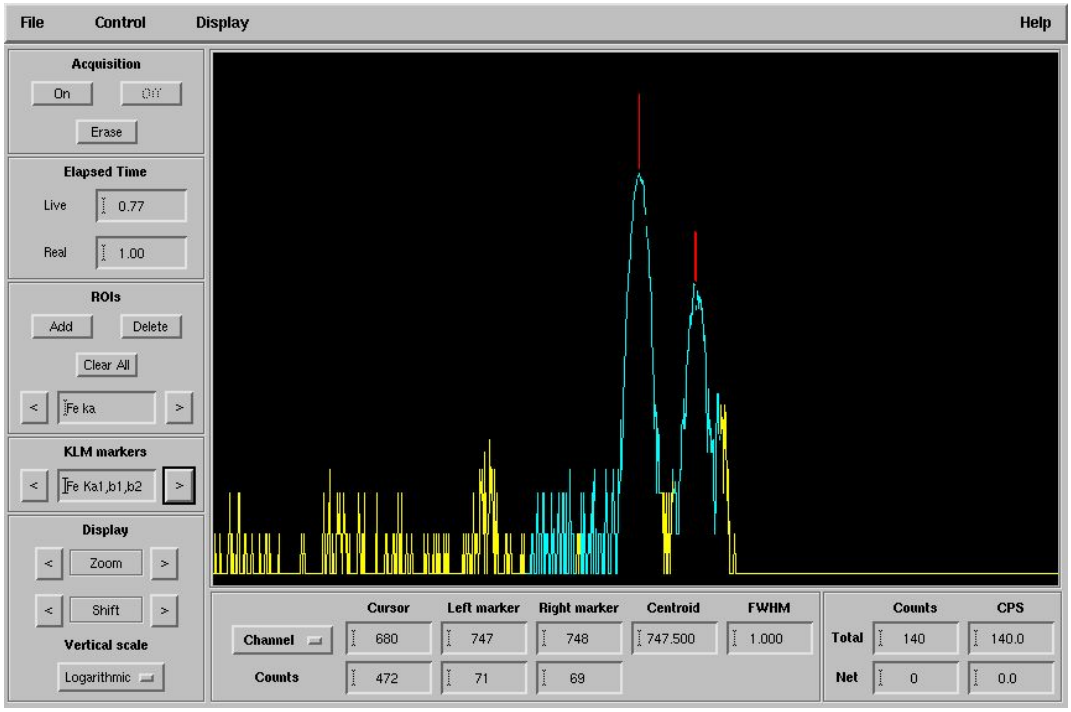
#31 se2hgap scan zero looks good (still rough edge)
flux pind4 7966-188
Amps_per_Volt(pind4) = 1e-05 A/V
7778 cps is a current of 0.07966 Amps
2.37e+09 photons per second (good)
#32-33 th scan with Fe3Al moved to peak

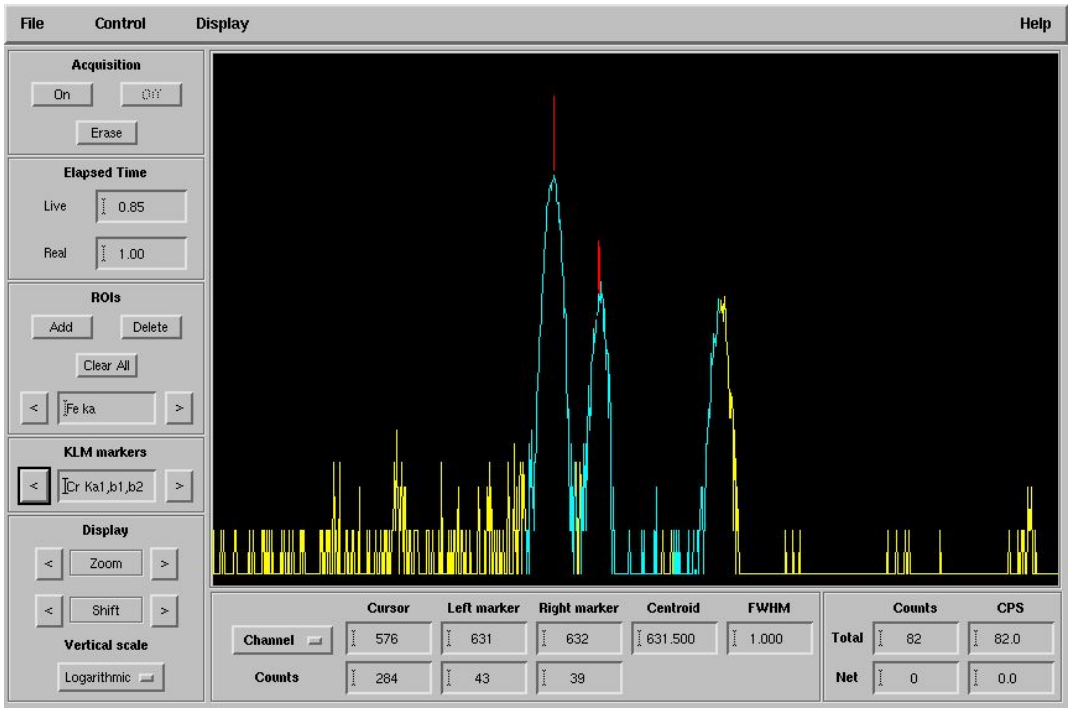


8/1/17 5h08 PM
Alec and I set up the MCA/Vortex SDD to look at Fe3Al and Cr fluorescence
Mounted overlooking sample.
Att 4 worked well with 23.5% dead time, detector 10 cm from sample



Saturn DXP settings **above**. Data makes sense
Cr Ka 543, 573, 603
Cr Kb 609, 630, 651
Fe Ka 647, 676, 705
Fe Kb 720, 748, 777
Plots of Fe3Al below. Next plot is a heavy metal blade with a Cr film





Alec loaded the MCA support in /home/beams/S8SPEC/macros/BCDA/epics_mca.mac
251.FOURC8IDE> setup_mca
Current MCA Setup:
No MCA defined. Please define MCA first.

Configure a new MCA? (NO)? yes
MCA mnemonic: ()? dpv

MCA name: ()? dpvortex
EPICS MCA PV: ()? dp_vortex_xrd45:mca1
Found MCA with 2048 channels
Reading 2048 channels of MCA
Created data array mcadat_dpv for MCA dpv

Configure a new MCA? (NO)?
New MCA Setup:

Mne	Name	EPICS_PV	Total_Chs	Use_Chs	Data_array
dpv	dpvortex	dp_vortex_xrd45	2048	2048	mcadat_dpv

Do you want to setup the ROIS?
(You can always use mca_rois to setup later.) (YES)?

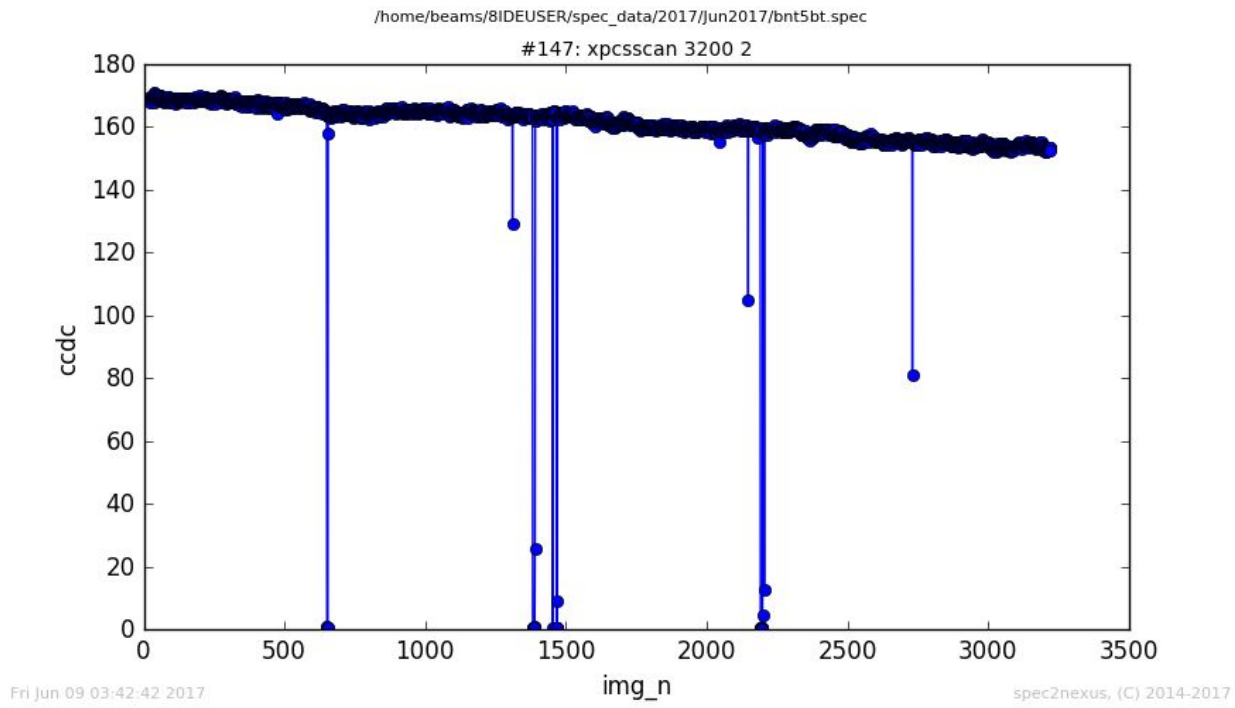
Current configured ROI for **dpv**:
mne: **dpv**R0 |pv: dp_vortex_xrd45:mca1.R0 |name:Cr ka |low: 543 |high: 603
mne: dpvR1 |pv: dp_vortex_xrd45:mca1.R1 |name:Cr kb |low: 609 |high: 651
mne: dpvR2 |pv: dp_vortex_xrd45:mca1.R2 |name:Fe ka |low: 647 |high: 705
mne: dpvR3 |pv: dp_vortex_xrd45:mca1.R3 |name:Fe kb |low: 720 |high: 777

Once you reconfigure the MCA ROIS externally(i.e. in MEDM),
use mca_rois to refresh, or you may not save the new ROIS.

To fix, to do:

1) all pind2, pind3 mono_init macros so that they produce this output: Note invert and input offset polarity.

2) Investigate shutter problem



3) Clean se2 horizontal blade.

4) Pin alignment with telescope

Useful parameters in spec

CEN Moves to center calculated from FWHM positions

pl_CFWHM

pl_FWHM

pl_MAX

pl_MIN

pl_SUM

pl_UHMX

pl_xMIN

pl_COM

pl_LHMX

pl_MAXX

pl_MINX

pl_SUMSQ

pl_xMAX Moves to x position of MAX