

CLS Run Fall 2016 Logbook

September 27-28, 2016

Participants: Zisis Papandreou, Andrei Semenov, Nazanin Samadi,
Richard Jones (remote from Storrs), and Brendan Pratt (from Storrs)

Useful numbers: Brendan Pratt 860-617-8138

Richard Jones 860-377-522

Table of Contents

[Goals for this run](#)

[CLS Beam Permit document](#)

[Shift schedule](#)

[Unpacking the diamonds](#)

[Mounting JD70-100 in beamline](#)

[Initial systems checkout](#)

[Rocking curves of JD70-100](#)

[Analysis of data from JD70-100](#)

[Dismounting JD70-100](#)

[Mounting JD70-104 in beamline](#)

[Rocking curves of JD70-104](#)

[Analysis of data from JD70-104](#)

[Dismounting JD70-104](#)

[Mounting JD70-105 in beamline](#)

[Rocking curves of JD70-105](#)

[Dismounting JD70-105](#)

[Packing up and checking out](#)

Goals for this run


1. Unpack the diamonds
2. Mount JD70-100 on holder and install in beamline
3. Check out beamline optics and verify camera focus
4. Take rocking curves of JD70-100 in 4 orientations
5. Transfer data from JD70-100 to UConn, verify data quality
6. Dismount JD70-100 and return to packaging
7. Mount JD70-104 on holder and install in beamline
8. Take rocking curves of JD70-104 in 4 orientations
9. Transfer data from JD70-104 to UConn, verify data quality

10. Dismount JD70-104 and return to packaging
11. Mount JD70-105 on holder and install in beamline
12. Take rocking curves of JD70-105 in 4 orientations
13. Dismount JD70-105 and return to packaging
14. Transfer all remaining data, photos, and software tools to UConn
15. Clean up and check out

CLS Beam Permit document

The document below is posted outside the BMIT endstation area, showing the activity that is happening this week on our beamline.

EXPERIMENT PERMIT



Experimental Permit

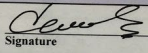
Beamline: BMIT
 Proposal # 24-8235
 Proposal Type: Special Requests

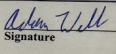
Experiment Title:	GlueX Diamond Scan		
Spokesperson:	Zisis Papandreou		
Approved Date:	August 31, 2016	Expiration Date:	31-Dec-2016
Phone # during experiment (optional):		Risk Level:	LOW

Sign On Before Start of Experiment
Note: Both signatures are required prior to starting the experiment.

I (Experimental Team Representative) agree to the following:

- The information on this experimental permit is accurate and complete.
- All materials/samples to be used and hazards have been identified.
- All required controls, training and safeguards are in place to start the experiment as per Experimental Control Plan.
- I accept responsibility for all team members and confirm they have completed the appropriate training.

Experimental Team Representative		
ANDREI SEMENOV <small>Printed Name</small>	 <small>Signature</small>	2016-SEP-27 <small>Date:</small> <small>[YYYY-MM-DD]</small>

Authorization by CLSI Staff to Start Experiment:		
Adam Webb <small>Printed Name</small>	 <small>Signature</small>	2016-SEP-27 <small>Date:</small> <small>[YYYY-MM-DD]</small>

Info from previous run

The logbook from the August, 2016 run is a valuable store of useful information for how to carry out these rocking curve measurements at CLS. Use the link below to obtain read-only access.

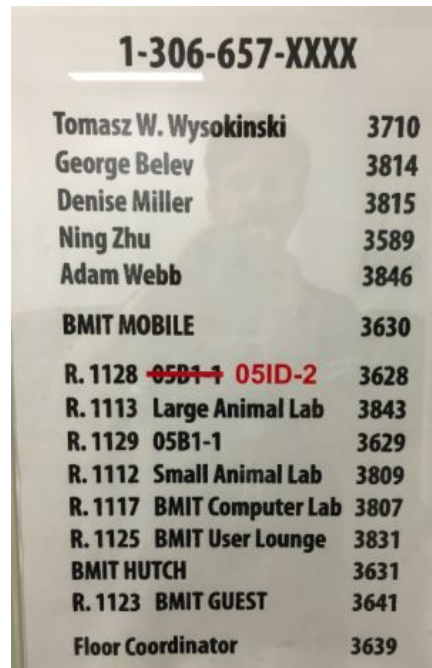
[Logbook from GlueX CLS summer run 2016](#)

[Link to photos taken during summer run 2016](#)

Shift schedule

Useful Information

- Phone numbers
 - a. Zisis Papandreou, email: zisis@uregina.ca, cell: 306-596-7775
 - b. Andrei Semenov, email: semenov@jlab.org, cell: 306-502-5291
 - c. Brendan Pratt: 860-617-8138
 - d. Richard Jones: 860-377-5224
 - e. Adam Webb, BMIT Science Associate, office: 306-657-3846, cell: 306-372-8304
 - f. Nazanin Samadi, BMIT Technical Assistant, cell: 306-717-5469
 - g. BMIT and other CLS phone numbers: see image below



1-306-657-XXXX	
Tomasz W. Wysokinski	3710
George Belev	3814
Denise Miller	3815
Ning Zhu	3589
Adam Webb	3846
BMIT MOBILE	3630
R. 1128 05B1-1 05ID-2	3628
R. 1113 Large Animal Lab	3843
R. 1129 05B1-1	3629
R. 1112 Small Animal Lab	3809
R. 1117 BMIT Computer Lab	3807
R. 1125 BMIT User Lounge	3831
BMIT HUTCH	3631
R. 1123 BMIT GUEST	3641
Floor Coordinator	3639

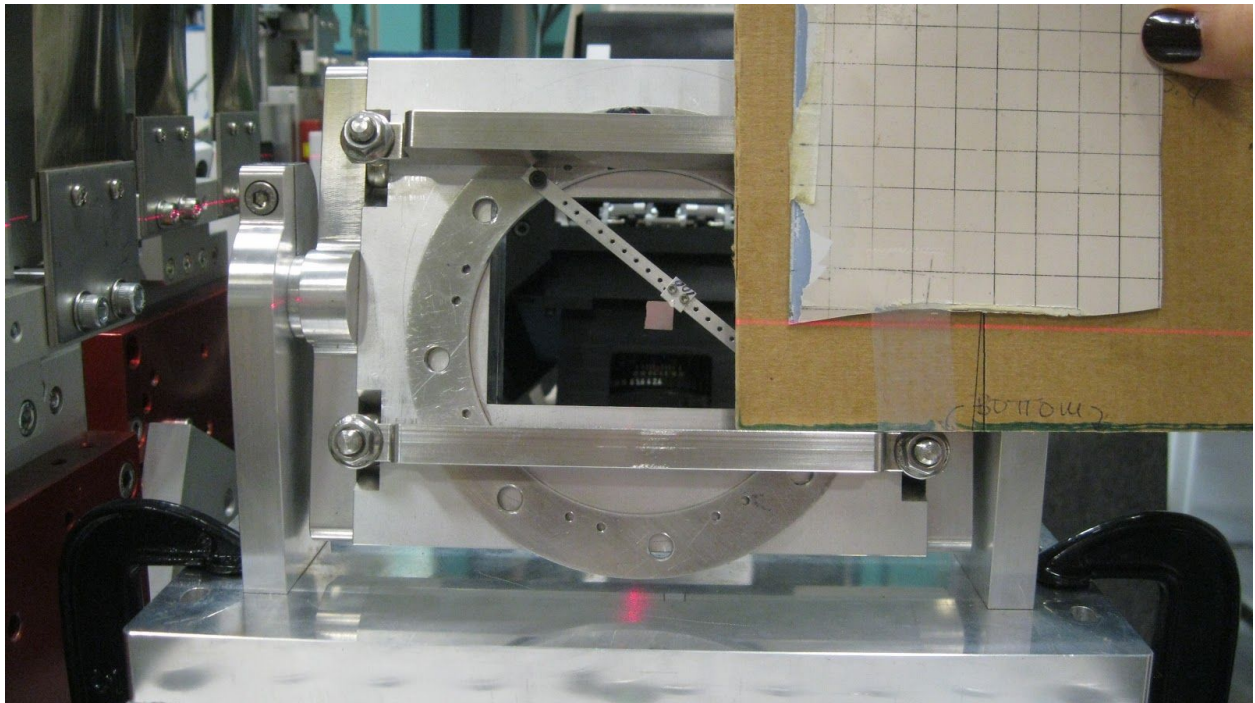
Unpacking the diamonds

Write in here your account of the unpacking of the diamonds from their shipping packaging and the mounting of the first one, JD70-100, including photos. Brendan Pratt has prepared detailed video (linked below) explaining how to do this safely.

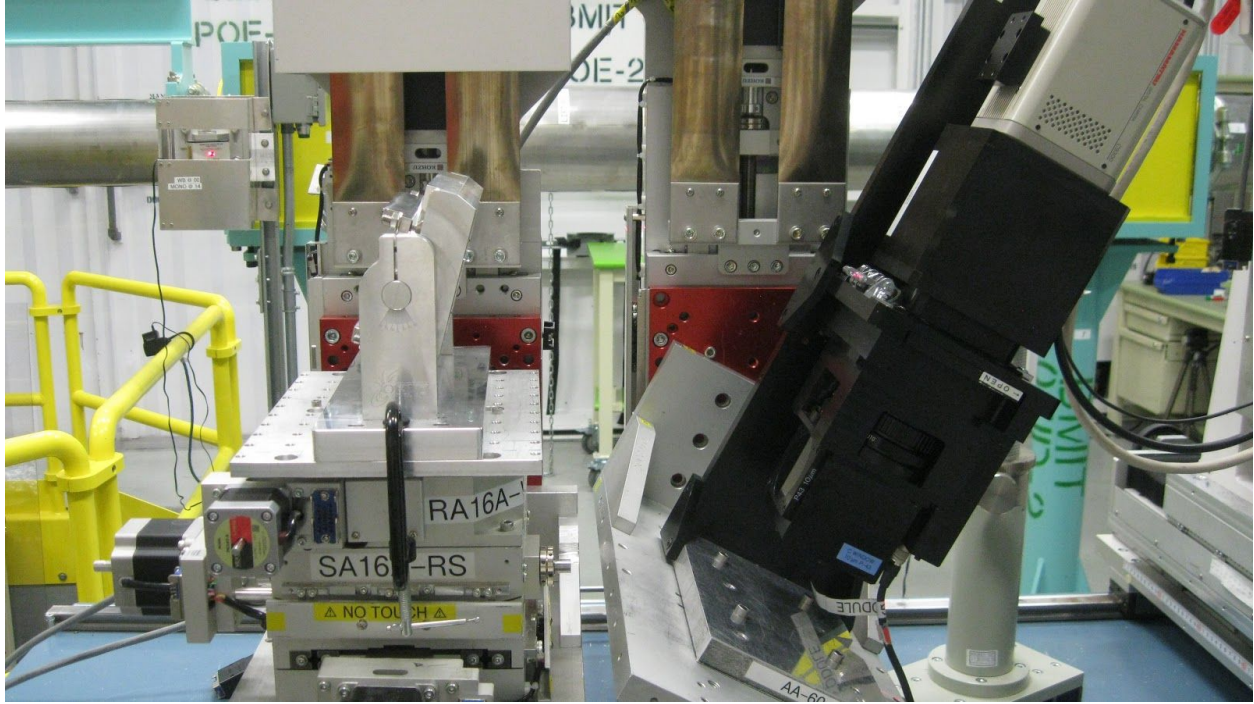
[Brendan's video of how to unpack and mount diamond targets safely](#)

Mounting JD70-100 in beamline

September 26, 2016 around 4pm: The crystal JD70-100 is unpacked and mounted on the beam line. After the smallest box opening, I noticed that the cut of one side of the crystal is not very good. In the box, there are no crystal broken parts, so we assume that this is not the accident but the "original" cut of the crystal. Note added by RTJ - The chipping that you see along one edge and corner of the two 50 micron samples were put there during polishing. They should still be intact and ok, it is just that the temperatures and pressures that happen during polishing can sometimes rim-rack the diamond at the edges.



JD70-100 diamond mounted on the beamline. (Please note that the cut of the left edge of the crystal is not good.) The laser level is shown on the cardboard. This crystal location is for the scan #1.



The side view of the JD70-100 setup. The camera is mounted similar to that it was in the end of Summer 2016 run.

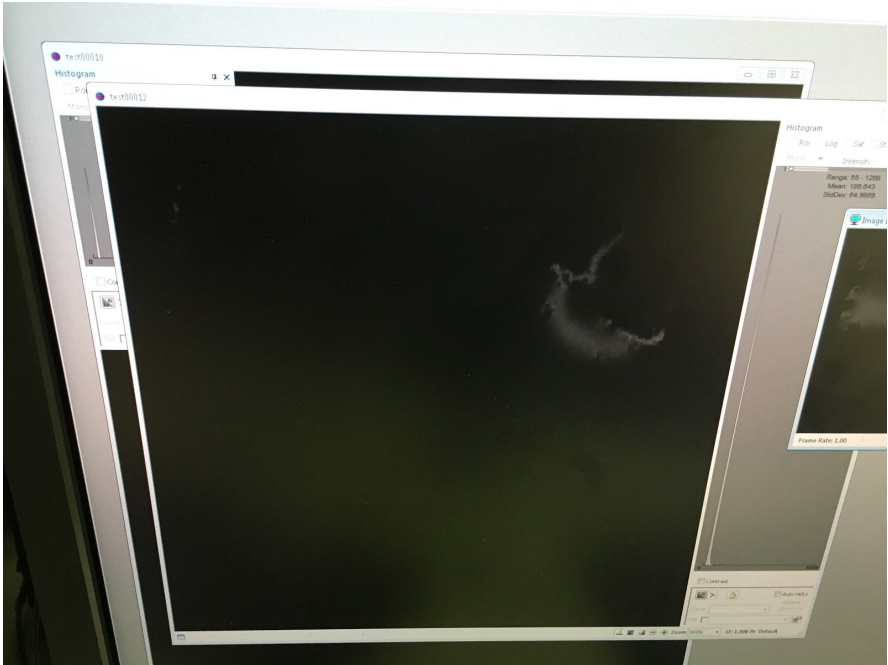
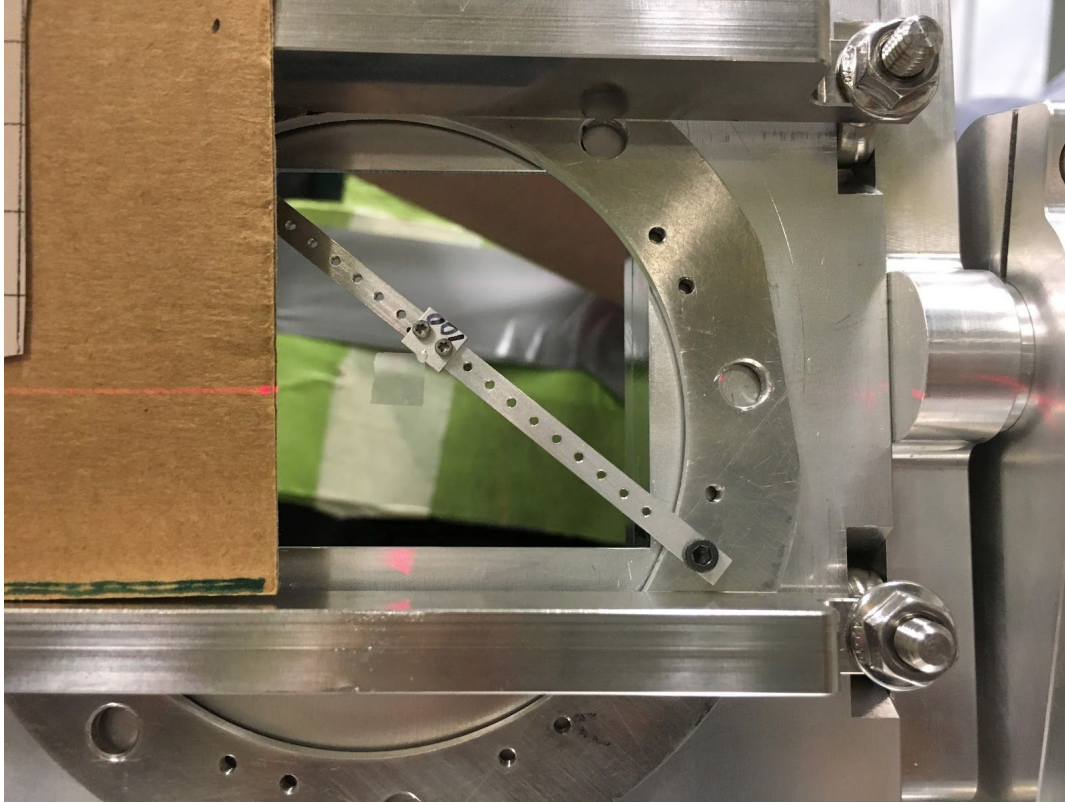


Photo of dog ear on the Counting House screen



Laser alignment of diamond (Sep 27, 1:50pm CST), position for Scans 1 and 2.

Beam size is 8mm vertical at the sample now, same as in the August run.

Initial systems checkout

The diffracted beam was found using steps of 0.01 degree on the Bragg stage with the speed of 0.01 degree/sec. The diamond was rocked in Bragg to cover the diffracted beam edge to edge from top to the bottom, until we lost it completely on each side. By doing this the scan range and also the specific region on the detector was selected to do the scans. We checked that the intensity be similar from top to the bottom of the diffracted beam as we rock it. The camera was focused to get a sharp image. The 1 mm Al filter was put in in addition to 0.1 mm Al to keep the mono more stable. And then the mono was tuned to its top. The motor holding current is set for micro stepping. (NS)

Rocking curves of JD70-100

We found the reflection spot, and focused the camera. The delay value is set to 0.15 s. The range for the scan #1 is from -0.095 to -0.056 deg (viz., 0.0390 deg difference). We decided 277 steps 0.0001409 deg each. And we have 20 microsteps per step.

We adjusted the vertical position of the diamond, and making the scan #2 (the same diamond orientation as for the scan #1) from -0.095 deg to -0.055 deg (diff of 0.0400 deg) with 284 steps of 0.0001409 deg each. Mono sensitivity is tuned to 20 nA.

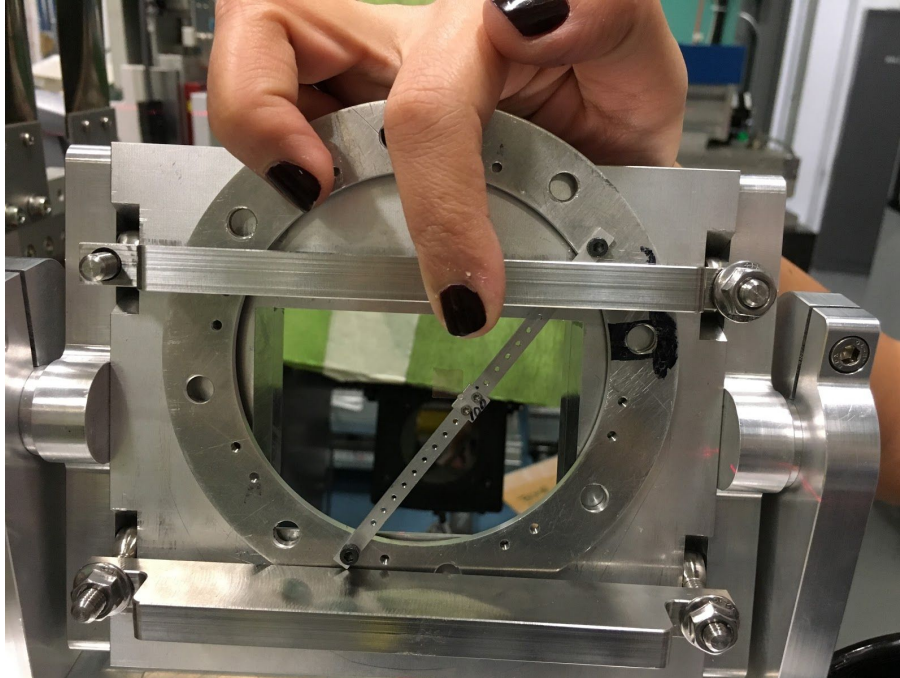
We rotated the frame 90 deg clockwise as beam sees it, and adjusted the vertical position of the diamond to see both top and bottom edges (the top edge is the “cracked one” now, so it’s no sharp top-edge available). The scan #3 is from -1.378 deg to -1.355 deg (diff of 0.023 deg) with 164 steps of 0.0001409 deg each.

We flip the frame, and set the “12 o’clock” mark to be on the top of the frame (the same as for the scans #1-2). The scan #4 is from -1.905 deg to -1.846 deg (diff of 0.059 deg) with 419 steps of 0.0001409 deg each.

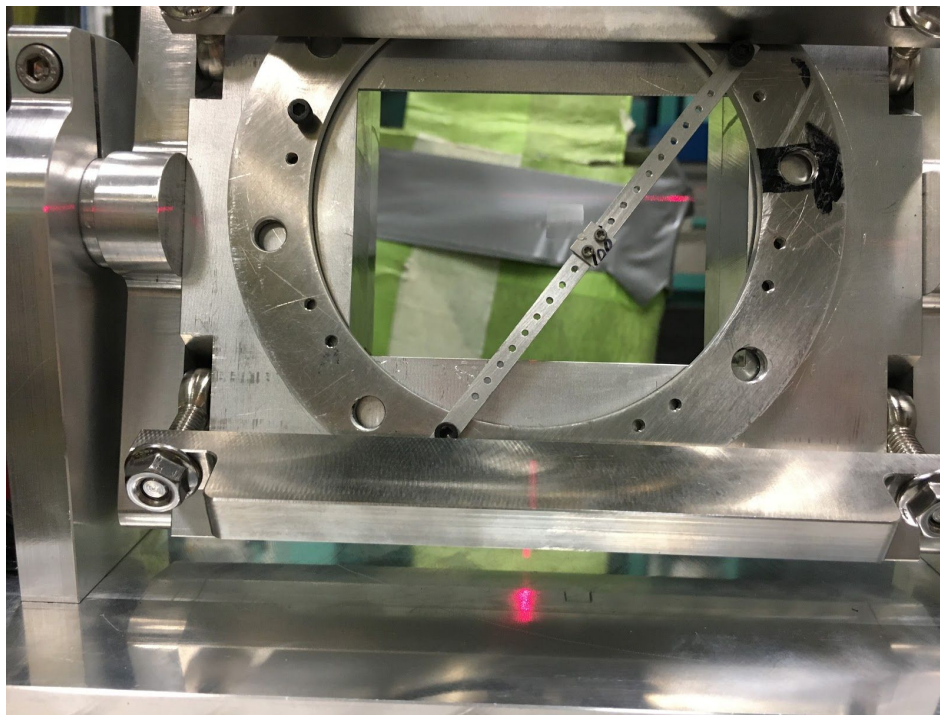
We rotated the frame 90 deg clockwise (to have “12 o’clock” mark on the right side as the beam sees it). The “cracked” edge is now the bottom one. The scan #5 is from -1.402 deg to -1.365 deg (diff of 0.037 deg) with 263 steps of 0.0001409 deg each.

scan number	theta range (deg)	no. steps	step size (urad)	image prefix
1*	(-0.095, -0.056)	274	2.459	JD70-100-1
2	(-0.095, -0.055)	282	2.459	JD70-100-2
3	(-1.378, -1.355)	163	2.459	JD70-100-3
4	(-1.905, -1.846)	417	2.459	JD70-100-4
5	(-1.402, -1.365)	261	2.459	JD70-100-5

*scan 1 clipped the bottom edge of the diamond



Attempt to position diamond for 90 deg rotated scan. Aborted this one. See next image for Scan #3 photo.



Diamond positioned for Scan #3, 90 degrees clockwise (as seen by incoming beam).

Andrei inserted a screw at the 10 o'clock position to prevent the ring from bending under the upper clamp's pressure.

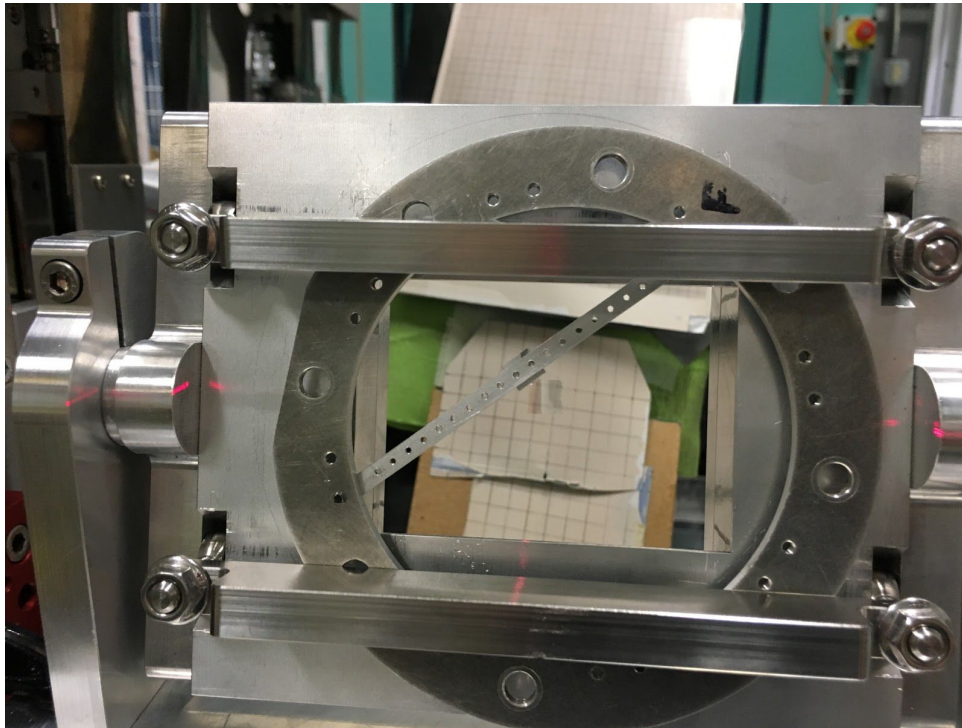


Photo of Scan #4 setup. Aluminum tab facing downstream, diamond at 12 o'clock.

Returned the diamond to the 12 o'clock position (as for Scans 1 and 2) and then flipped it, so that the aluminum tab holding the diamond on the holder is now facing downstream.

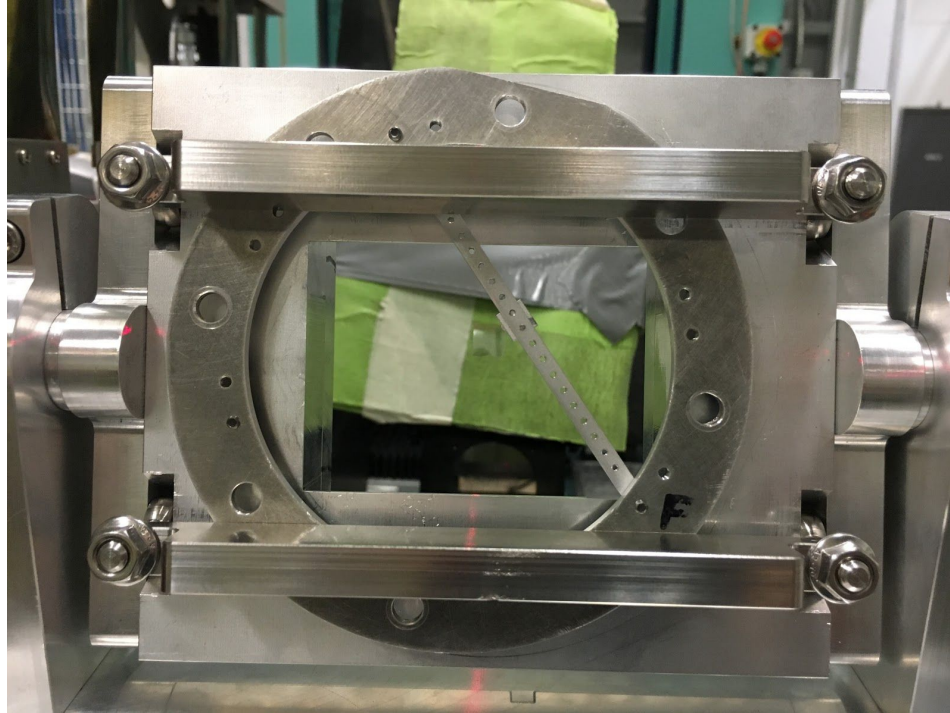


Photo of Scan #5 setup. Aluminum tab facing downstream, diamond at 3 o'clock. Jagged edge at bottom.

Analysis of data from JD70-100

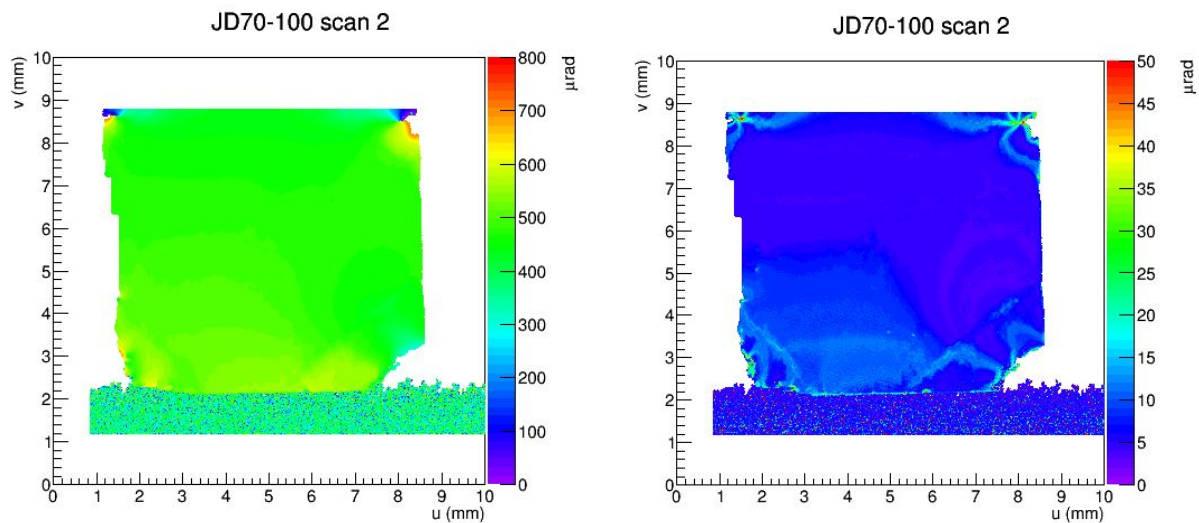


Figure: Rocking curve peak fit centroid angle (left) and sigma (right) for all pixels in scan 2. The band across the bottom is noise pixels that were not eliminated by the noise reduction algorithm.

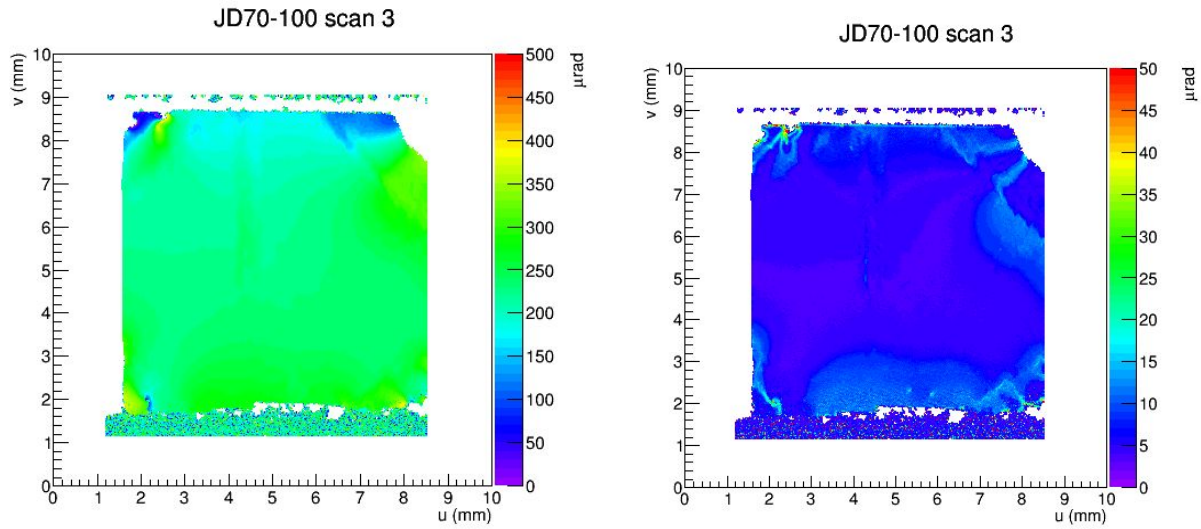


Figure: Rocking curve peak fit centroid angle (left) and sigma (right) for all pixels in scan 3. The band across the bottom is noise pixels that were not eliminated by the noise reduction algorithm.

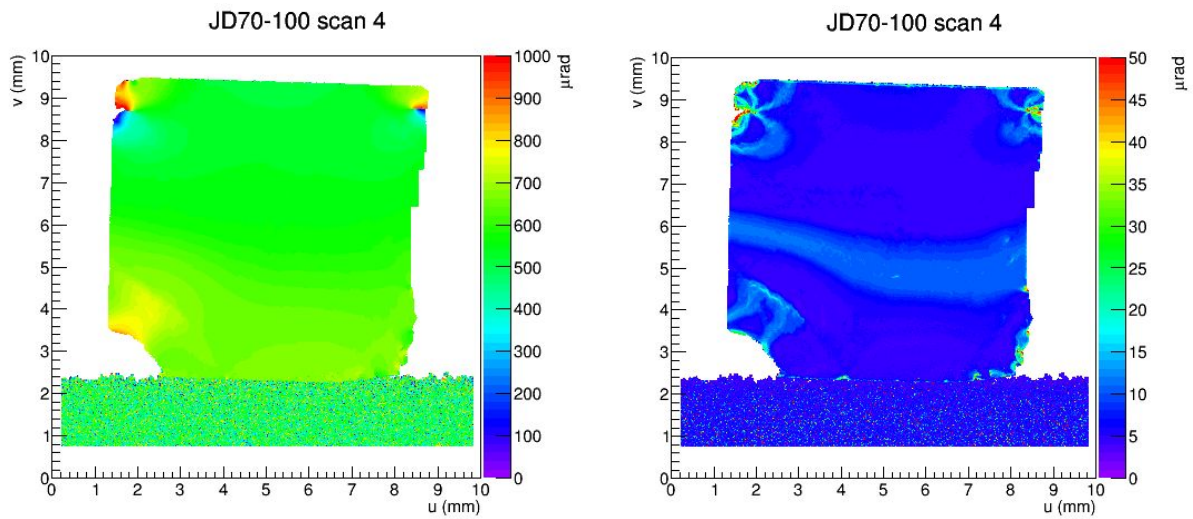


Figure: Rocking curve peak fit centroid angle (left) and sigma (right) for all pixels in scan 4. The band across the bottom is noise pixels that were not eliminated by the noise reduction algorithm.

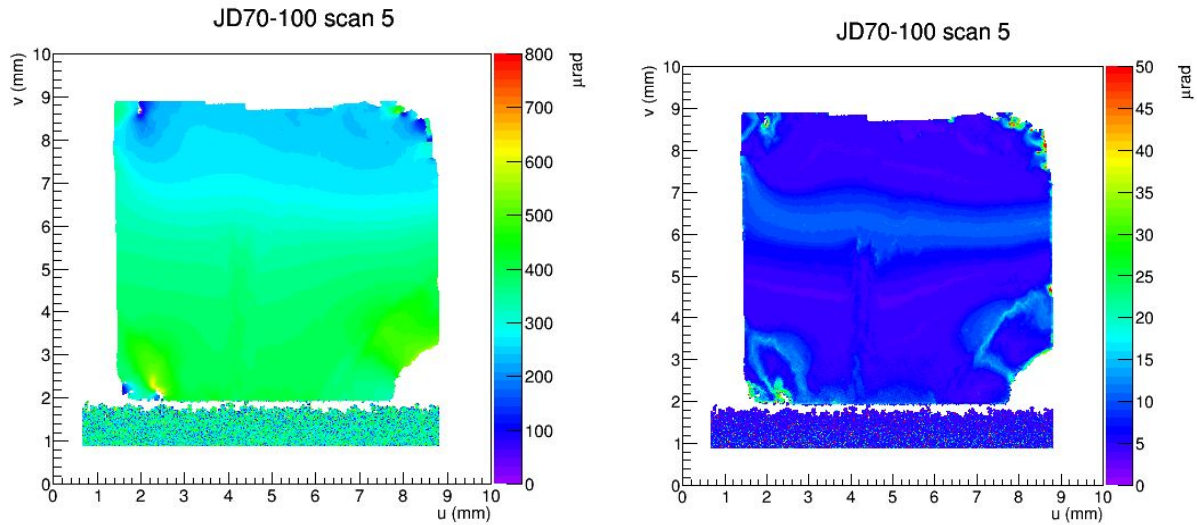


Figure: Rocking curve peak fit centroid angle (left) and sigma (right) for all pixels in scan 5. The band across the bottom is noise pixels that were not eliminated by the noise reduction algorithm.

Dismounting JD70-100

Following the procedures outlined by Brendan in his video linked above, removed the bar from the mounting ring and take the JD70-100 diamond with its tab off the bar. Took photos of this process for documentation purposes and posted them below.. Returned the diamond to its original packaging.



Photo of JD-70-100 back in its "pill box".

Mounting JD70-104 in beamline



Guess who is next? Hint:



Photo of JD-104 mounted on its bar.



Figure: One large fry.

Rocking curves of JD70-104

We set JD70-104 at the position similar to that JD70-100 had for its scans #1-2 (viz., “12 o’clock mark is up and visible from the beam). The scan #1 is from 5.140 deg to 5.238 deg (diff of 0.098 deg) with 348 steps of 0.0002818 deg each. (Bad data because of the wrong start point of the scan.)

Scan #2: re-do of the scan #1 with the correct starting point.

We rotated the frame 90 deg clockwise as beam sees it (“3 o’clock”). The scan #3 is from -2.930 deg to -2.841 deg (diff of 0.089 deg) with 316 steps of 0.0002818 deg each.

We flip the frame and set the “12 o’clock” mark to be on the top. The scan #4 is from -6.488 deg to -6.383 deg (diff 0.105 deg) with 373 steps of 0.0002818 deg each.

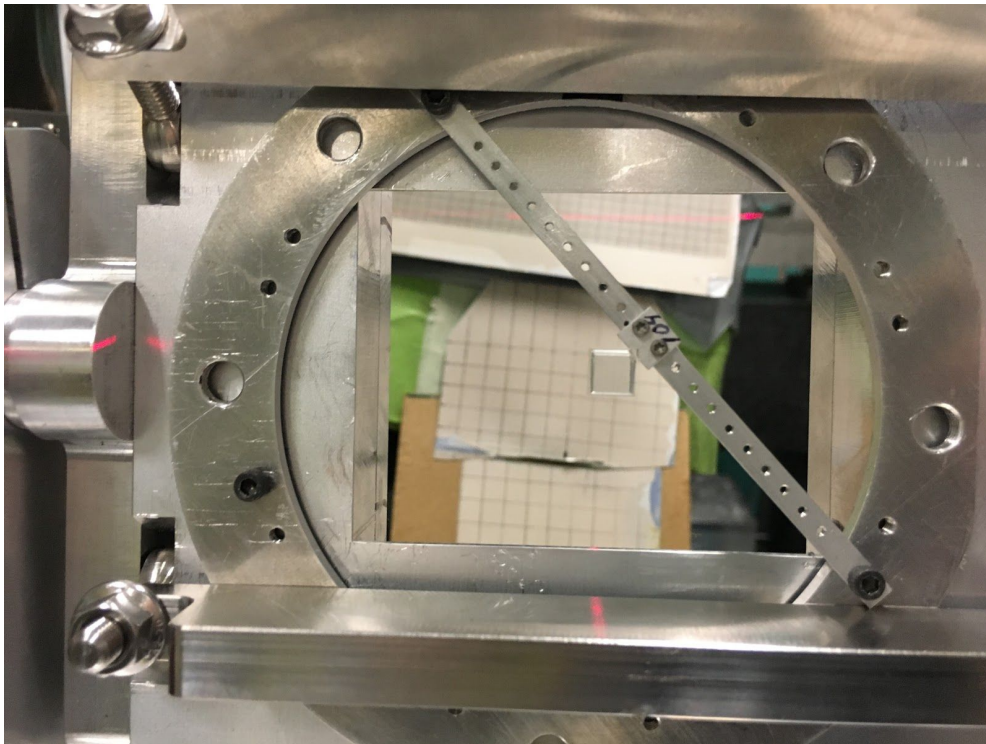
We rotated the frame 90 deg clockwise as beam sees it, so the “12 o’clock” mark is on the right side (as beam sees it). The scan #5 is from -3.017 deg to -2.914 deg (diff of 0.103 deg) with 366 steps of 0.0002818 deg each.

scan number	theta range (deg)	no. steps	step size (urad)	image prefix
1*	(5.140, 5.238)	346	4.9183	JD70-104-1
2	(5.140, 5.238)	346	4.9183	JD70-104-2
3	(-2.930, -2.841)	314	4.9183	JD70-104-3
4	(-6.488, -6.383)	371	4.9183	JD70-104-4
5	(-3.017,-2.914)	364	4.9183	JD70-104-5

* Bad data (scan was done from the top edge up instead of from the bottom edge)



Photo of JD-104 mounted on target holder, for its Scan #1 configuration (12 o' clock, facing upstream).



2nd attempt: Photo of JD70-104 mounted on target holder, for its Scan #1 and 2 configuration. We moved the ring to the left (in this view).

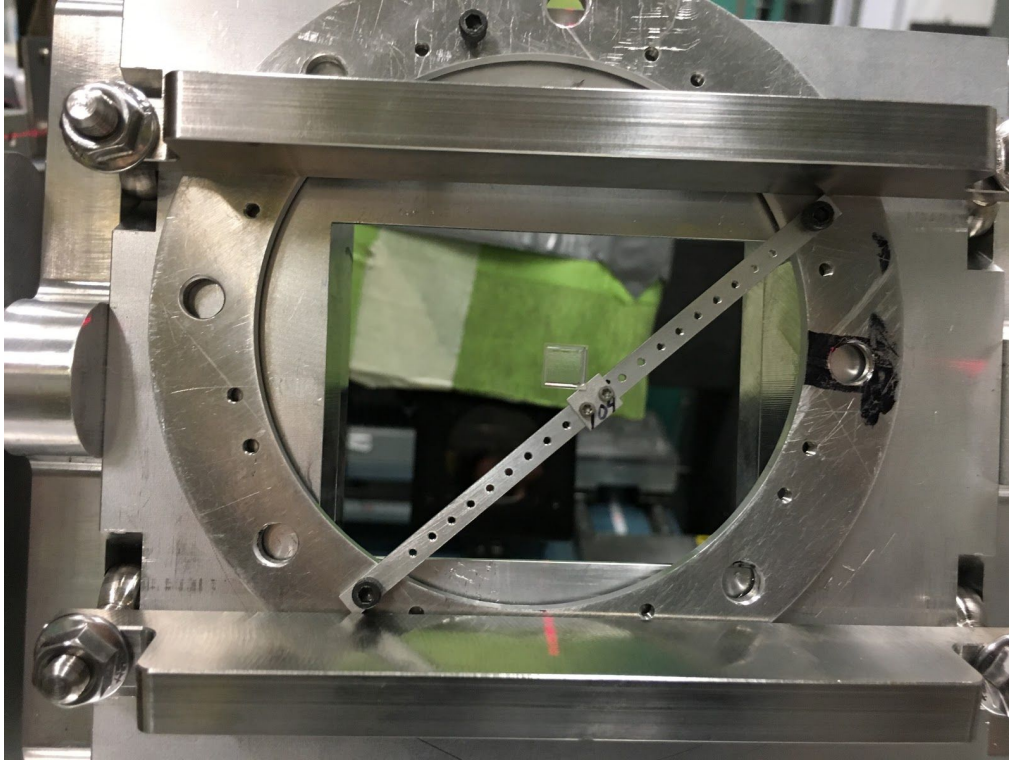


Photo of JD70-104 for Scan #3, diamond at 3 o'clock.

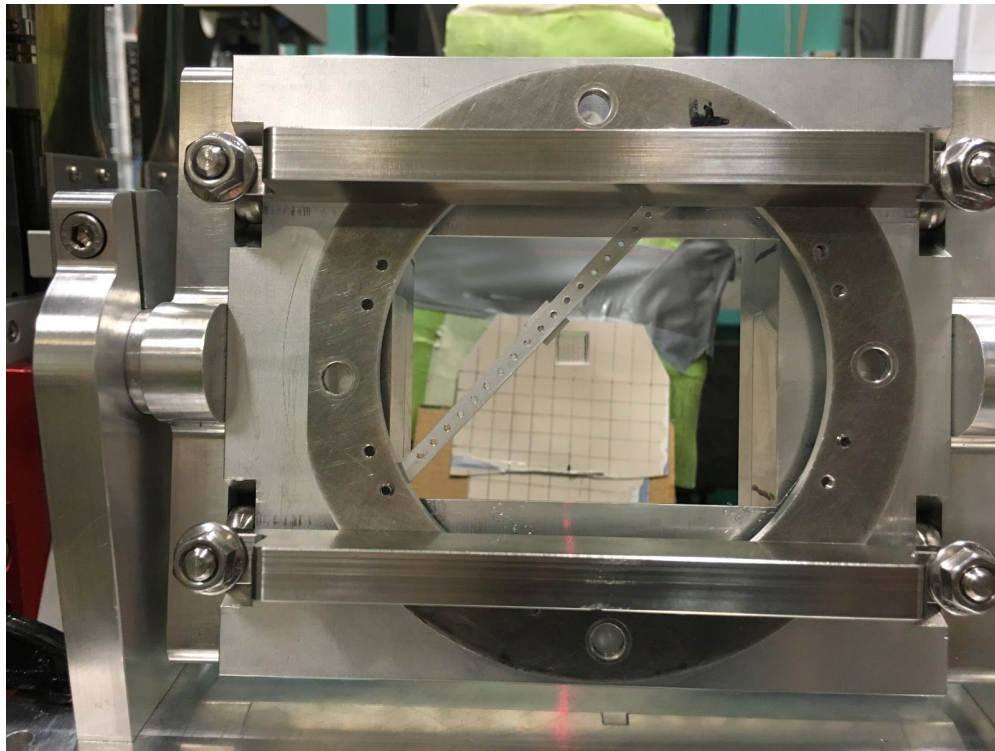


Photo of JD70-104 for Scan #4, diamond at 12 o'clock but facing downstream.

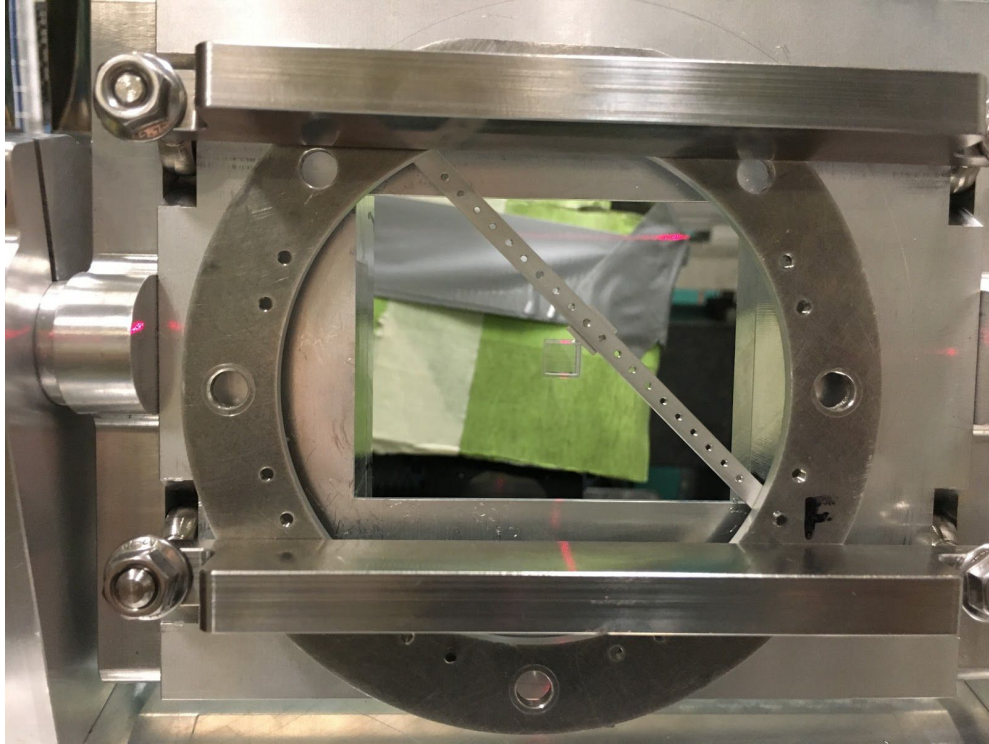


Photo of JD70-104 for Scan #5, diamond at 3 o'clock and facing downstream.

Scan 5 done. Data pushed over to UConn.

4am: GONE TO SLEEP FOR A FEW HOURS: BACK 9am Sask time

Analysis of data from JD70-104

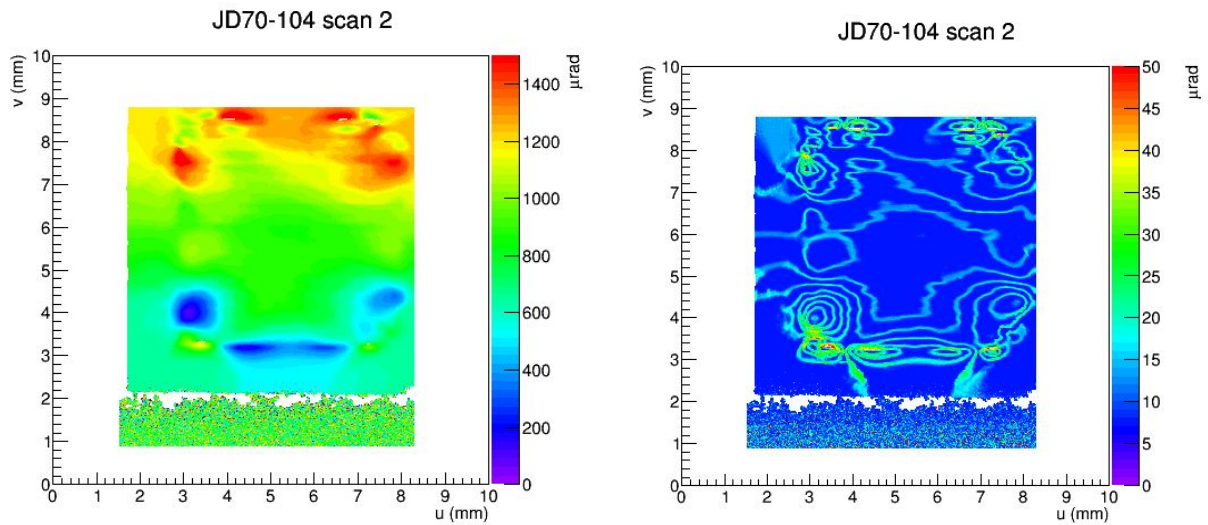


Figure: Rocking curve peak fit centroid angle (left) and sigma (right) for all pixels in scan 2. The band across the bottom is noise pixels that were not eliminated by the noise reduction algorithm.

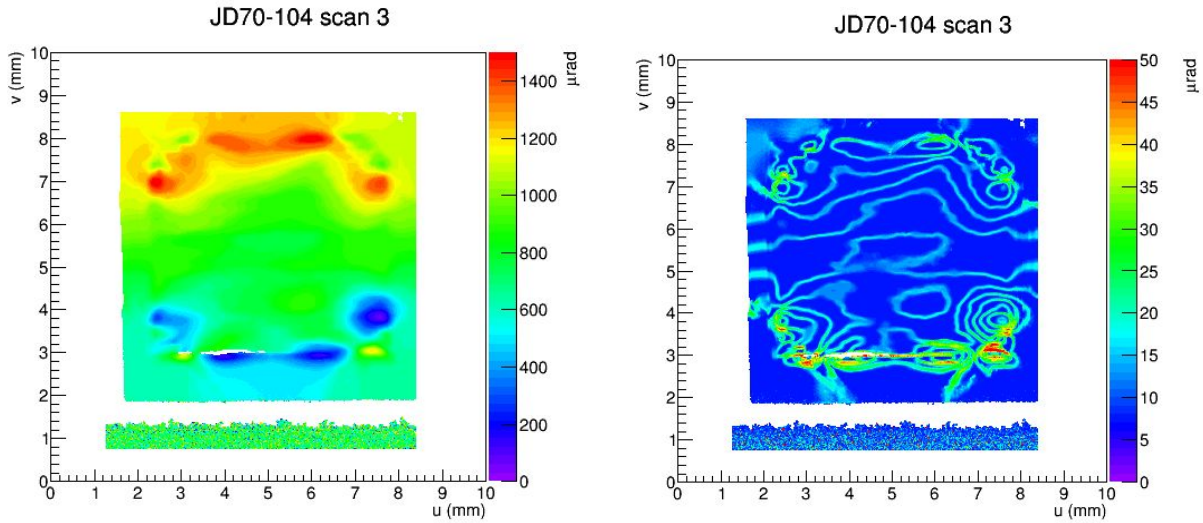


Figure: Rocking curve peak fit centroid angle (left) and sigma (right) for all pixels in scan 3. The band across the bottom is noise pixels that were not eliminated by the noise reduction algorithm.

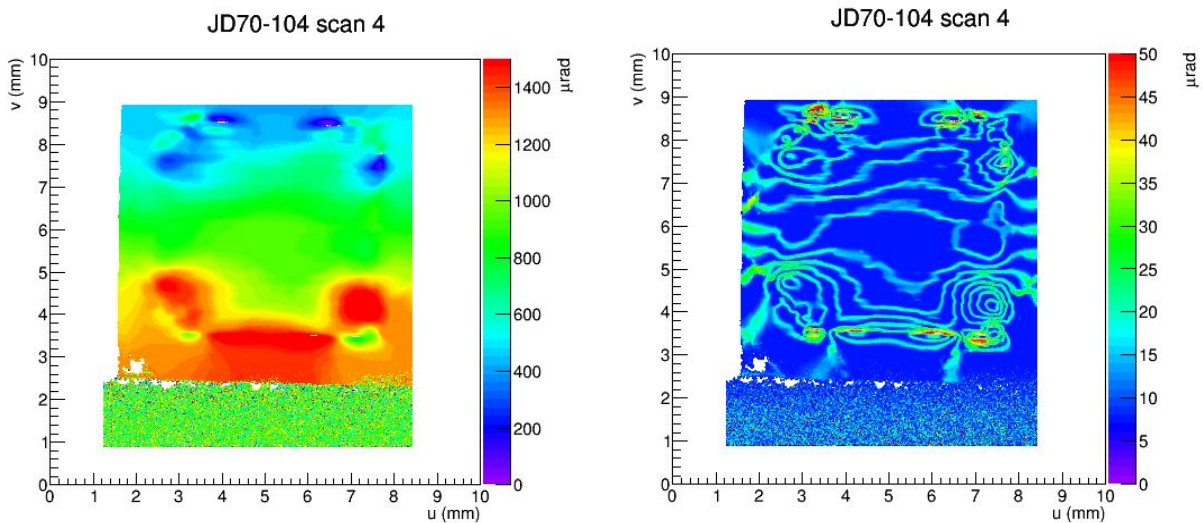


Figure: Rocking curve peak fit centroid angle (left) and sigma (right) for all pixels in scan 4. The band across the bottom is noise pixels that were not eliminated by the noise reduction algorithm.

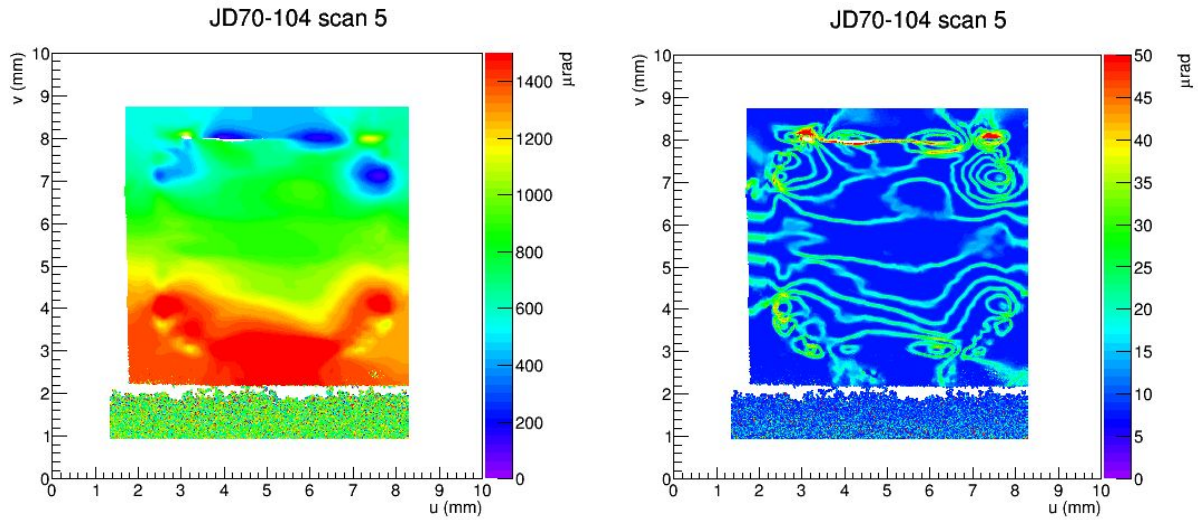


Figure: Rocking curve peak fit centroid angle (left) and sigma (right) for all pixels in scan 5. The band across the bottom is noise pixels that were not eliminated by the noise reduction algorithm.

Dismounting JD70-104

Followed the same instructions here as were written above for JD70-100.

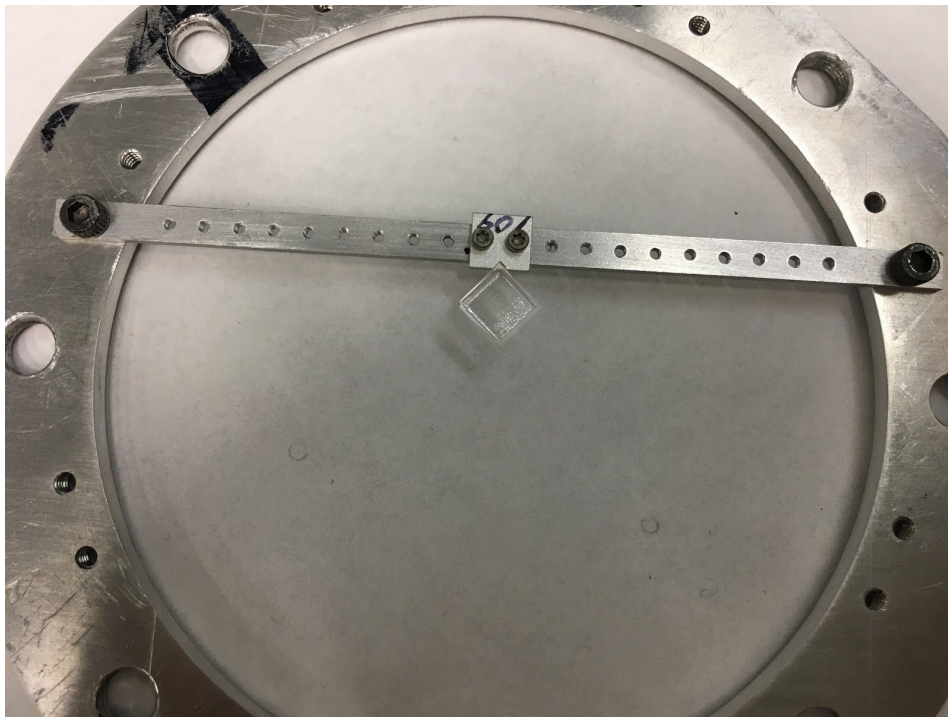


Photo of JD70-104 after taken off beamline.

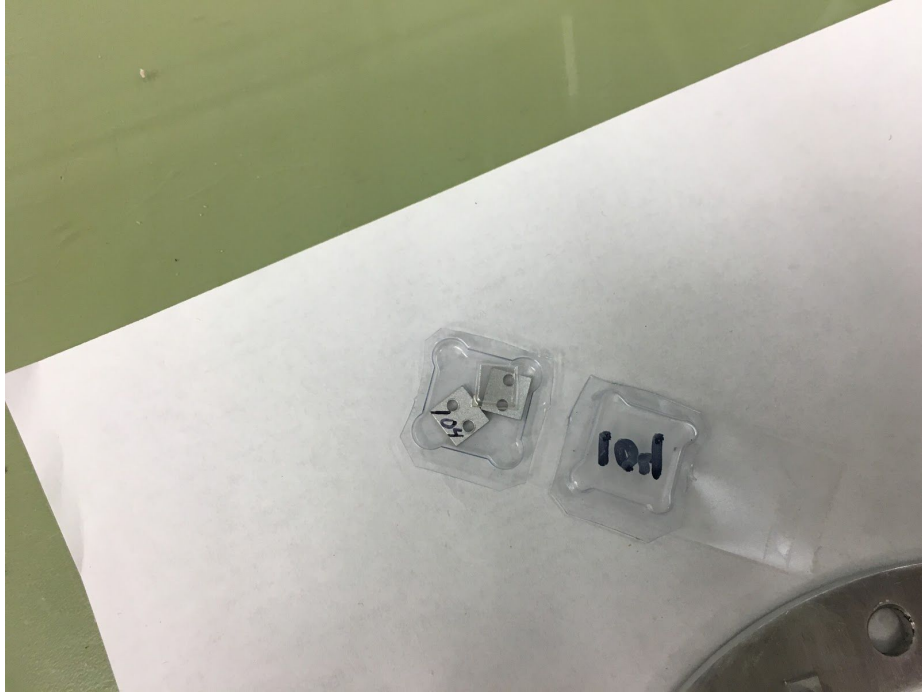


Photo of JD70-104 back in its "pill box".



Photo of JD70-104 with "pill box" closed.

Mounting JD70-105 in beamline

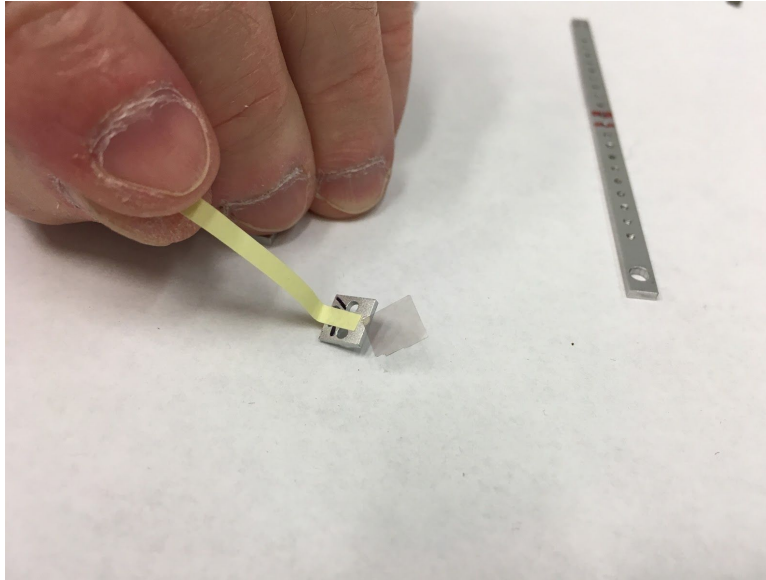
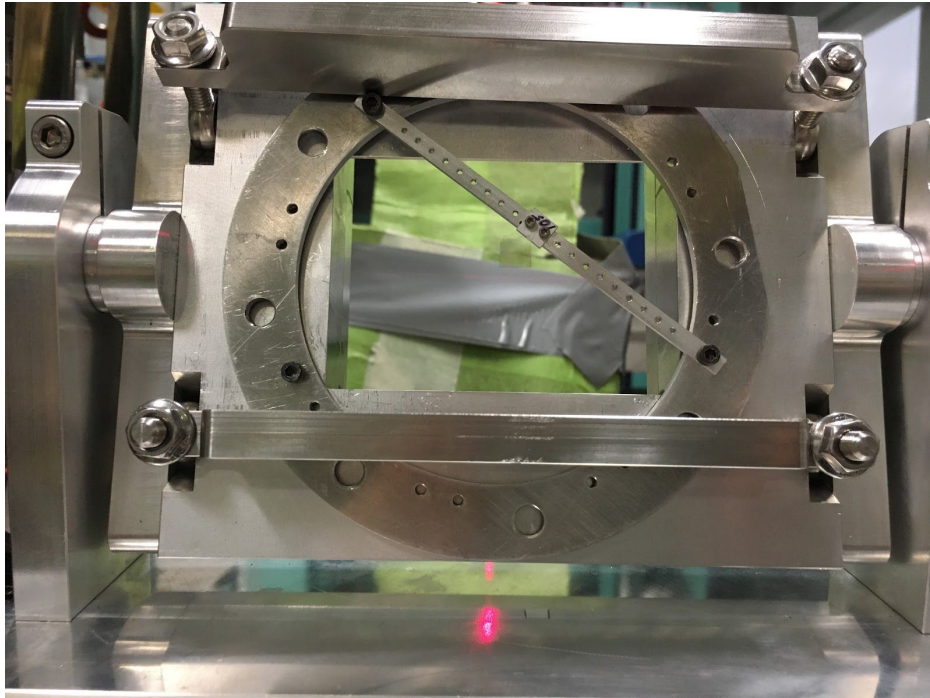


Photo of JD70-105 right after taking it out of its "pill box". Note the jagged edge and clipped corner.



Photo of JD70-105 mounted on the bar and ring.



Scan #1: Photo of JD70-105 mounted in beamline, 12 o'clock position, facing upstream.

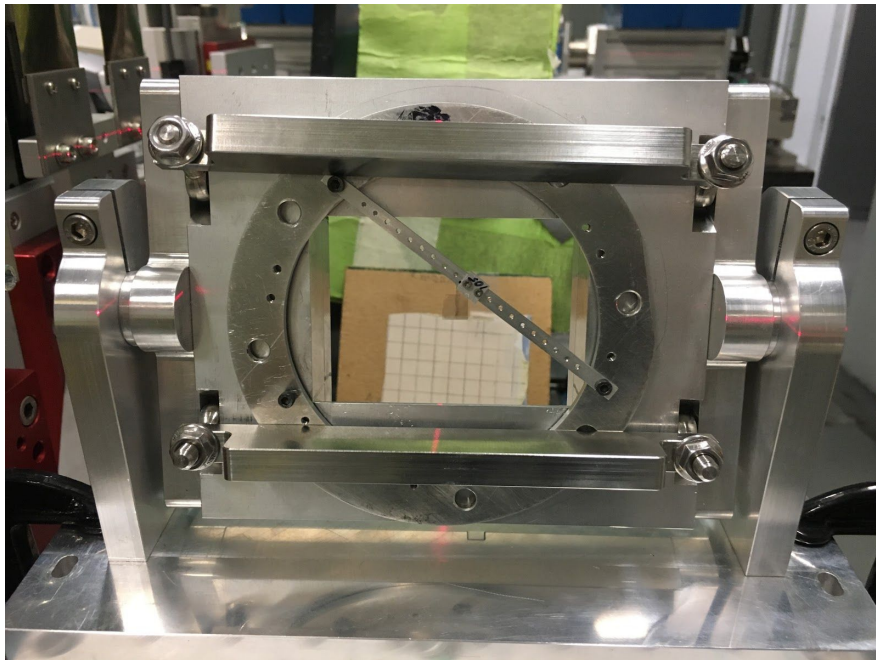
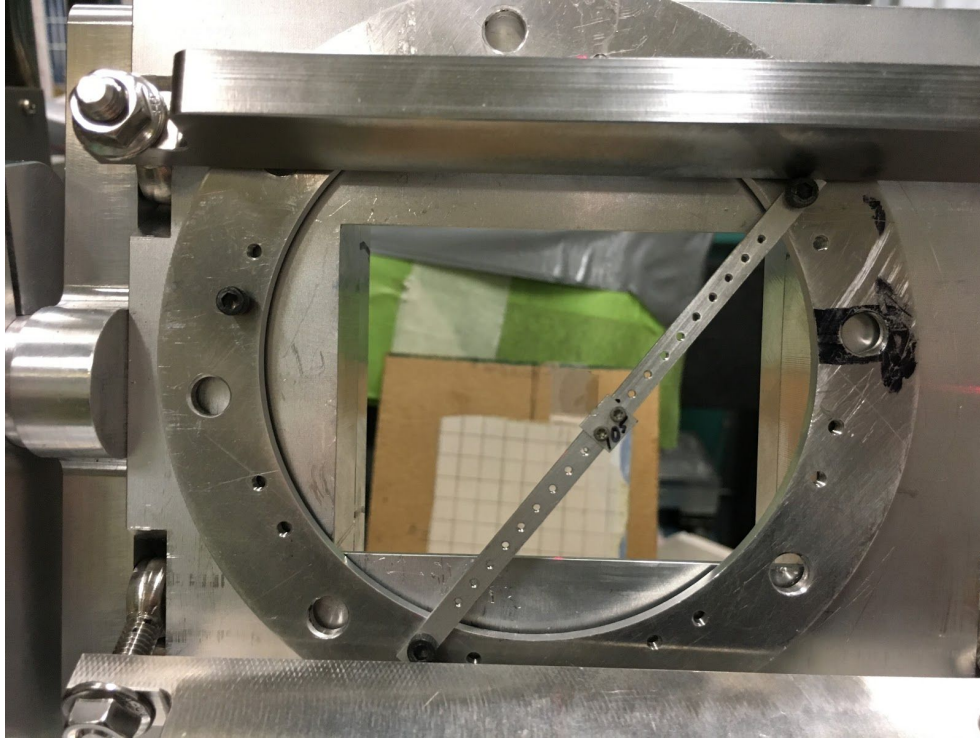
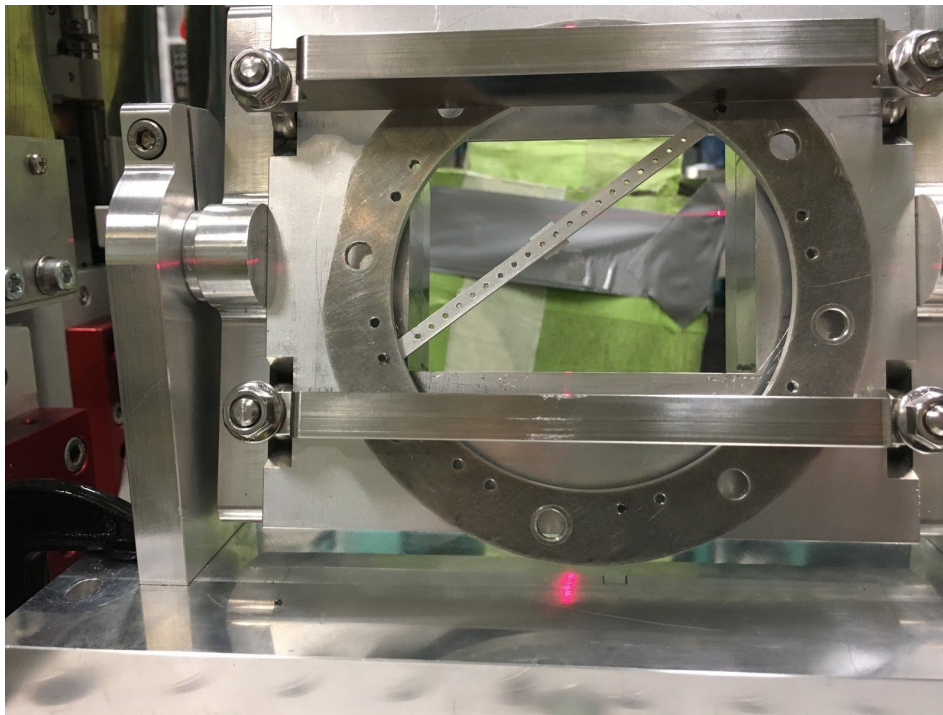


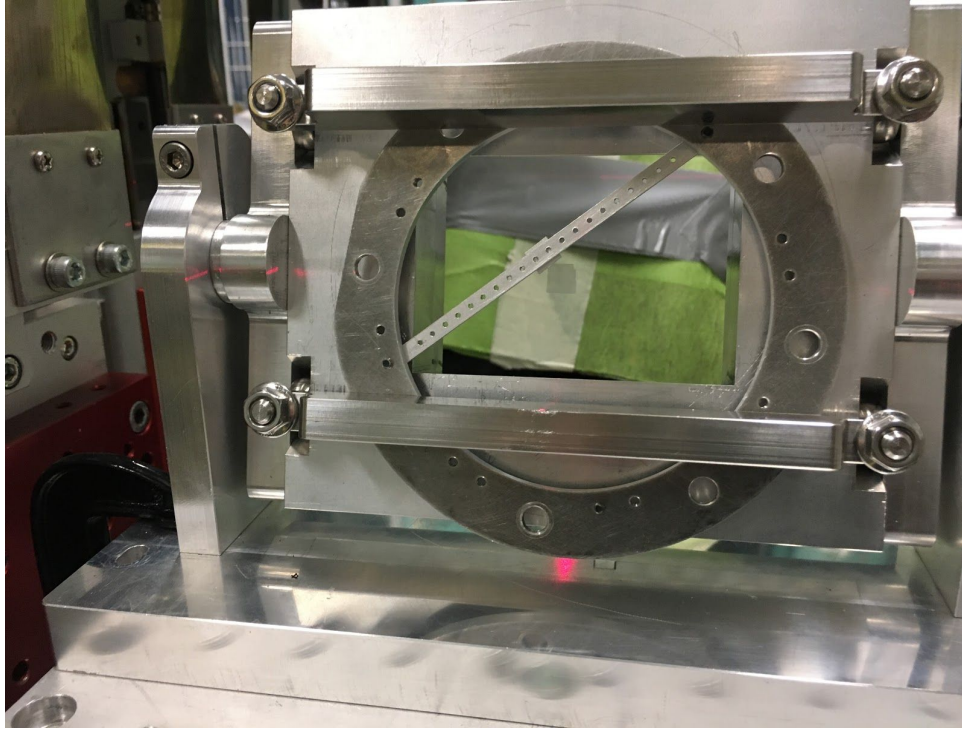
Photo of JD70-105 mounted in beamline, 12 o'clock position, facing upstream, taken from a different angle.



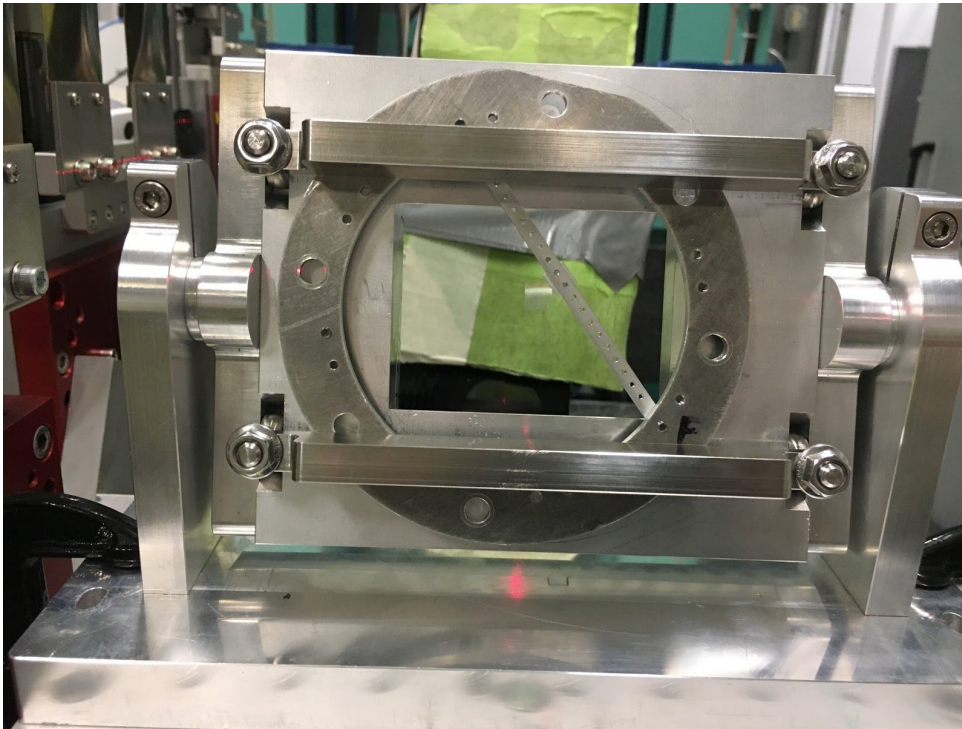
Scan#2: Photo of JD70-105 mounted in beamline, 3 o'clock position, facing upstream



Scan#3: Photo of JD70-105 mounted in beamline, 12 o'clock position, facing downstream, head on.



Scan#3: Photo of JD70-105 mounted in beamline, 12 o'clock position, facing downstream, from a side angle.



Scan#4: Photo of JD70-105 mounted in beamline, 3 o'clock position, facing downstream, head on.

Rocking curves of JD70-105

We set JD70-105 in the position similar to that the crystal JD70-100 was set for the scans #1-2 (viz., “12 o’clock” mark is on the top). The scan #1 is from -0.224 deg to -0.184 deg (diff of 0.040 deg) with 284 steps of 0.0001409 deg each.

We rotated the frame 90 deg clockwise as beam sees it (viz., “12 o’clock” mark is on the right as beam sees it). The scan #2 is from -0.389 deg to -0.342 deg (diff of 0.047 deg) with 334 steps of 0.0001409 deg each.

We flip the frame and set it to the position to have “12 o’clock” mark on the top. The scan #3 is from -0.637 deg to -0.582 deg (diff of 0.055 deg) with 390 steps of 0.0001409 deg each.

We rotated the frame 90 deg clockwise (so we have “12 o’clock” mark on the right as beam sees it). The scan #4 is from -0.474 deg to -0.440 deg (diff of 0.034 deg) with 242 steps of 0.0001409 deg each.

scan number	theta range (deg)	no. steps	step size (urad)	image prefix
1	(-0.224, -0.184)	282	2.459	JD70-105-1
2	(-0.389, -0.342)	332	2.459	JD70-105-2
3	(-0.637,-0.582)	388	2.459	JD70-105-3
4	(-0.474, -0.440)	240	2.459	JD70-105-4

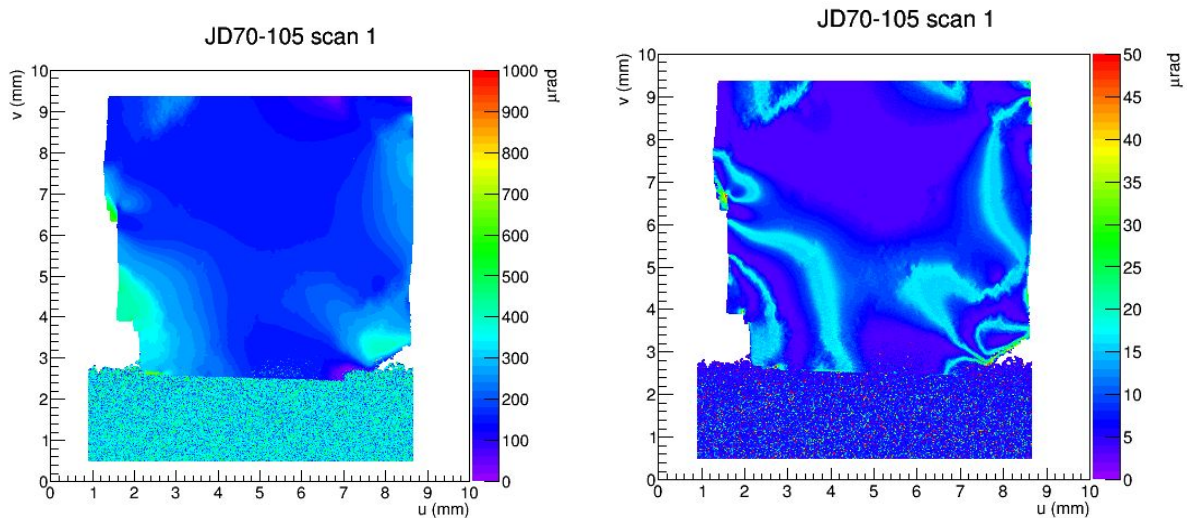


Figure: Rocking curve peak fit centroid angle (left) and sigma (right) for all pixels in scan 1. The band across the bottom is noise pixels that were not eliminated by the noise reduction algorithm.

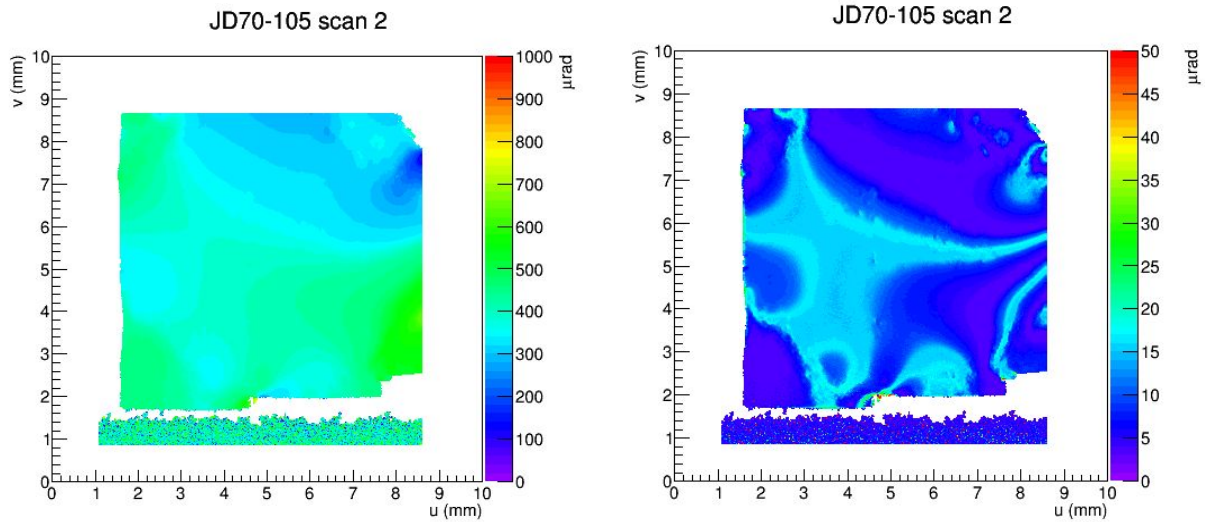


Figure: Rocking curve peak fit centroid angle (left) and sigma (right) for all pixels in scan 2. The band across the bottom is noise pixels that were not eliminated by the noise reduction algorithm.

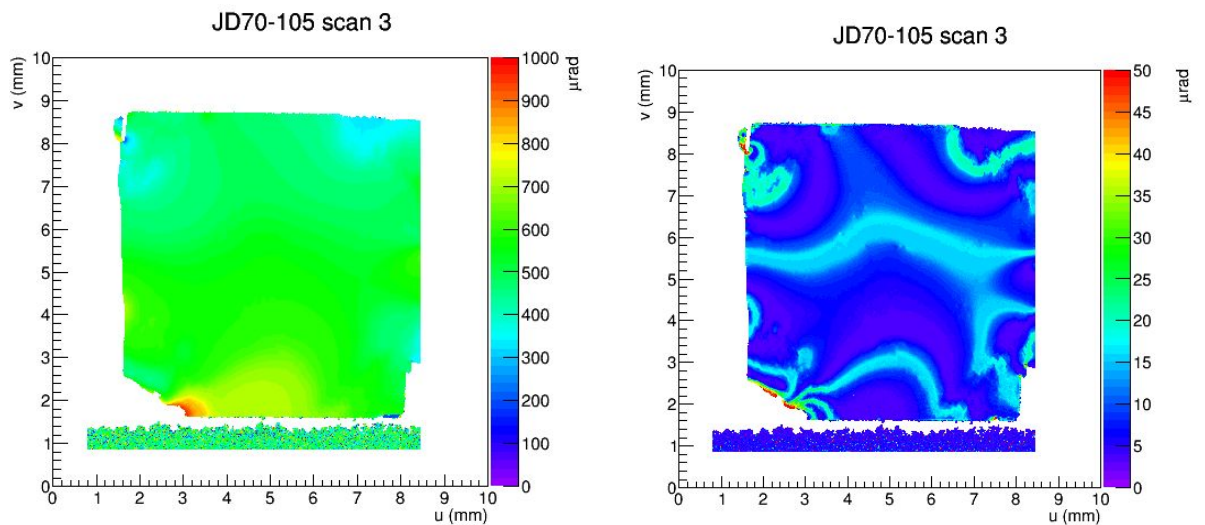


Figure: Rocking curve peak fit centroid angle (left) and sigma (right) for all pixels in scan 3. The band across the bottom is noise pixels that were not eliminated by the noise reduction algorithm.

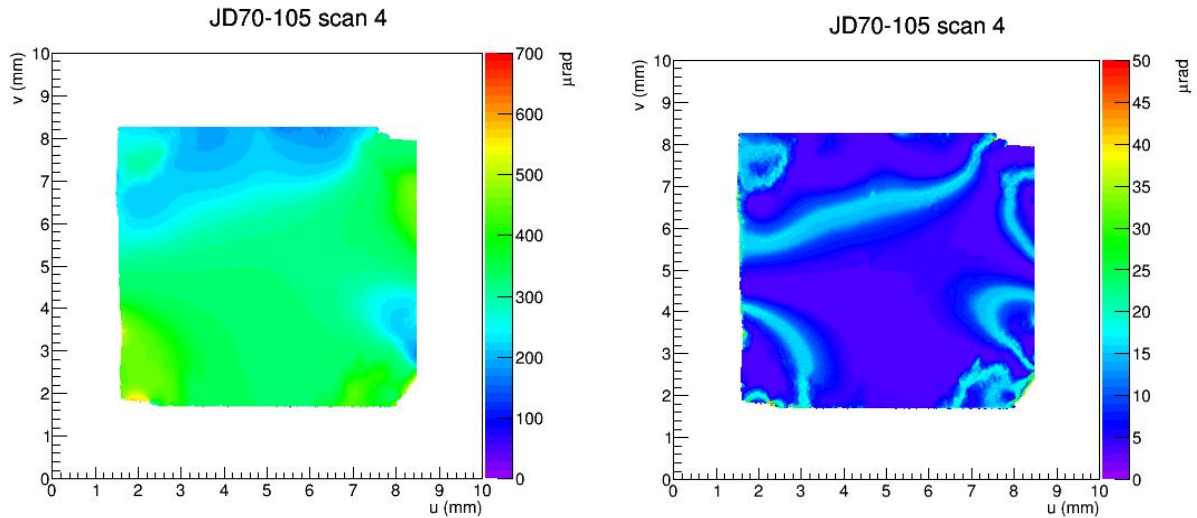


Figure: Rocking curve peak fit centroid angle (left) and sigma (right) for all pixels in scan 4. The band across the bottom is noise pixels that were not eliminated by the noise reduction algorithm.

Dismounting JD70-105

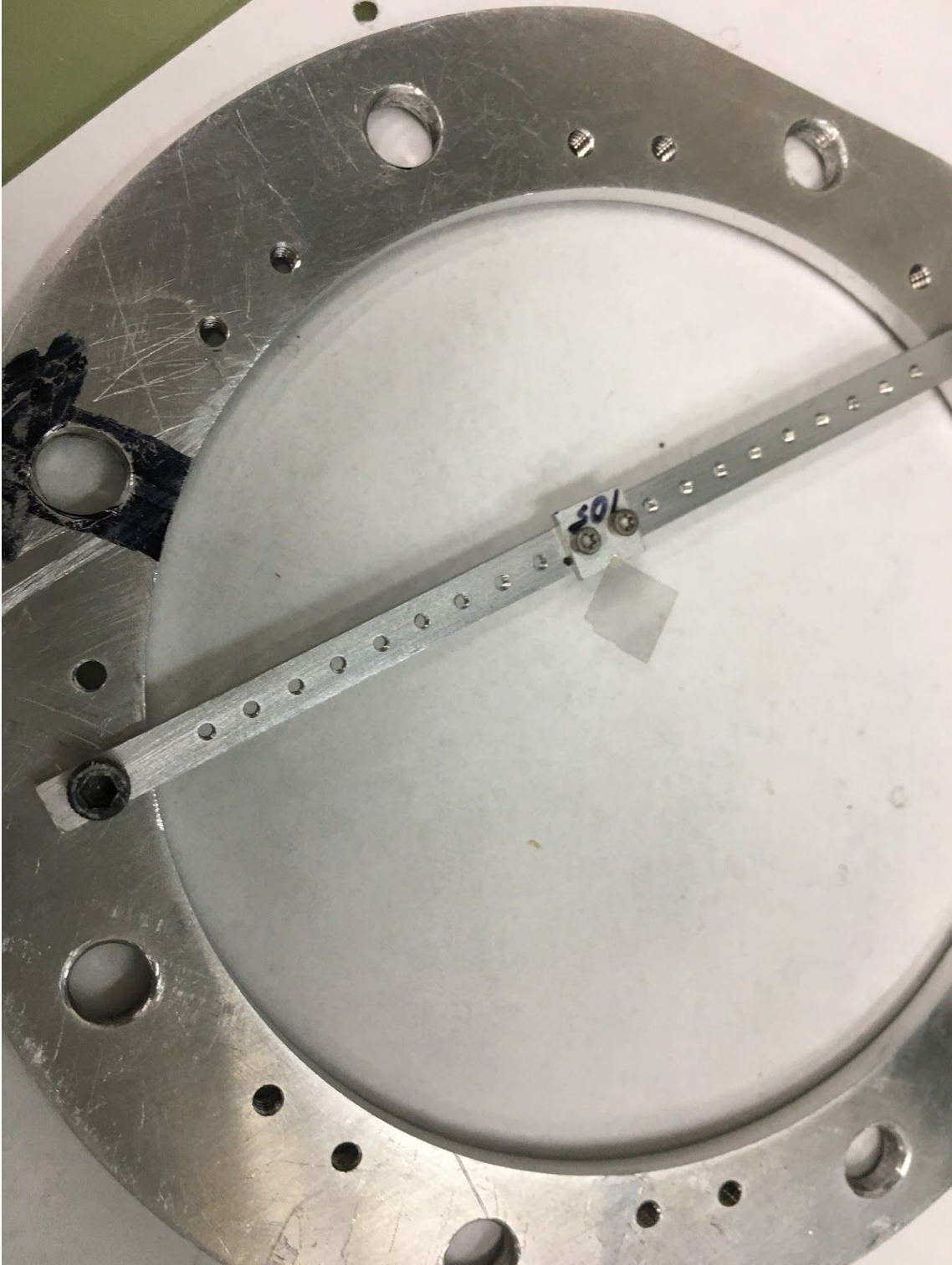
Followed the same procedures as were written above for JD70-100.

Packing up and checking out

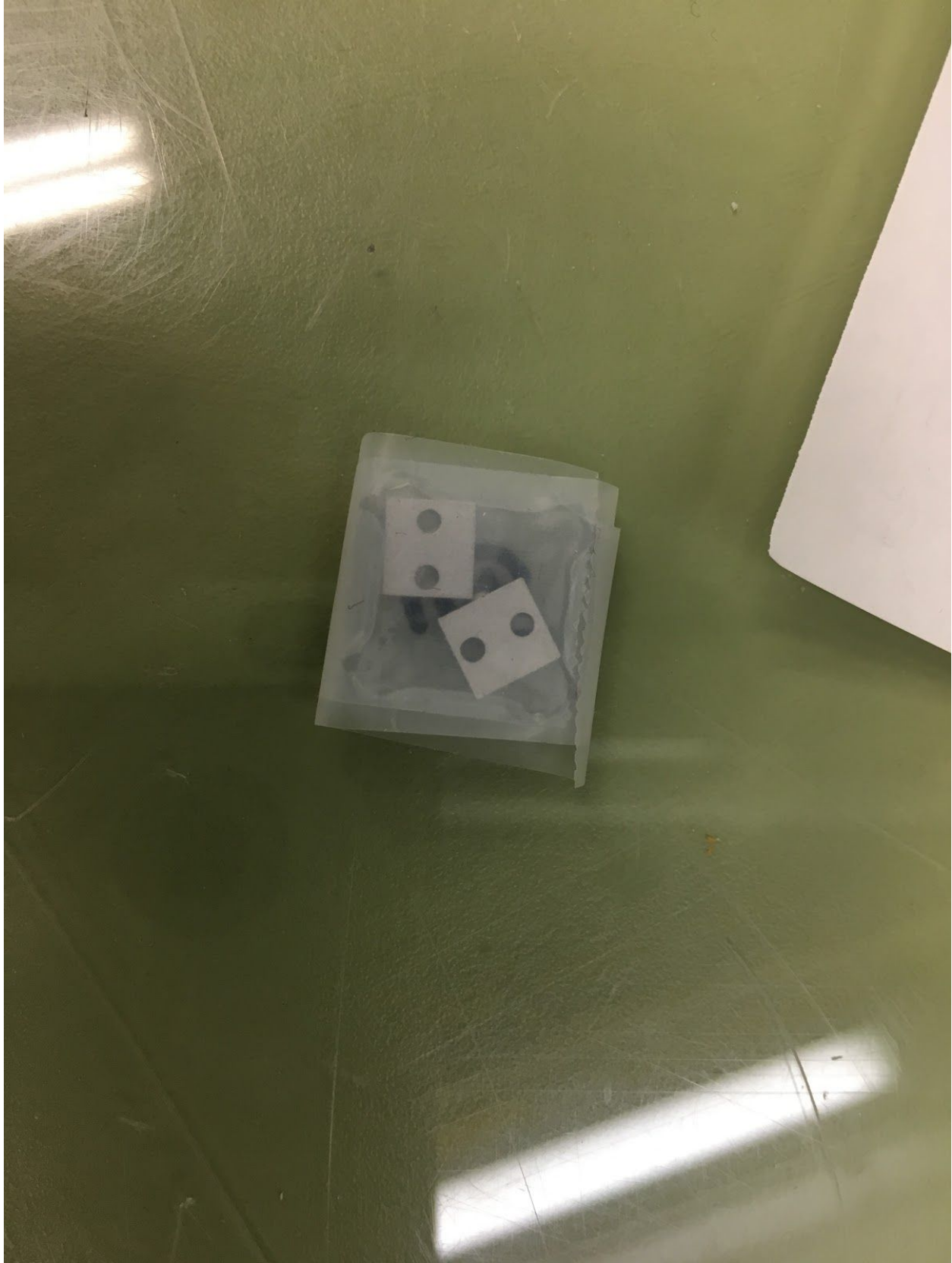
Tarball of Denise's script was sent to Richard by email (ZP).

Zipped archive of all photos may be obtained from: (79 MB)

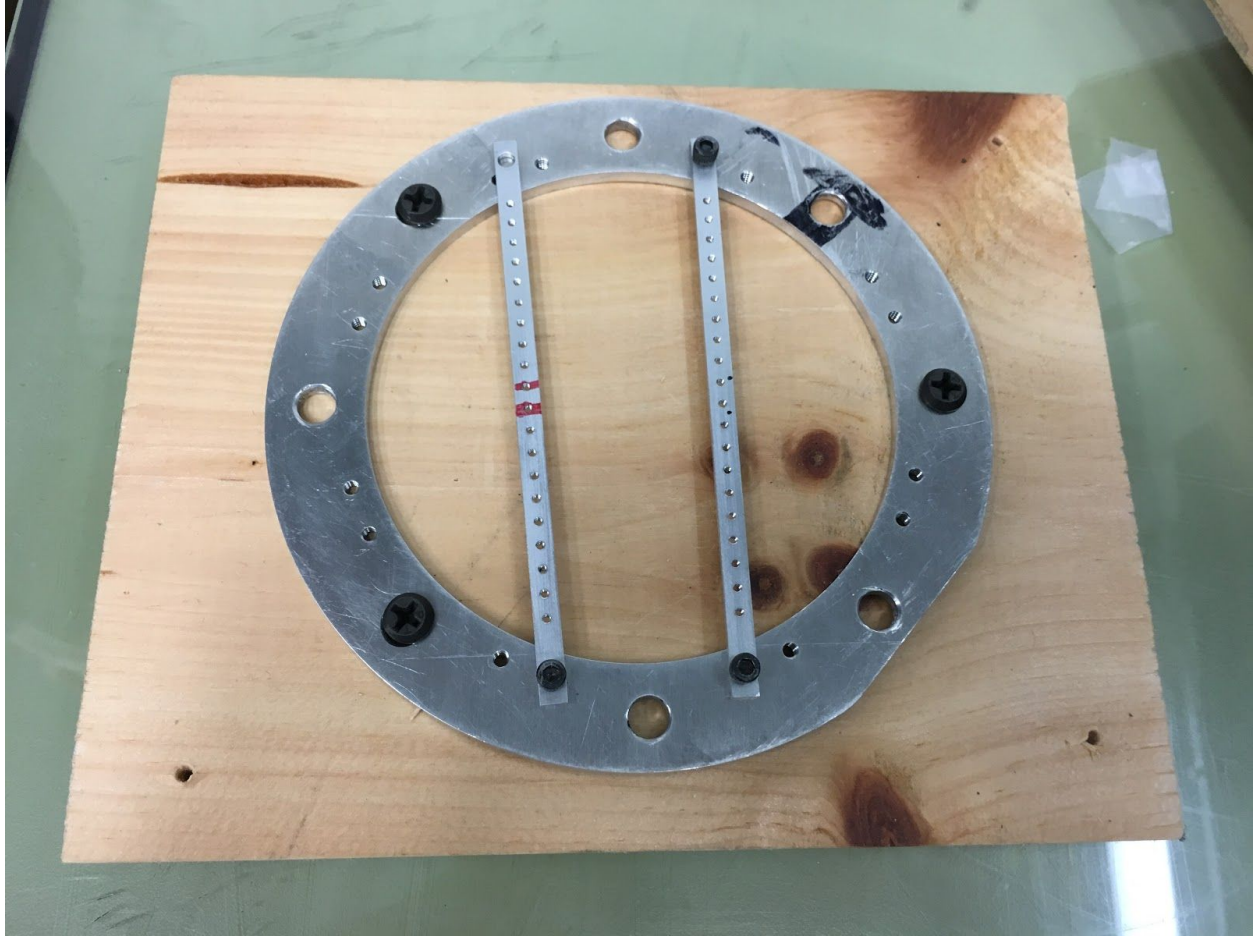
http://kronos.phys.uregina.ca/~zisis/CLS-Photos_SeptemberRun.zip





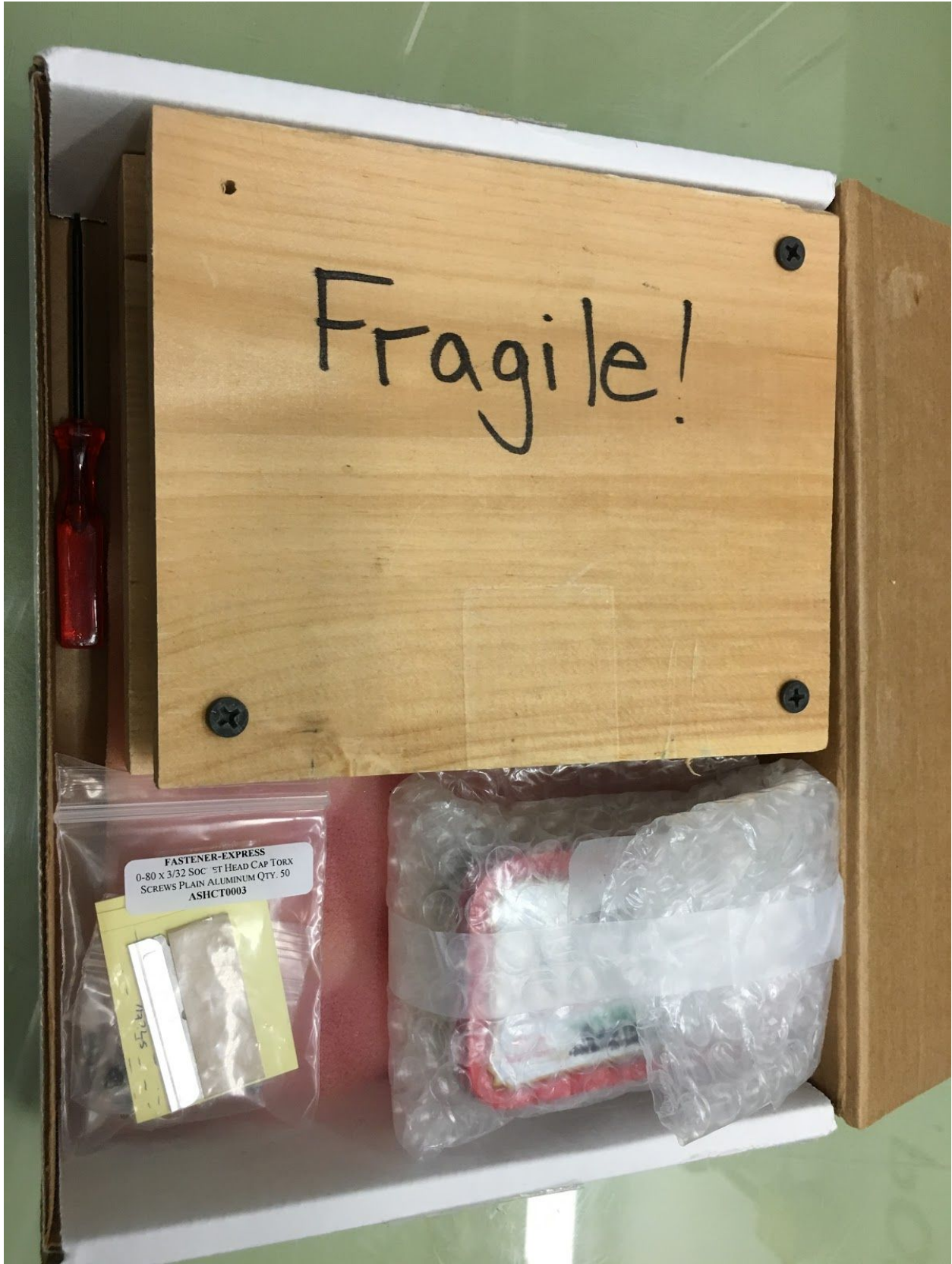


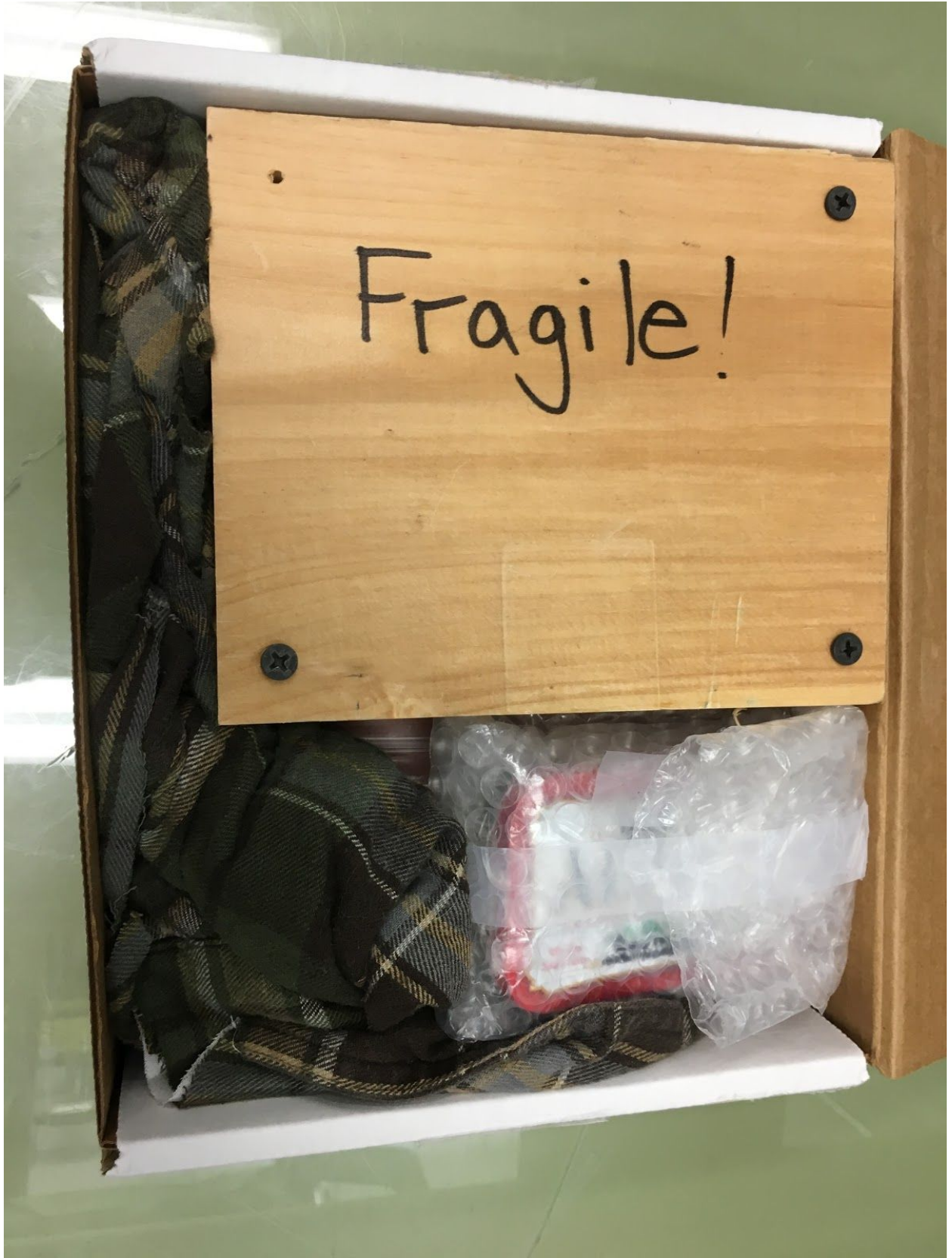














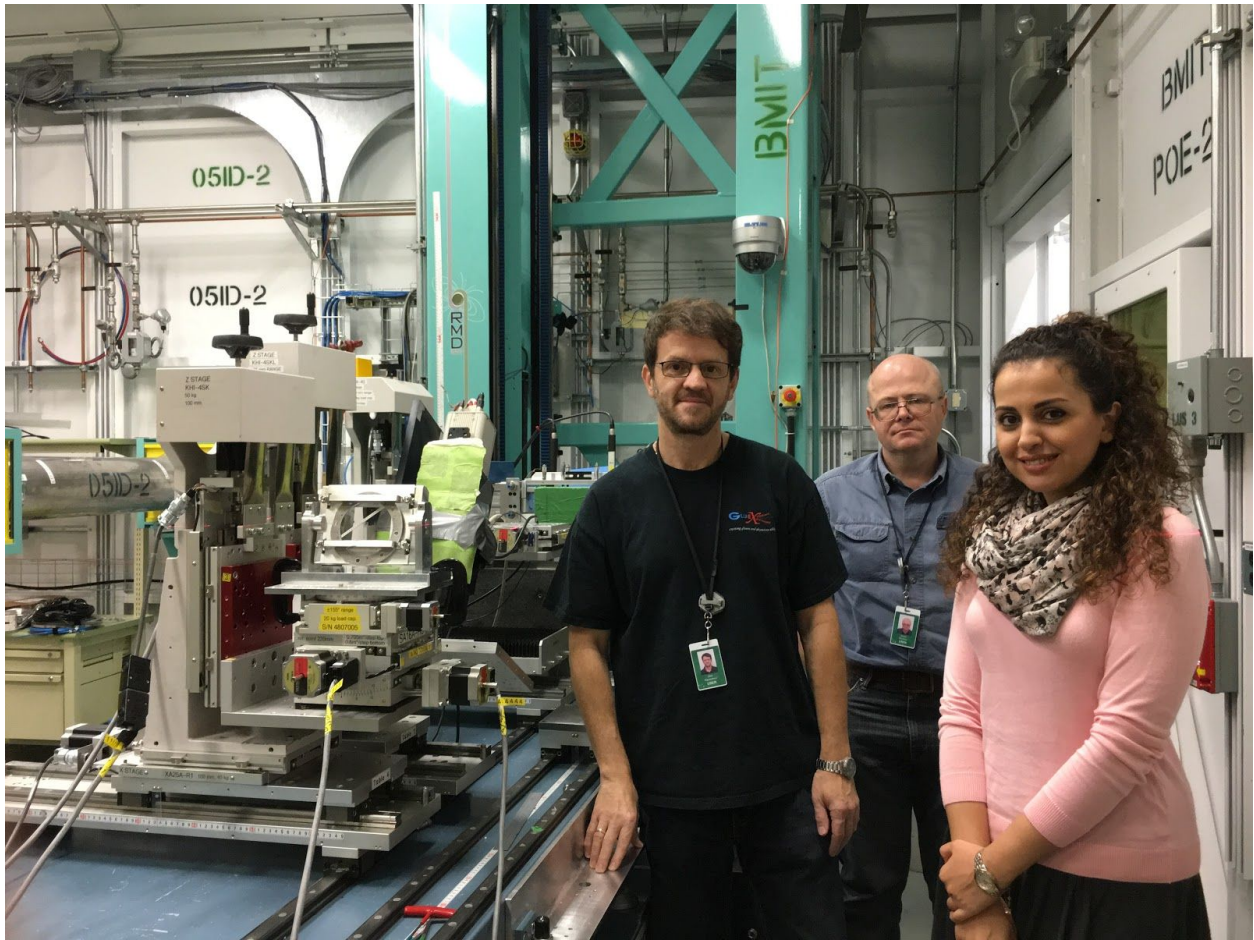
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Bravo, team Saskatchewan, you won a hat trick! Thank you for all of the tender care you gave to our samples, and the excellent data that you collected.

-Richard Jones, for the (remote) UConn team