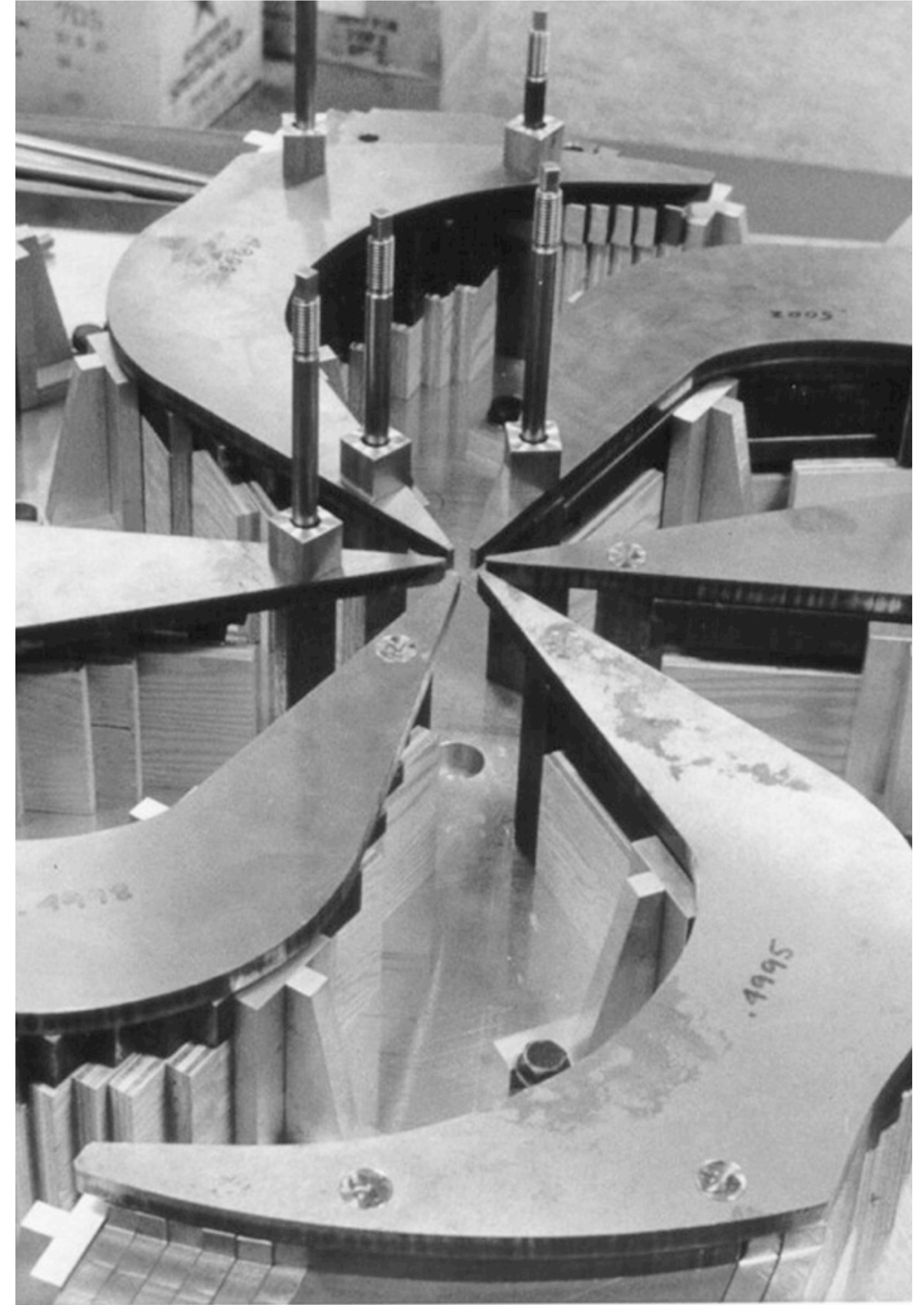


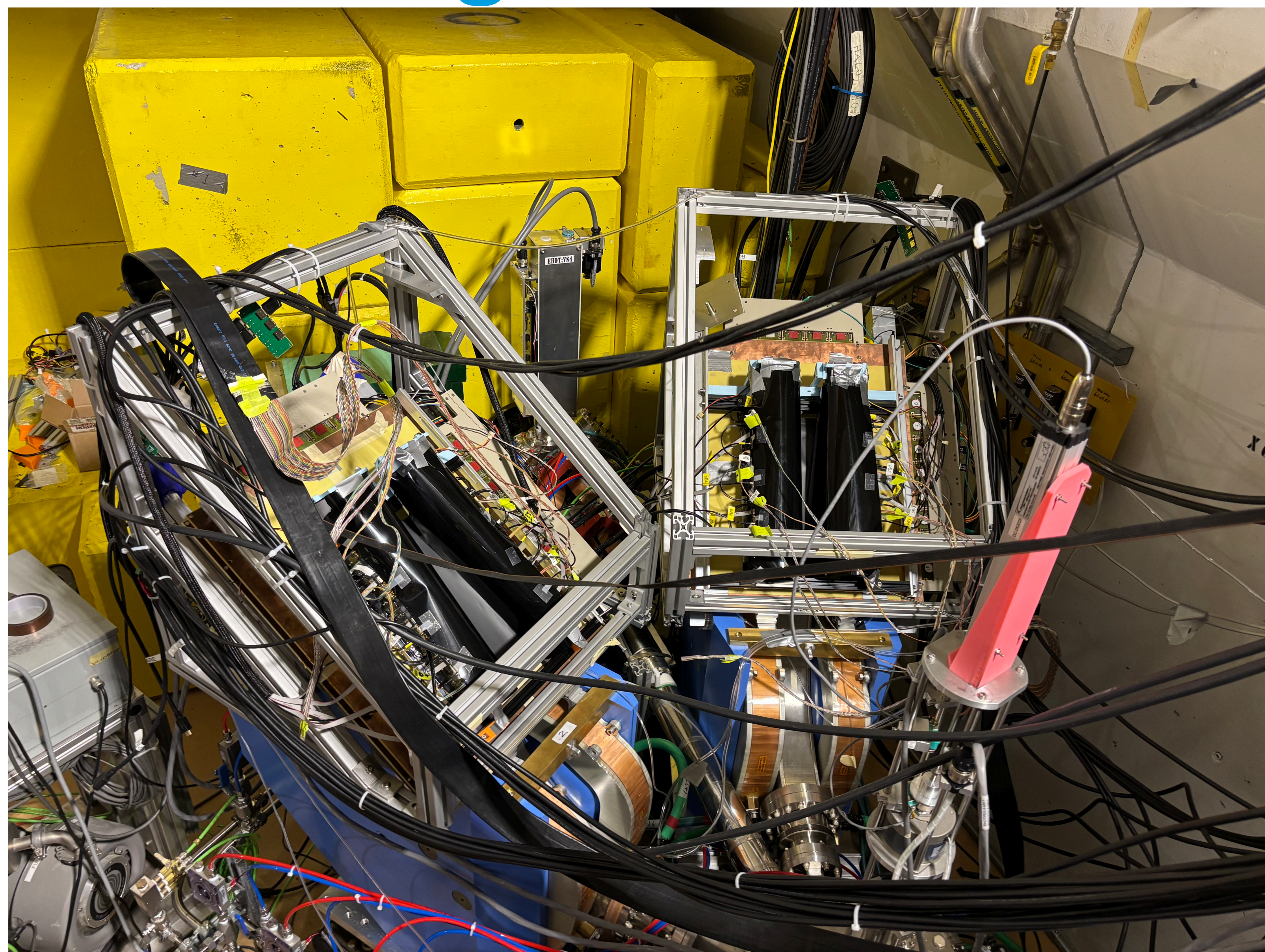
Installation wrap-up

Laura Miller

DarkLight collaboration meeting
2025-07-02



TLDR: we did the thing



Longer story...

- This installation never would have been possible without all the very helpful techs here at TRIUMF
- If you happen to meet any of them while you are here please give them your thanks
- Ran into a lot of problems during the install, most were to do with integration and difficulties with the shielding frame design
 - Not going to go into detail on all of these today
 - Shielding frames have been modified several times
 - Integration issues were resolved largely due to the aforementioned very helpful techs at TRIUMF

Week #1: May 5th-9th

- Prior to this week: vacuum cleaning of parts was underway
- Hatch was opened and dump shielding was removed
- Vacuum cleaning continued and leak testing of components began

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Week #1: May 5th-9th

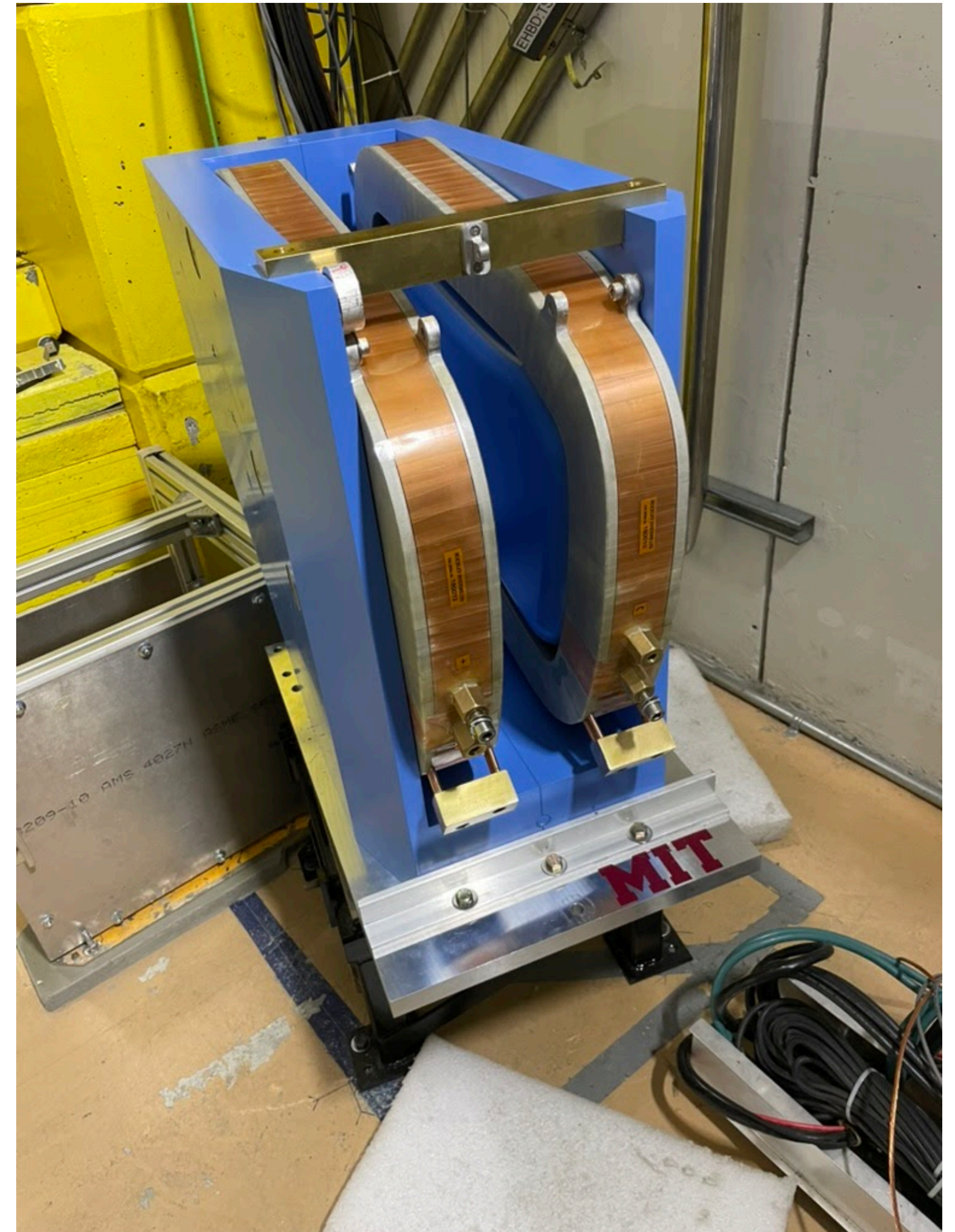
- Prior to this week: vacuum cleaning of parts was underway
- Hatch was opened and dump shielding was removed
- Vacuum cleaning continued and leak testing of components began
- Existing eLinac beam line was disassembled

5



Week #2: May 12th-16th

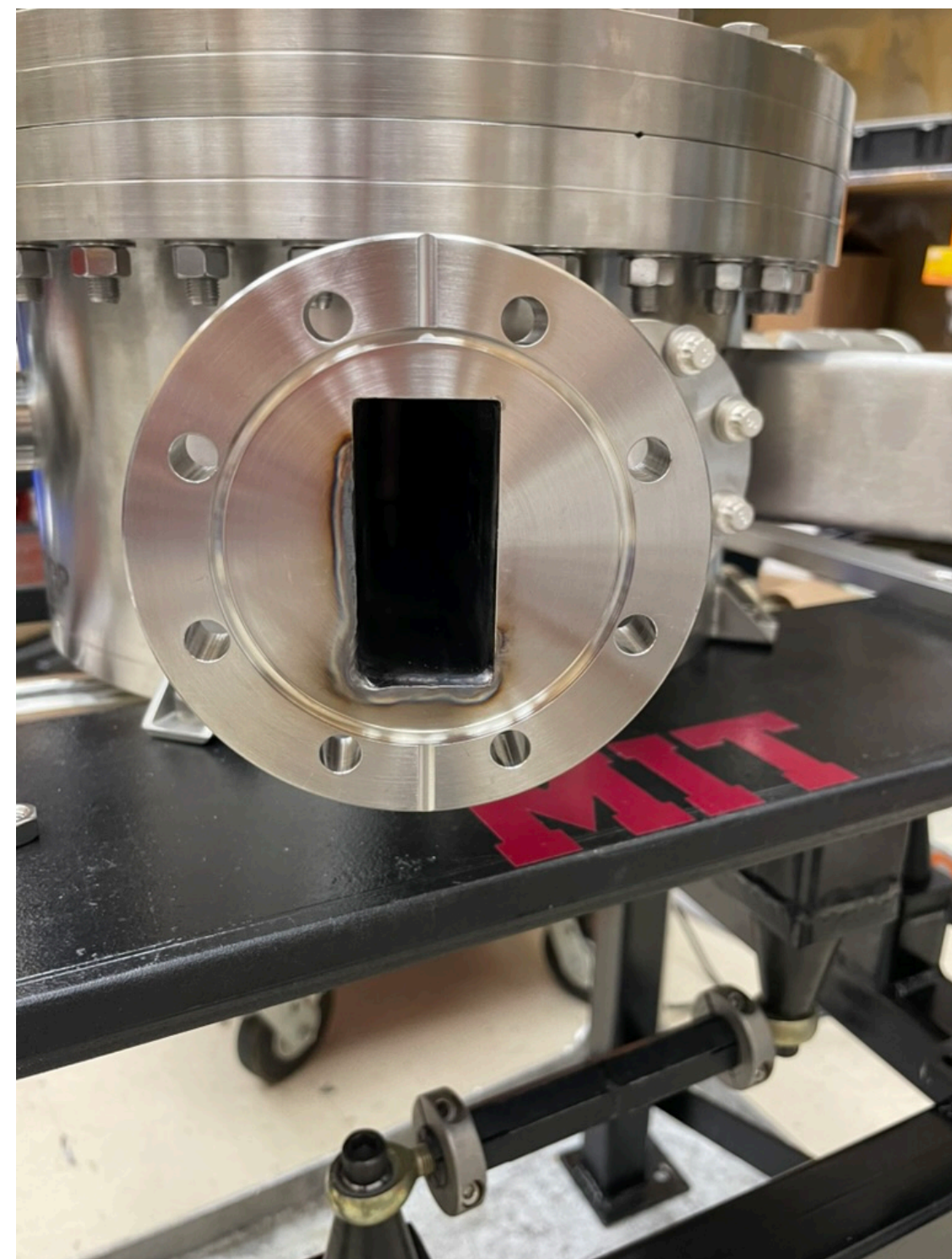
- First dipole stand and dipole were installed
- Target ladder surveyed, carbon target installed
- Reassembly of target chamber was underway, last leak checks of spectrometer arms and bellows were completed



Week #3: May 19th-23rd

- Leak discovered in target chamber
- Brian got to the bottom of it after a couple attempts (Thanks Brian!)
- Chamber had to be disassembled again and recleaned (we installed silver plated nuts and bolts after this)
- Downstream optics components started to be installed

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Week #4: May 26th-30th

- Target chamber was installed and aligned
- Downstream beam pipe pieces were installed
- Collimator was finished being welded, and that section of beam line was created

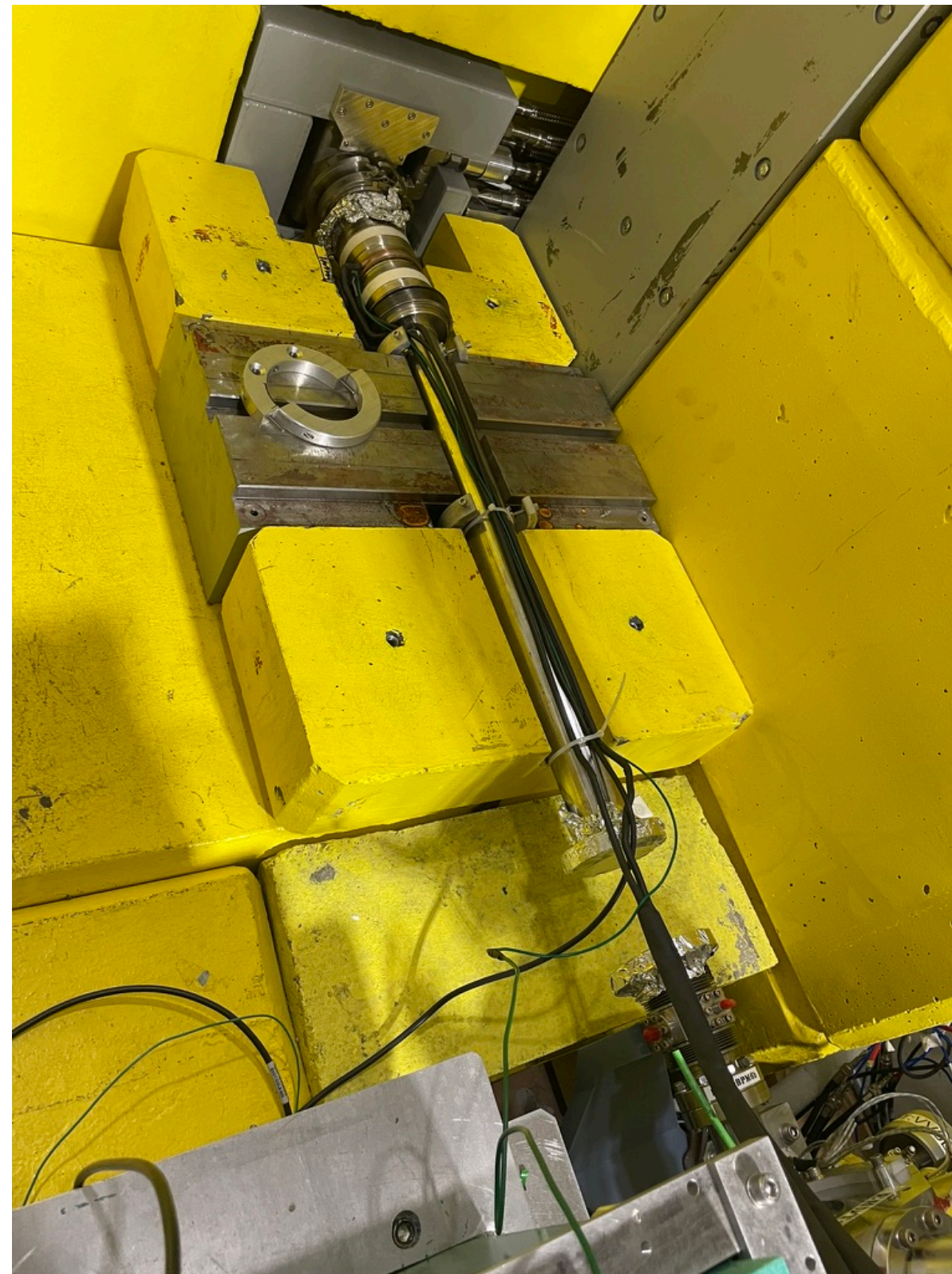
8



Week #5: June 2nd-6th

- PMQ spool piece and collimator section installed
- Second dipole was installed and aligned
- Test fit of a GEM occurred this week, some interferences with the GEM frame and the shielding frame identified and rectified

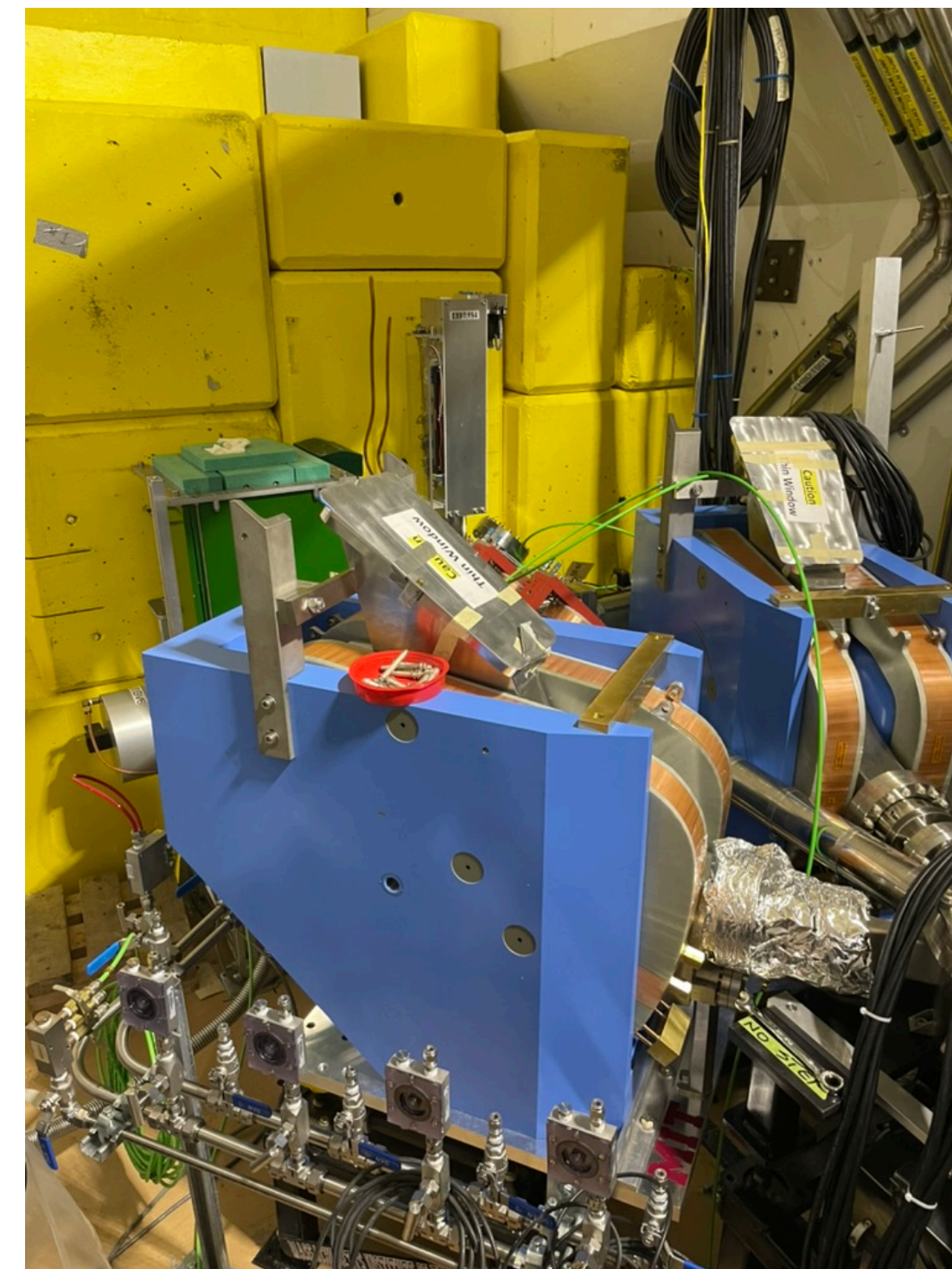
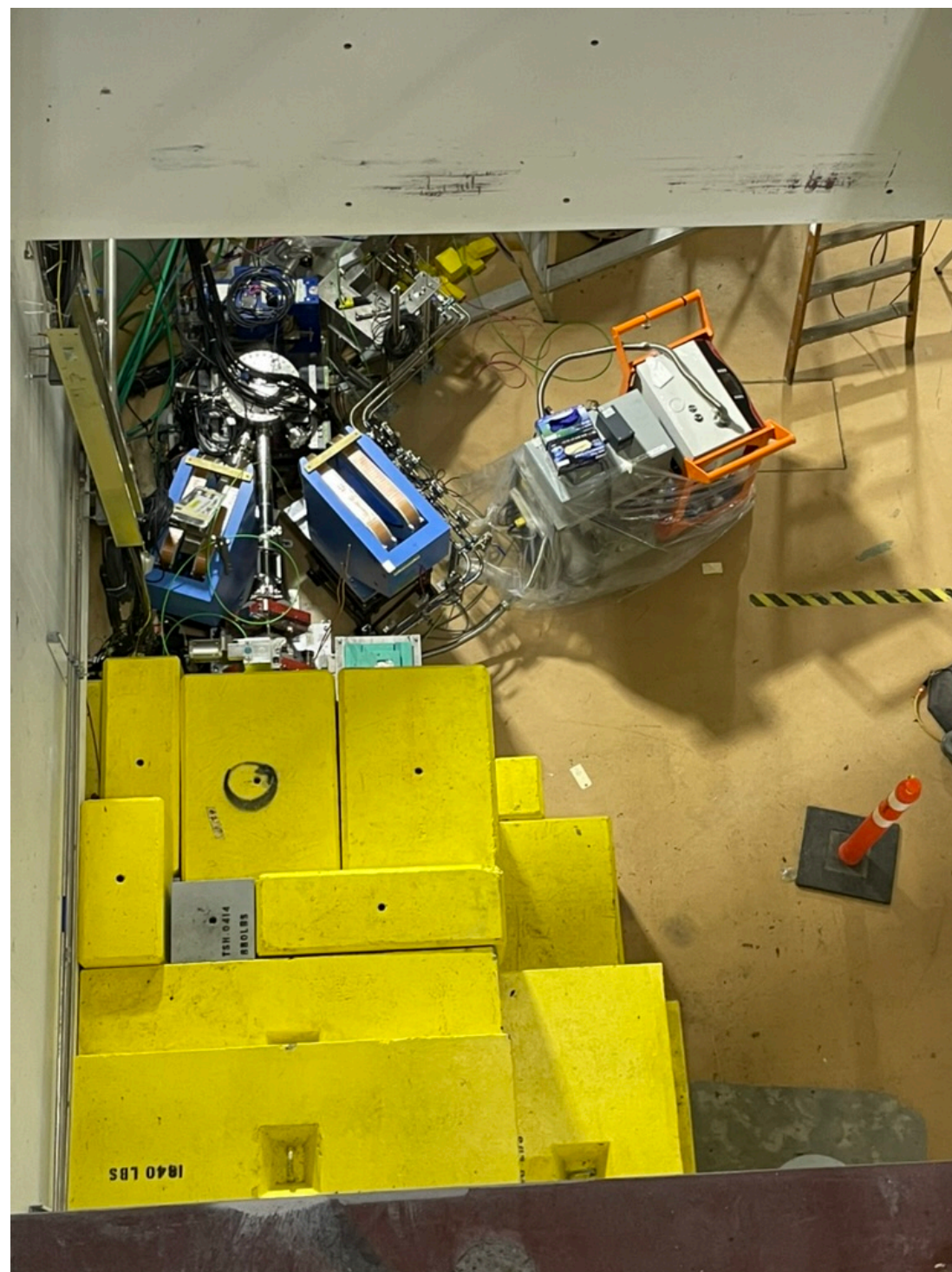
9



Week #6: June 9th-13th

- Collimator section was pumped down successfully
- Dump shielding reassembled and hatch blocks replaced
- Second spectrometer arm installed, and target ladder installed, pump down of section started
- Experiment shielding started to be shaped

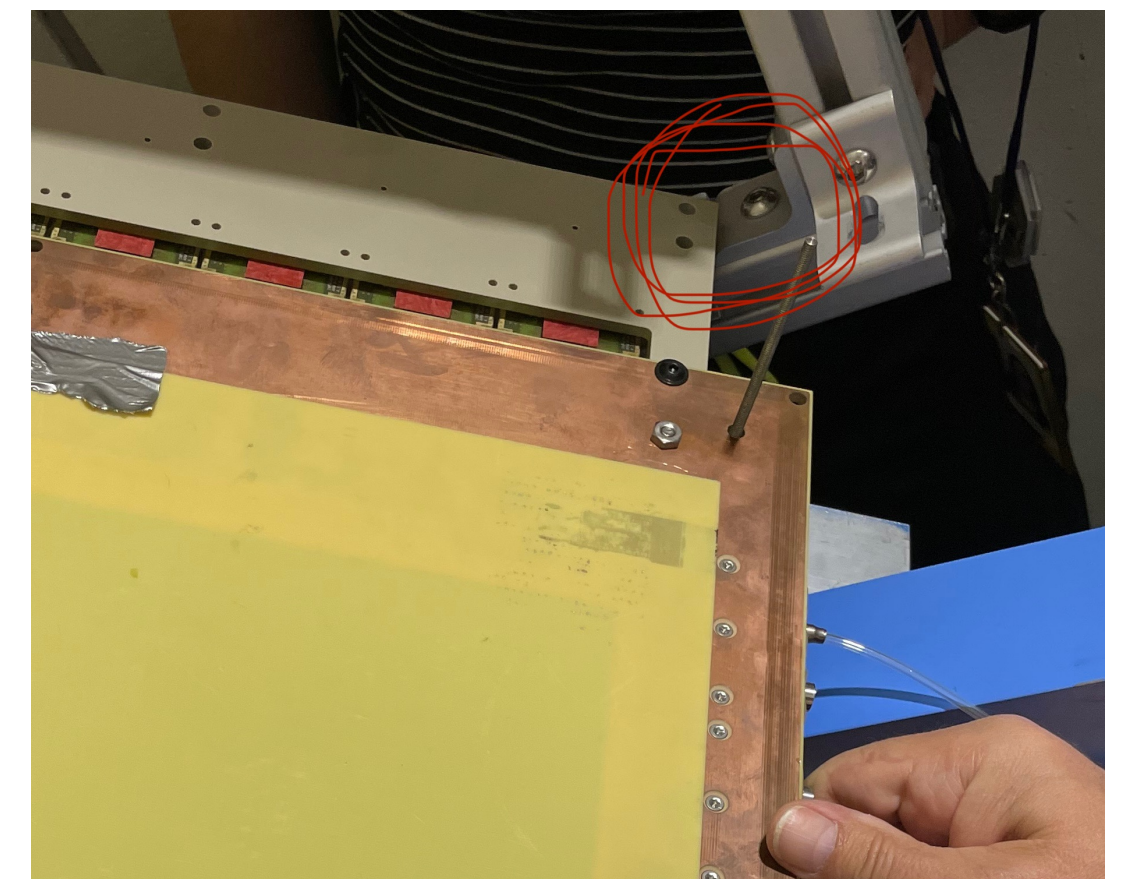
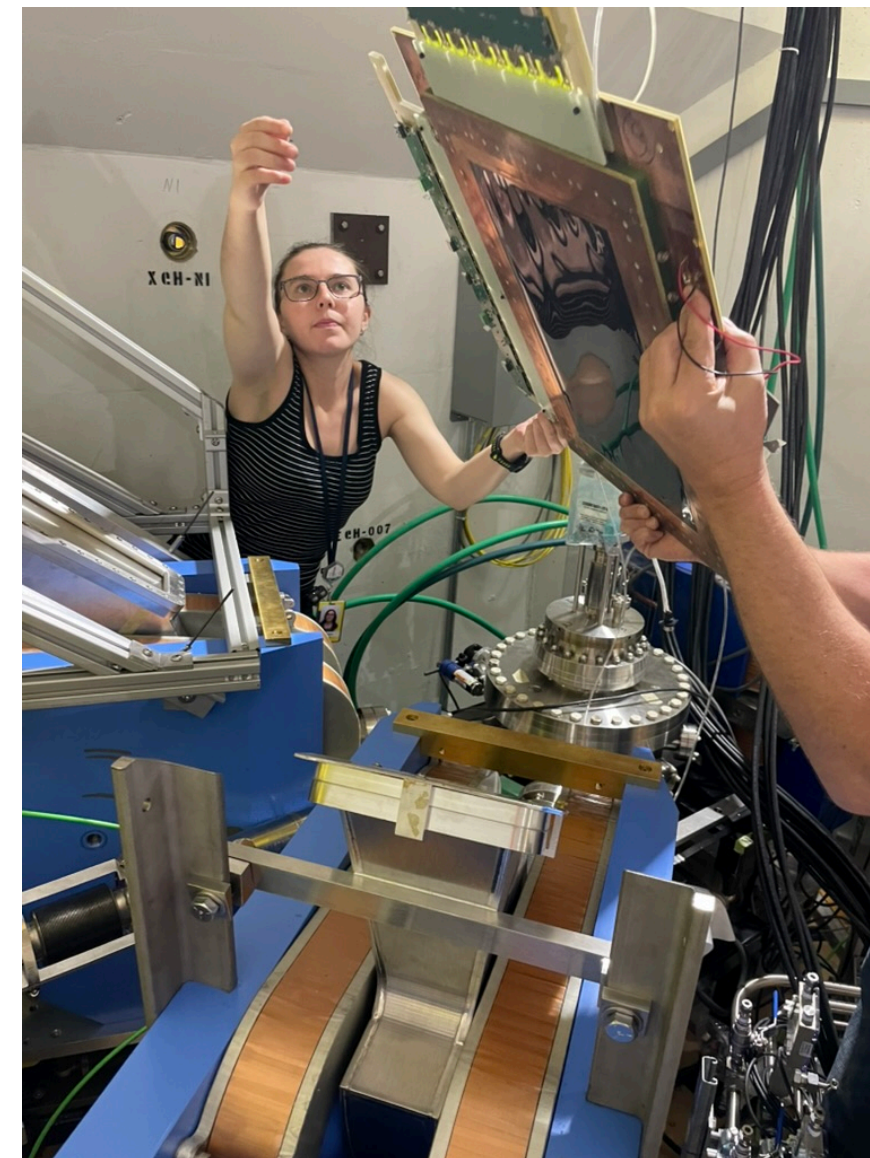
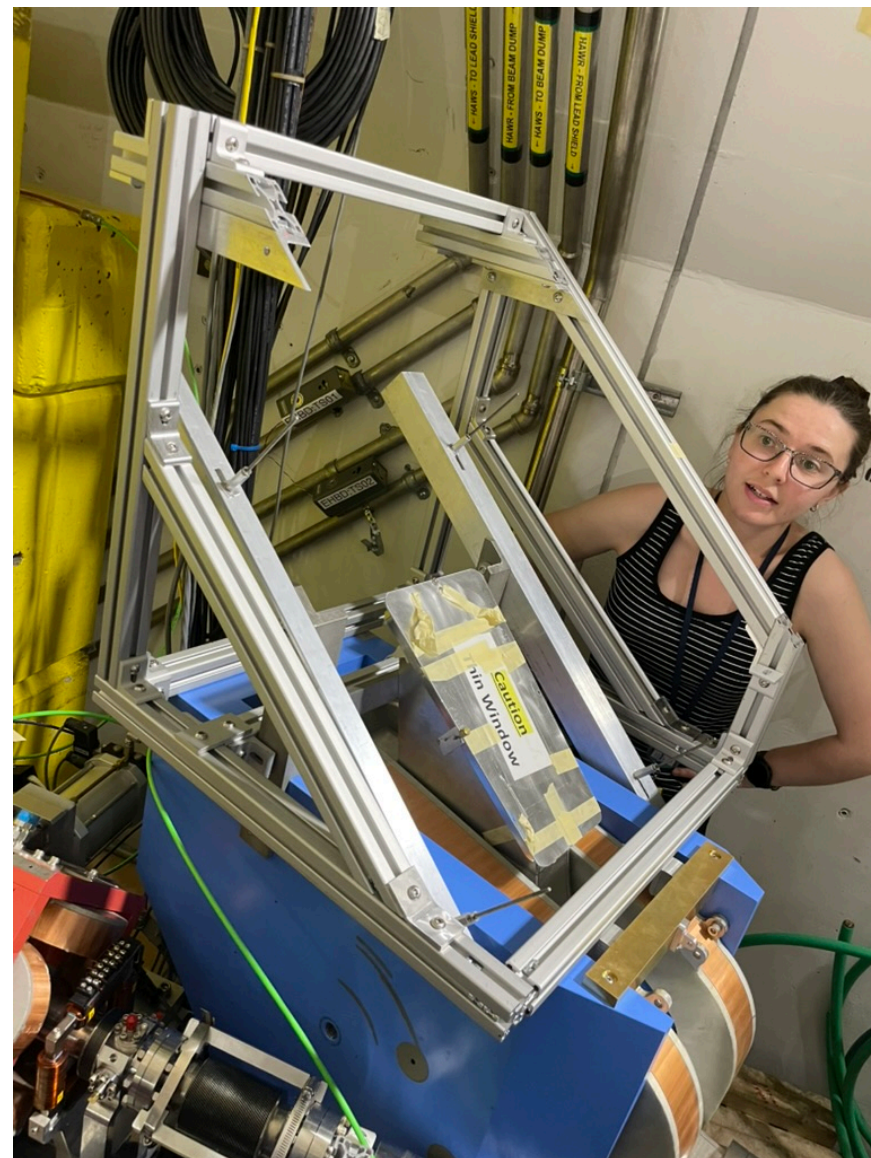
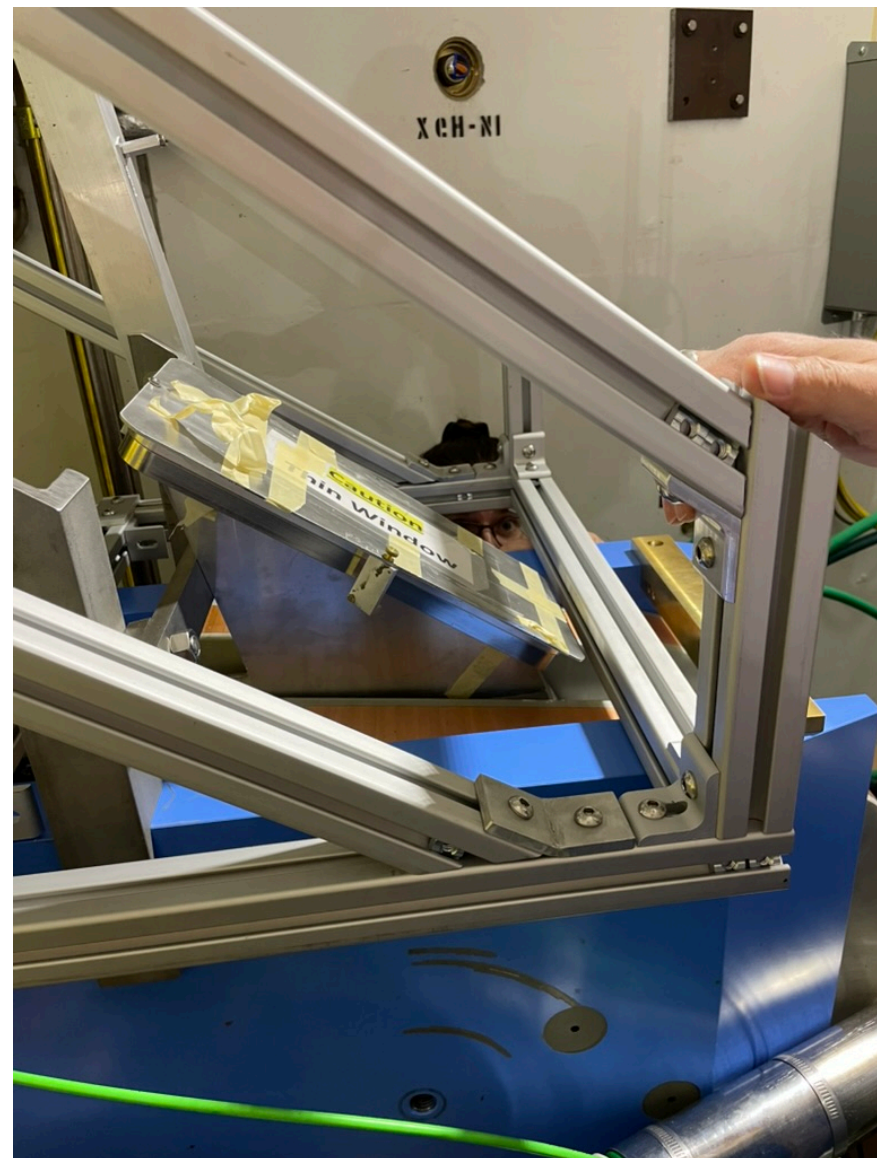
10



Week #6: June 9th-13th

- Collimator section was pumped down successfully
- Dump shielding reassembled and hatch blocks replaced
- Second spectrometer arm installed, and target ladder installed, pump down of section started
- Experiment shielding started to be shaped
- GEM shielding frame and first GEM test installed, interferences found between the frame and the APV support

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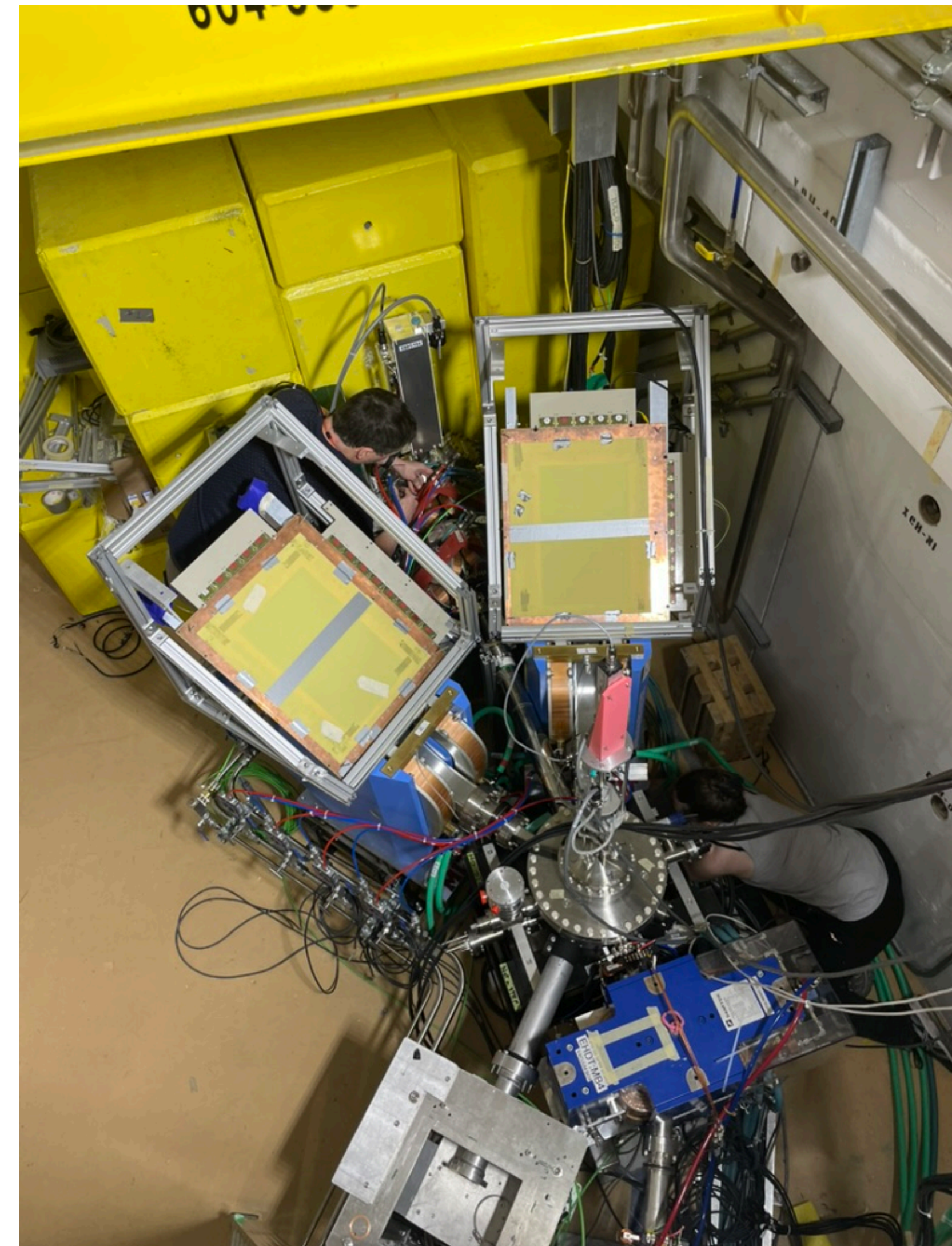


Week #6: June 9th-13th

- Collimator section was pumped down successfully
- Dump shielding reassembled and hatch blocks replaced
- Second spectrometer arm installed, and target ladder installed, pump down of section started
- Experiment shielding started to be shaped
- GEM shielding frame and first GEM test installed, interferences found between the frame and the APV support
- GEM reinstalled with modification to the APV support, tested communication with the APVs
 - HDMI cables were found to have an amplifier chip that obscured the analog signal
 - Ultimate solution was to order 50' + 25' passive cables and connect with adapter

Week #7: June 16th-20th

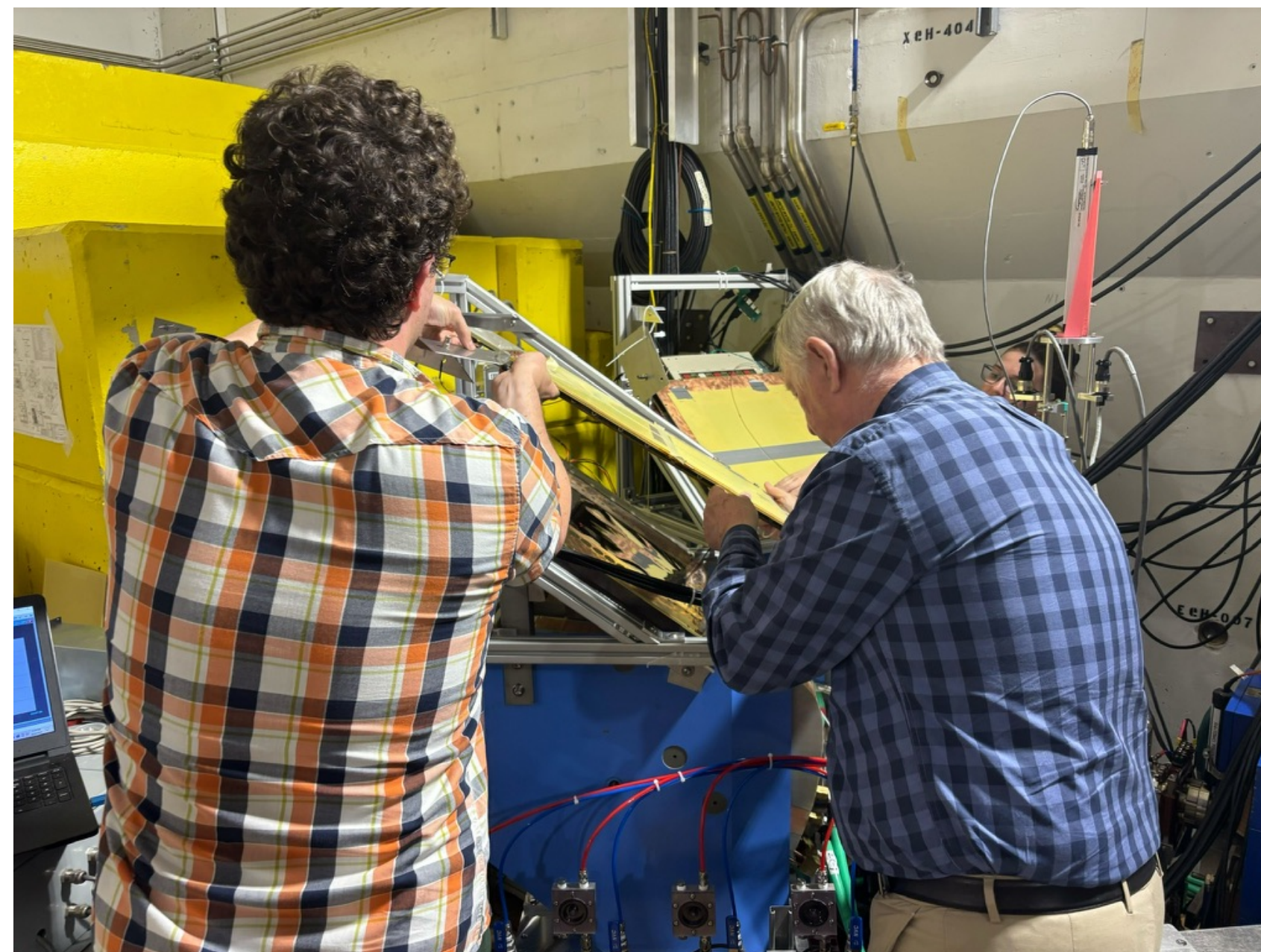
- Water and compressed air connections finished
- Electrical power hooked up for the dipoles
- Bottom GEM on the other arm installed
- Work began on lead shielding
- Vacuum was not reaching the level expected due to off-gassing by the PEEK
 - Small turbo pump temporarily installed on the chamber



Week #8: June 23rd-27th

- Attempt to install top GEM, but interference with the gas tubes and the frame prevented this
- Replaced front bar with one inch piece of 80/20 and top GEMs installed
- Can communicate with APVs on all four GEMs, all four on Ar/CO₂
- Vacuum still not sufficient after pumping down for several days, heat tape applied to bake out the PEEK

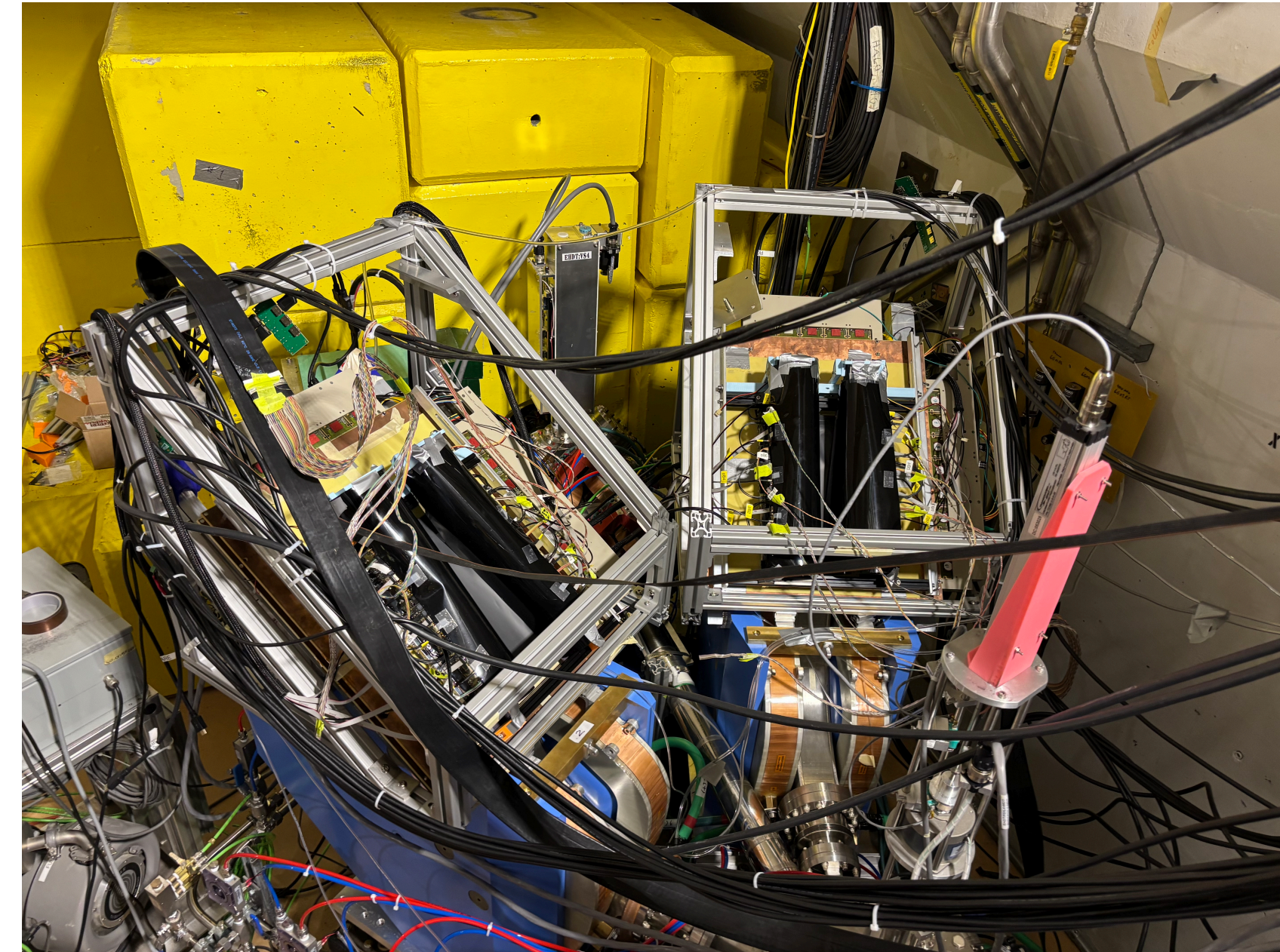
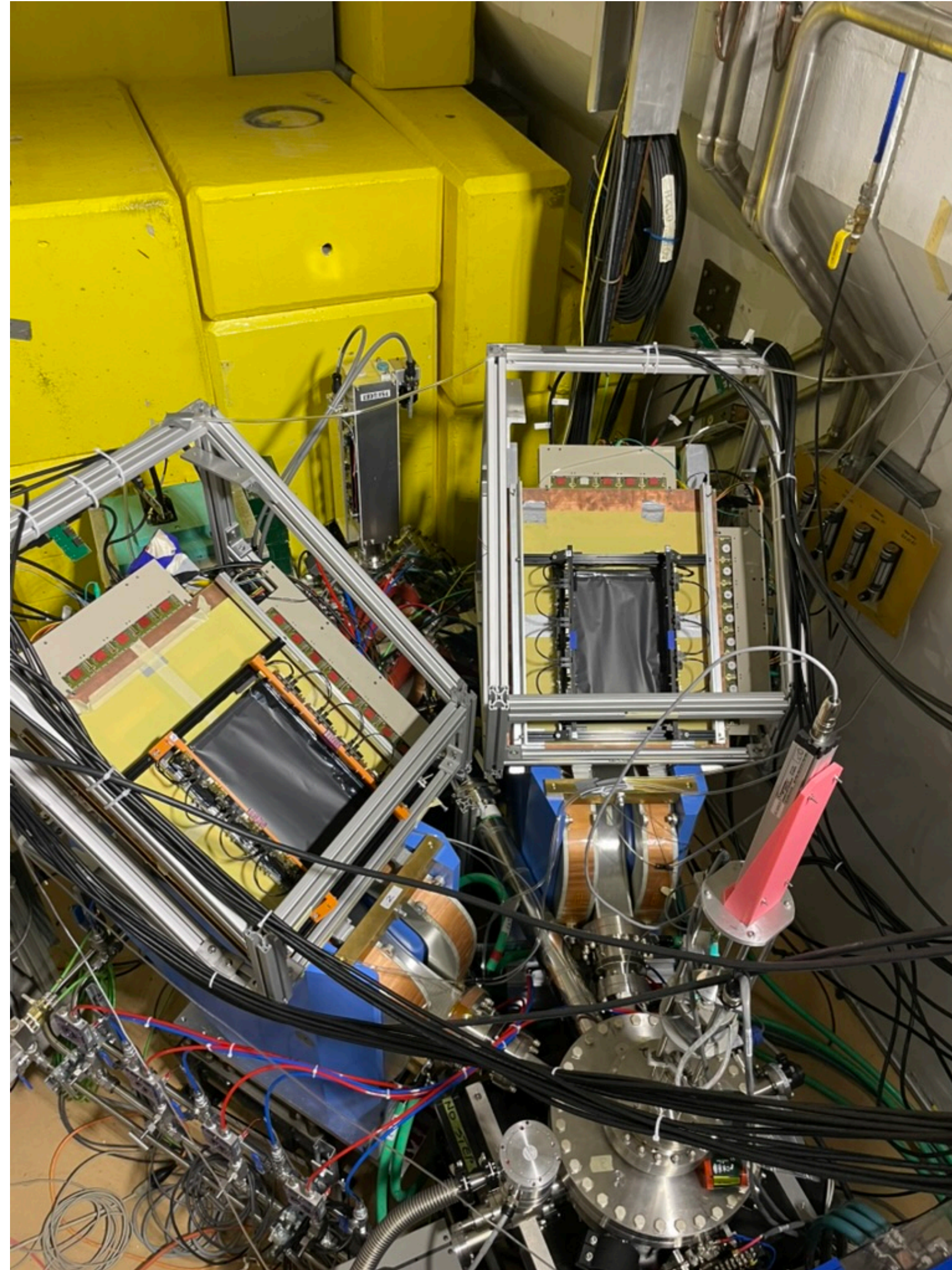
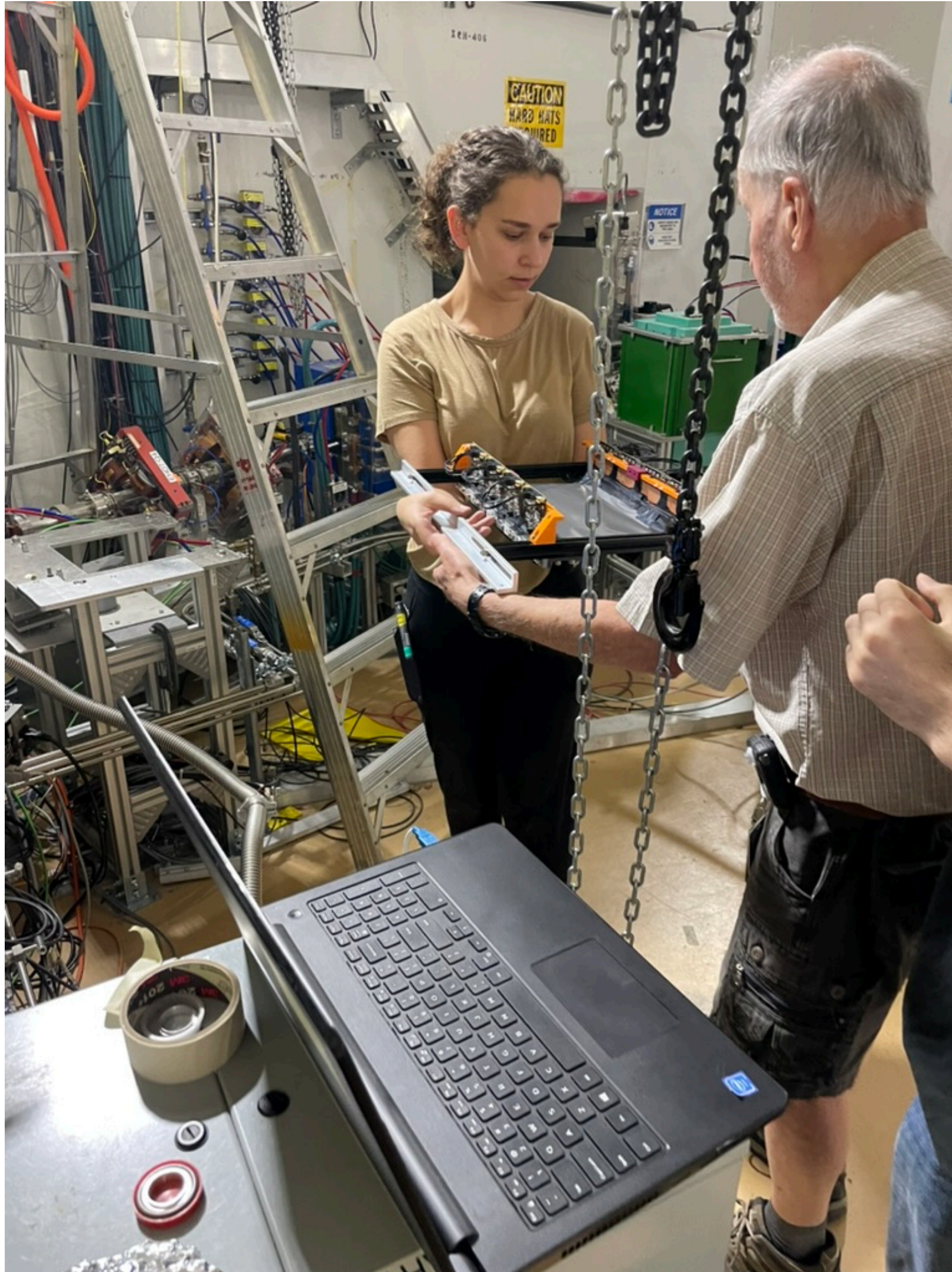
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Week #9: June 30th-July 1st

- Trigger installation

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What's still outstanding

- Positioning of the GEMs:
 - Survey results will be along very soon
 - GEM position may need to be modified to try to get closer to the focal plane
- Efforts to improve the vacuum are ongoing
 - Slow, low temperature bake out continues but seems to have improved things
 - How much it improves is still to be determined
- Minor work still to do with the triggers on the e-hall roof
- Shielding needs to be finished and installed once the e-hall reopens
- Tantalum targets went missing between now and the end of the test run a few years ago, will need to be installed before physics run

Plan for this coming week

- Trigger power connections on the e-hall roof should be completed today
- E-hall is closed from today until further notice so e-gun conditioning can occur
 - Bake-out will continue until e-hall reopens
 - Shielding will be installed once the e-hall reopens
- While the hall is closed:
 - Can take cosmic data to test the DAQ
 - Survey results can be examined to determine how we need to move the GEMs
 - Shielding can be completed and staged for installation

Thanks! Questions?