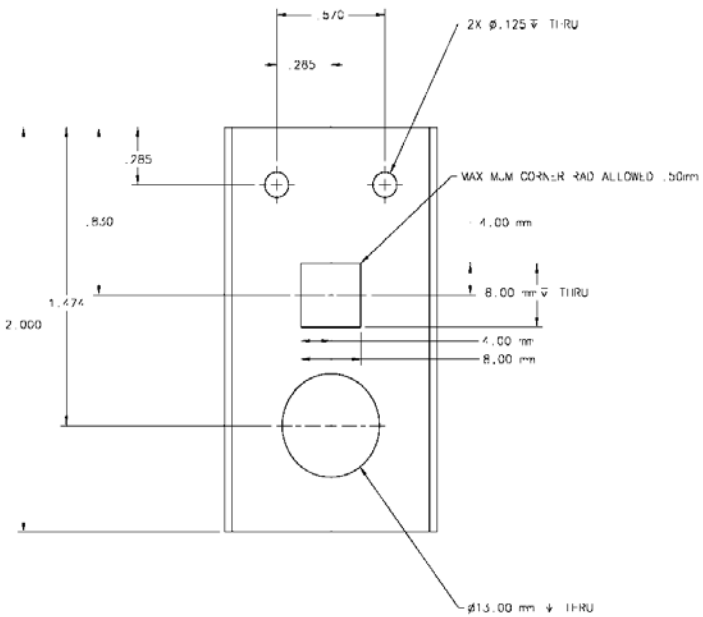
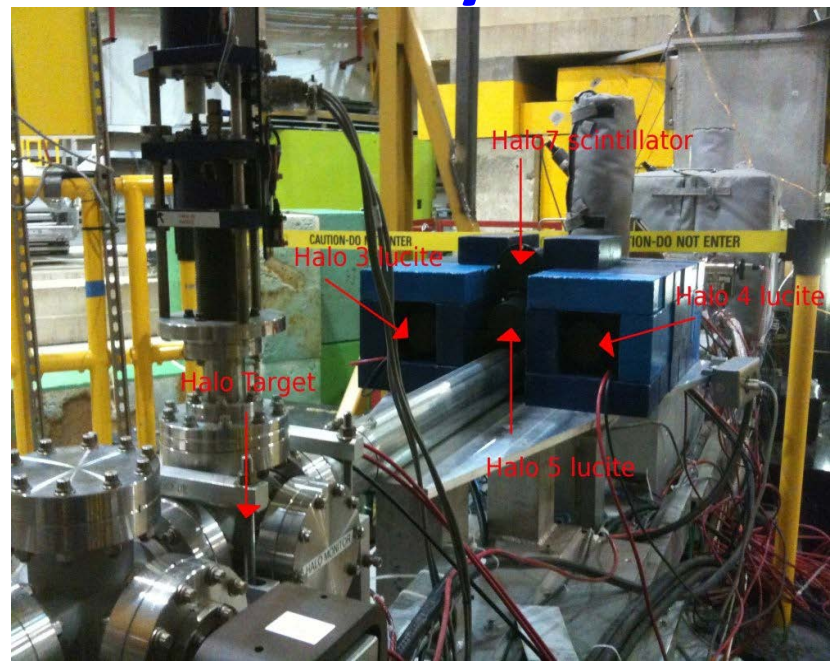
Halo Monitor Plans in Hall A - Discussion

Mark Pitt, Virginia Tech March 17, 2016

- Brief review of halo monitor use during Qweak in Hall C
- What is currently installed in Hall A and observations from Dec. 2015
- Why we aren't using it now and request (to us) for plan

Qweak Beam Halo Measurement System





Halo target: thin aluminum with two holes, mounted near usual Hall C pivot on superharp linear drive mechanism

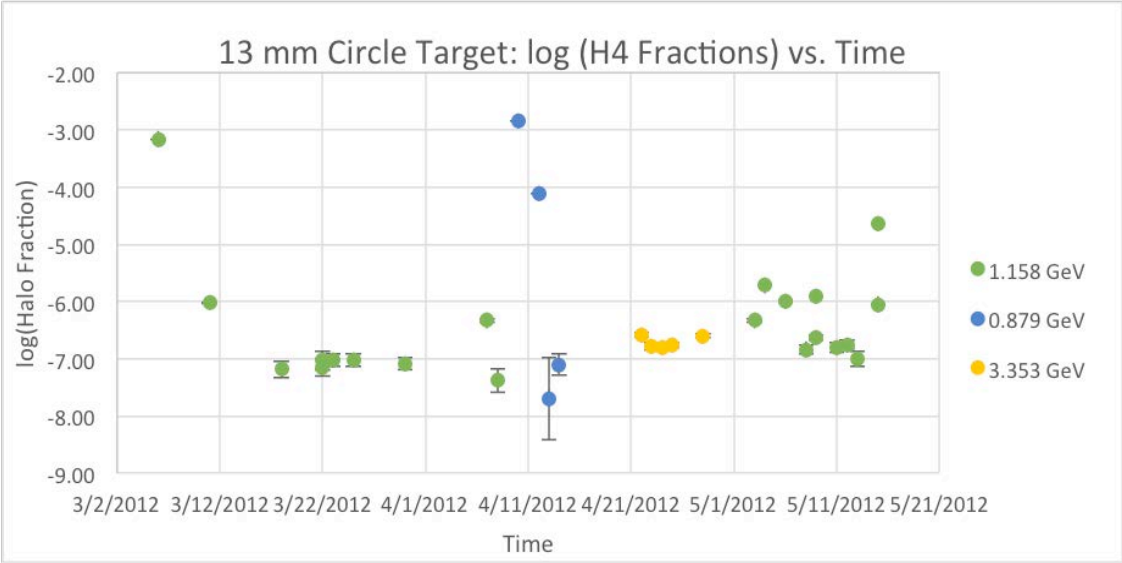
- 8 x 8 mm square hole (for invasive check on beam halo "specs")
- 13 mm diameter hole; to put in place during routine production running

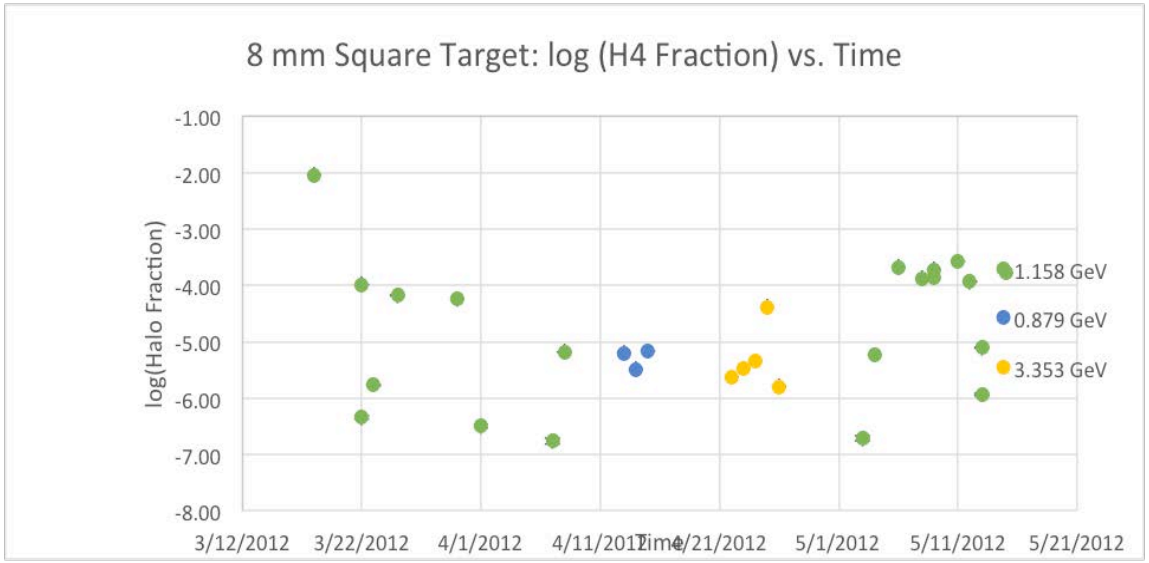
  → size of the smallest aperture in the experiment: tungsten beam collimator

Monitored with lead shielded lucite+ 2 inch PMT "halo monitors"

Calibrated by putting 1 nA of beam directly into halo target frame

Typical Qweak Halo Characterization Results

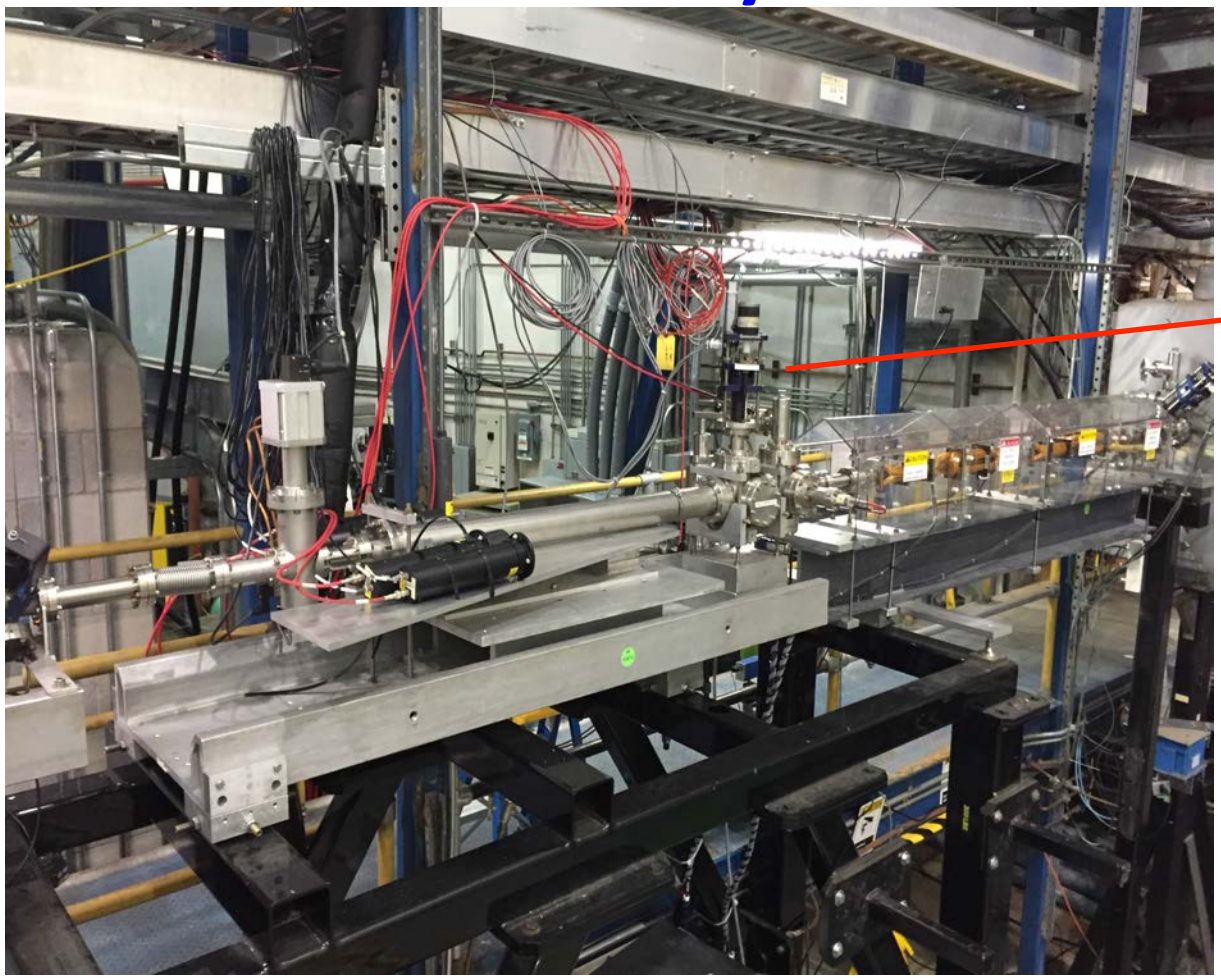




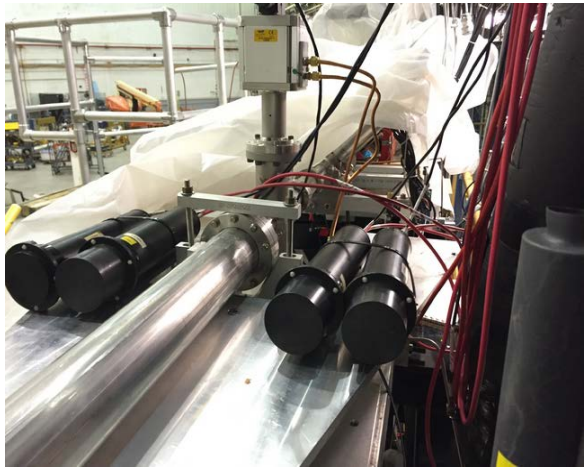
13 mm Halo "Circle" Target: Typical: 10^{-7} – 10^{-6} but as large as 10^{-3} observed

8 mm "Square" Target: Typical: 10^{-7} – 10^{-4} but as large as 10^{-2} observed

As Currently Installed in Hall A

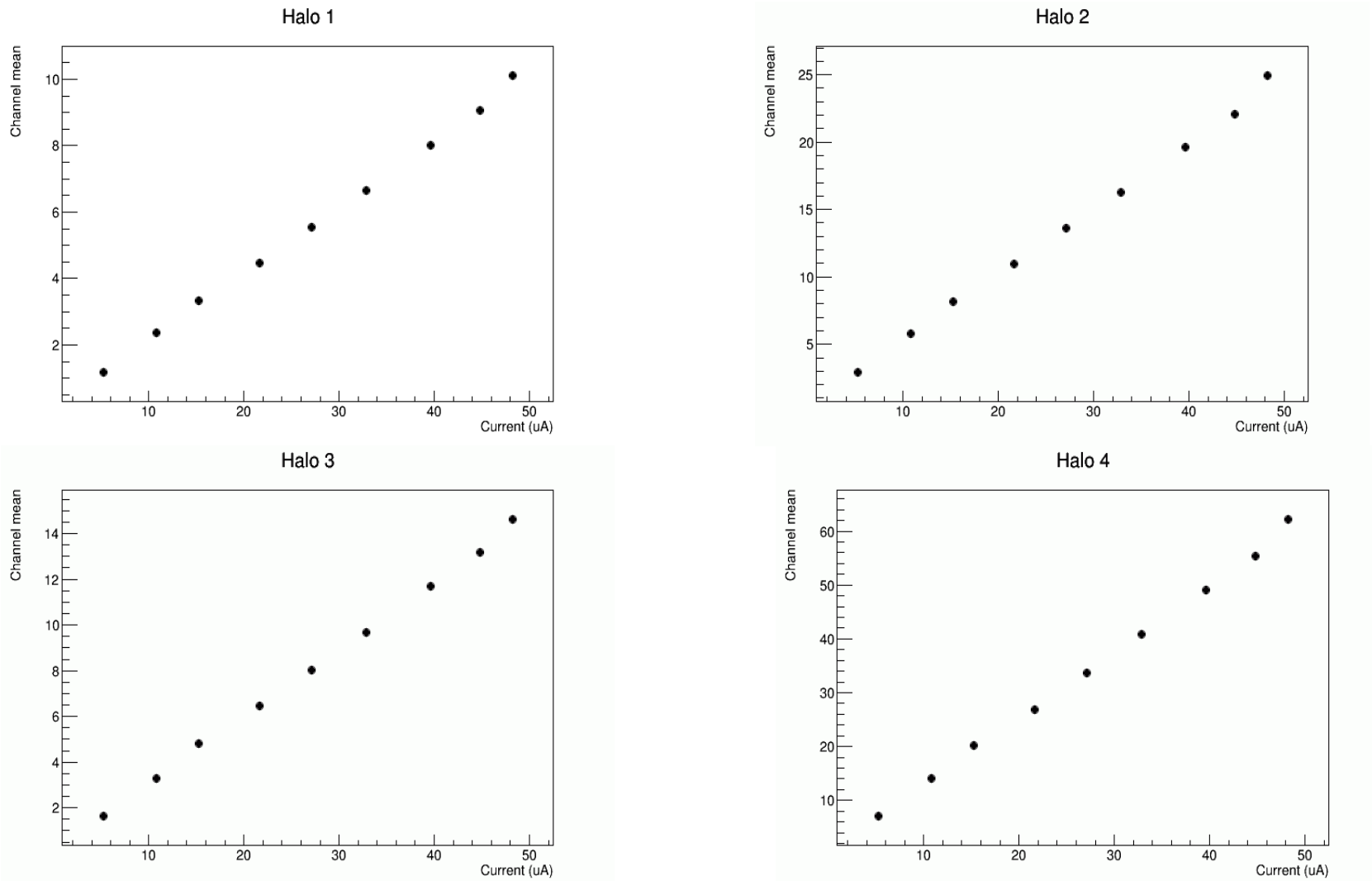


Help me!
I'm locked
out!



- Halo target drive installed (with Qweak target) but locked out
- Four detectors in place (3 lucite, 1 scintillator); tested and working in Dec. 2015

Behavior of Detectors in Hall A in Dec. 2015



- With no target, halo monitors responded basically linearly up to 50 uA
- Need to convert these to rates to insure that these rates are small compared to signal anticipated with halo target in and non-negligible halo

To-do for Halo Monitors in Hall A by end Spring Run

- Check halo rates with target in at various voltages (and again with target out if the opportunity arises): needed to assess whether we need downstream shielding for the monitors
- Convert the DAQ outputs to rates; cross-check with Bob's EPICS scaler set-up

FSD Issue Prevents Using Halo Target in Spring 2016

Subject: Re: FSD request for halo monitor
From: Henry Robertson <robertsn@jlab.org>
Date: 1/27/16, 5:44 PM
To: Cynthia Keppel <keppel@jlab.org>
CC: Omar Garza <garza@jlab.org>, Mark Pitt <pitt@vt.edu>, Yves Roblin <roblin@jlab.org>, "Roger D. Carlini" <carlini@jlab.org>, gomez <gomez@jlab.org>, Jessie Butler <jbutler@jlab.org>, Pamela Kjeldsen <kjeldsen@jlab.org>, "Arne P. Freyberger" <freyberg@jlab.org>, Andrew Kimber <kimber@jlab.org>

Dear Thia,

Myself, Omar, and Pam have discussed this project request. Looking into what may have existed in Hall C, I have found significant information and documentation missing. Some of the staff that developed the data acquisition boards and firmware are long gone from the lab. We do not believe that cobbling a system together that does not meet the real needs of Hall A and the lab in the long term is the right approach. Preferably, a representative of Hall A could develop a set of requirements that includes the desirable controls, the necessary status signals (for Hall A and for Operations), and the complete operation requirements necessary when running beam into the hall, e.g. hardware interlocks, software interlocks, system limits, EPICS/screen requirements.

Henry

From: "Cynthia Keppel" <keppel@jlab.org>
To: "Omar Garza" <garza@jlab.org>, "Henry Robertson" <robertsn@jlab.org>
Cc: "Mark Pitt" <pitt@vt.edu>, "Yves Roblin" <roblin@jlab.org>, "Roger D. Carlini" <carlini@jlab.org>, "gomez" <gomez@jlab.org>, "Jessie Butler" <jbutler@jlab.org>
Sent: Tuesday, January 26, 2016 11:04:36 AM
Subject: FSD request for halo monitor

Dear Omar and Henry,

I am not quite sure who to request this from, but it must at least involve both of you and so I am hoping that you can steer this forward for me?…

Hall A recently installed the (old) Hall C halo monitor in the beam line. I believe that, to utilize this, we should have an FSD to monitor movement on the ICN, MPS. The monitor places ~1/8" Al into the beam.

Please advise, or let me know that this is in the works!

Thanks,
Thia

Plan from a Follow-up Meeting

-------- Forwarded Message --------
Subject: Hall A Halo Monitor
Date: Fri, 5 Feb 2016 13:29:09 -0500
From: Omar Garza <garza@jlab.org>
To: Trent Allison <allison@jlab.org>, Keith Cole <colek@jlab.org>, Pam Kjeldsen <kjeldsen@jlab.org>, Henry Robertson <robertsn@jlab.org>, Cynthia Keppel <keppel@jlab.org>
CC: Andrew Kimber <kimber@jlab.org>, Roger Flood <flood@jlab.org>, Christopher Curtis <curtis@jlab.org>, Jim Dahlberg <dahlberg@jlab.org>, Carlini@Jlab.Org <carlini@jlab.org>

Everyone,
A few of us had a meeting to discuss the Hall A HALO Monitor. I will attempt to summarize our plan.
Please feel free to correct or add anything I may have left out.

* Hall A HALO Monitor will remain locked in the out position to prevent accidental insertion during the Spring Run.
* Upon completion of the spring run, the HALO Monitor will be removed and fiducialized to confirm the slit positions. Per availability of (Alignment Group)
* We will immediately start working on implementing a new FSD/ADC Module to support the HALO Monitor. (EESIC)
* EESIC will provide the Software Group with the required FSD trip windows for the multi-slit target flag. Also, perform final testing of the hardware and software.
* The drive control for the HALO Monitor is already in place and working. Additional parameters may be required. (EESIC & Software)
* Final FSD connections will be handled by (EESSG).
* All PMT data acquisition, associated hardware, and software etc, will be handled by Hall A (HALL A Scientists)
* Final system testing must be completed by August 2016.

Thanks,
Omar

Request from Thia to PQB group

On 02/22/2016 05:50 PM, Cynthia Keppel wrote:

> Hi Omar,
>
> Thank you for following up!
>
> Since we aren't pushing for it for this run anymore, I have given it back to the PQB group to discuss and determine what is truly needed for the long term solution…. do they, for instance, need something that can have multiple positions or is just a "goes in/goes out" really all they will ever use? I appreciate the estimates to bring it to the previous functionality. This will certainly help us in the decision making process.
>
> Very best,
> Thia

- Quick answer to her direct question: Yes, we definitely need multiple positions

Thoughts for Discussion

- Things to be decided for plan to Omar/Thia:
  - Is 2-axis functionality needed (my answer: probably not, for now. BUT would FSD hardware/software need to be radically upgraded if we add two axis capability later?)
  - How many positions do we need to define for running beam to be allowed without masking FSD?
  - Fiducialization for the alignment group would primarily be for setting the left-right alignment; in principle we can tie that together to the aligned stripline BPMS and known "nominal" beam positions there to "guess" at the left-right alignment (Qweak required a two-step process to get it right: determine nominal beam trajectory and then remachined target with holes offset in the horizontal)
  - What is maximum number of holes we could in principle put on such a target?

- Make new target after spring run to be installed when the alignment group fiducializes
  - Mark can try to guess at left-right offset (if needed) based on stripline BPM data and stripline BPM survey reports (maybe…)
  - Can somebody help to figure out what actual shape/size of beamspot is at location of halo monitor? (which is not too far from the extended raster magnet system)
  - We need to choose size/shape for at least two holes in target:
    - Invasive check on beam halo specs.
    - Check on smallest aperture in beamline

- Need to start thinking about how to use superharp upstream of halo monitor along with the halo monitor detectors to characterize the beam halo profile (as we did a bit during Qweak). Would it be good to have carbon wires for this?