GEn-II Polarized ^{3}He Target Plan

G. Cates - UVa

March 14, 2022

GEn-II target installation and commissioning team

(only physicists shown on this page)

- UVA
  - Gordon Cates
  - Huong Nguyen (senior res. scientist)
  - Vladimir Nelyubin (senior res. scientist)
  - Al Tobias (staff)
  - Hunter Presley (grad student)
  - Chris Jantzi (grad student - graduating)
  - Mingyu Chen (grad student - graduating)
- William and Mary
  - Todd Averett
  - Jack Jackson (grad student)
  - Kate Evans (grad student - part time GEn-II)
  - Junhao Chen (grad student - graduating)
- JLab
  - Jian-Ping Chen
  - David Flay (staff)
  - Arun Tadepalli (staff)
  - Bill Henry (post-doc)
- Univ. of Kentucky
  - Wolfgang Korsch
  - Murchana Roy (grad student - graduating)
- Temple
  - Melanie Rehfuss (grad student - graduating)

Core groups at present by location

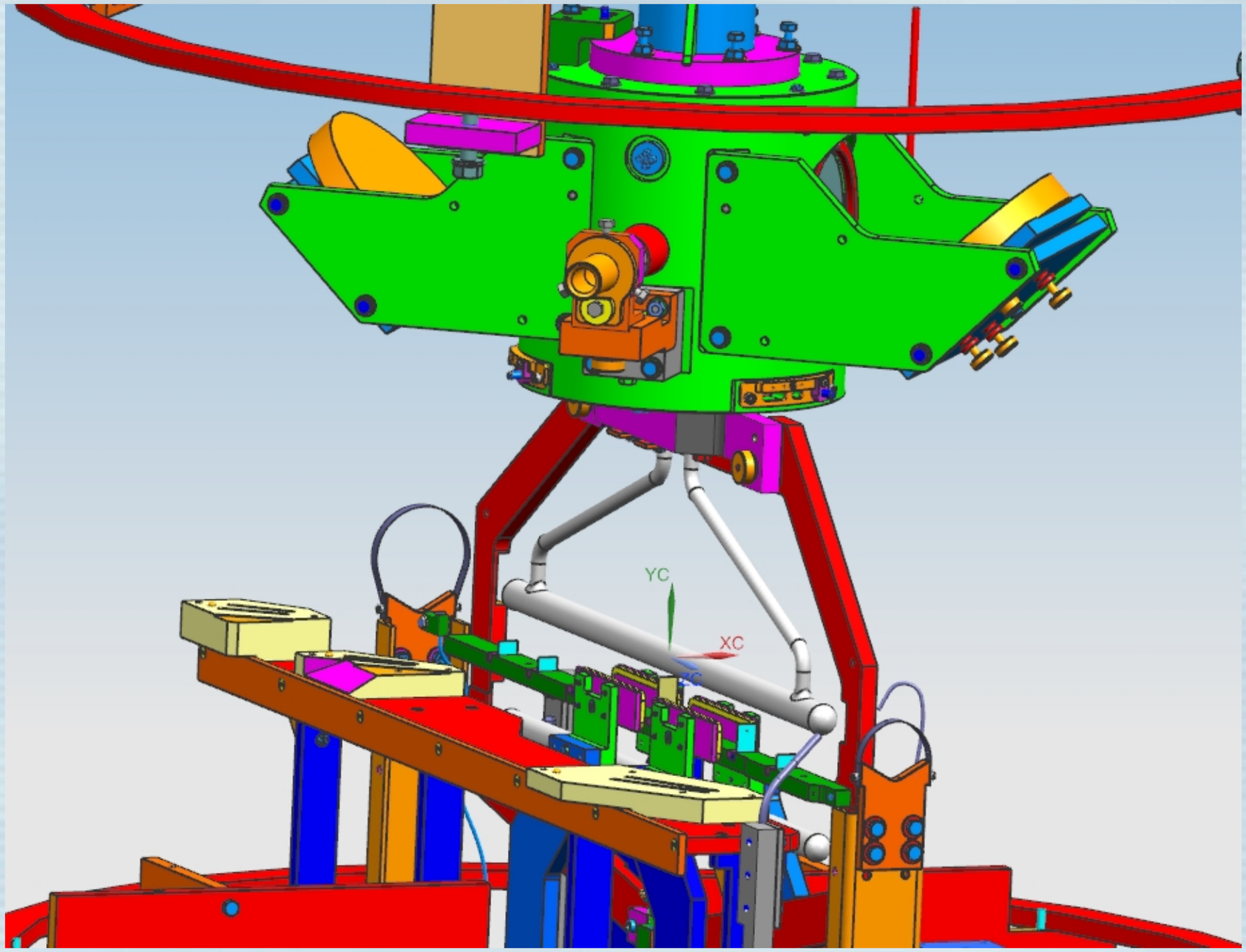
(only physicists shown on this page)

- Local to JLab right now
  - Jian-Ping Chen
  - David Flay (staff)
  - Arun Tadepalli (staff)
  - Bill Henry (post-doc)
  - Todd Averett
  - Jack Jackson (grad student)
  - Kate Evans (grad student - part time GEn-II)
- Local at UVa right now
  - Gordon Cates
  - Huong Nguyen (senior res. scientist)
  - Vladimir Nelyubin (senior res. scientist)
  - Al Tobias (staff)
  - Hunter Presley (grad student)
  - Chris Jantzi (grad student - graduating)

Most of these people will be full or part-time at JLab by this summer

GEn-II Polarized ^{3}He Target System

GEn-II Polarized ^{3}He Target Ladder



Jessie's GEn-II target installation schedule

(Periodically updated - most recent from March 3rd)

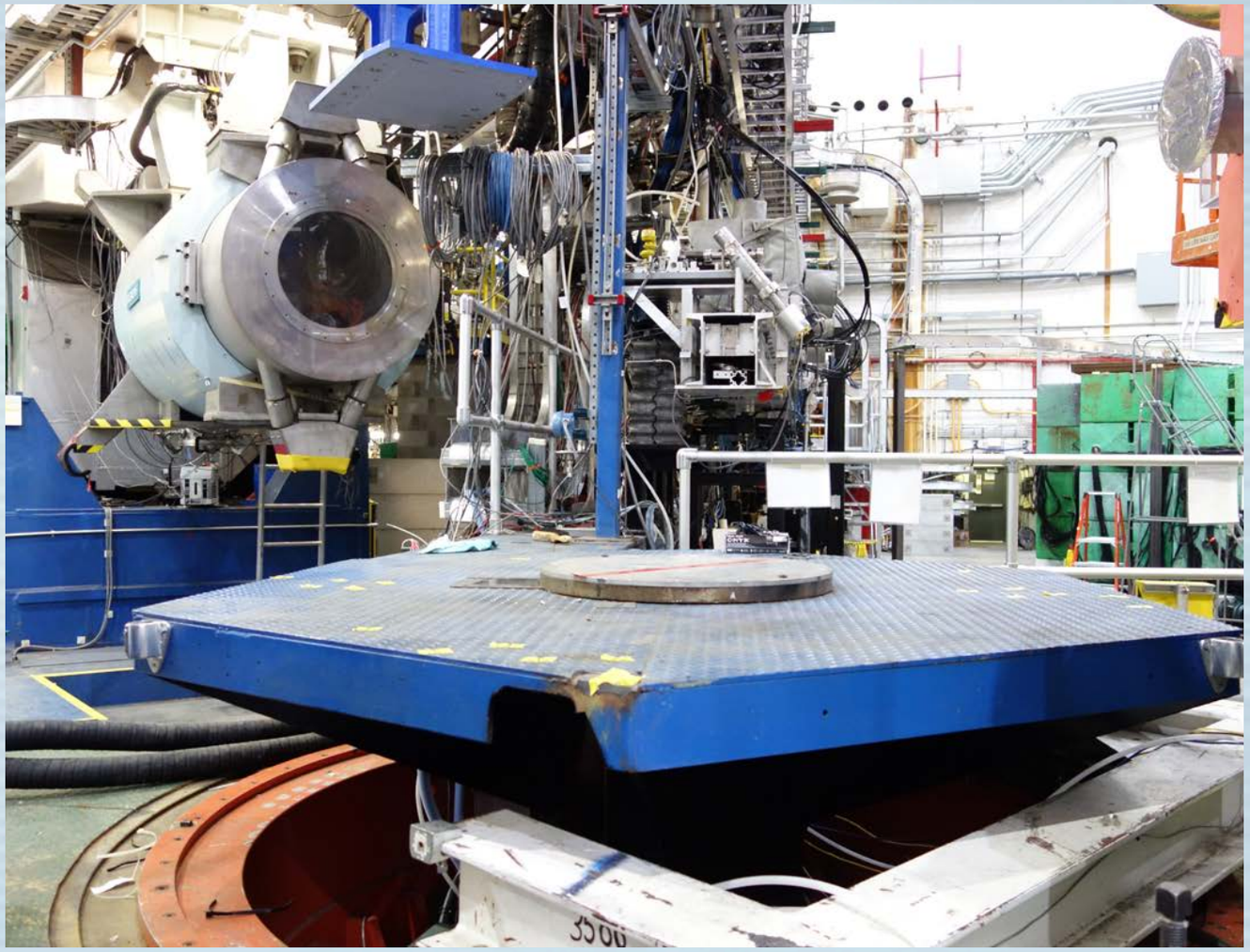
A few dates (among many!)to give a feeling for the overall schedule

These dates will move around somewhat as the interdependencies of the different tasks are further analyzed, but I give them to provide a feel for the timeline.

- Deinstallation of GMn - Feb. 21, 2022
- Helmholtz coils move to Hall A - March 7 (actual)
- Survey and alignment prior to installing coils (March 8)
- Install top cover of magnetic shield (April 8th)
- Install laser box frame around target mechanism (May 30th)
- Laser/Optical system checkout (June 15th)
- Commissioning begins (July 14th)
- Commissioning complete (August 24th)

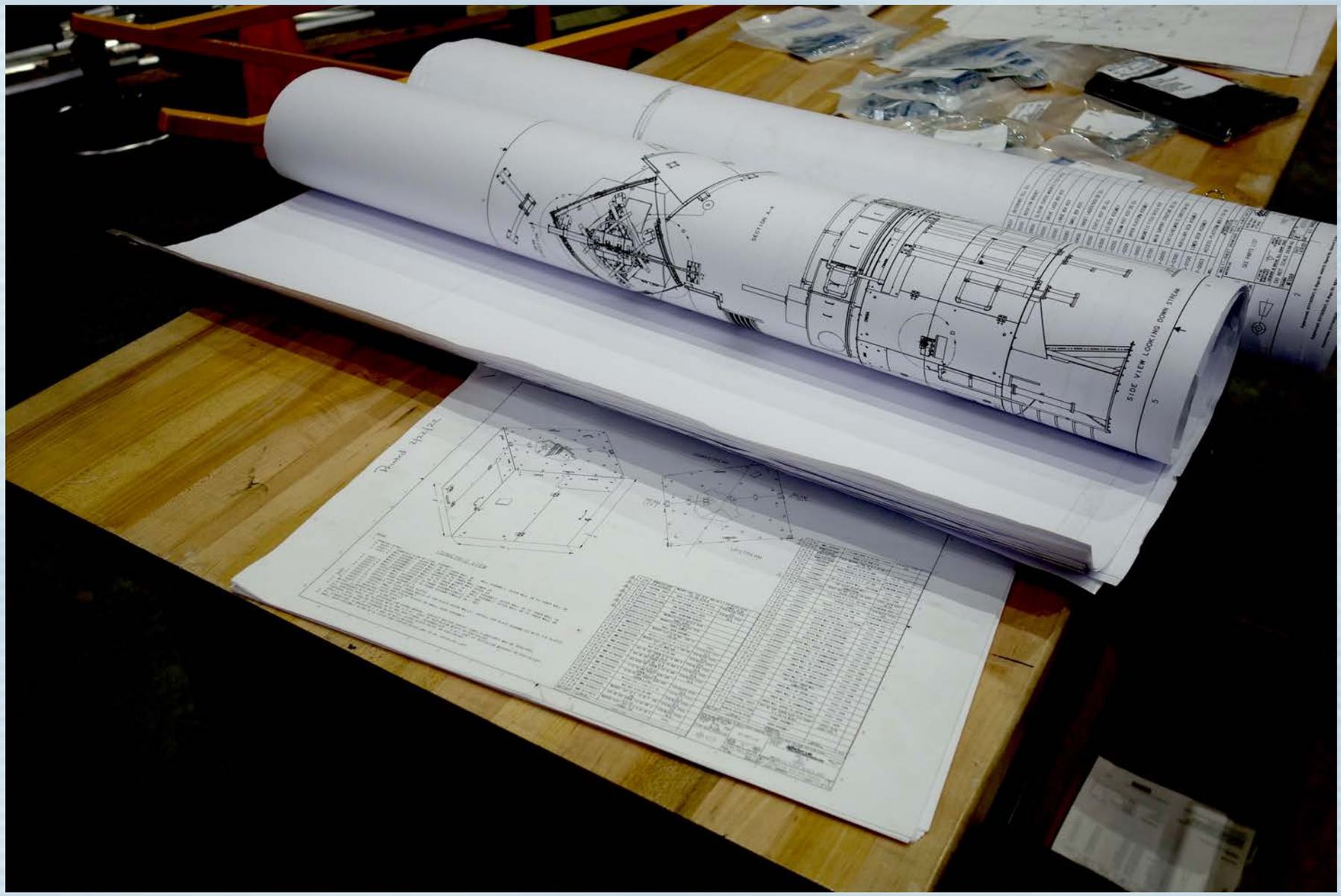
GEn-II installation begins

The cryo-target being moved out on February 22nd.

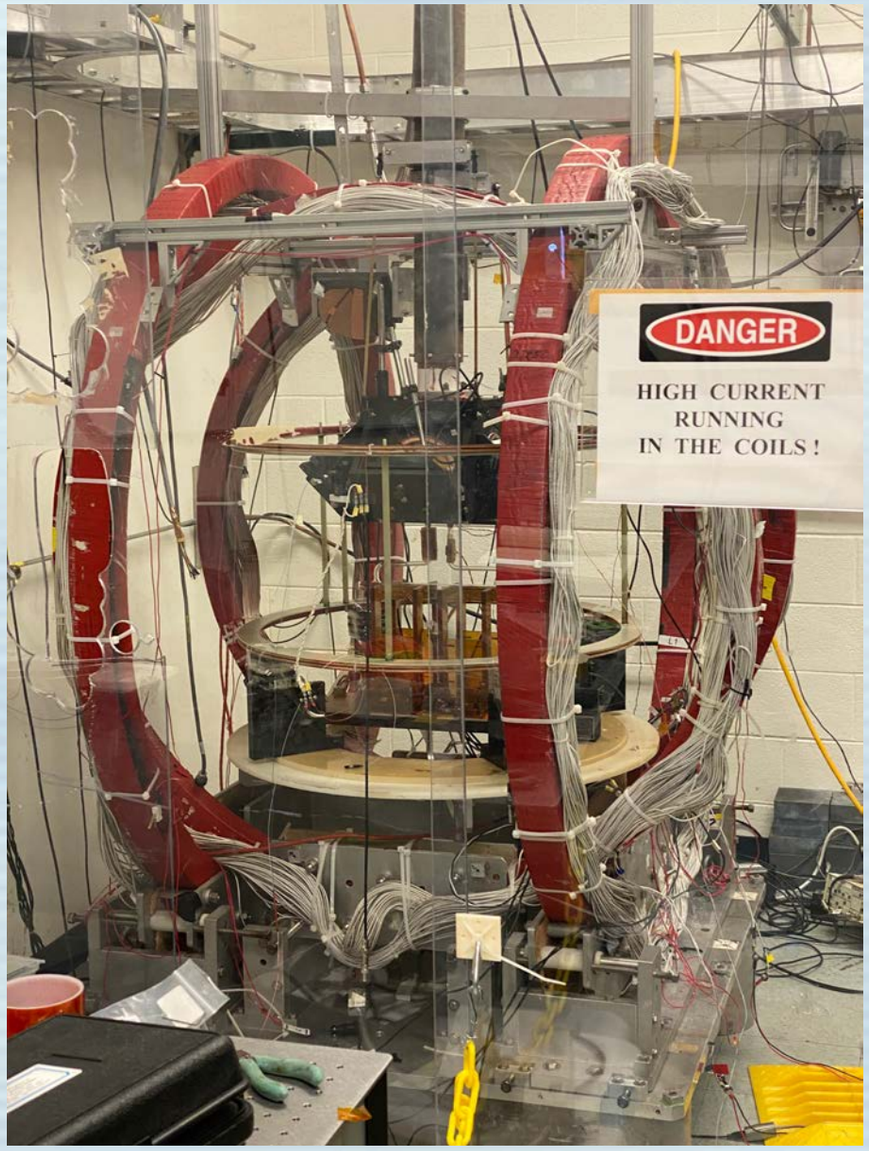


The cryo-target being moved out on March 2nd.

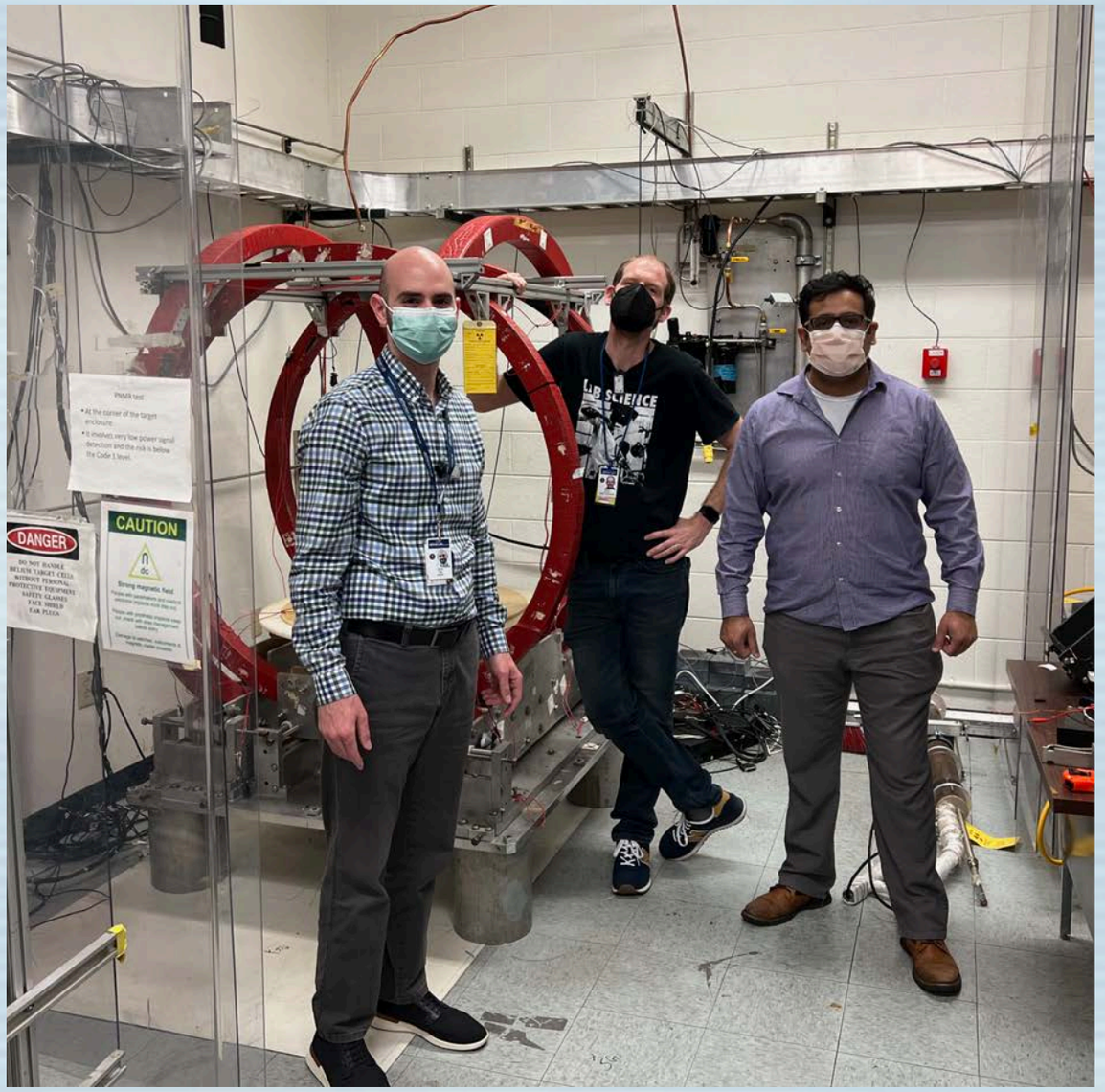
GEn-II installation begins



Preparing the Helmholtz coils to be moved



The setup in the target lab on March 2nd.



David. Jack and Arun after preparing the coils to be moved on March 2nd.

Detailed target plan for the physicists

Still a work in progress, but a good start

Current draft of target installation and commissioning plan

GEn-II target installation tasks

Draft version 1.1 — March 10, 2022

The list below uses Jessie's schedule as a starting point. I have included tasks that either we expect to do ourselves, or are tasks with which we might want to be monitoring closely. The tasks are grouped as they appear in Jessie's schedule. However, they are ordered according to the date on which they supposed to be completed. While I expect that we will want to organize this list somewhat differently, I am hoping it is a decent starting point.

Task	Start date	Lead person
Laser Room Activities	2/8 - 3/7	Jian-Ping
Order Lasers Complete		
Laser Room Clean up Complete		
Prepare/Clean Laser Fibers		
Pull Laser Fibers: LR to Hall		
Set Up Lasers		
Set Up Computers		
Set Up Interlocks		
In-Situ Laser Test		
Test Interlocks		
Circular Raster	2/8 - 3/10	David
Install Hardware		
Testing and Optimization		
Run Ethernet Cable From CH to Hall		
Install Data Acquisition System	2/8 - 4/20	Arun, Hunter and Target team
Install Control Software		
Install Readout Software		
EPICS Interface w/ LabVIEW		
Install RTD Readout Connections		
Test Operations		
Install CW NMR System	3/14 - 4/22	Gordon and Jack
Fabricate and Install Pickup Coils		
Pull Cables: Pivot to Counting House		
Install RF Generator, Circuitry		
Acquire Patch Panel		
Install NMR Electronics in Counting House		
Final Installation and Checkout		

Current draft of target installation and commissioning plan

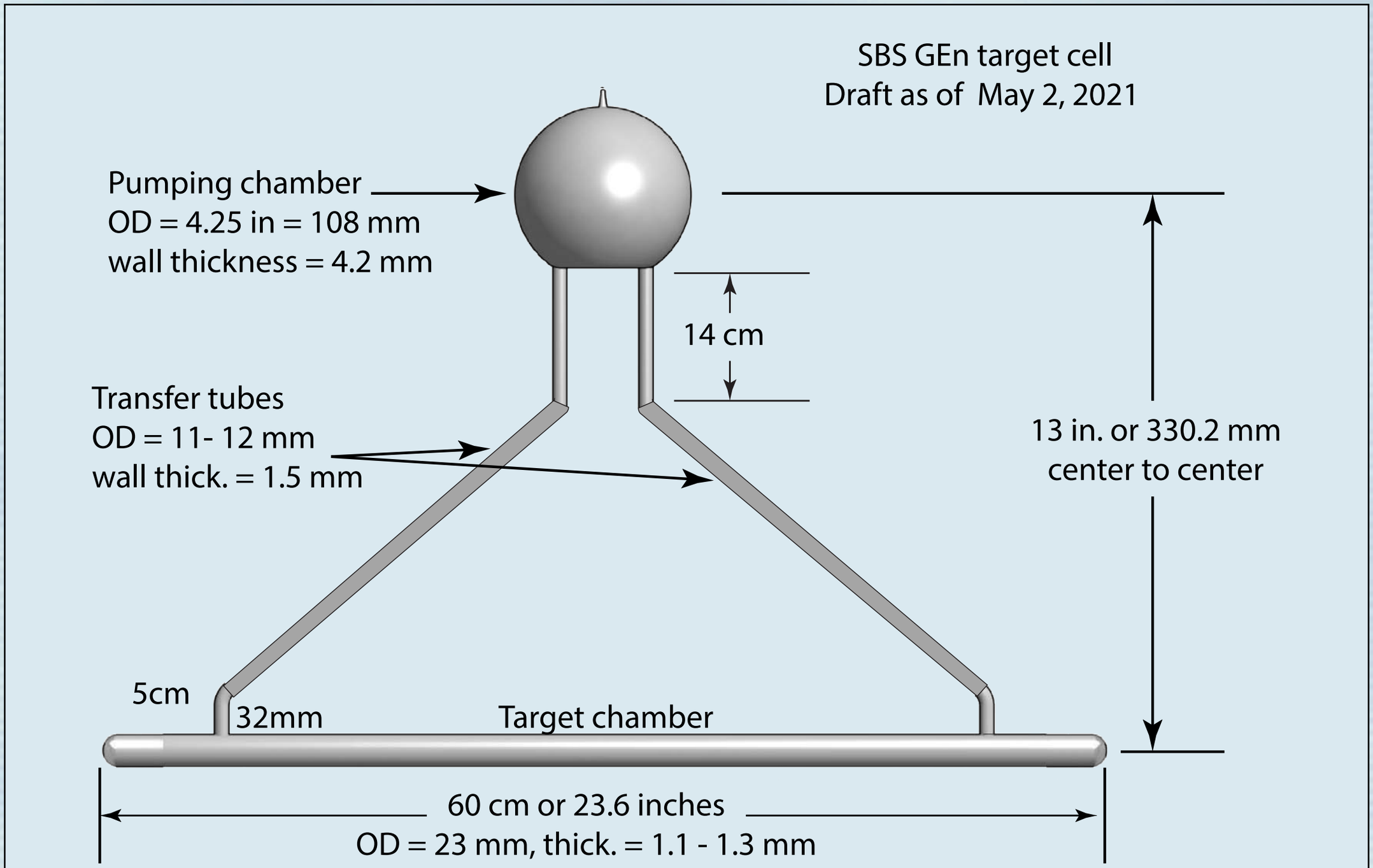
Task	Start date	Lead person
^{3}He Cell Preparation	2/8 - 4/26	Arun and Kate Evans
Acquire RTDs		
Fabricate RTDs and Wiring		
Attach and Prepare Wiring to RDTs		
Attach RTDs to Cell		
Install Heater Coil		
Mount Cell to Bottom Plate		
Mount Cell to Ladder		
Alignment of Cell on Ladder		
Survey and Alignment		
Install Oven Heater System	5/2 - 5/20	Todd
Install Heater Systems (x3)		
Notify Newport News Fire Department (via Tim M.) About Enclosure		
Install Oven		
Newport News Fire Department Inspection of Enclosure		
Connect Air Supply/Filtering System		
PID Control Hardware		
PID Control Software and Optimization		
Install Laser Box Frame Around Target Mechanism		
Install Target Mechanism	4/13 - 5/27	Todd and Bert
Install Ladder		
Install Carbon Foils and Holes		
Install Reference Cell		
Install Gas System		
Connect Gas System		
Motion Control (Motors, Control Hardware,)		
Install FSD Interlocks		
Survey and Alignment		
Test Motion and FSD		
Install Camera		
Install Laser Optics System	6/1 - 6/24	Gordon
Install Breadboards		
Install Optics Elements (Mirrors, Splitters, Stanchchion)		
Install Laser Fibers in Box		
Install Laser Fiber RTDs		
Install Fans Pointing Towards Laser Fiber Tips		
Survey and Alignment		
Install Enclosure		
Install Interlocks for Panels		
Laser/Optical System Checkout		

Current draft of target installation and commissioning plan

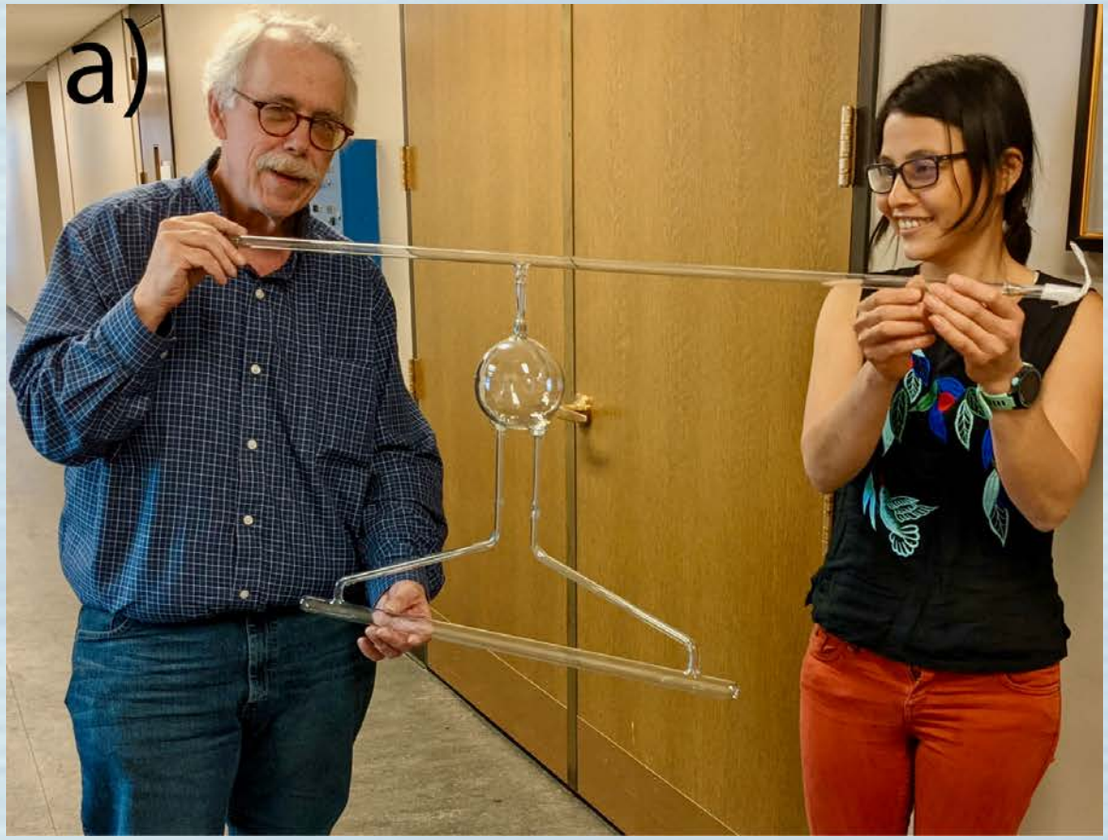
Task	Start date	Lead person
Connect Alarms and Interlocks (Hardware)	6/13 - 7/15	Jian- Ping and Mark Taylor
Target Enclosure		
Laser Interlock the Hall		
FSD: Target Motion, Lasers, Cooling Jets, Temperature		
VESDA Interface		
Testing		
Connect Alarms and Interlocks (Software)	6/27 - 7/15	Arun
Lasers		
Laser Enclosure		
3He Cell Temperature		
Target Motion		
FSD		
Testing		
Magnetic Field Testing	6/13 - 7/1	Bogdan
Install Compass 1 (JLAB)		
Install Compass 2 (UVA)		
Install Power Supplies (Helmholtz Coils, Correction Coils)		
EPICS Interface to LabVIEW (Software)		
Install Magnetometers		
Measure: B Field Direction		
Measure: B Field Magnitude/Gradient		
Survey and Alignment		
Install EPR System	3/14 - 7/13	Gordon and Jack
Acquire RAD-Hard Photodiode		
RF Coils		
Pull Cables: Pivot to Counting House		
Install Circuitry		
Acquire Patch Panel		
Install Electronics in Counting House		
Final Installation and Checkout		
Install GEn Equipment	2/28 - 7/15	Gordon and Bill Henry
Install HelmHoltz Coils Power Supply		
Connect Leads Between Power Supply and Magnet		
Cooling jets		Todd and Bert
Alignment		David

Target Cell Production

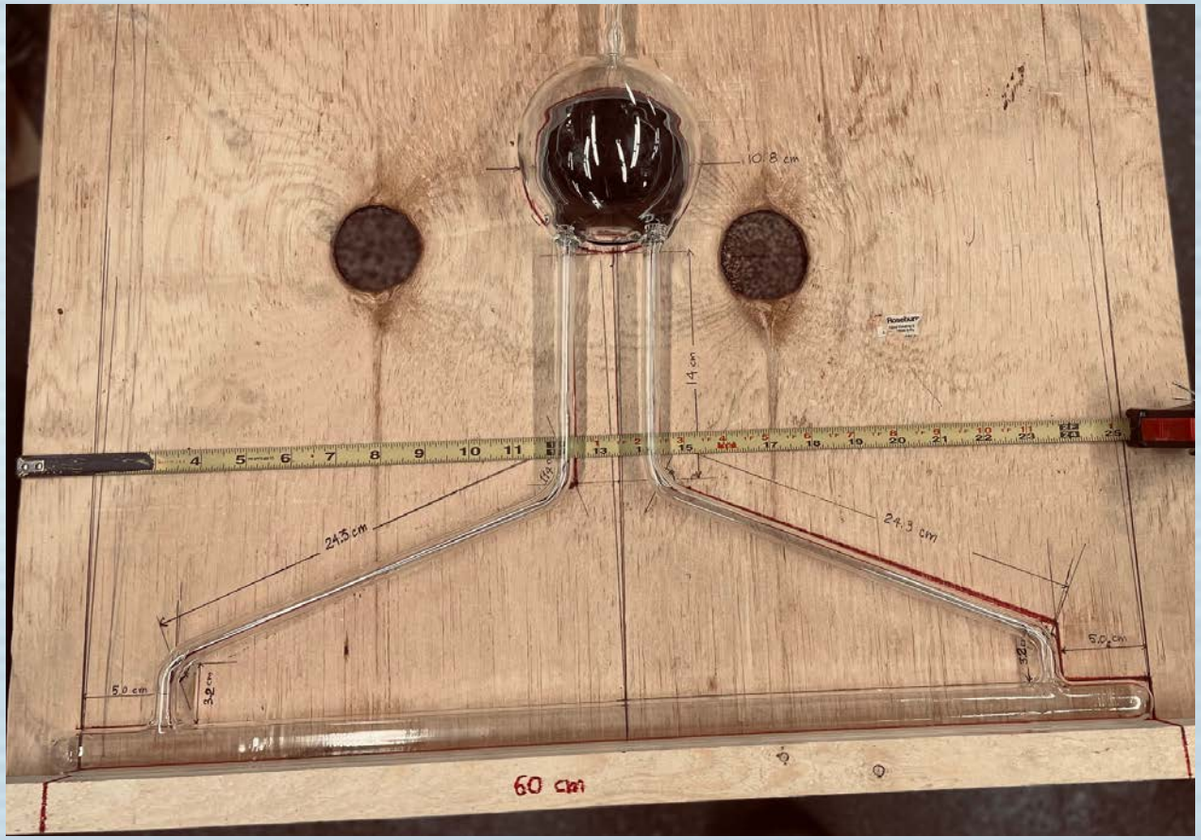
GEn target-cell design



Cell Fabrication at Princeton



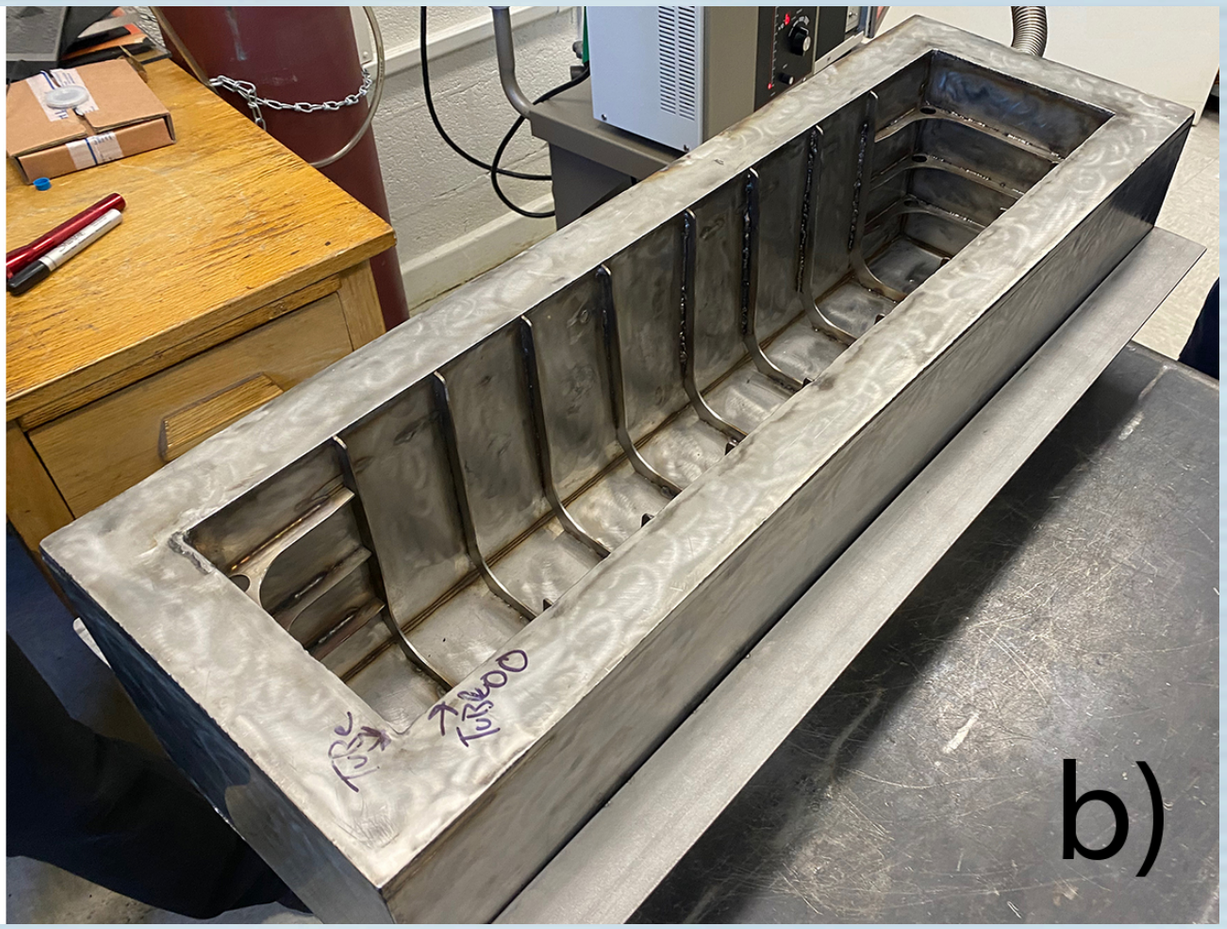
Prototype cell Talisker



Jig for maintaining tolerances

Baking oven and new liquid helium dewar both complete and in use

Bake-out oven for large (60cm) GEn-II cell design



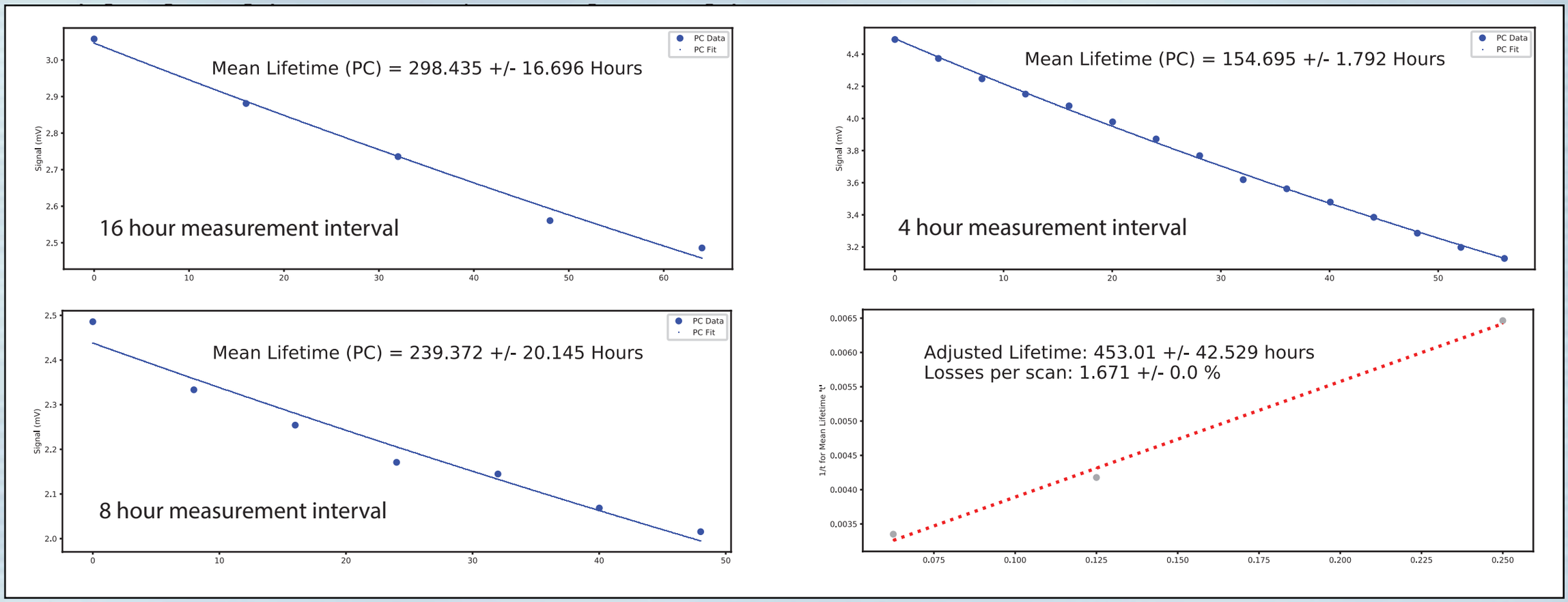
LHe dewar for large (60cm) GEn-II cell design

Selected dates leading up to full-scale production

- Prototype Talisker filled - 9/2/21
- First production cell Triviline filled - 12/20/21
- Tiger mounted, but removed due to concerns regarding both contamination and annealing technique - 1/20/22
- Mike Souza's annealing oven modified to hold fully assembled cell, first week of February.
- Test cell Kappa11 filled 2/17/22
- Kappa11 raw lifetime measured to be 298 hours (longest ever measured in our lab).

- Failed attempt to fill A'bunadh (3/11/22)
- Expected arrival date for re-annealed Tiger and Ukraine - 3/15/22
- Expected fill date for next cell - 3/26 or 3/27/22.

Kappa11 results



- Raw lifetime of 298 hours observed, longest ever.
- Adjusted (Intrinsic) cell lifetime of 453 hours.
- Lifetime associated with wall relaxation: 800 - 1000 hours
- Exquisite test of cell-production apparatus.

Cell Production Timeline

- Expect to fill up to eight additional cells by August 1st.
- Need 5-6 good cells for the run, consistent with expected yield (7 out of 11 at UVa for A1n and d2n).
- William and Mary available to fill cells if needed.
- Additional cells can be filled after the beginning of the run if necessary.