



SLAC System Test Update (+)

Kimberly Palladino

September 1, 2015



Work remaining to Run 1

- Internal cabling/camera fibers attached to feedthroughs and final CF connections made atop main flanges
- Cabling to PLC
- Continued work on slow controls
- Lower flanges to operational height, build out Xe vessel and internals
- Reworking 2 Phase heat exchanger, installation of final Purification tower parts
- Small plumbing tasks remaining
- Additional small tasks (1 PMT hook up, etc)
- Safety paperwork and pressure tests

Same as last week



Schedule Update

- Milestone update (first liquid run):
 - Gas system pressure testing ~September 9
 - Start of first run with Xe (no TPC) ~September 14
 - Circulation and purification starts ~September 16
 - Trying hard to get things turned on before Coimbra!
- Milestone update to TPC (slips linked to SLAC upper corner drawing status)
 - Fabrication of new Xe vessel at UW imminent
 - Fabrication of LBNL TPC parts underway
 - LBNL parts arrive week of September 21-25
 - Assembly at LBNL starts September 28
 - SLAC parts arrive ~October 23
 - TPC comes to SLAC ~October 30
 - Pumpdown starts November 6
 - HV testing starts November 20



Compressor



- Turned on in manual mode last week (temporary cooling water too)
- Some changes to be made for instrumentation and controls
- Baseline info for Ar flow rates vs restriction



More things

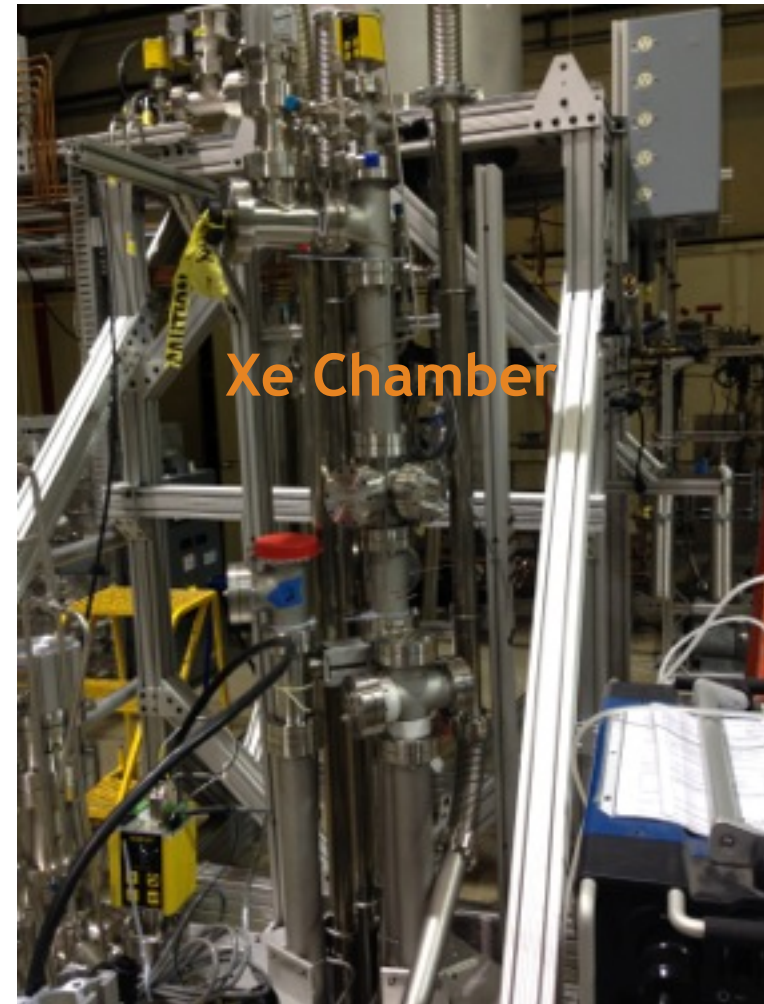
- Booking my Coimbra travel
- Official application to join LUX is in, month countdown started last Wednesday, my membership will date to last October.
 - Will be talking to the DD and simulation groups with Shaun actively in the next week
 - Shaun and I will plan to go to analysis workshop and LUX meeting in Albany week of Oct 19
- Proposal writing dedication about to begin



Backup slides



Populating Flanges







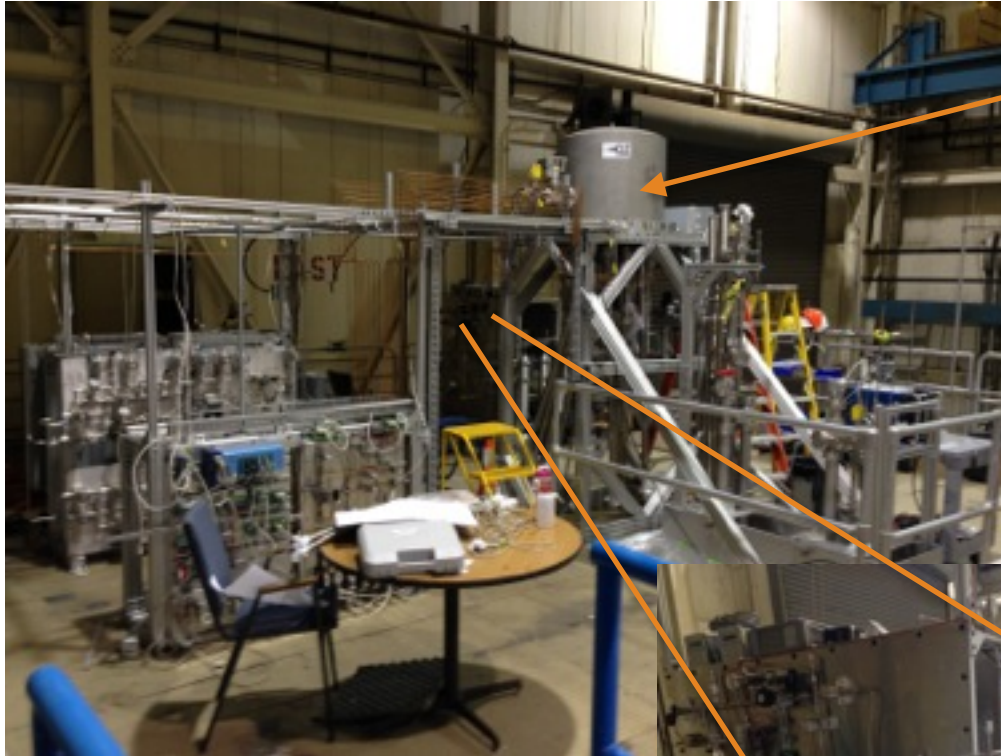
SRV



- SRV vessel and thermosyphon line installation complete
- Cabling to PLC complete
- Final hookup of gas cylinders remains



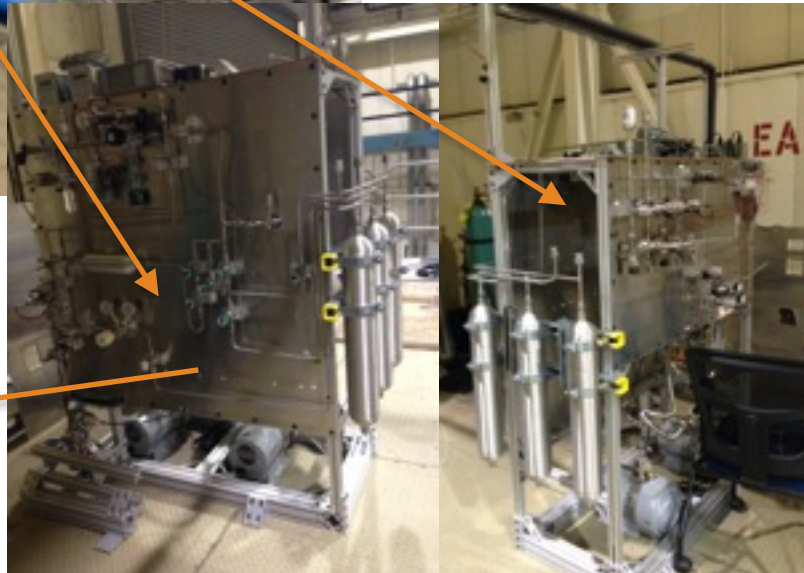
Hardware update: Deck



Thermosyphon work in last 2 weeks to repair plumbing and temp sensors

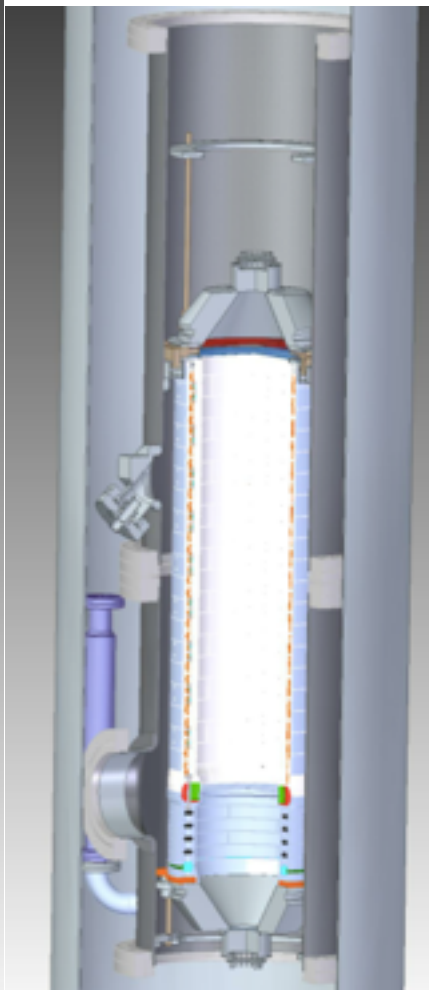
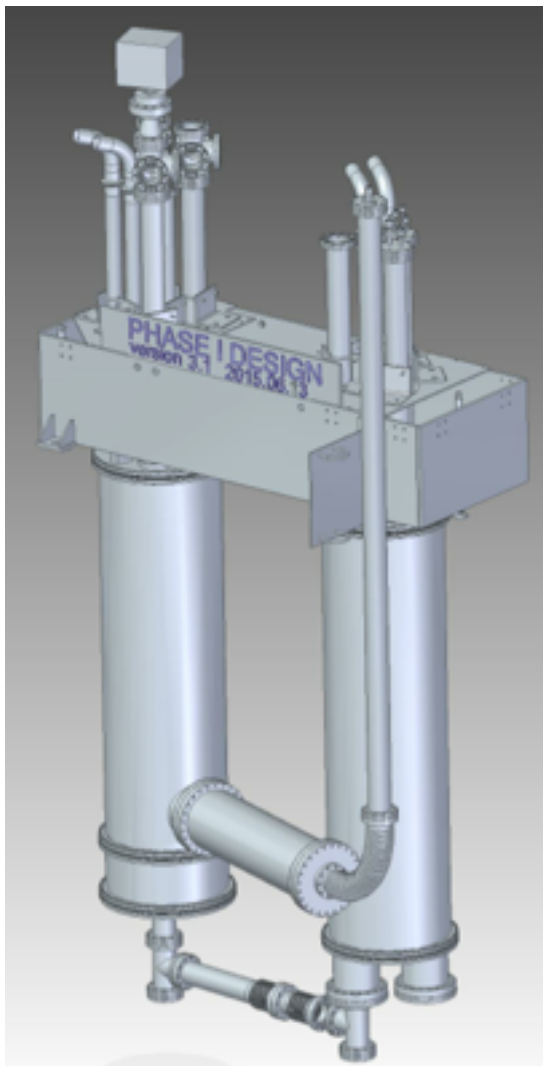
Cabling to PLCs ongoing

Sampling system (mainly Kr removal) installation by UMD group





Design Work 7/1/2015

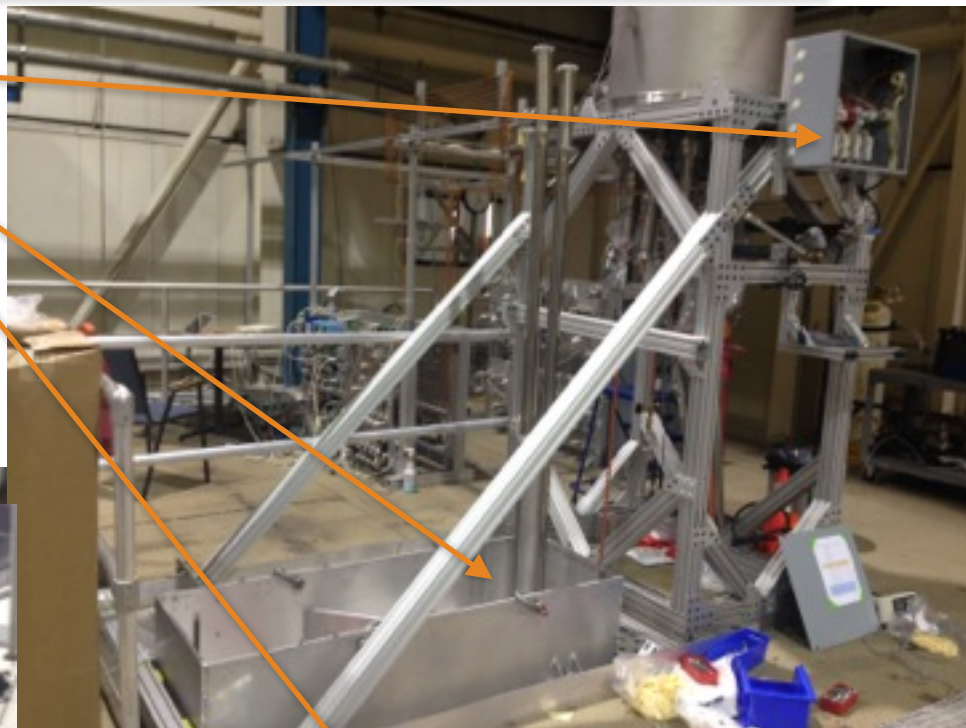


- Much progress on
 - Big picture of TPC in vessels
 - Vessel suspension
 - Feedthroughs
 - Cabling
 - Plumbing
- Work will continue, some decisions will be made in situ



Hardware update 7/21

- Heater box mounted
- Vessel vacuum flanges raised to deck to attach feedthroughs and plumbing
- Starting cleanroom-ifying stand





Plumbing Update 7/21



- 1" lines to circulation pump almost complete
- Electricians will do wiring in next 2 weeks for PLC and motor control box
- Chilled water also in queue
- Remaining plumbing to be done is to main vessels and SRV



Plumbing Update 7/9/2015



TS lines complete,
half of the pneumatic lines complete
Xe lines in progress
Getter arrived!





More plumbing updates



- Working on TS connections and top feedthroughs to the Purification tower and Xe vessels
- Planning for LN line to fill dewars outside, venting LN boil off, and Xe lines to the compressor shack
- SRV panel mounted and reassembly of vessel
- Leak checking N2 lines and panels

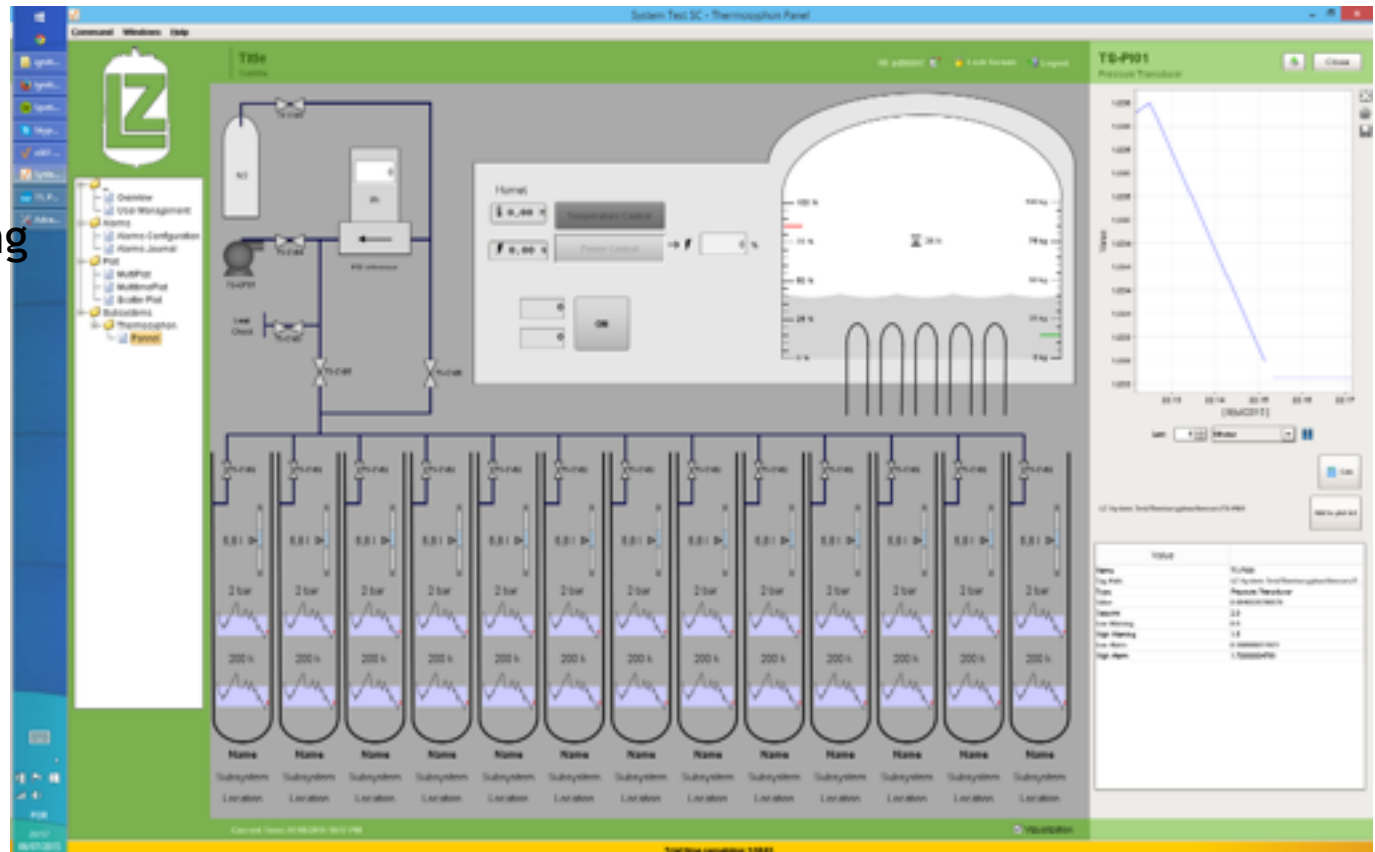


Slow control update 7/9/15

- Ignition talking to ADAM modules operated pneumatic valves for leak checking!
- GUI work starting: different interfaces easy to add once device is loaded
- Many other subpages also: alarms, lists of valves etc.

PLC should
be arriving July 20

Hugh and Eric coming
at end of month too





Plumbing work 7/1/2015



Lines to TS, TS cooling to vessels, interconnect plumbing all in process, about 3 weeks left





Safety 7/1/2015



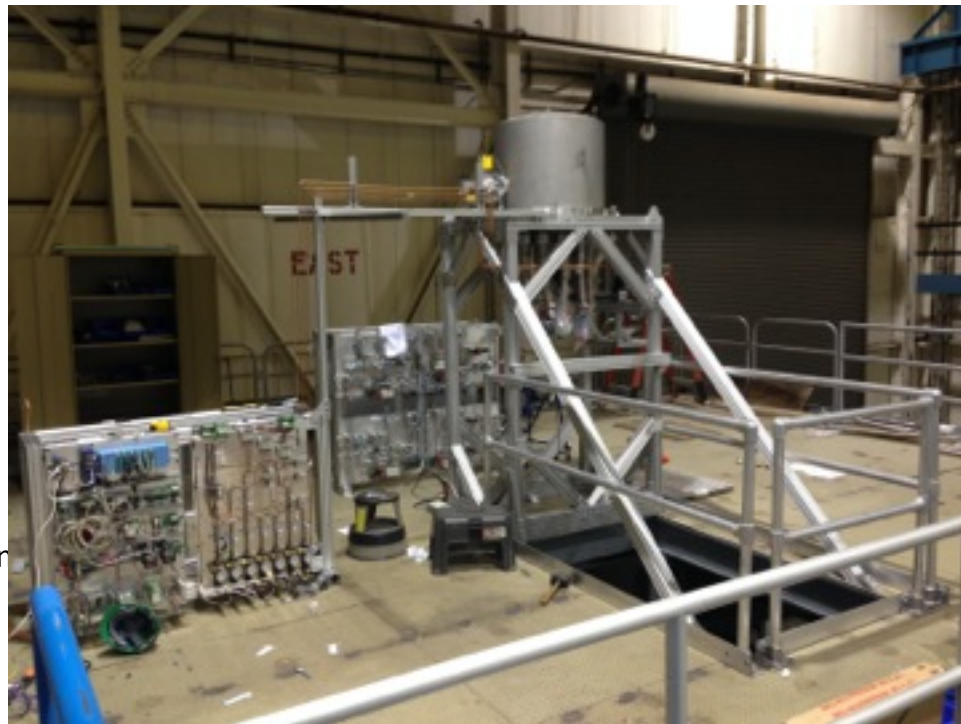
- Continued Process Hazard Analysis work (including tomorrow on sampling program on phone meeting)
- Pinwheel shows ventilation
- Still finishing documentation, pressure testing



Old Status slide

Recent & upcoming work

- Thermosyphon plumbing work started and will take the next few weeks to complete
- SRV pressure testing looking good, final test to be completed
- Vessel pressure testing keeping up with installation
- Working on electricity and pneumatic air (including emergency outage planning)
- Computing and networking progressing
- DAQ boards just arrived for testing
- Continuing work with PLC planning
- Planning signal feedthroughs & working on documentation plan for instrumentation
- Integrating TPC drawings with infrastructure drawings
- Reworking Xe vessel suspension and U-tube design
- Working on getting documentation uploaded
- People starting to become SLAC User's for computing and site access: if you are interested, let me know
- Joao arriving from Coimbra to work on Ignition
- Starting to add people to luxzeplin slack chat also, if you are interested, let me know
- Hardware focus the next few weeks is on getting gas/ instrumentation panels and purification tower installed



Global effort to put information on the Twiki: but obviously a work in progress!



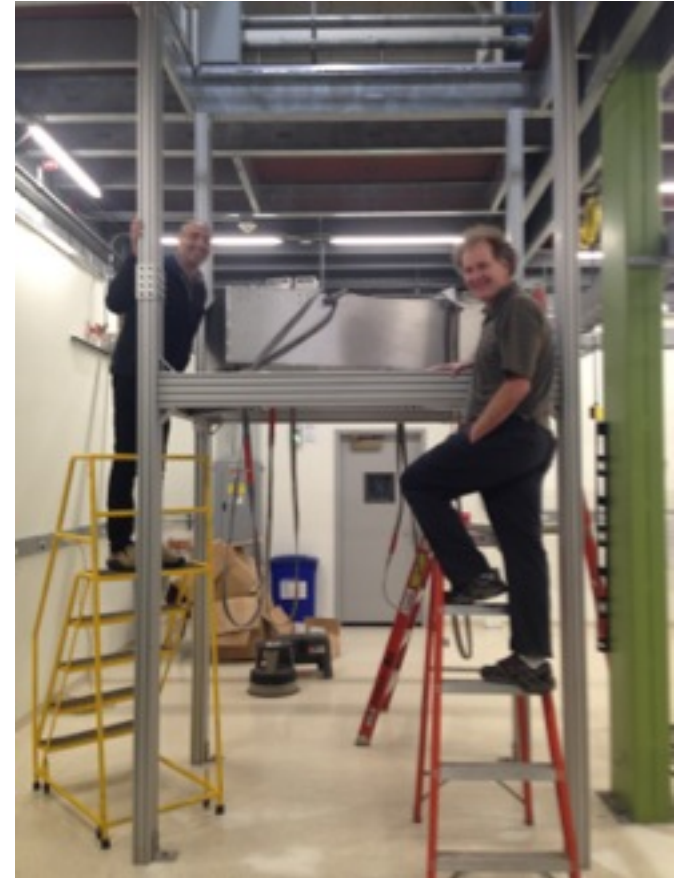
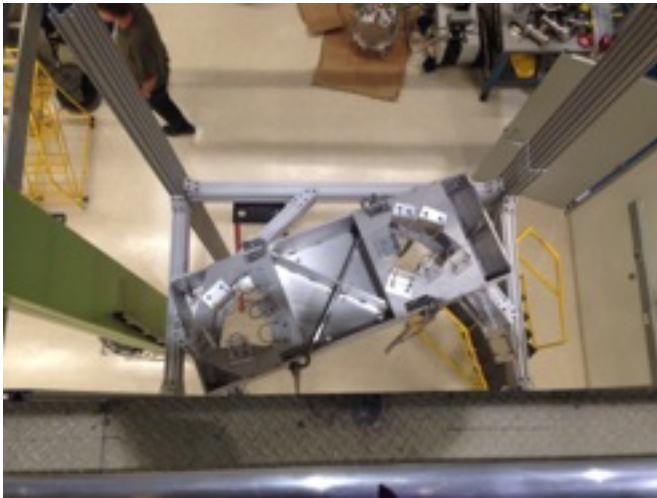
Prettier CAD



From <https://www6.slac.stanford.edu/news/2015-05-20-slac-gears-dark-matter-hunt-lux-zeplin.aspx>

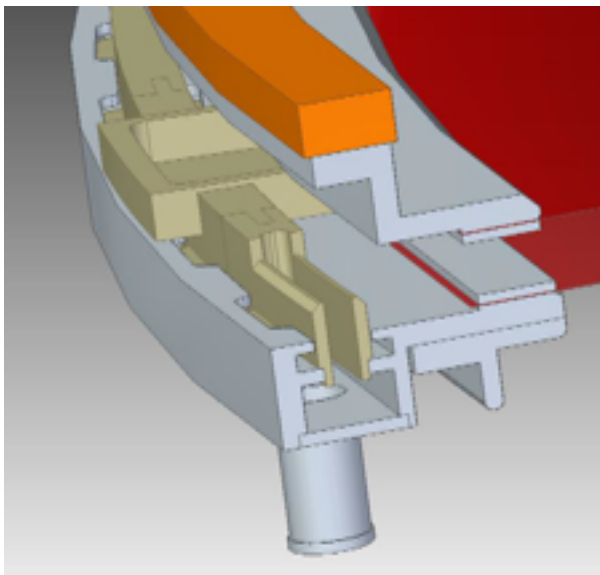
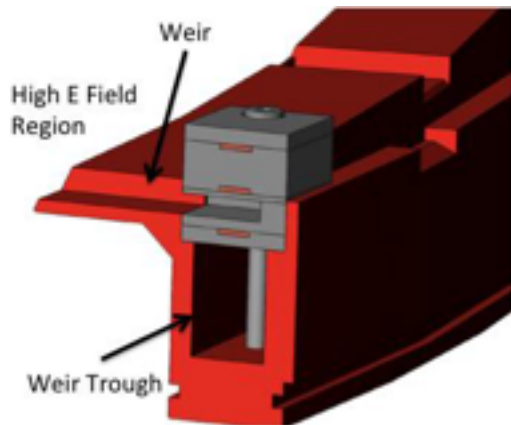


Vessel Stand





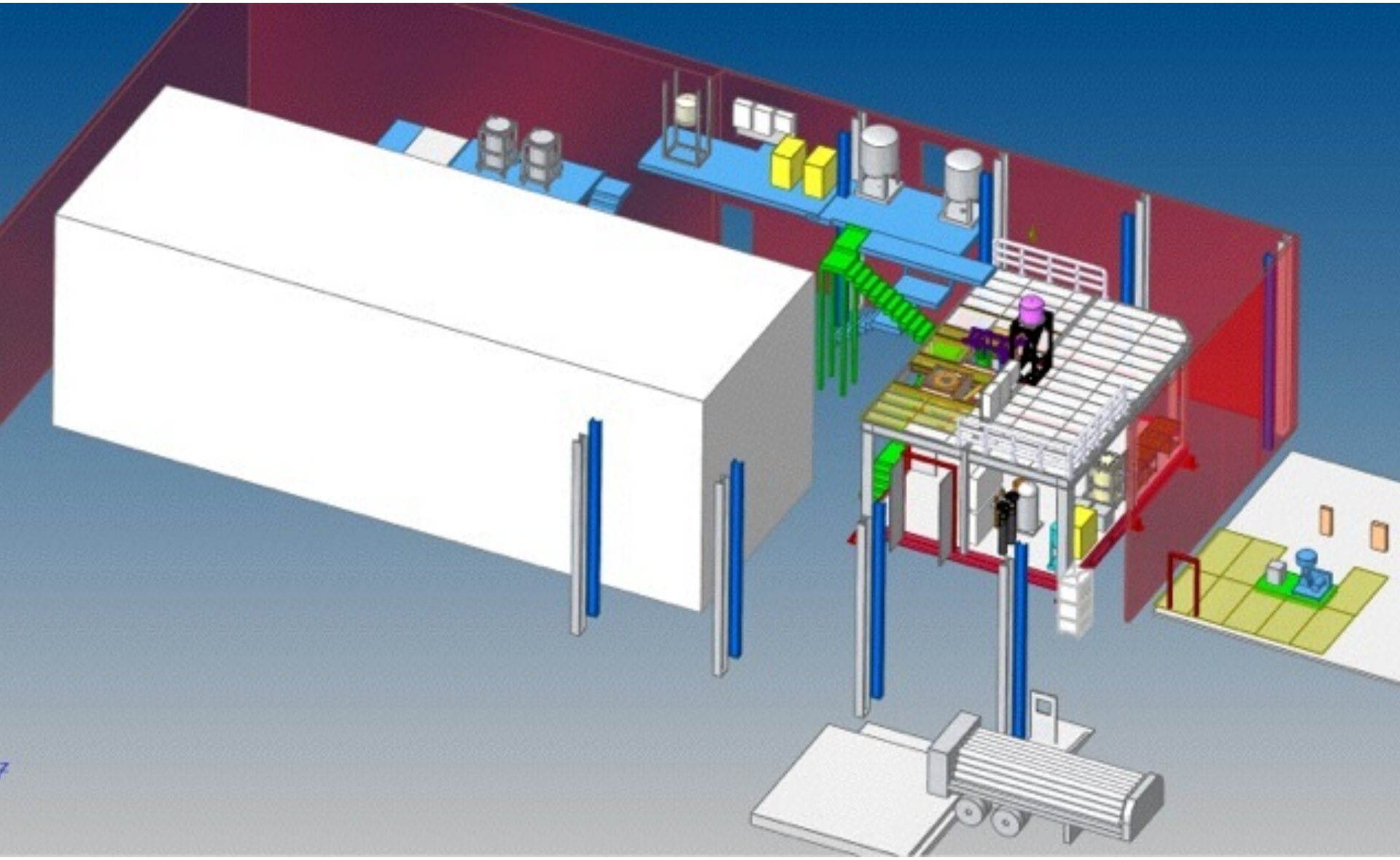
Sensor discussion



- Coming out of the discussion with Knut about the extraction region and weir trough for the System test
 - Basic weir precision sensors for the liquid level, won't quite have access as Hans has shown in past
- What are our level sensor requirements? Tom's proposal:
 - tip-tilt
 - inner Surface quality
 - gate and anode position
 - linearity between gate and anode
- Do we want to not have x and y position sensors and add 2 WPS to the skin



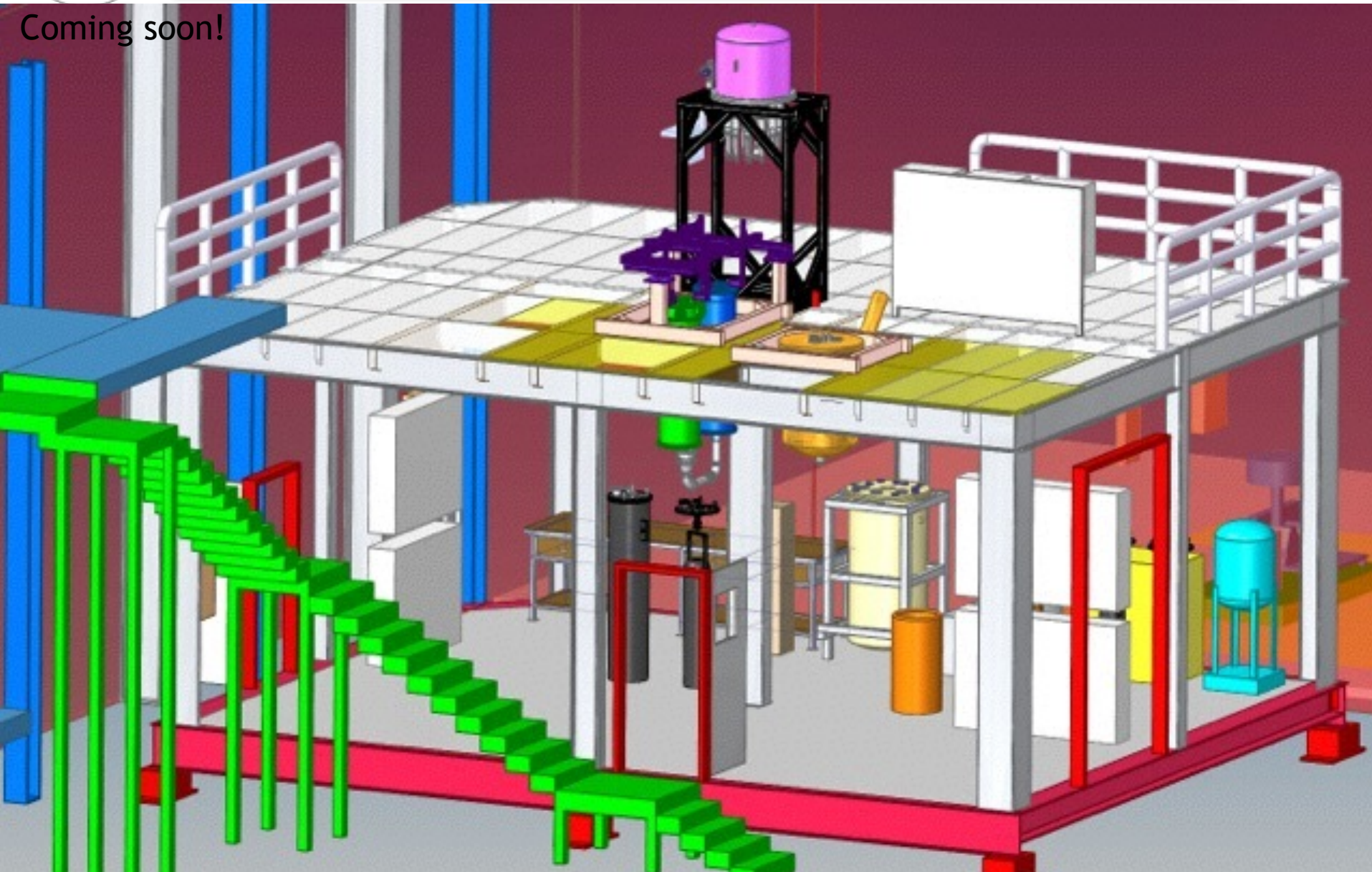
SLAC Platform





SLAC System Test Platform

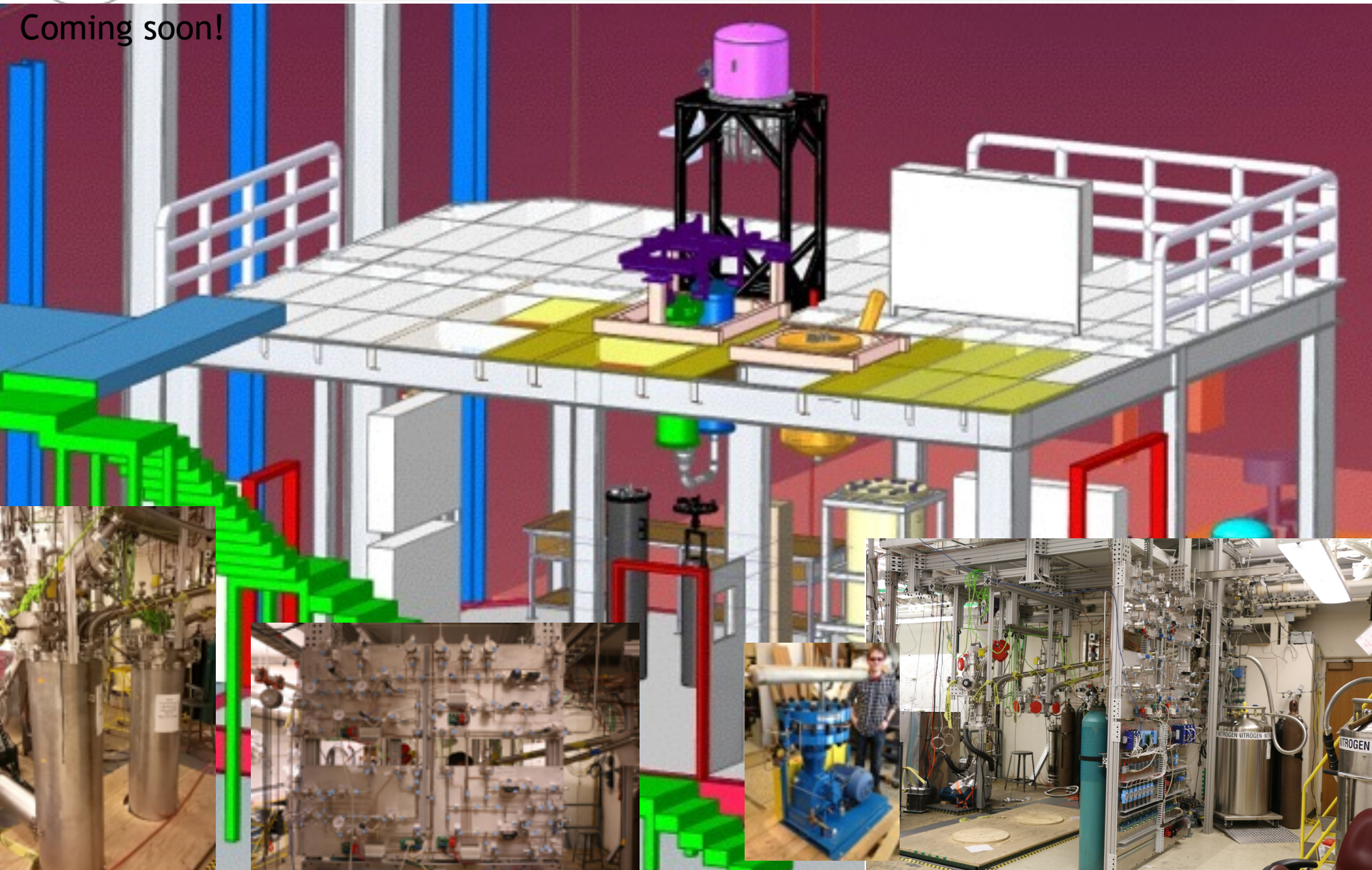
Coming soon!





SLAC System Test Platform

Coming soon!





Lab Ready



Photos from D. Moore and S. Luitz



In/On the Hut



Photos from D. Moore and S. Luitz

K. Palladino - System Test



Short Term Schedule

- Finishing TPC drawings (at LBNL and SLAC) by end of May and moving to fabrication by end of July
- Installation into lab space: now thru June
 - Vessels, gas system, electronics, computing
 - Still procuring things large (getter) and small (burst disks, etc.)
- Work on slow controls: PLC and Ignition/LUX database needed in June
 - at FNAL/SLAC/Edinburgh/Coimbra
- Phase I DAQ: at SLAC based on DarkSide R&D boards
- Gas testing (in Ar or N₂) of RFR and initial grids in June
- Initial cryo run (no TPC) beginning of July
- TPC assembly with QA controls at LBNL in August
- Other contributions (camera, sensors) in August?
- Initial TPC run September



Short Term Schedule

- Finishing TPC drawings (at LBNL and SLAC) by end of May and moving to fabrication by end of July

- Installation into lab space: now thru June

Results needed for CD-2 and prior reviews

- Vessels, gas system, electronics, computing

- Still procuring things large (getter) and small (burst disks, etc.)

- Work on slow controls: PLC and Ignition/LUX database needed in June

- at FNAL/SLAC/Edinburgh/Coimbra

This schedule may be tough to meet, but has slipped from plan presented at CD-1/3a and we'd also like to make up time if possible

- Phase I DAQ: at SLAC based on DarkSide R&D boards

- Gas testing (in Ar or N₂) of RFR and initial grids in June

Involvement from other groups is encouraged!

- Initial cryo run (no TPC) beginning of July

Talk to Kim and Tom if you are interested

- TPC assembly with QA controls at LBNL in August

- Other contributions (camera, sensors) in August?

- Initial TPC run September



Camera fibers & cable lengths

- New scheme for the camera fibers to top and bottom of TPC: includes 3' extension

- Top fiber lengths:

- 82"
- 86"
- 86"

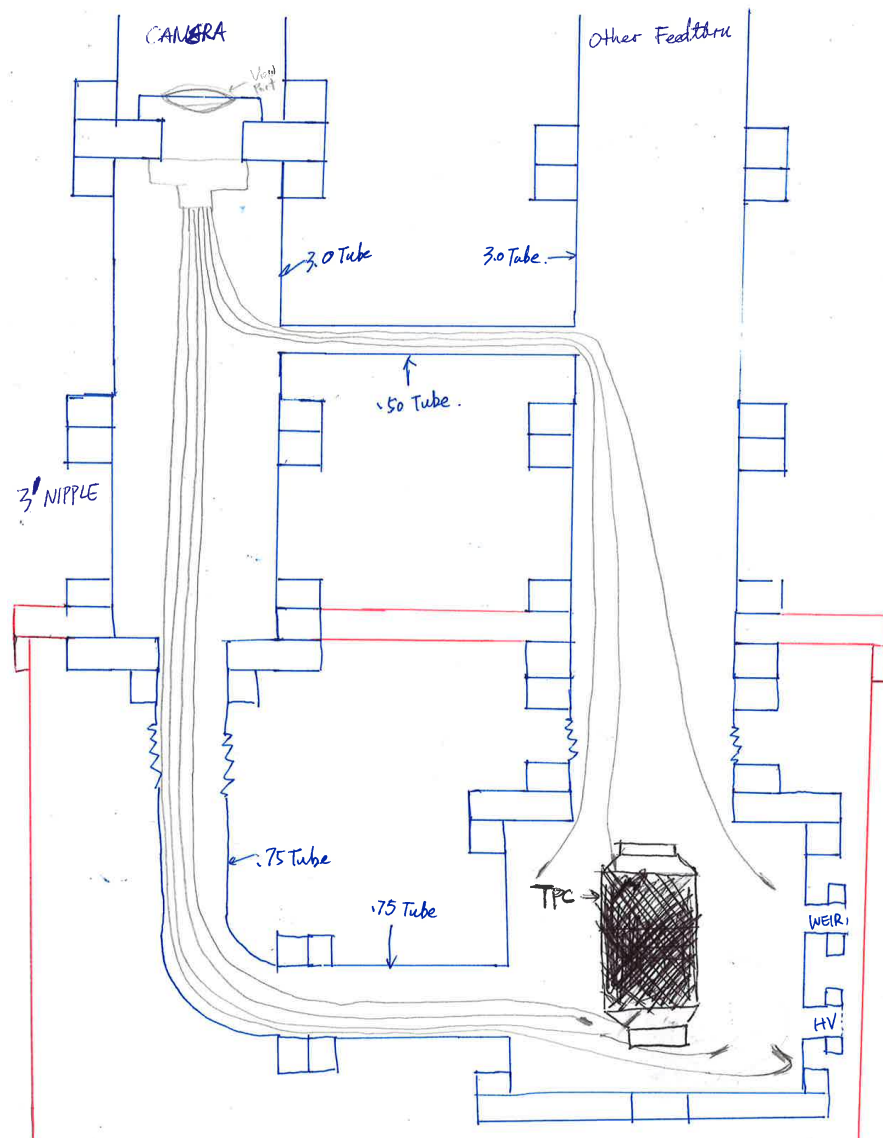
- Bottom Fiber lengths:

- 110"
- 120"
- 130"
- 140"

- First pass at other cable lengths too https://docs.google.com/spreadsheets/d/1T_2js5ptQxahwCBTOss56sz1VqMhM_T7LeoNwV3rbWk

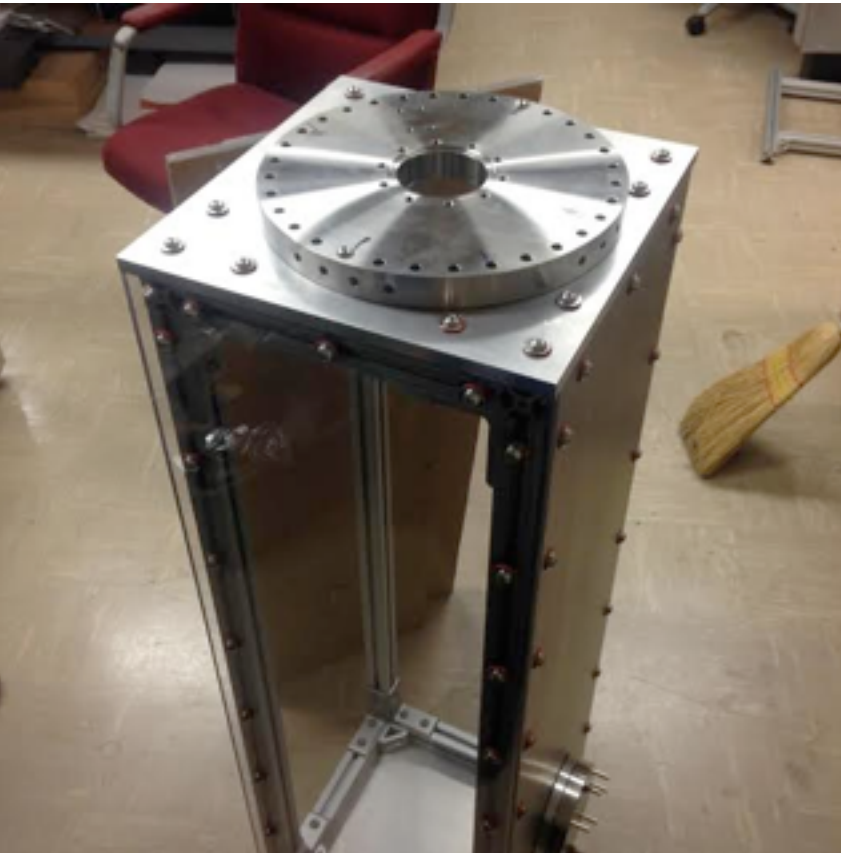
- With 15% spare:

- Coax: 779 ft
- P-Bronze: 874 ft
- 16 AWG copper: 212 ft
- thin copper 515 ft





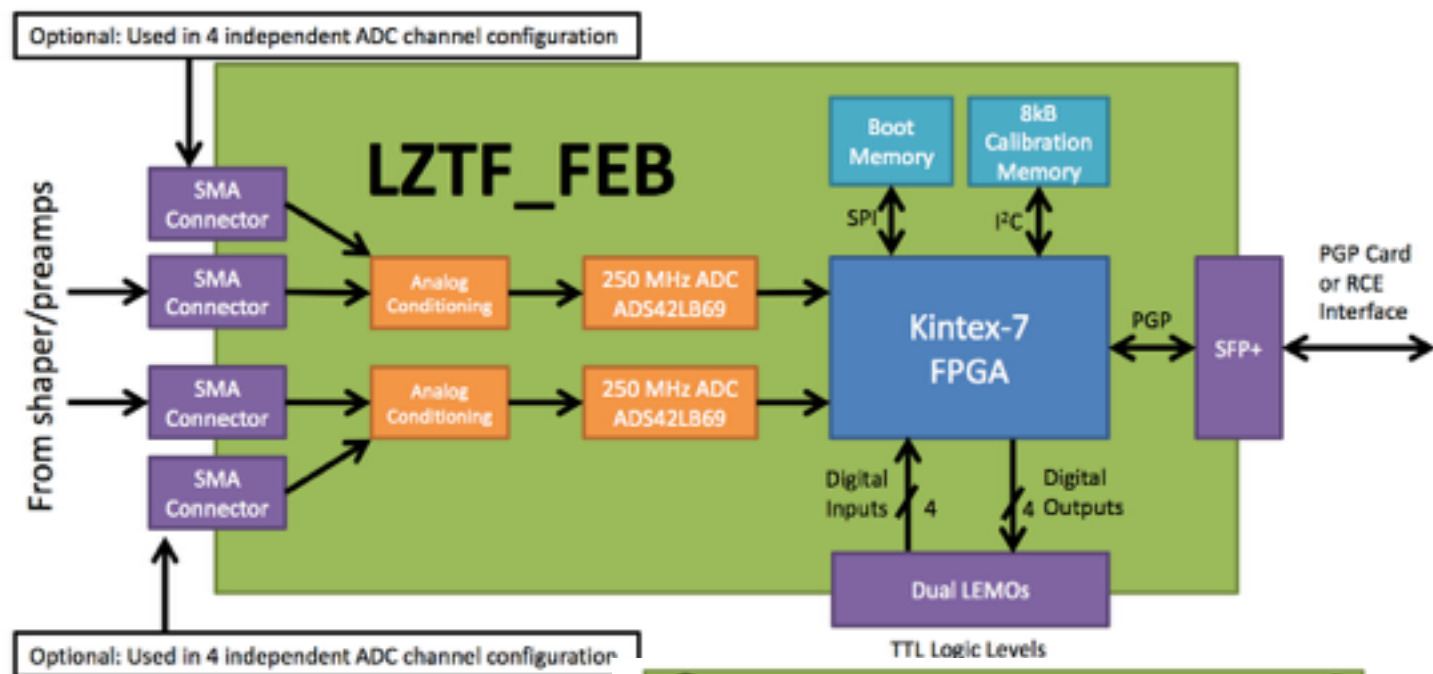
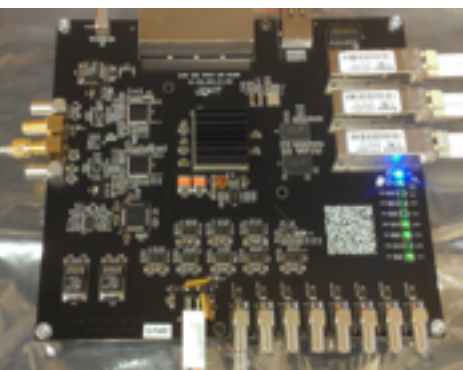
Gas Box Testing



- Mates to Xe vessel CF flange/ spare (pictured)
- Mates to Phase 1 HV feedthrough
- 3 transparent polycarbonite sides
- Plan to run with slight over pressuring with N₂ and Ar
- Early standalone tests and pre-run in-situ tests
- Start testing in May/June



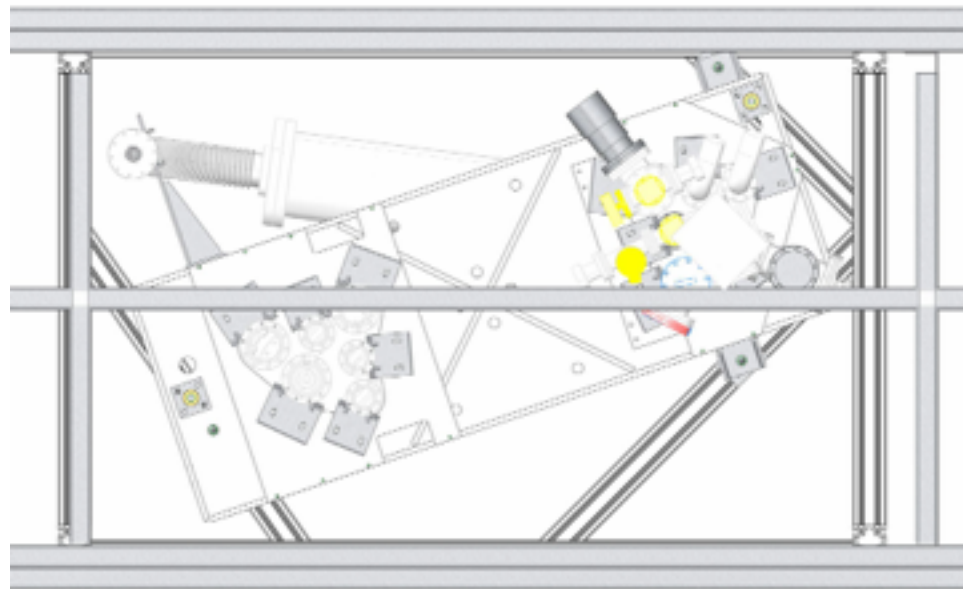
Phase I DAQ



- Dealing with 2 orders of magnitude range in each of S1 and S2 from single pe to calibration sources expected to get above backgrounds
- Based on DS-50 250 MSPS single channel board-> 4 channels, with 2 amplification ranges per PMT
- Separate pre-amp to allow flexibility in signal gain

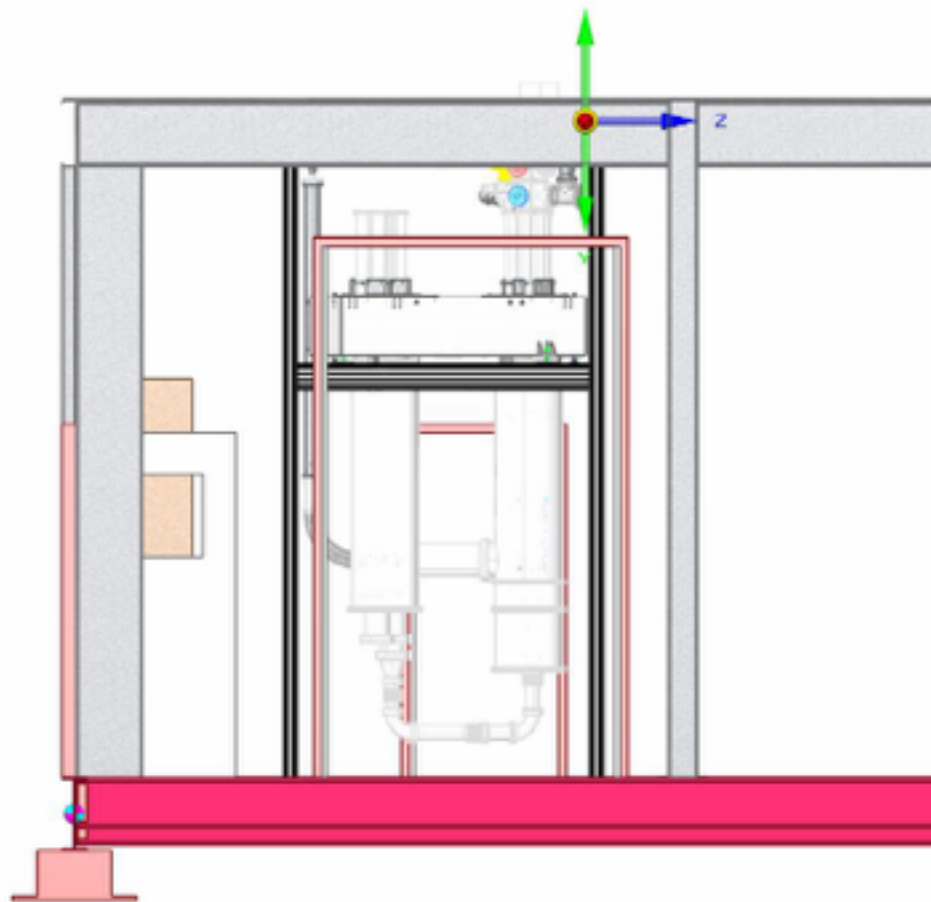


Vessel Stand



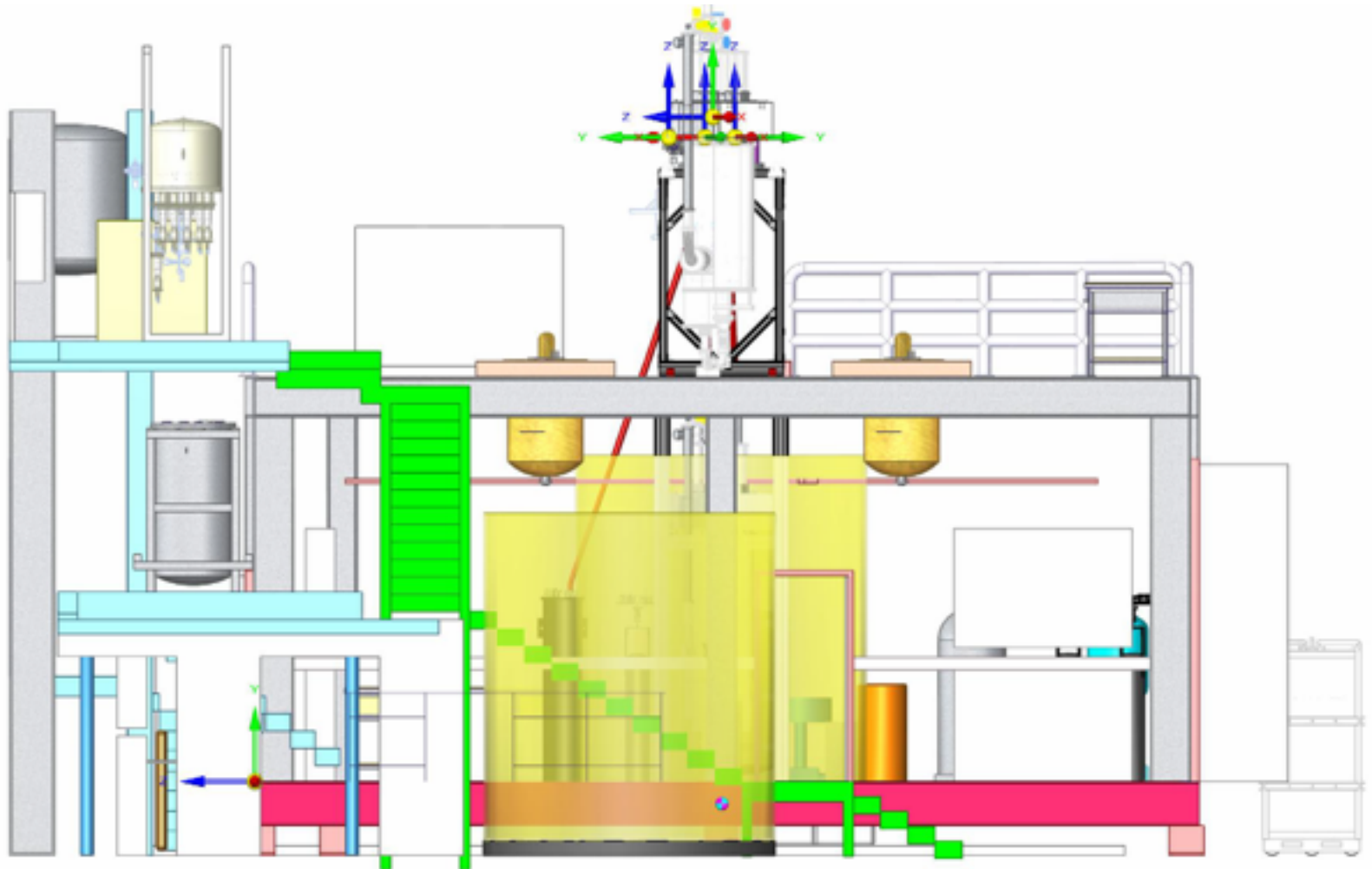
T-slot frame anchored to floor and ceiling

Aluminum box holds flanges and allows leveling of detector





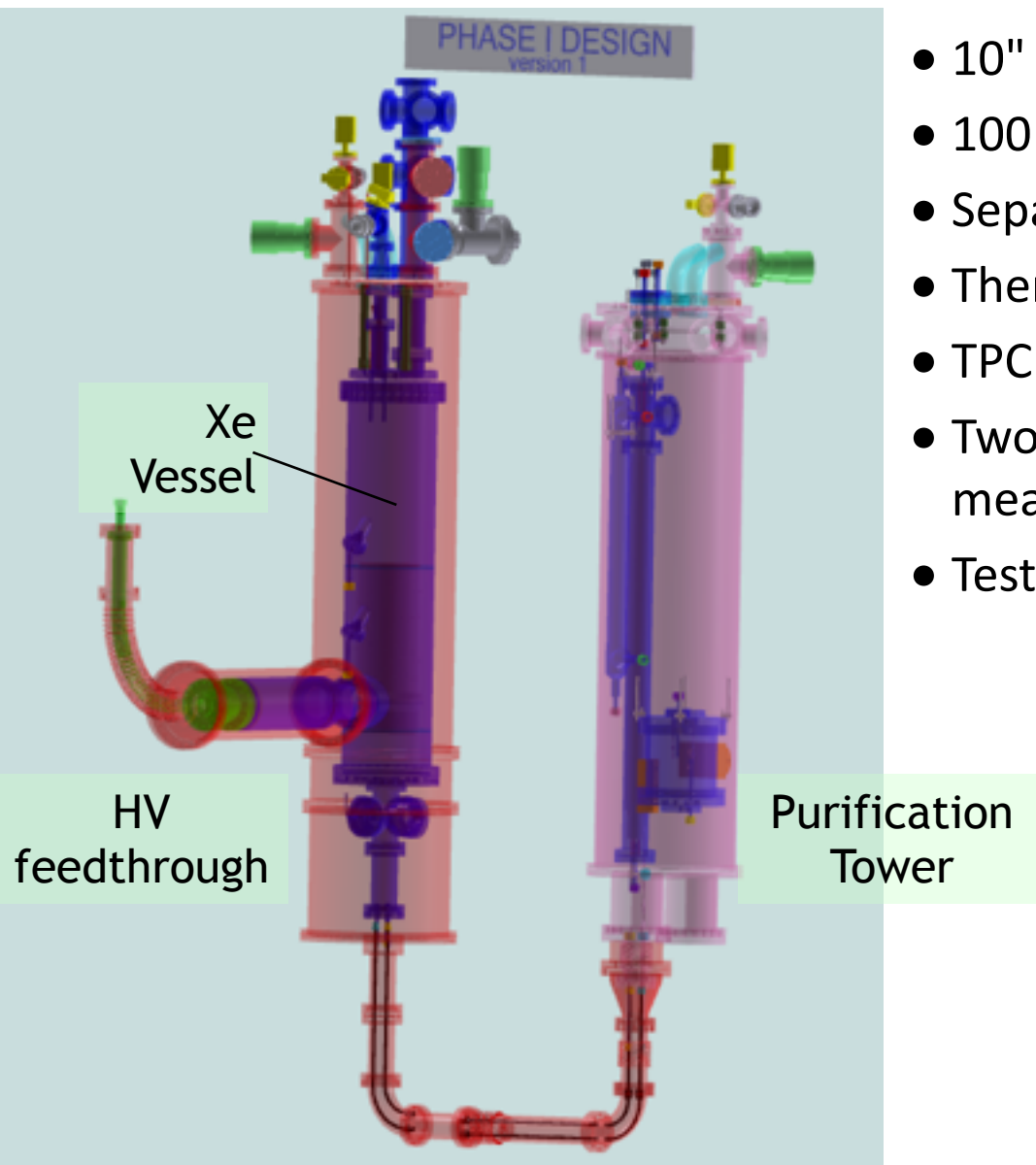
Planned Lab Side View





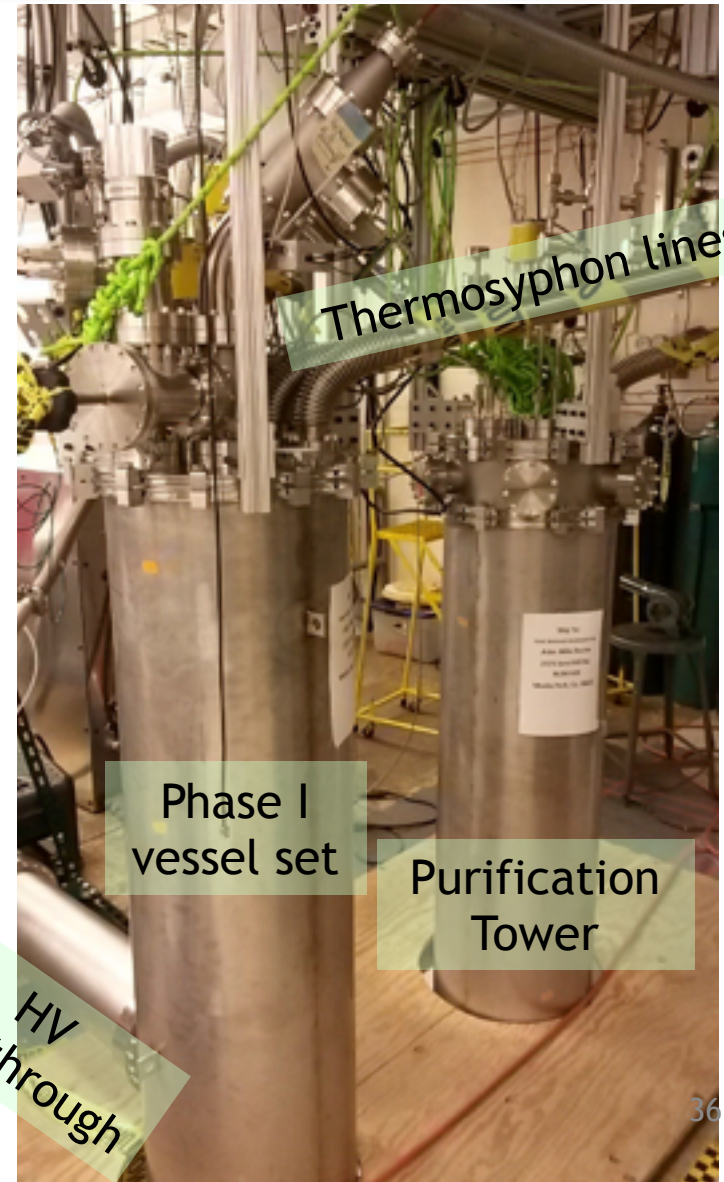
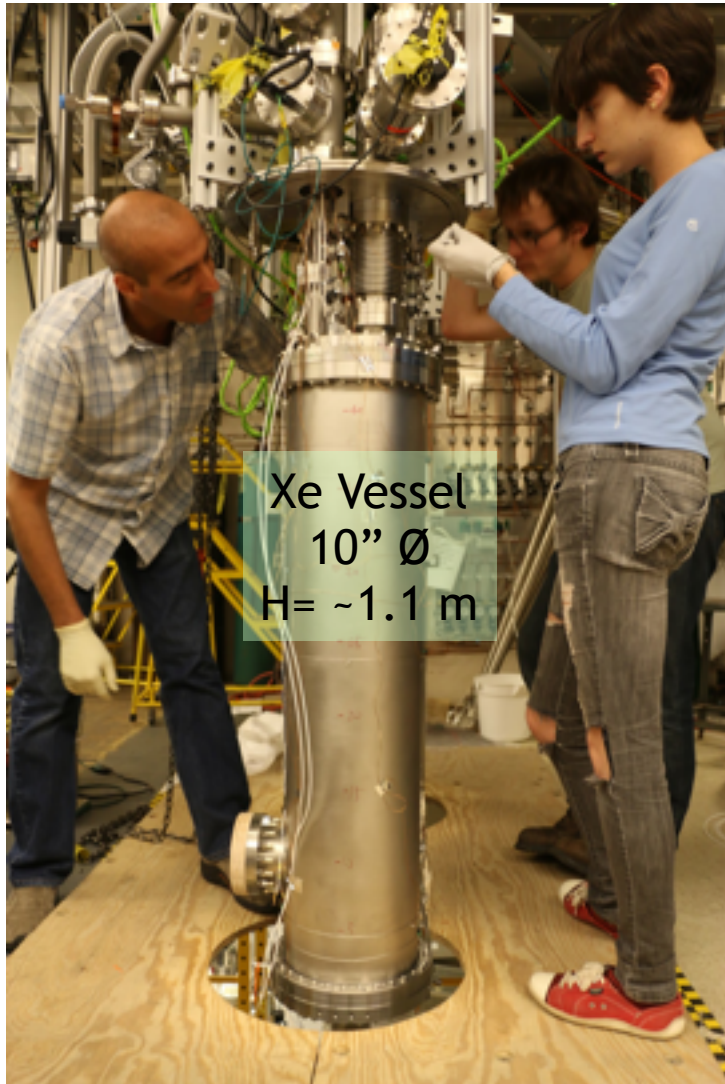
Phase I – SLAC

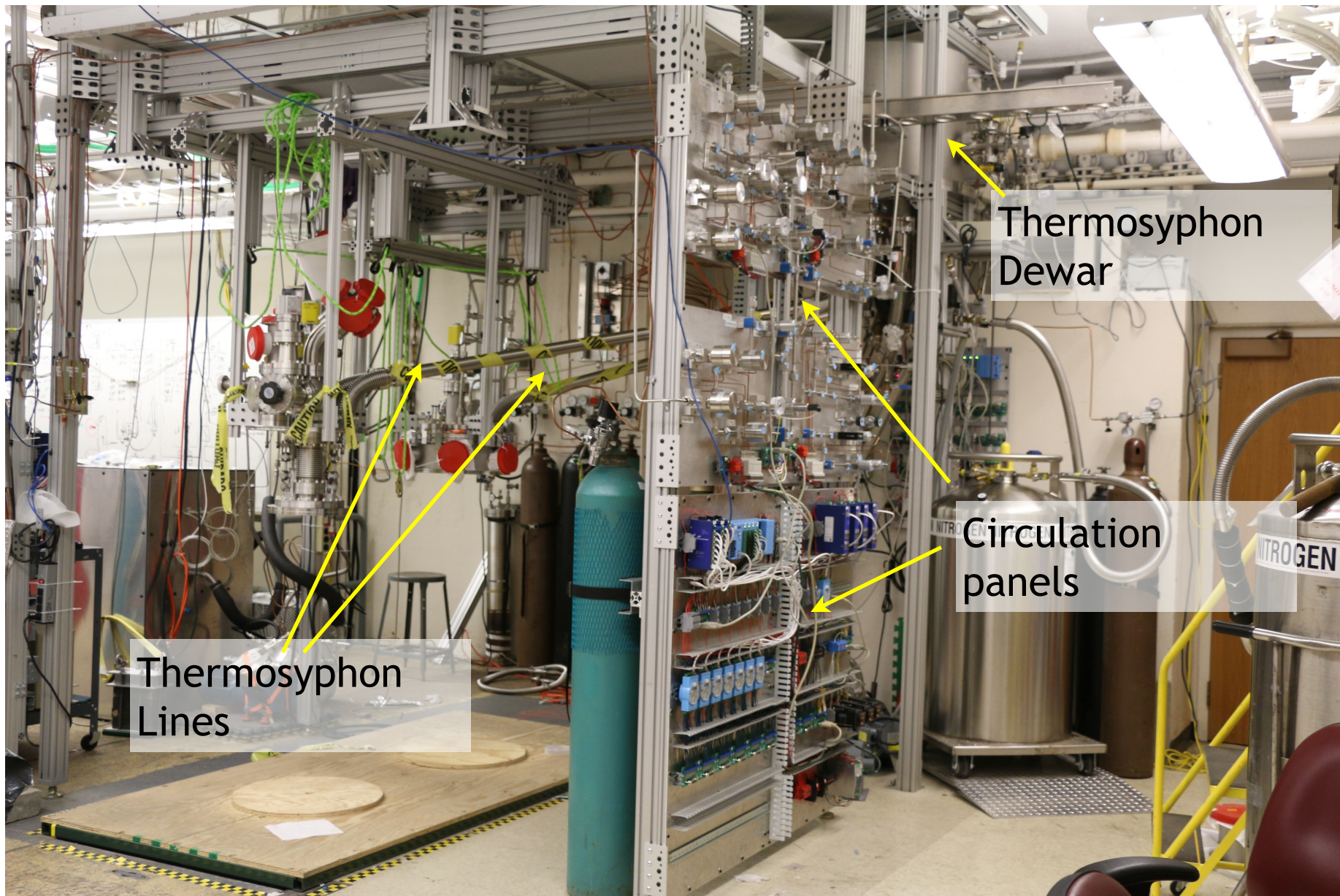
- 10" $\varnothing$ test vessel, 100 kg Xe
- 100 kV cold feedthrough
- Separate purification tower
- Thermosyphon cryogenics
- TPC prototype from LBNL
- Two PMT 2-phase readout for purity measurement
- Tests of cathode ring surface area





Phase I – SLAC





Thermosyphon
Lines

Thermosyphon
Dewar

Circulation
panels

NITROGEN



Xe Purification and Cryogenics

- Full external purification tower architecture, controlled fluid flow through weir
- Gas circulation through 1/2" tubing, using 10 bar compressor
 - > 200 slpm capable (LZ = 500 slpm)
- Same layout as LZ system, including separate purification tower
- Thermosyphon cryogenics - multiple ~200 W heads available.
- Compressor-based recovery - same as LZ.

