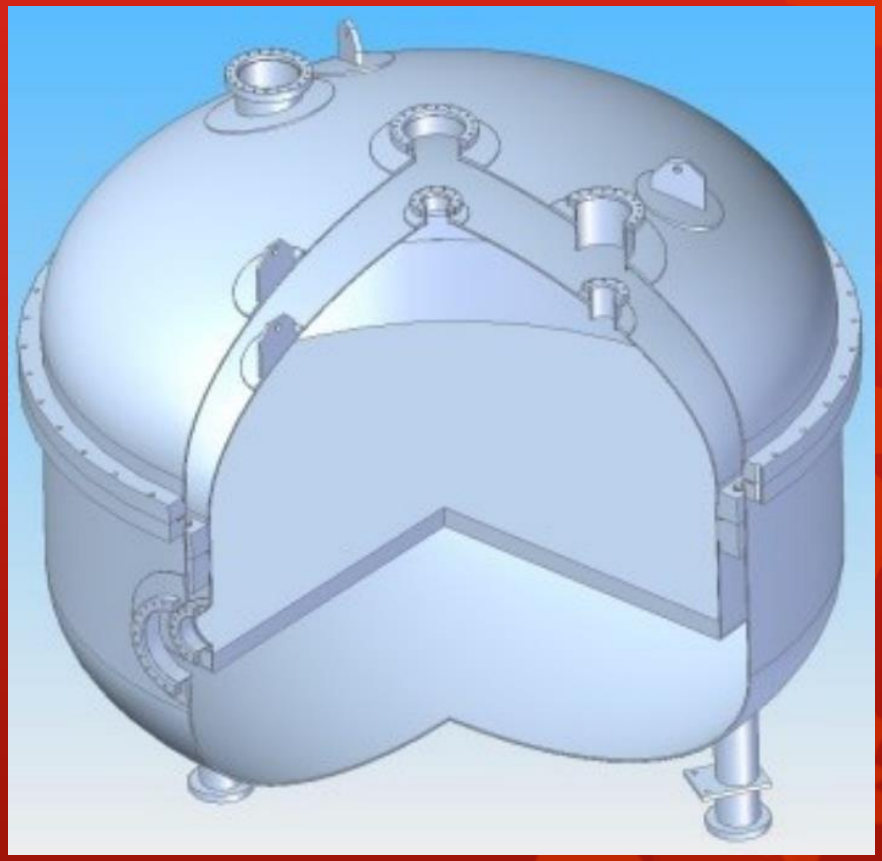
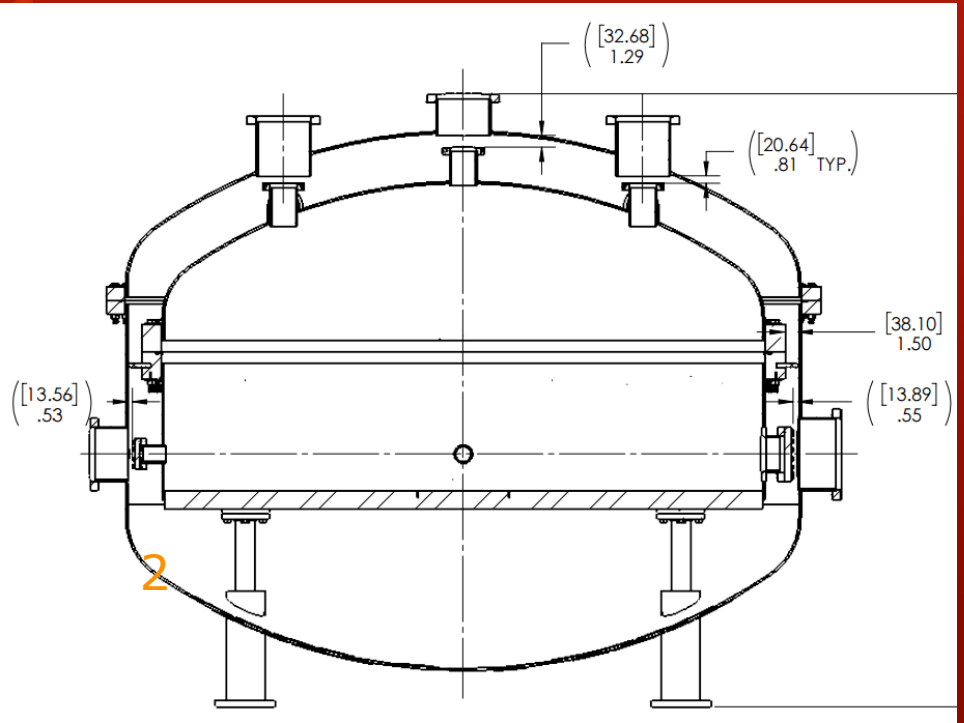
Phase 2 Design

The thoughts so far...

What Is Phase 2?

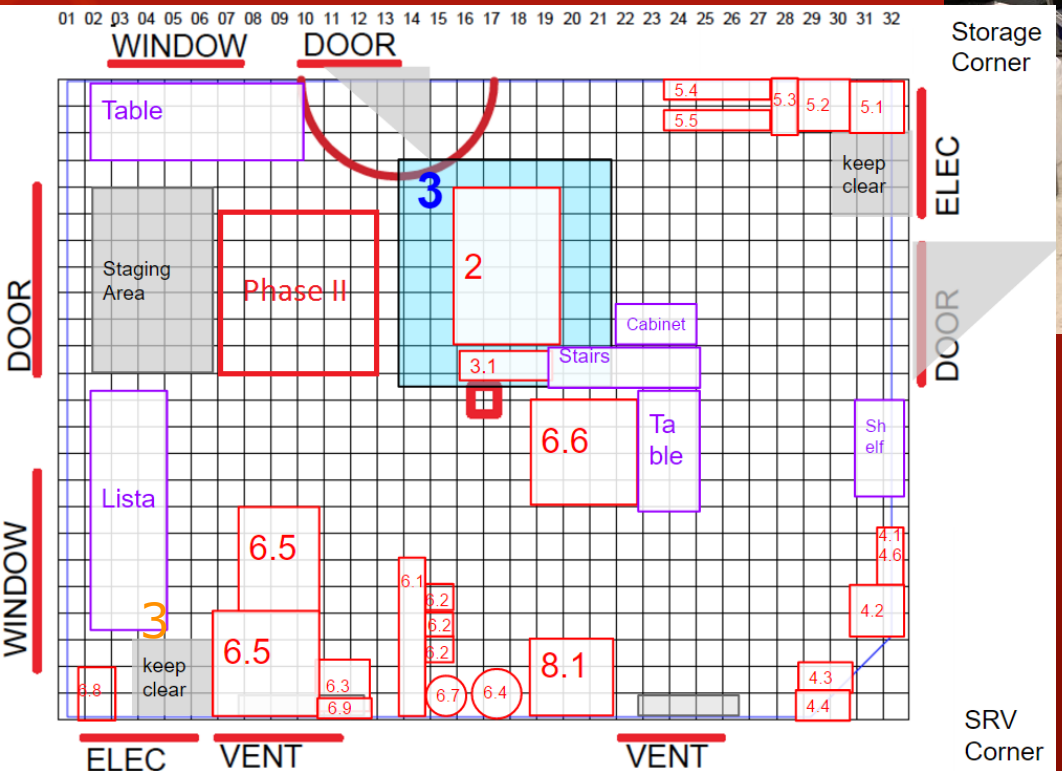
- ~500kg LXe vessel for testing LZ grids
- ~2m diameter, 1.5m tall (OV)





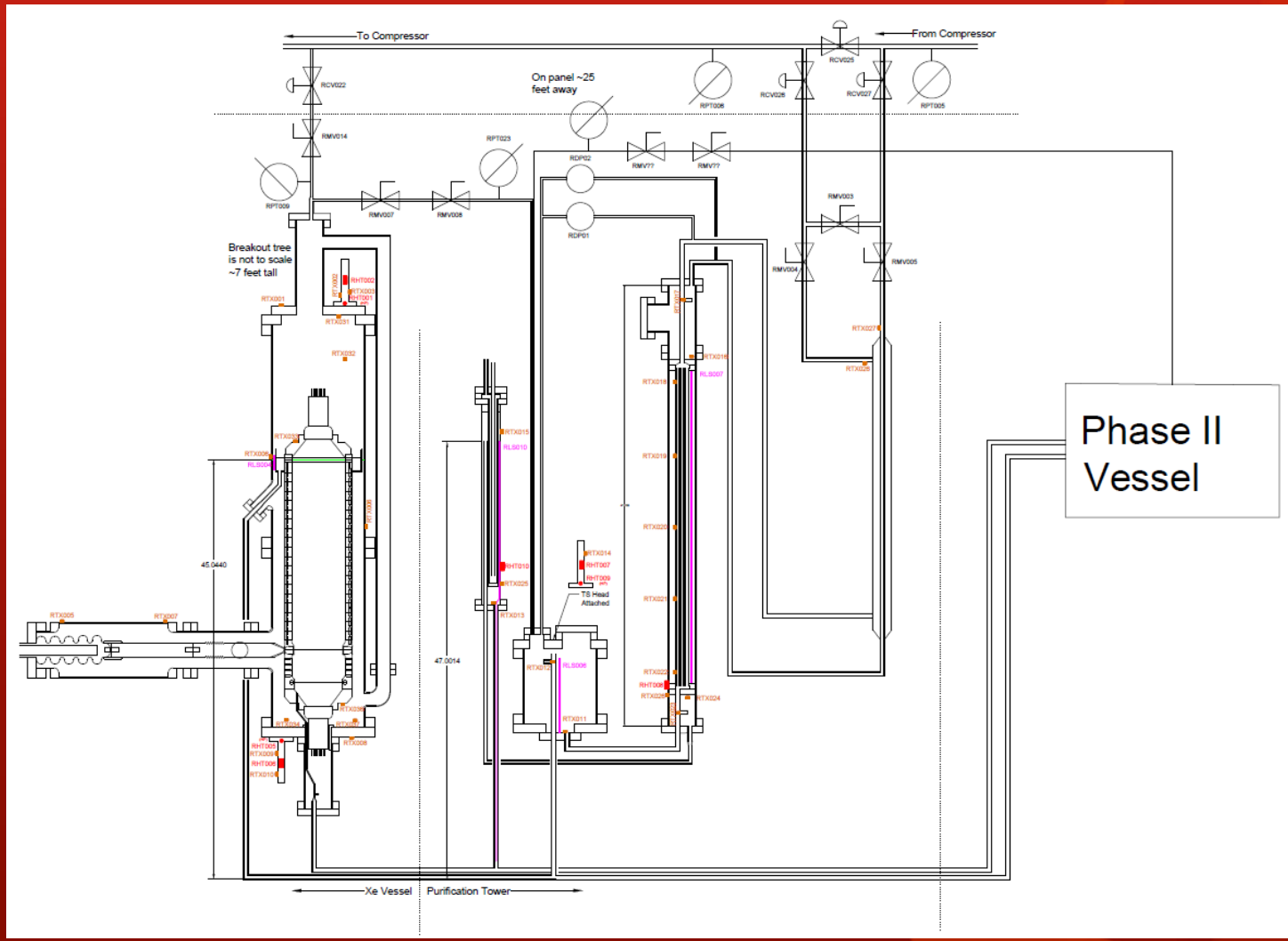
Where are we going to put it?

In the Hut, between Phase I and the double doors



How is it connected?

- Alternately connect the current heat-exchange tower to phase I and phase II
- One pressure equalization line to the reservoir



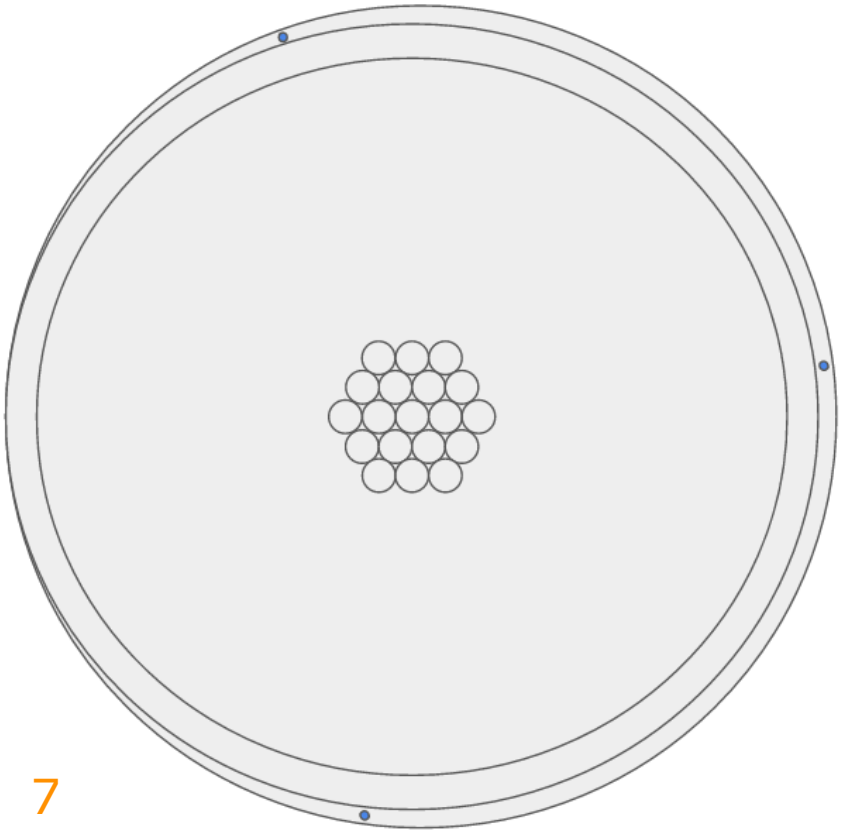
Interlude of Kim's thoughts about the inside...

What's inside the vessels?

Assume teflon lining bottom, and top dome to boost lightyield
An inner metal sleeve to stand in for the LZ vessel ID: will it really fit?
- Allows services to be run externally to it, especially long level sensors, PMT and sensor cabling, liquid spill lines
- Can act as weir for cathode style tests
- Can act as a support for the PMTs
- Only 1 adjustable, or 2? Or one and take cathode operating voltage into account
- Maybe titanium?
- Is it installed asymmetrically?

Assume PMTs are on an array attached to the lower vessel

What's inside the vessels? Top View (scale not perfect)



Phase II vessel: 66.13" ID (1679.6 mm)
Top of LZ vessel: 62.16" ID (1578 mm)
Bottom of LZ vessel: 65.43" ID (1662 mm)
LZ TPC: 57.32" ID (1456 mm)
OD of weir manifold: ??

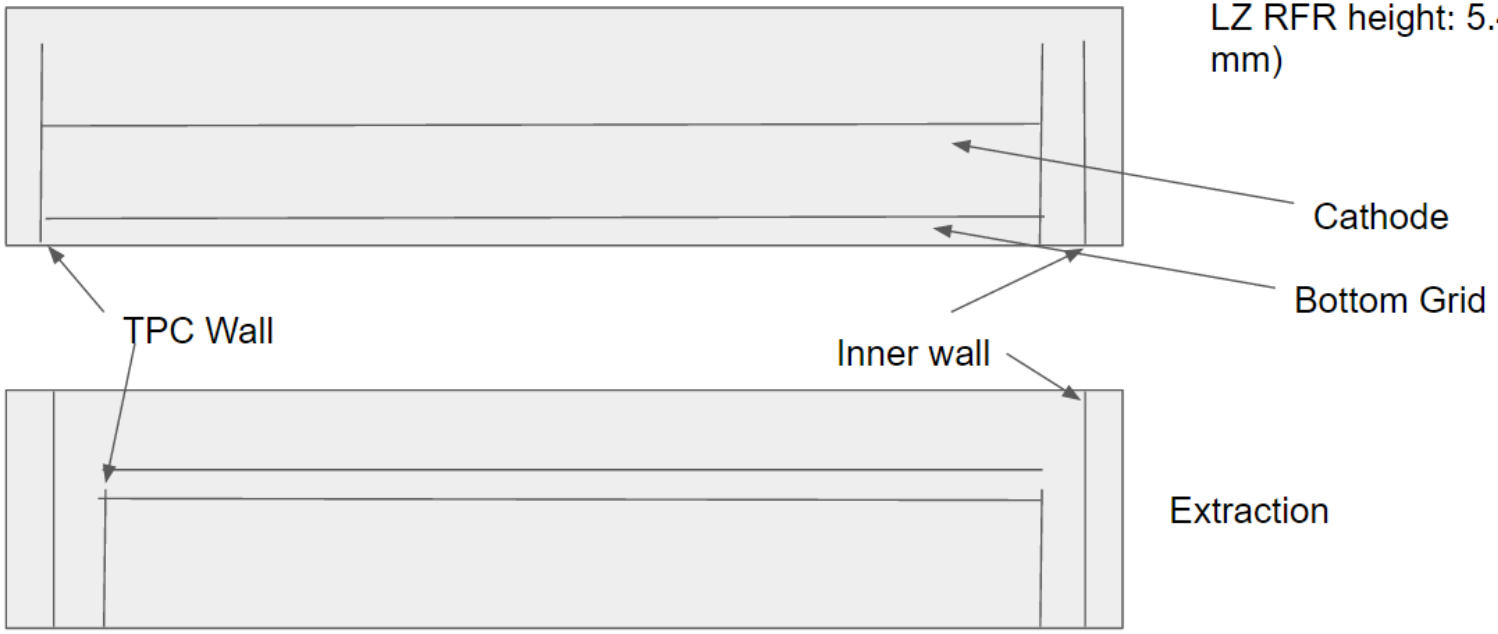
19 2" LUX PMTS: in 1 array?

Or 7 centered and 12 distributed?

What's inside, profile

Total height 15" includes bottom plate,
10" from center of feedthroughs to top

LZ RFR height: 5.4" (137.5 mm)



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Aaaaaand, we're back...

How are we going to cool it?

- Initial cooling done with pressurized liquid nitrogen through tube thermally connected to the outside of the bottom shell of IV.
- Perhaps on TS on top with copper straps down the side to cool the top.
- Copper straps can further cool flange lip from the bottom

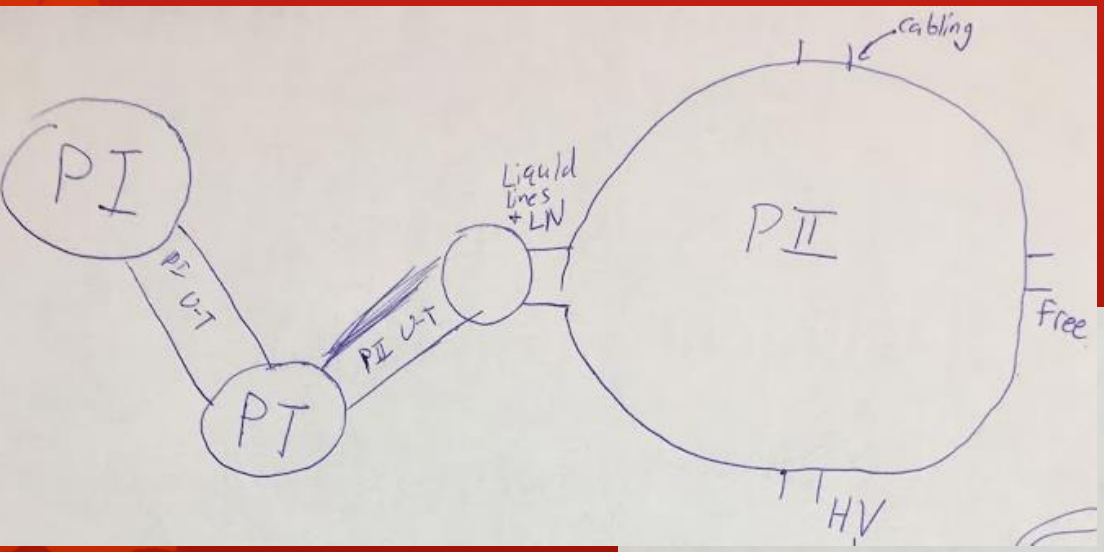
Keepin' it cool…

- I fully acknowledge that this slide exists solely so I could use that title…
- Once cold, temp can be maintained by one TS on the bottom and one on top, LXe can help spread the heat around.

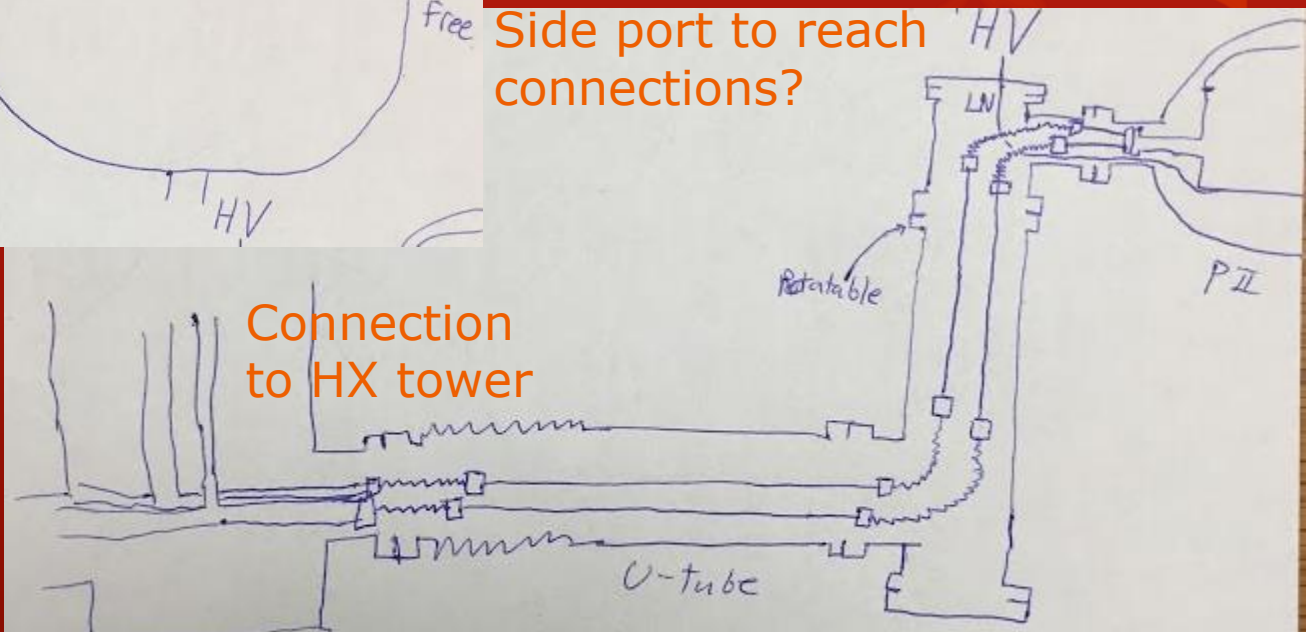
Liquid Line Layout

- Worked through many scenarios (available to view in other attachment).
- Simultaneous circulation of both Phase I and Phase II not feasible.
  - Would require either equal gas pressure in both vessels,
  - or circulation rates governed by the pressure in a vessel
- Either:
  - have both connected and one isolated by liquid cryogen valves while circulating the other,
  - or just cap the connections to one while working on the other.

Liquid Line Connections: U-tube



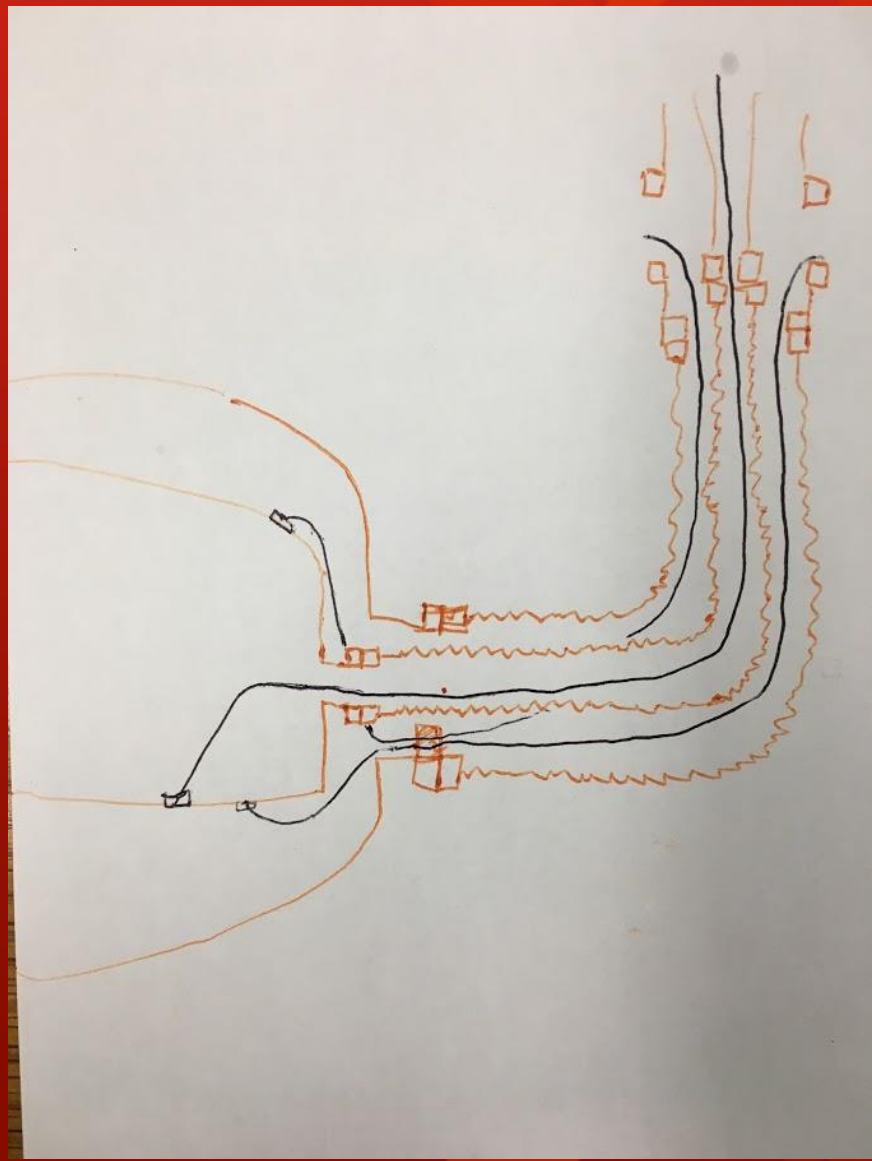
Side port to reach connections?



Side port to reach connections?

How to make the Xe & Vacuum space connections from the same port?

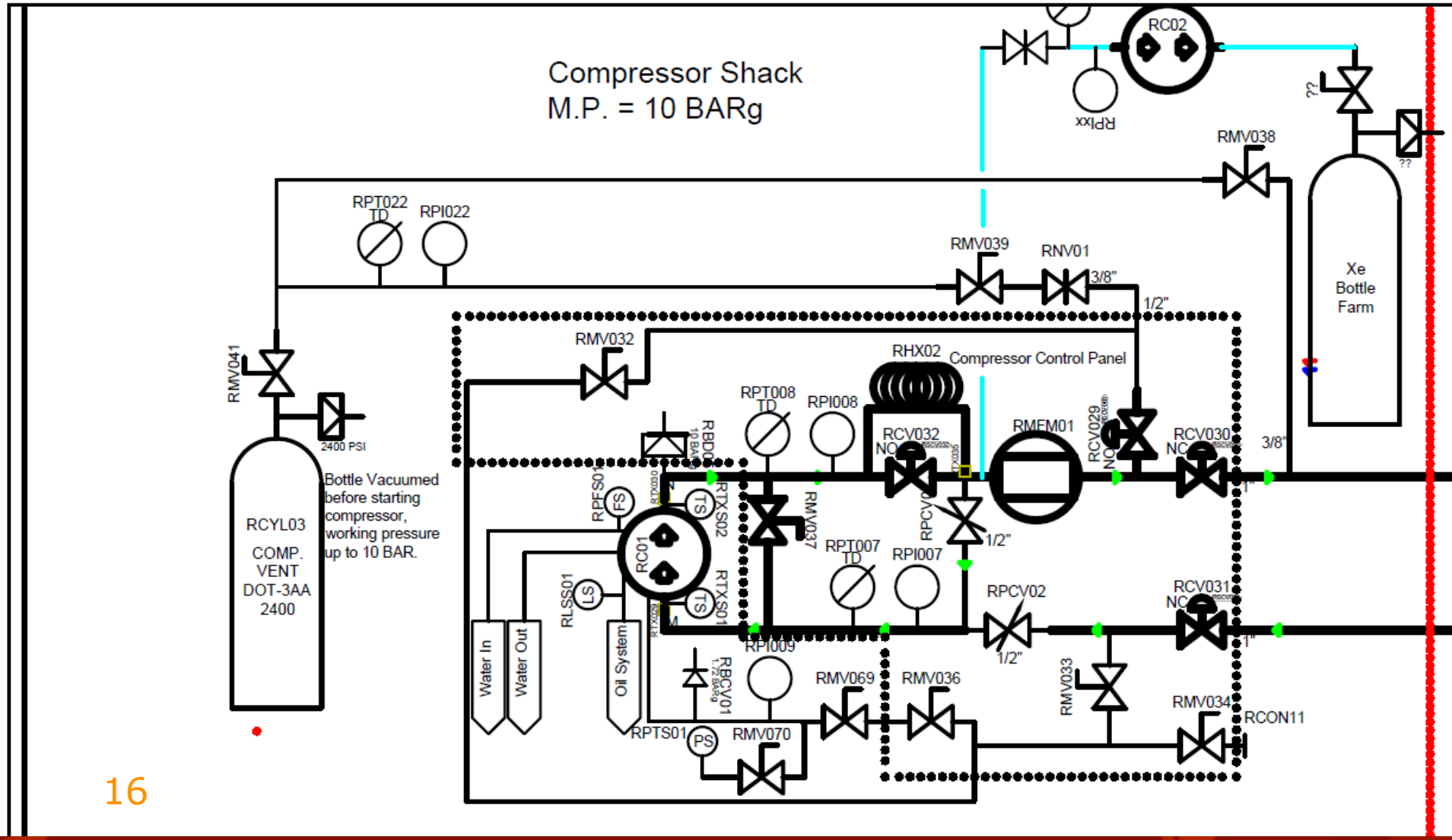
- Nested bellows for the electronics?



Recovery

- Use LUX compressor
- Physical location: compressor and bottle farm both in compressor shack
- Recovery path: circ compressor -> choke-down (regulator?) -> recovery compressor -> bottles (current thoughts, but not final)

Compressor Layout with Recovery Compressor



New part in blue

A Design Snaffu

- Not enough room to hold nuts on the bottom of the inner vessel flange for sealing.
- Perhaps need to make a special piece in order to actually assemble.
- Fortuitously, there are tapped holes in between the through-holes in the bottom flange