

A detailed 3D CAD model of the PRad-II Gas Target assembly. The model shows a complex arrangement of cylindrical components, flanges, and a central blue and cyan assembly. A thin green laser line is visible on the left side. The background is a light blue gradient.

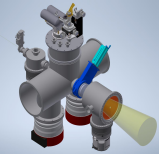
# PRad-II Gas Target Status

*Xiangdong Wei*

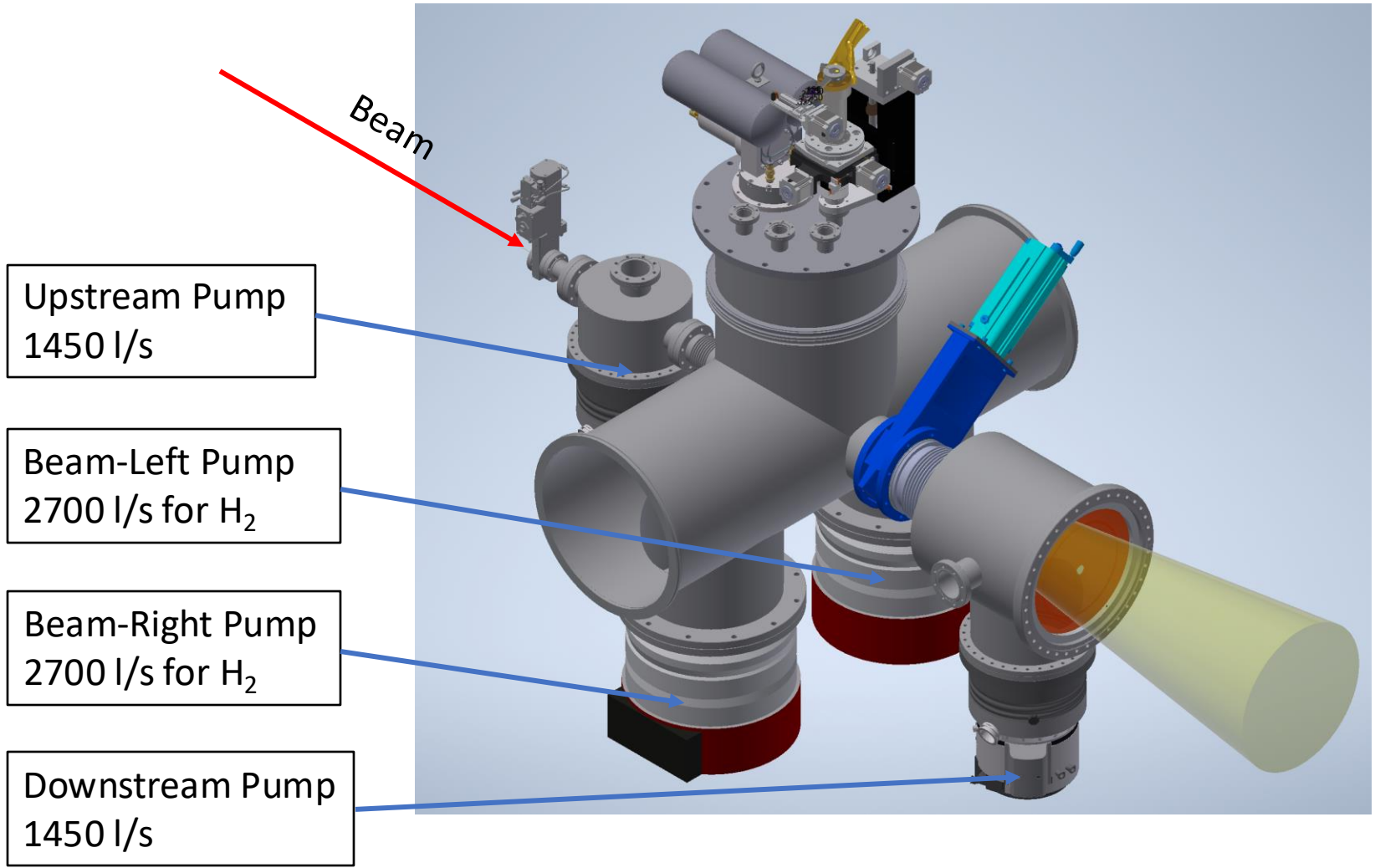
Jefferson Lab

PRad-II/X-17 collaboration Meeting

11/11/2024

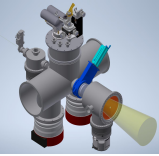


# Target Designs



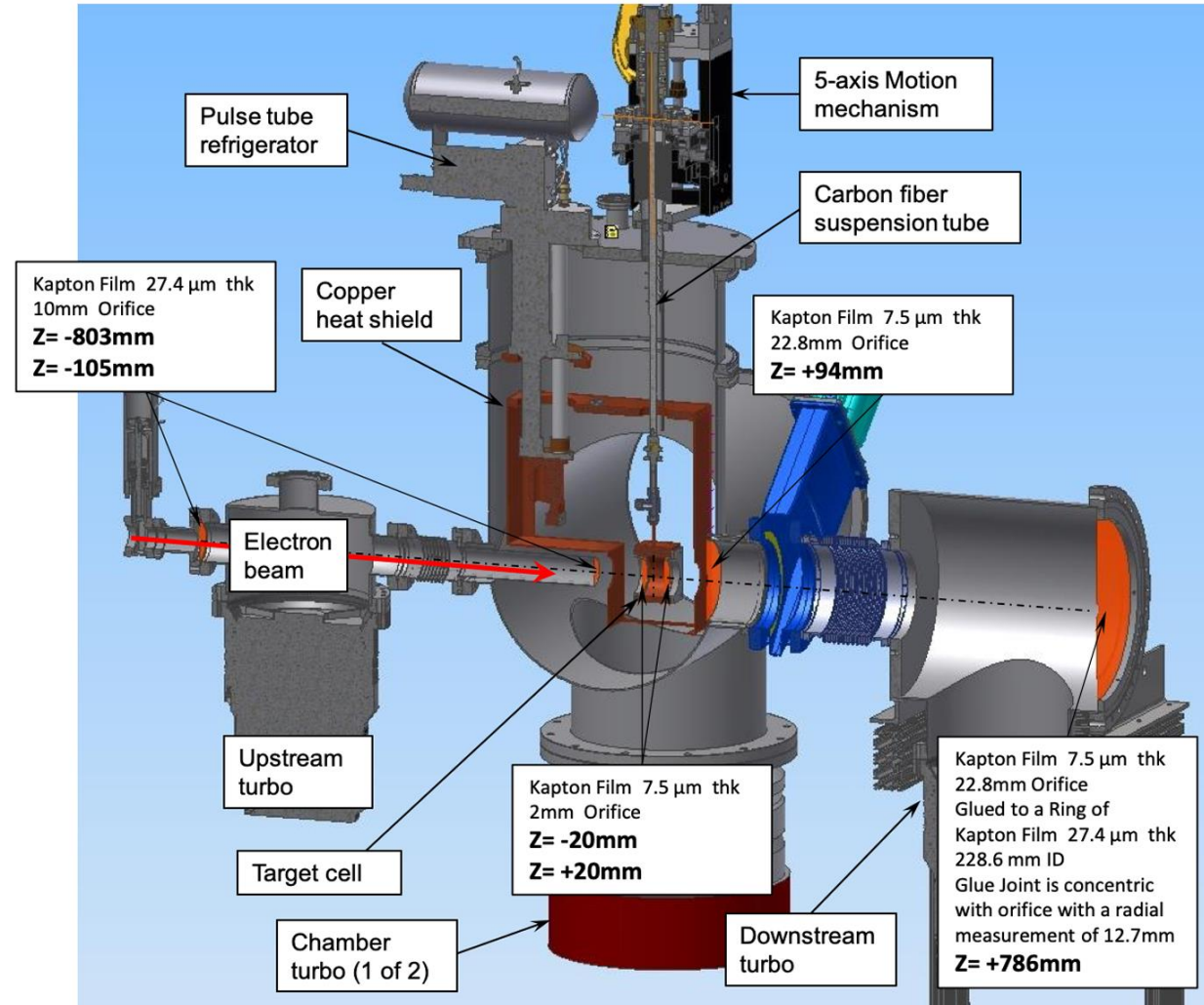
**5 Turbo pumps around the target:**

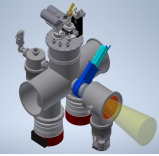
Both 2700 l/s turbo pumps are backed by a 1900l/s turbo pump and then fed into a multi-stage roots pump.



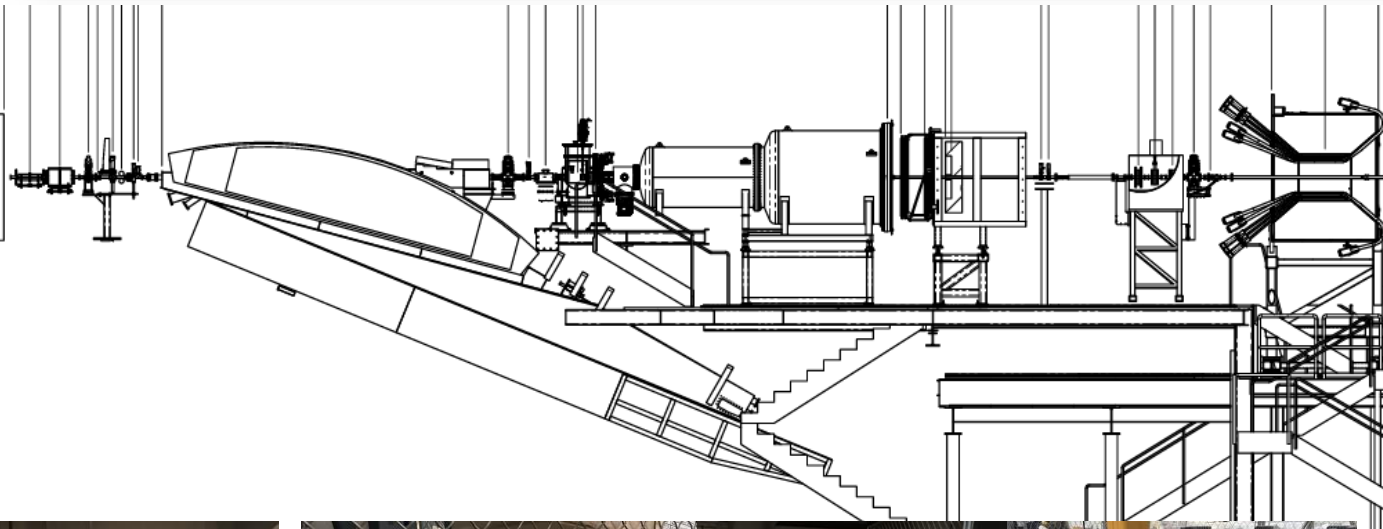
# Target Parameters

- **Target cell:** 75 mm x 75 mm x 40 mm,
- **Thin end walls:** 63mm dia. by 7.5 $\mu$ m thick polyimide foils,
- **"Windowless"** ---Beam enter and exits via 2 mm holes on the center of Kapton foils,
- **Target Material:** High-purity hydrogen gas (>99.99%),
- **Target Length:** 40 mm,
- **Target Pressure:** 0.63 mBar,
- **Target Temperature:** Regulated at 20K,
- **Vacuum Vessel Pressure:** 6.8 x 10<sup>-4</sup> mBar,





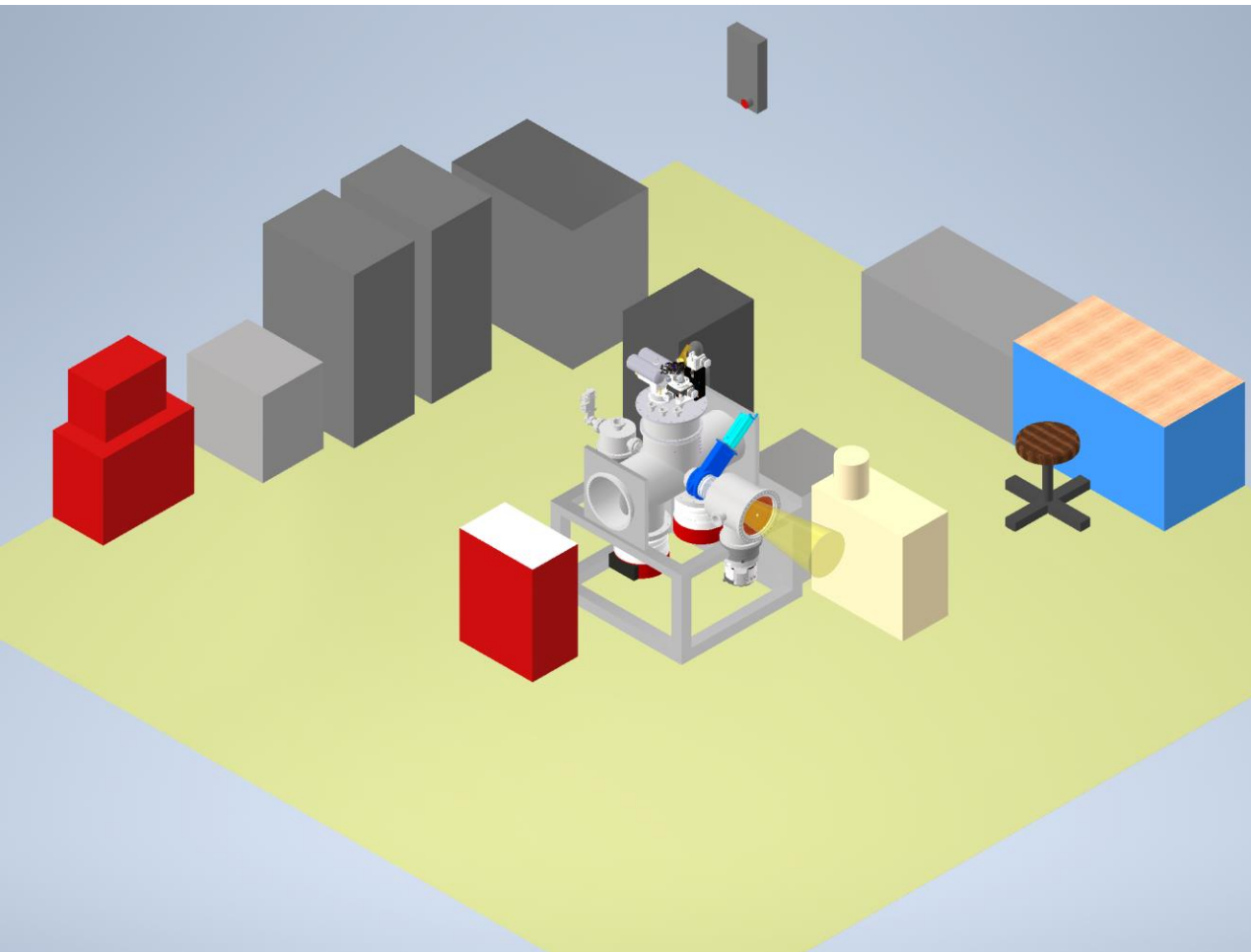
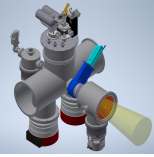
# Brief Target History



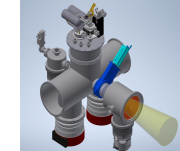
- **Used during 2016**
- **Most of the components were kept in a storage place with for future use**
- **Only a few parts were repurposed**
- **Most of the target components were located and move to Experiment Staging Building, ESB, last months**
- **Preparation of target testing is on going**



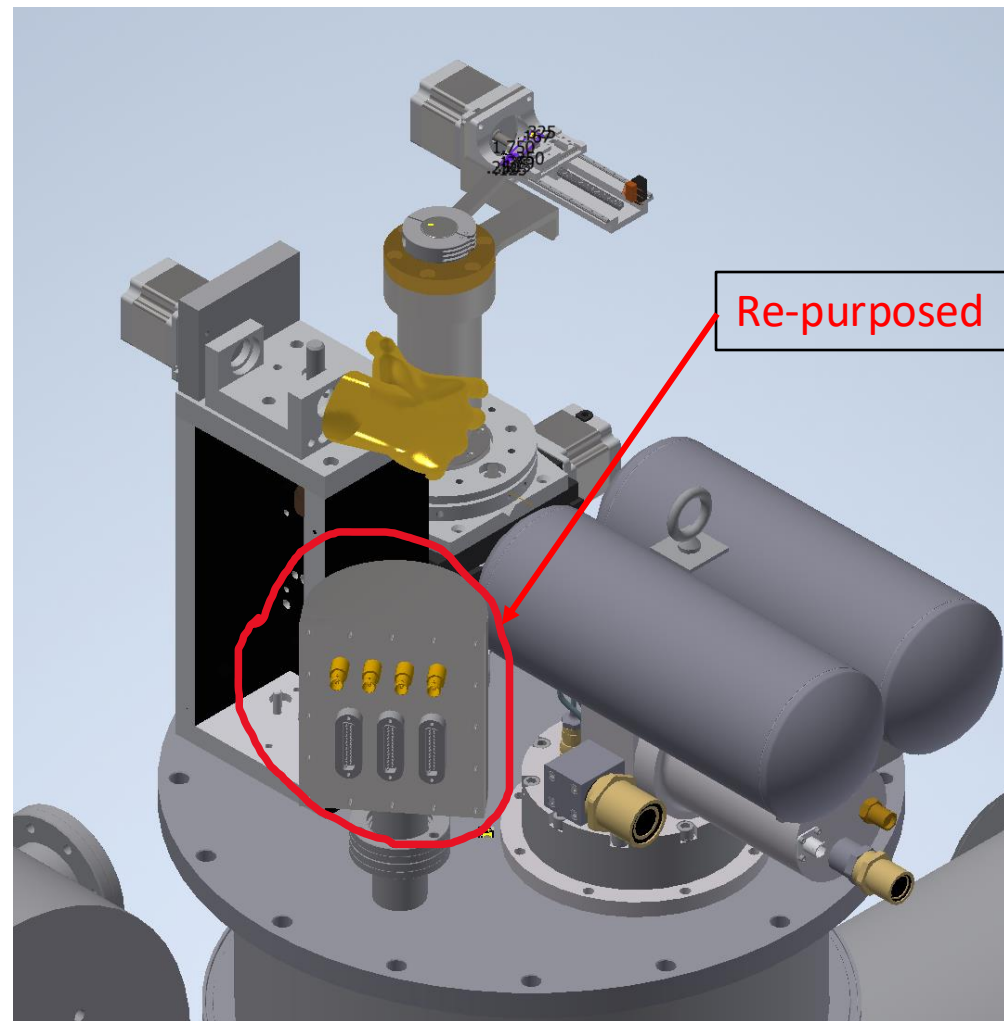
# Test area setup in ESB



# Other components for the target



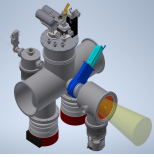
1900 I/s Turbo Pump and multi-stage roots pump



Top of the Vessel

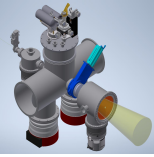


Control Rack



# Status Today

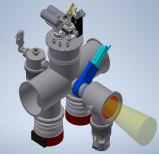
- **Most of power and control cables are in the ESB and ready to be plugged in**
- **Very few components are still not in place (the temperature controller—looking for the original calibrated one, a homemade multi-connector feedthrough for T sensors were repurposed—a new one will be made, etc.)**
- **The chilled water distribution hoses have all been replaced**
- **Working on the ePases for power distributor (Big Bertha) hookup and individual component testing**
- **Cabling have been started**
- **Start working on the target position controller**



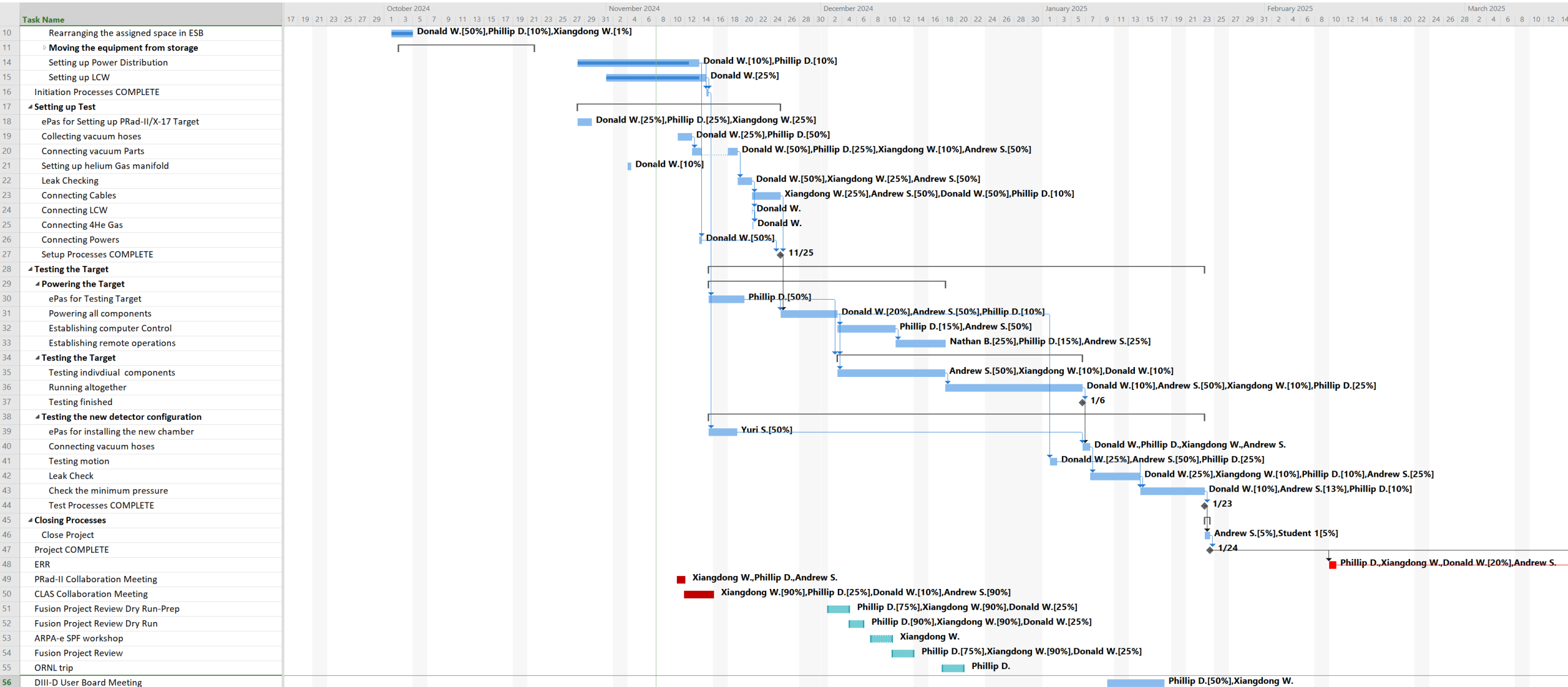
# Short Term Plan and Aggressive Goal

- **Powering up all components**
- **Testing each pump separately (to avoid rushing for long lead time repair works)**
- **Running all pumps and leak check the target setup**
- **Establishing remote control for the hall operation (needs Nathan's help)**
- **Testing target performance with  $^4\text{He}$  (use 2 x flow to compensate low  $\text{H}_2$  pumping rate)**
- **Adding Scintillators and testing vacuum performance (under Youri's guidance and help)**
- **Ready for ERR in Q2 FY2025**

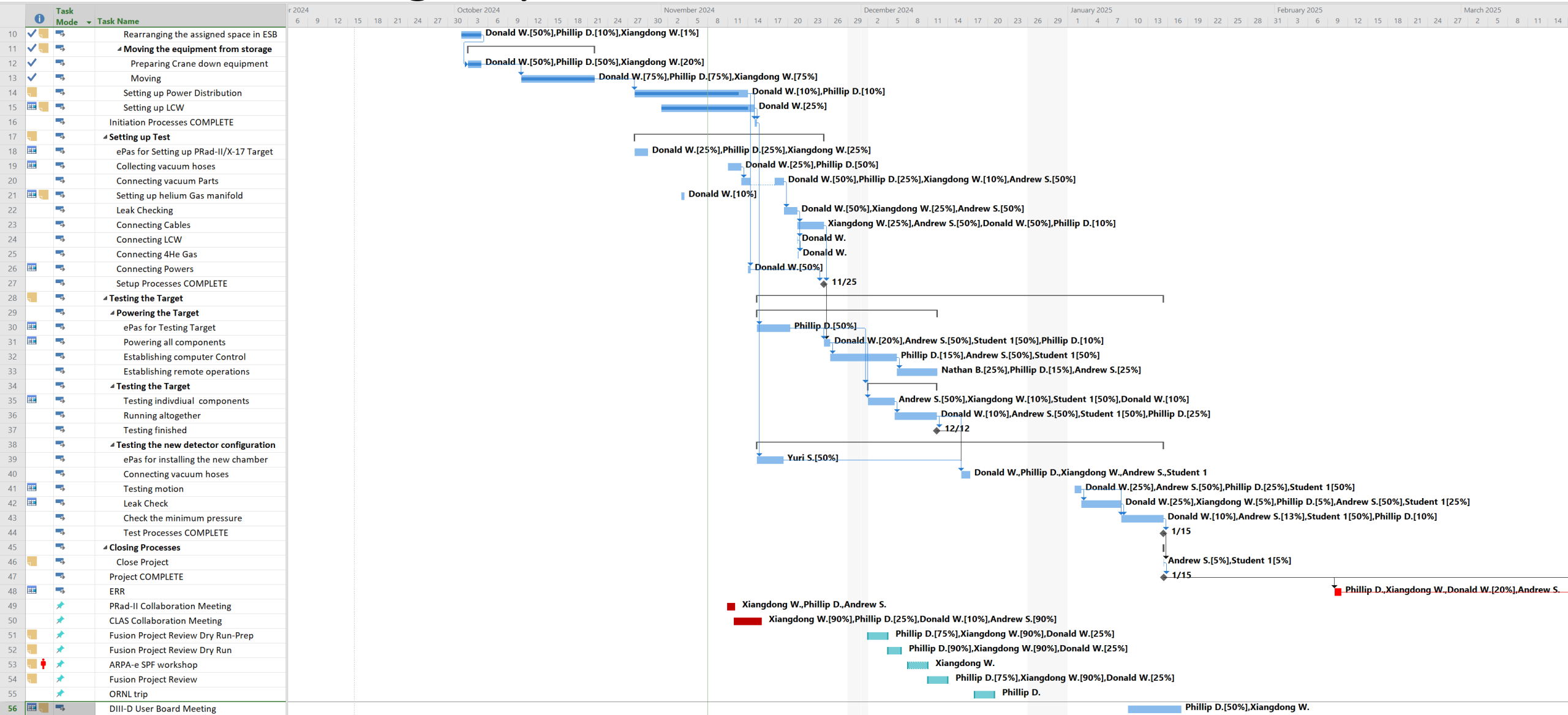
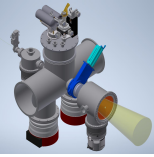


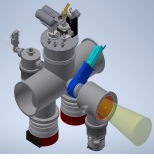


# No Contingency Schedule with current Workforce



# No Contingency Schedule with additional Workforce



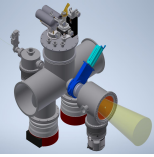


# Issues contributed to the schedule

- Most people working the target (DW, PD and XW) have a funding (>60% support) review in December. Need 2 weeks to prepare
- PD and XW have multiple trips for the other project (also deadline driven)
- Building Irradiation Cryostat and prepare additional vent line at CEBAF Injector

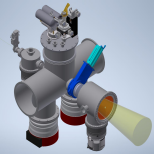
==>More help (beyond Andrew Schick, the new team member from UMass) is needed for the next 3 months---RESOLVED





## Just In Case (thinking ahead)

- **The target performance is relied on the 2 large turbo pumps (Pfeiffer HiPace 3400, no long available). A spare with the similar H<sub>2</sub> pumping speed will cost >\$93K.**
- **The 1900 I/s pump to backup the HiPace 3400s was borrowed from another hall. We should consider to have our own spare**
- **The 1900 I/s turbo pump and the multi-stage roots pump (Pfeiffer A 803H) can be replaced by a larger multi-stage roots pump with 2 X pumping speed (Pfeiffer A 1804H)**
- **All turbo pumps and the cold head compressor need chilled water to run, therefore a spare chiller might be a reasonable thing to have**



# Summary

- The target is being set up in the ESB for recommissioning after long time storage
- The performance test is scheduled to finish in early 2025
- A more aggressive schedule for **a January ERR is possible but would require more help from collaborators and without unplanned delays**
- Spare equipment are needed to ensure the reliable physics runs