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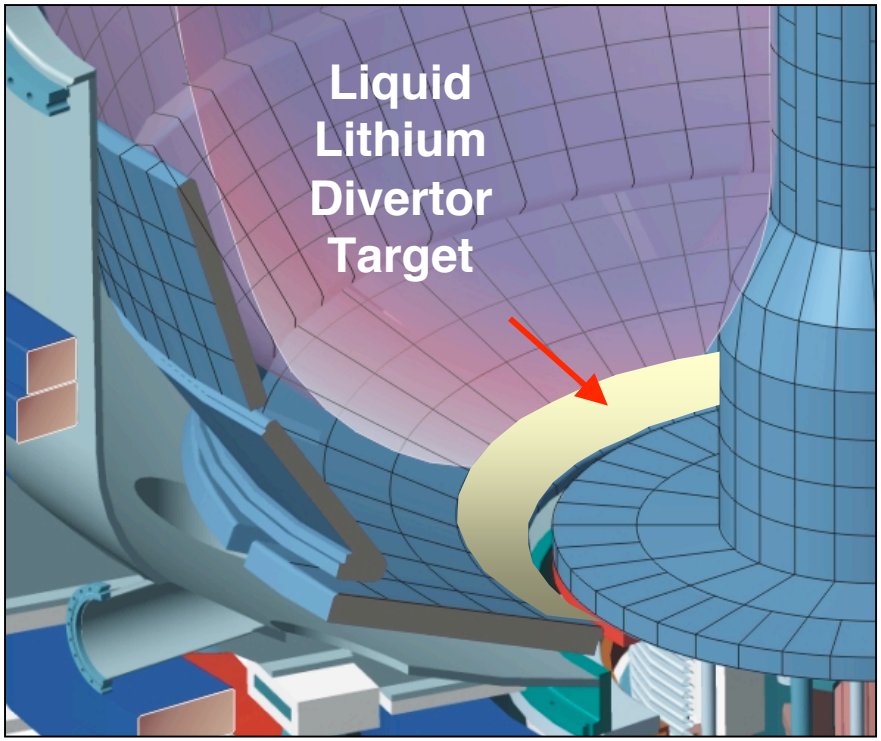


Summary of Planning for Liquid Lithium Divertor Conceptual Design Review And FY08 Installation

H. W. Kugel, R. A. Ellis III, R. E. Nygren

December 18, 2007

The Physics Goal and Specifications for FY09 LLD Operation

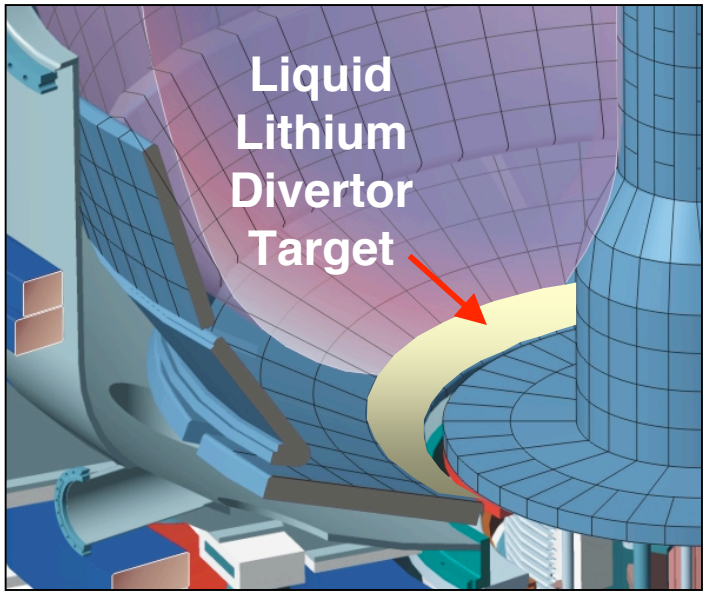
• Physics Goal for LLD

- Determine effectiveness of large area liquid surface for pumping in lower divertor region

• LLD FY09 Technical Specifications

- Location - lower outer divertor, 2.5-5 cm outboard of CHI gap, 15-20 cm wide
- Shape - conical section
- Surface - Li/Mo?/SS/Cu (LTX style plate)
- Lithium loading method - Dual LITER for Li coatings
  - Will test preloading, and loading solids
- Heating - resistive, helium, or suitable liquid (engineering analysis TBD)
- Cooling - helium or suitable liquid (engineering analysis TBD)

The Following Design Has Been Chosen to Meet the 2008 Installation Schedule



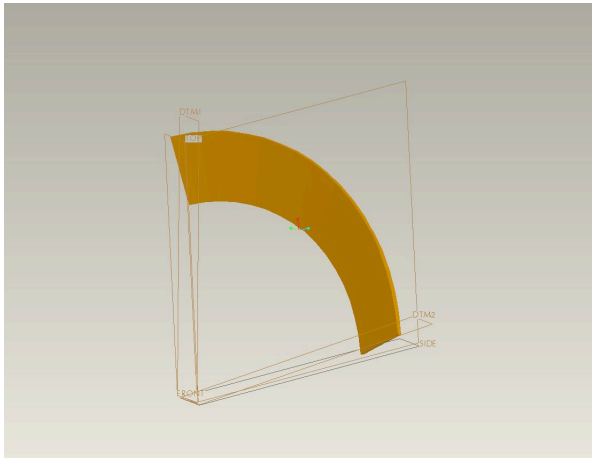
1) Copper baseplates to be installed in four sections
   - Includes heaters for temperature control

2) Thin stainless steel brazed liner to protect copper from molten lithium
   - Covered with plasma-sprayed molybdenum or "passivated" lithium

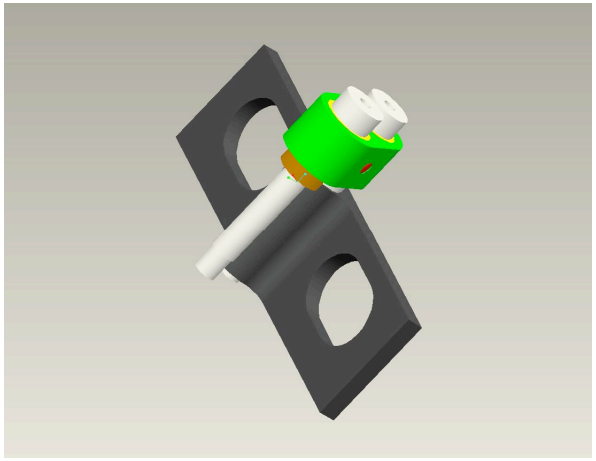
3) Thin liquid lithium coating as plasma facing component
   - Lithium from evaporator or deposited in solid form

4) Use of copper with stainless steel liner based on LTX shell experience

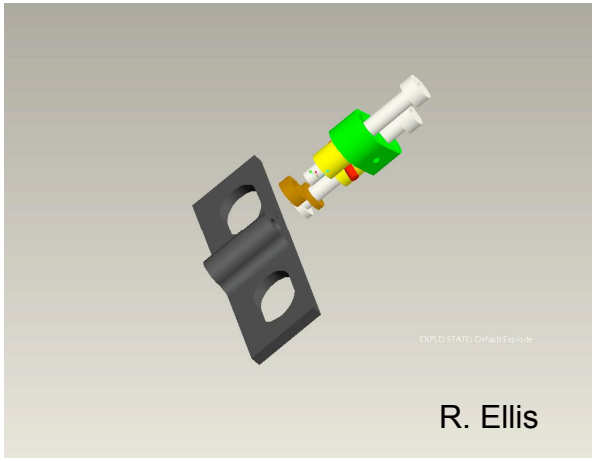
5) Evaporation for lithium coatings based on NSTX LITER experience



90°SEGMENT



FASTENER



R. Ellis

FASTENER EXPANDED

Evolution of NSTX-Sandia Lab Collaboration

Proposed FY07 work: Mo mesh design, thermal analyses, Mo wetting tests
Status: late start, concept modifications, design/analysis/testing (not completed)

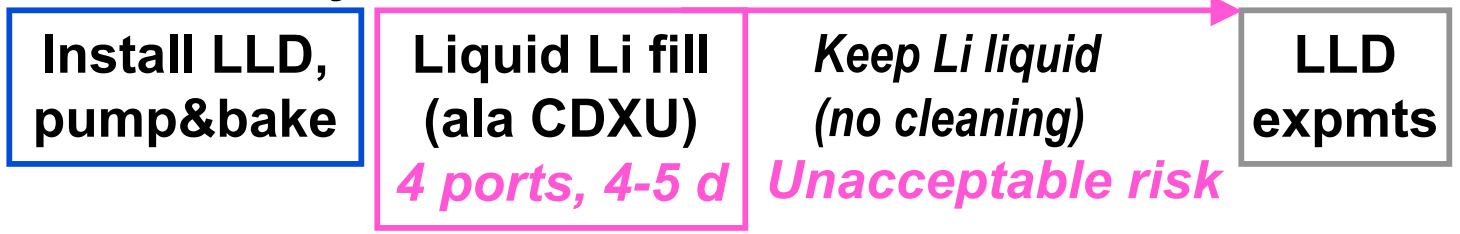
A. Mo mesh in tray – motivation: *best thermal diffusion*

B. Mo coated plate – motivation: *LTX technology, known mat'ls*

Evolution of NSTX-Sandia Lab Collaboration

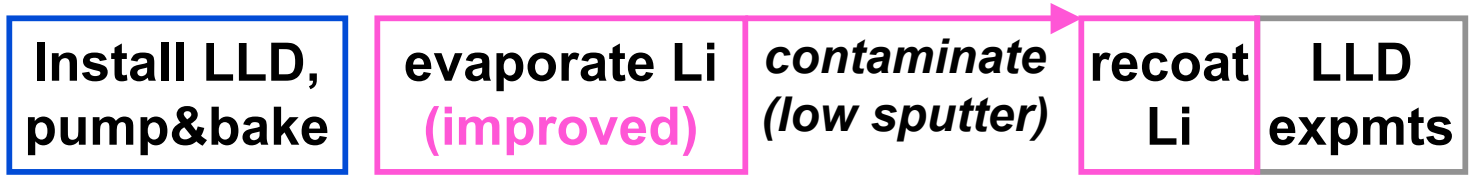
Proposed FY07 work: Mo mesh design, thermal analyses, Mo wetting tests
Status: late start, concept modifications, design/analysis/testing (not completed)

A. Mo mesh in tray – not in FY08



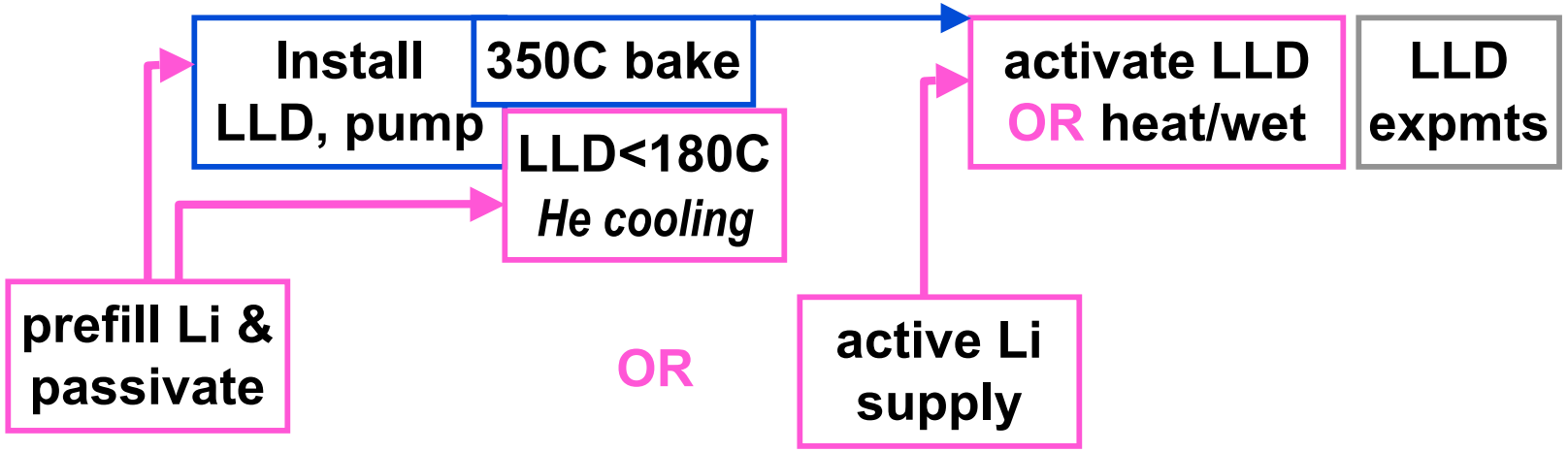
Rethink: 1. Li supply/wetting; 2. Li contamination/cleaning
Schedule-driven solution – simplest, heat removal not great

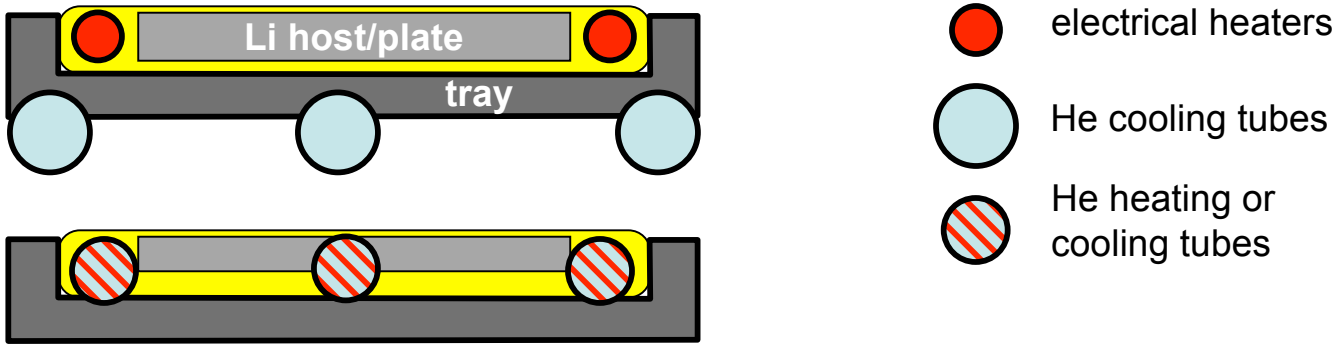
B. Mo coated plate – FY09 Operation



C. Filled Mo mesh – development for FY10/NHTX
More complex, more development time, better heat removal

C. Filled Mo mesh – development for FY10/NHTX





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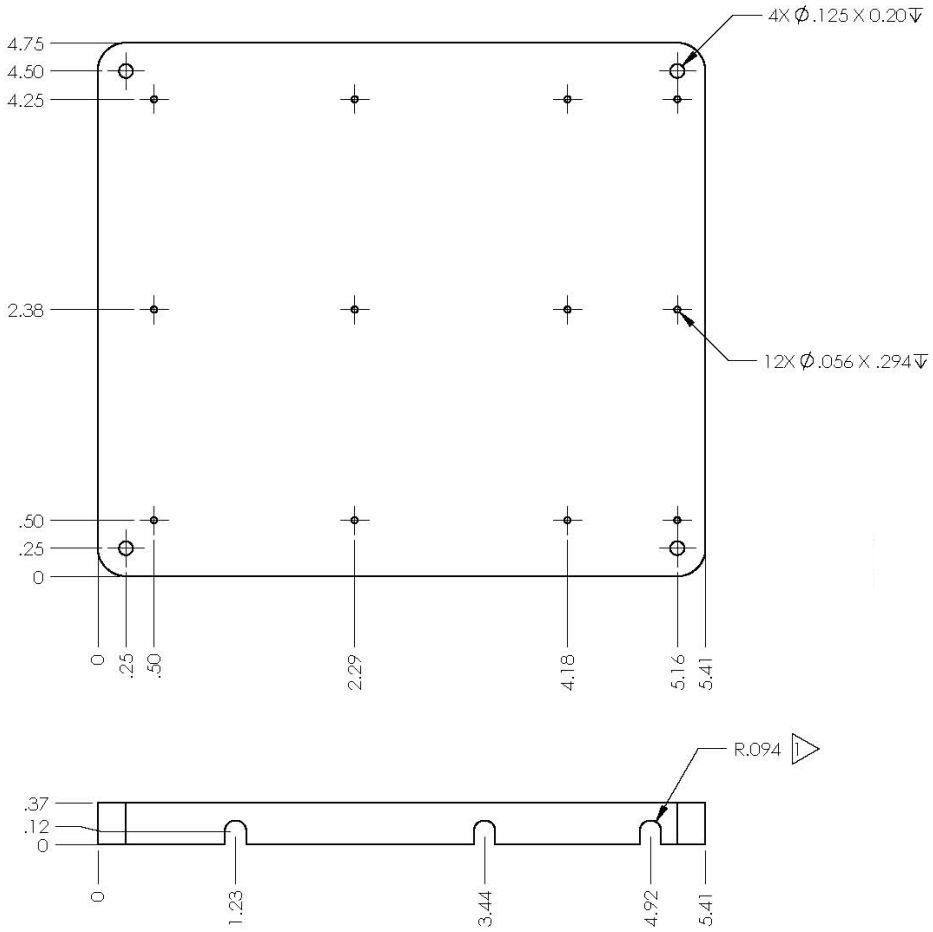
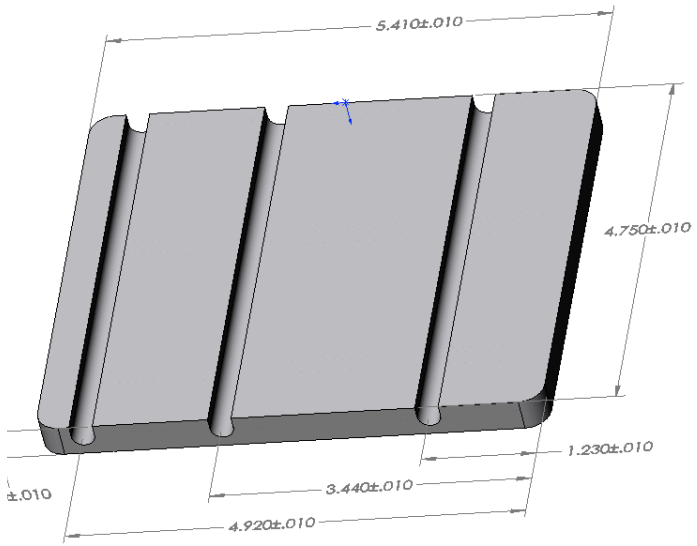
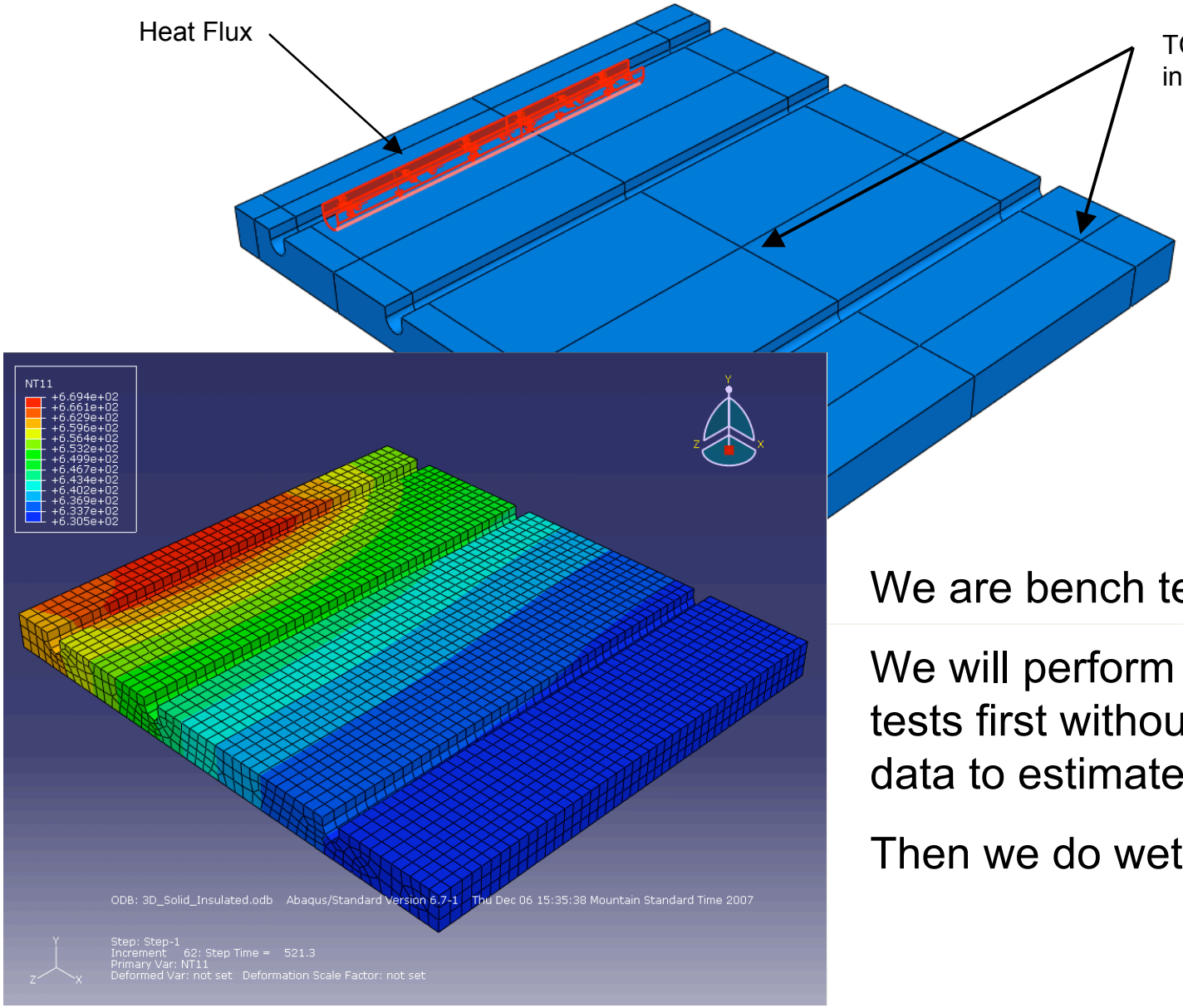


Ultramet Mo mesh
40% dense
CVD Mo on pyrocarbon

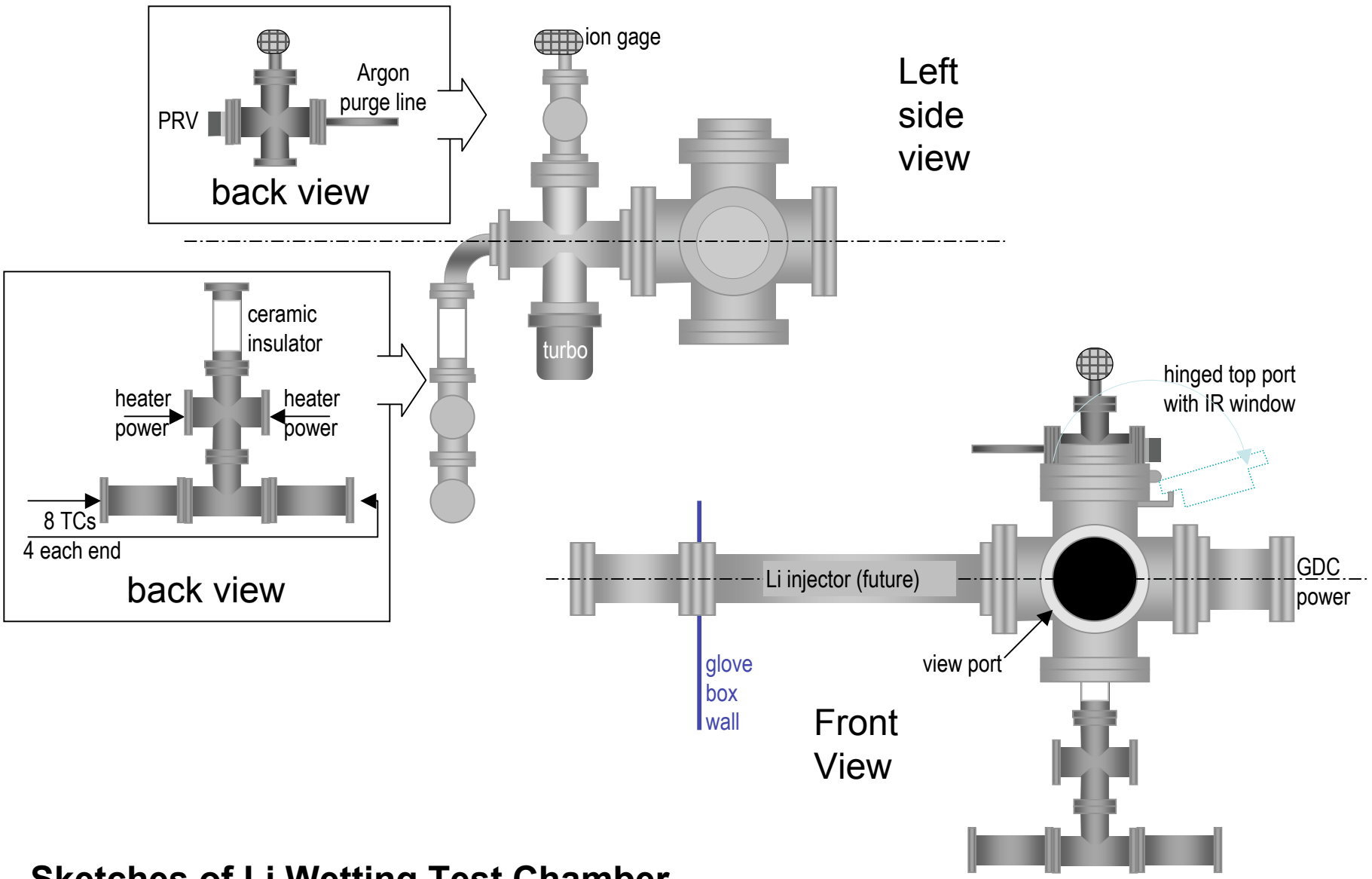




We are bench testing mesh.

We will perform heating tests first without Li and use data to estimate k of mesh.

Then we do wetting tests.



Sketches of Li Wetting Test Chamber

Thanks for PPPL summer internship by Laura Berzak

Laura (NNSA Fellowship) was excellent "LLD Lieutenant"

- **System requirements, diagnostics for wetting test**
- **Visual Basic program for TCs, benchtop validation**
- **Directed technicians and other students on vac chamber**
- **Authored test plan for wetting test**