

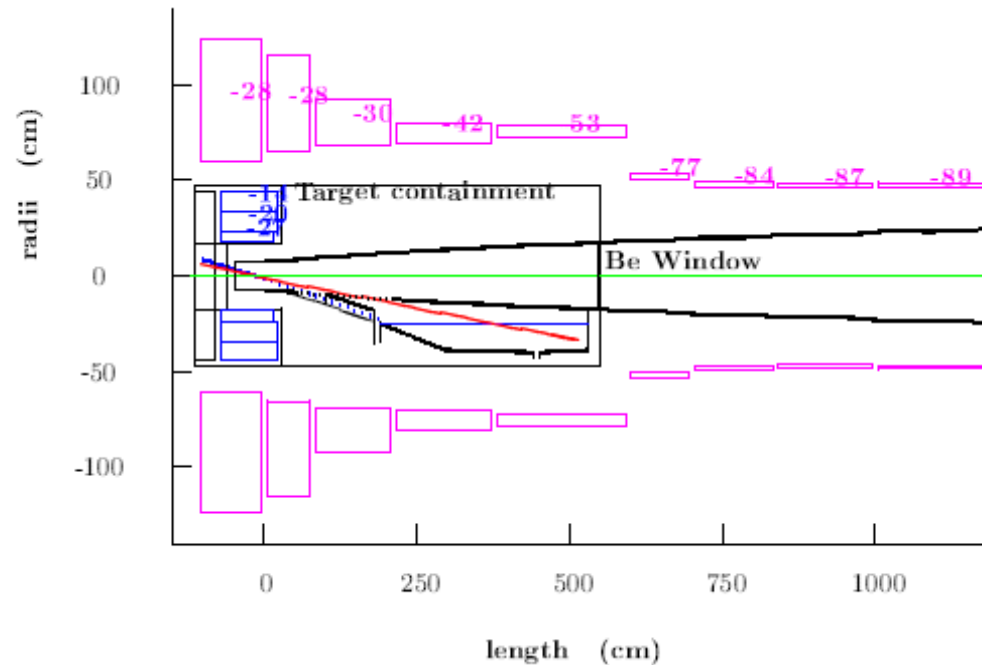
Neutrino Factory Cryostat 1 Concept

V.B. Graves

MERIT Videoconference

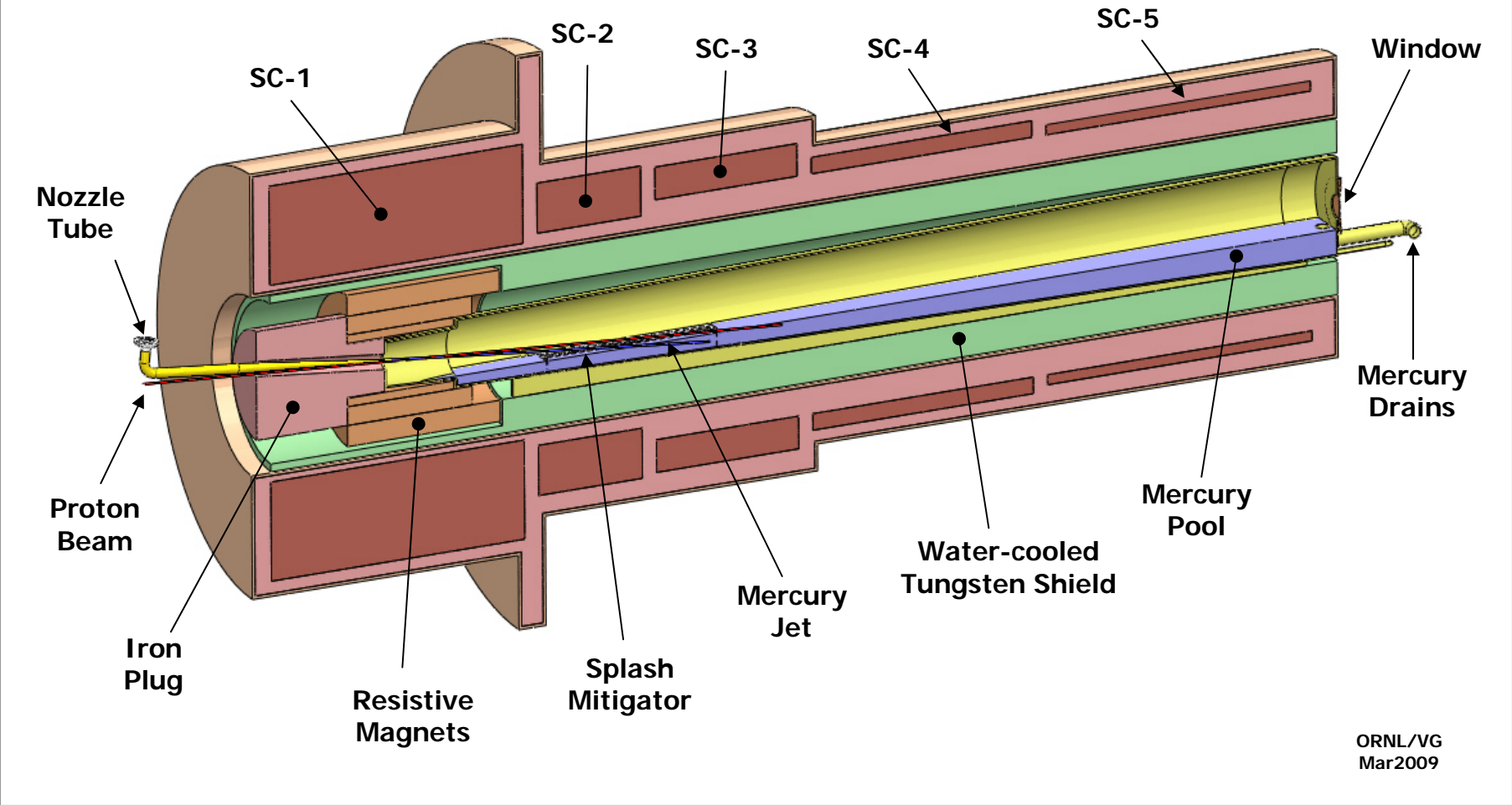
Mar 11, 2009

Study 2 Cryostat Schematic (Fig 3.4)

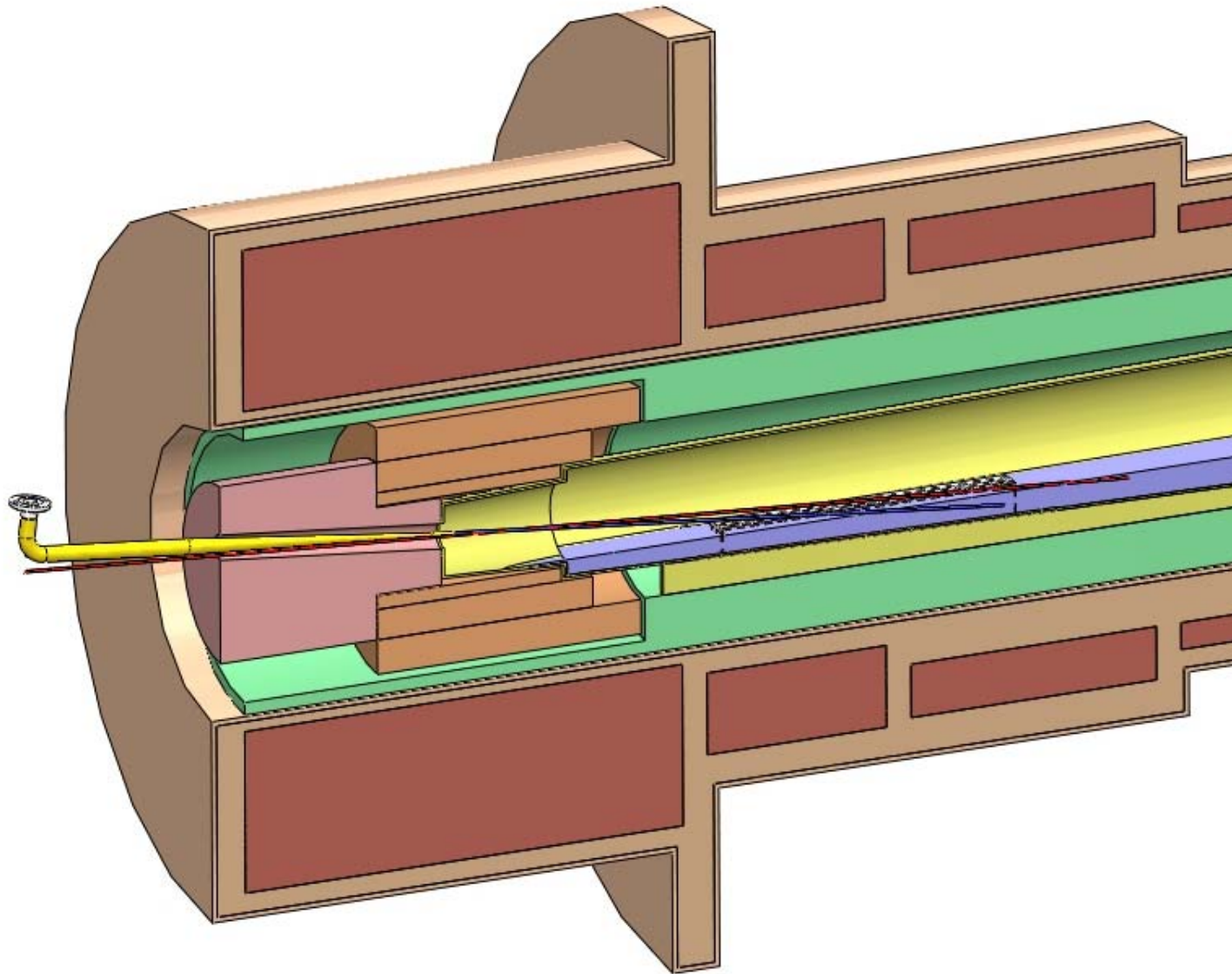


- Target containment extends to end of SC-5
 - Be window also at this location
- Overflow drain at left end of pool determines pool depth
- Jet travels through a splash mitigator prior to entering pool
- Containment encompasses nozzle tip

Neutrino Factory Study 2 Target Concept

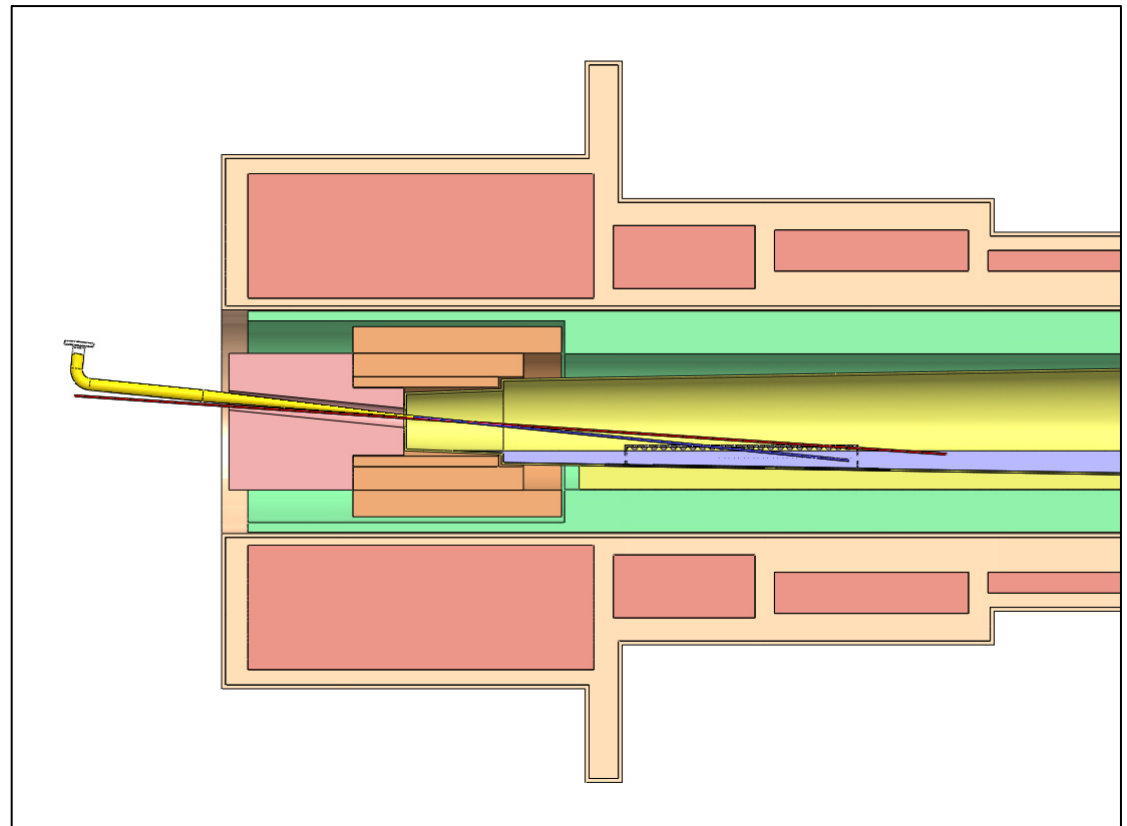


Cryostat 1 Upstream End



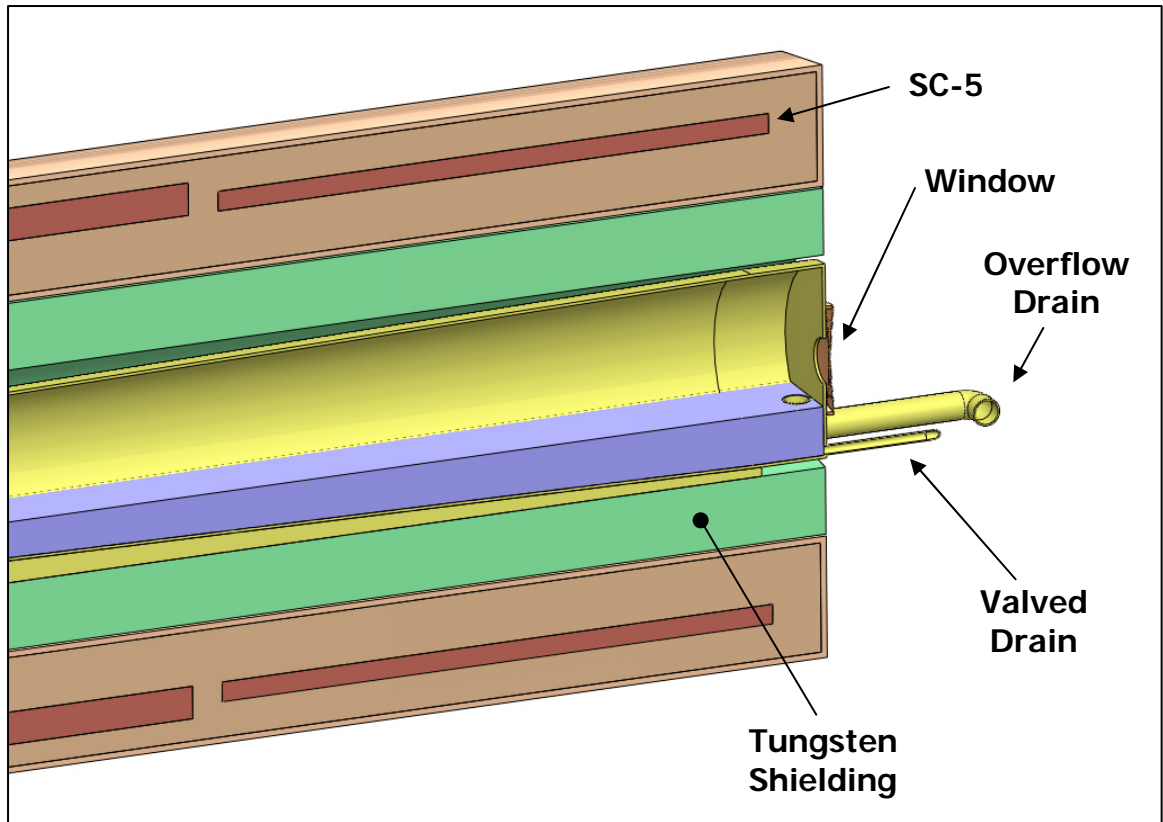
Front View

- Includes slope for Hg drainage
 - Could potentially drain under resistive magnets
- Mechanical issues between nozzle and beam
 - Will be worse if Hg is double-contained
- Iron plug restraints will be an issue
- Splash mitigation scheme incorporated
- Relatively thin beam stop (Hg depth)

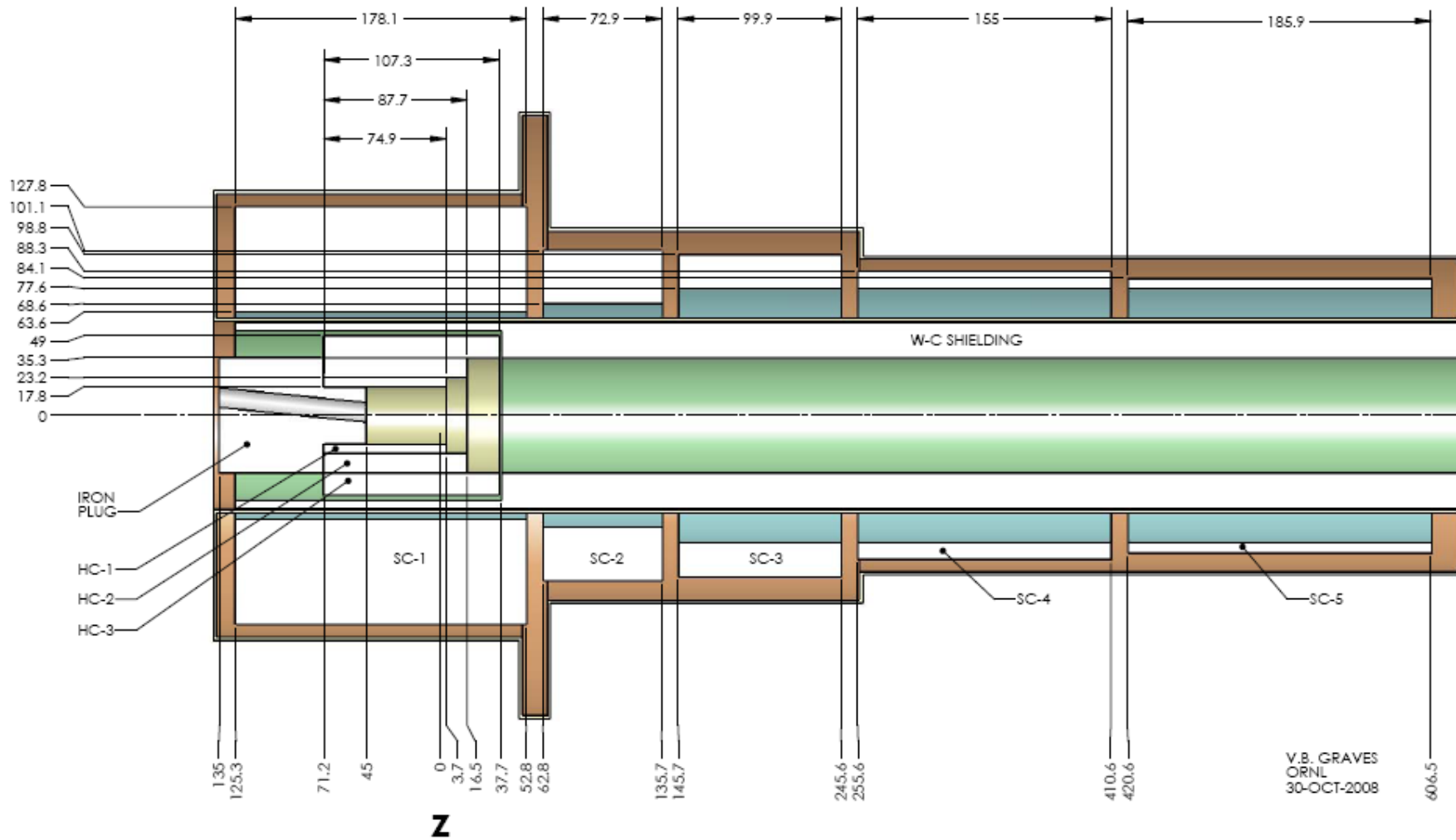


Cryostat 1 Downstream End

- Window becomes a liquid barrier
 - Window actually on replaceable component
- Drainage piping relatively flat for some distance
- Mercury pool serves as additional SC shielding

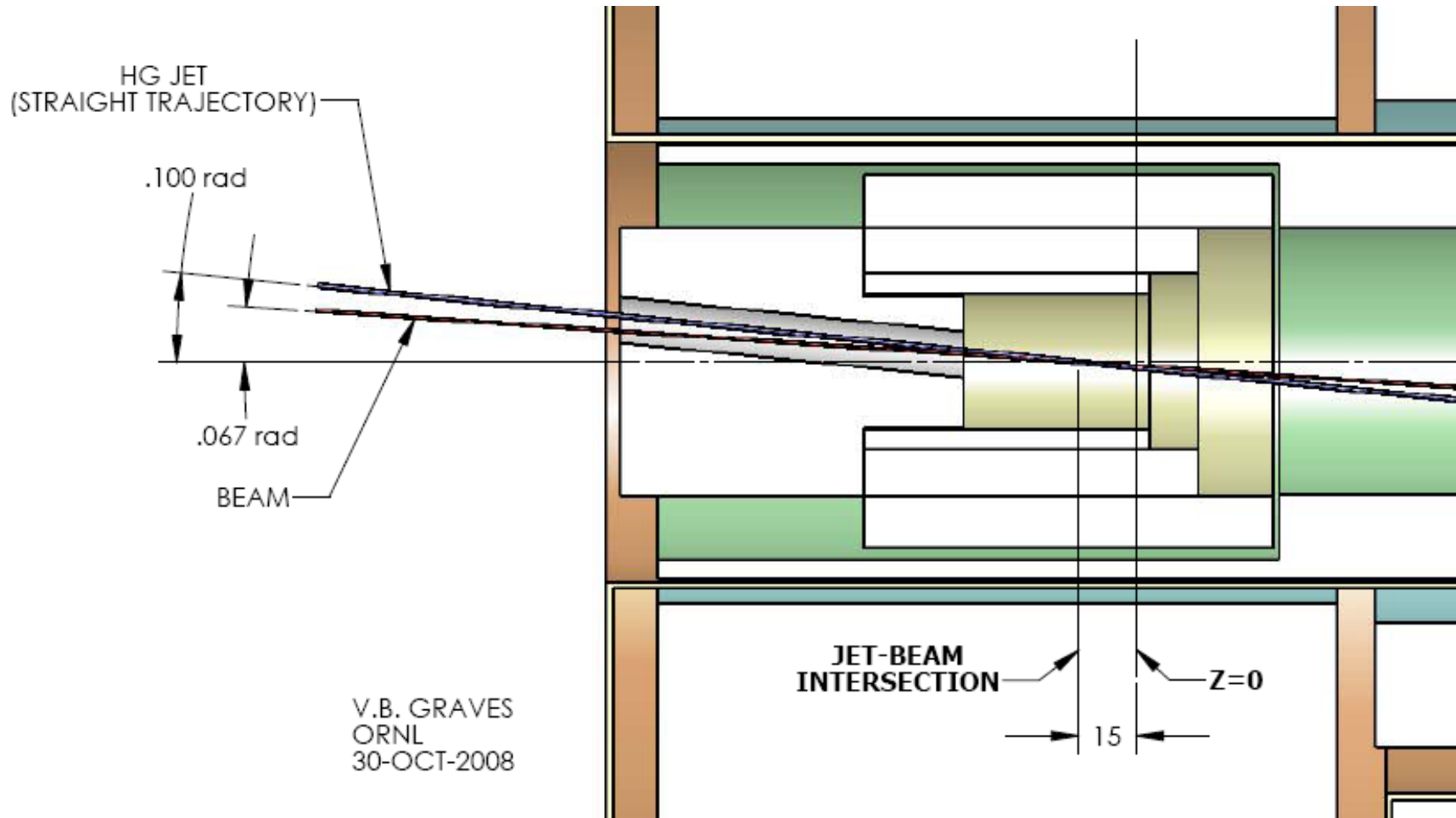


NF Cryostat 1 Dimensional Info



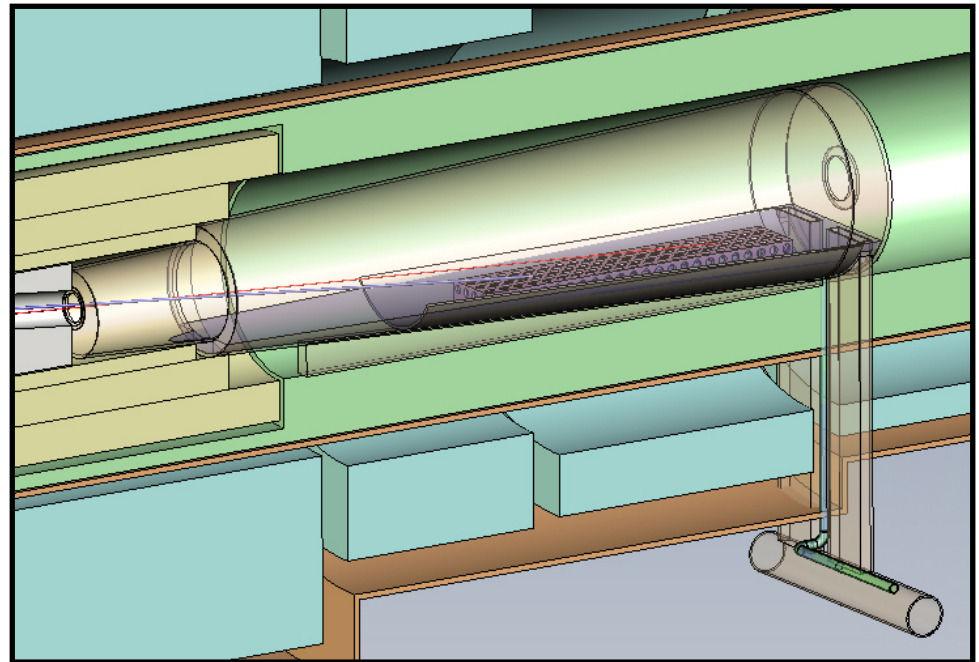
Based on Study II Tables 3.13, 3.14
Dimensions in cm

NF Hg Jet Layout



Study 2 Mercury Containment Vessel Alternate

- Another containment approach includes a shortened Hg container
- Drain lines exit cryostat between SC-3 and SC-4
- This would trap container in the cryostat, preventing future replacement

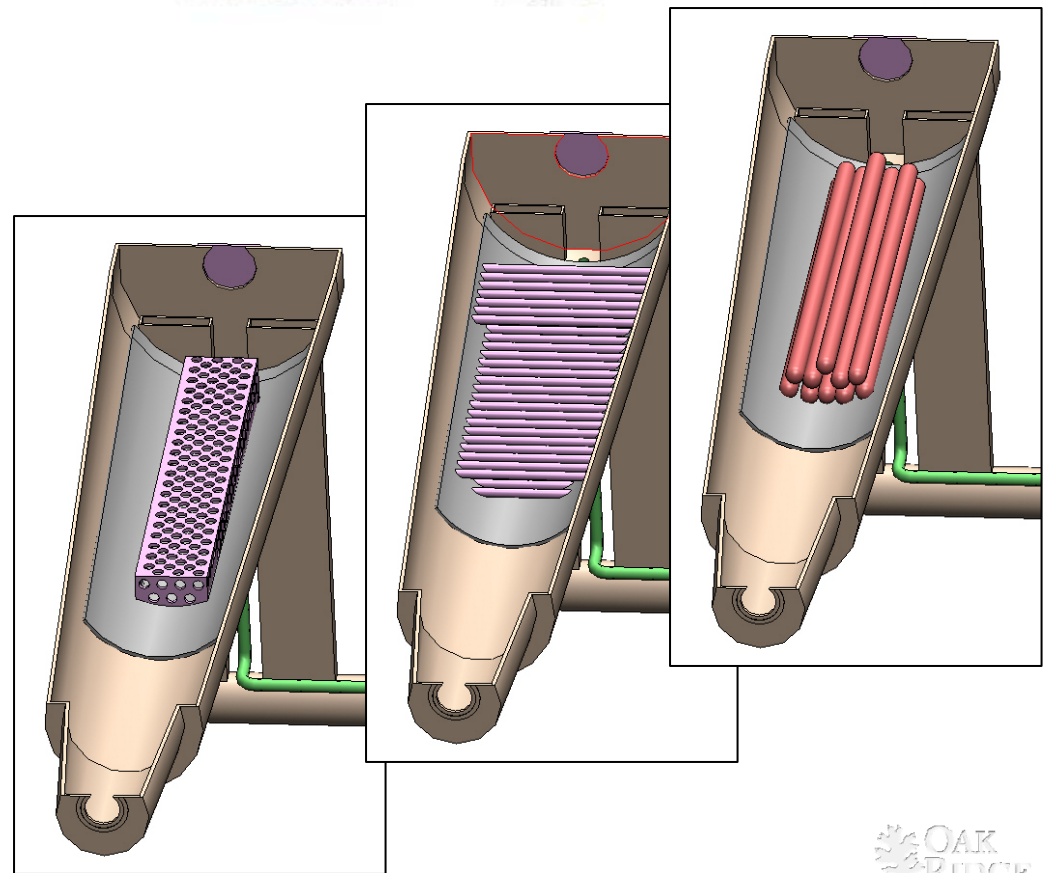
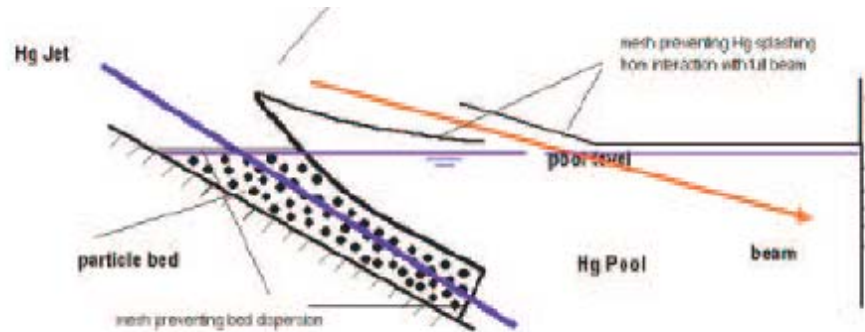


Containment Design Requirements

- Material compatible with high-field magnets
 - Must also withstand some number of full-power beam pulses with no Hg in vessel (accident scenario)
- Desire no replaceable components
- Provide support for Hg weight
 - ~220 liters, 3 metric tons
- Sloped (1° - 2°) for gravity drain
- Overflow drain for 20m/s jet (1.6 liter/s)
- Vent for gas transfer

Splash Mitigation

- Study 2 assumed a particle bed of tungsten balls to minimize effects of jet entering pool
- Many other feasible concepts to accomplish this function
- Simulation/analytical studies may be useful to limit options
- Pool circulation and drainage locations also need to be studied
- Prototypic testing needed for comparison & final determination



Summary

- 3D conceptual model of a Neutrino Factory main cryostat is being refined
- Design and integration of this cryostat with a Hg containment vessel is very complicated
 - Mechanical issues may require physics compromises
- IDS is only funding avenue potentially available for serious design work