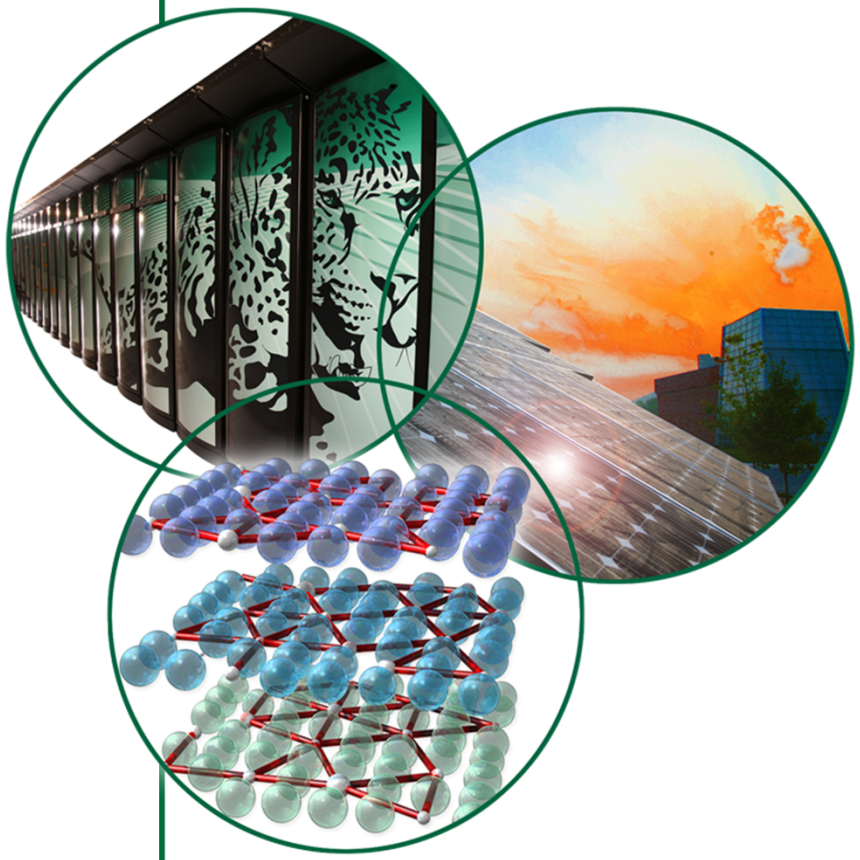
Neutrino Factory Target Vessel Concept Update

V. Graves

T. Lessard

Target Studies EVO

June 26, 2012

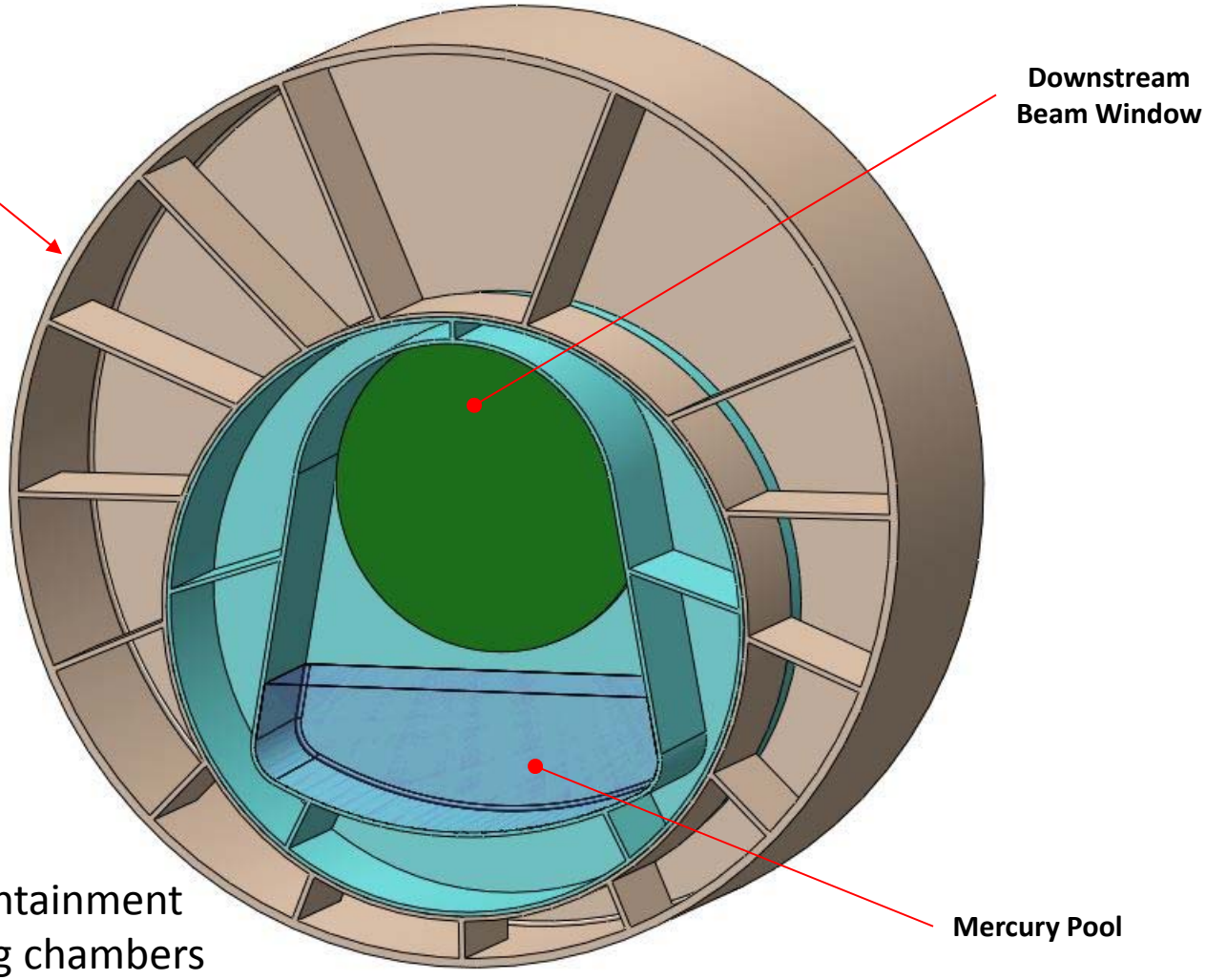


U.S. DEPARTMENT OF ENERGY

OAK RIDGE NATIONAL LABORATORY

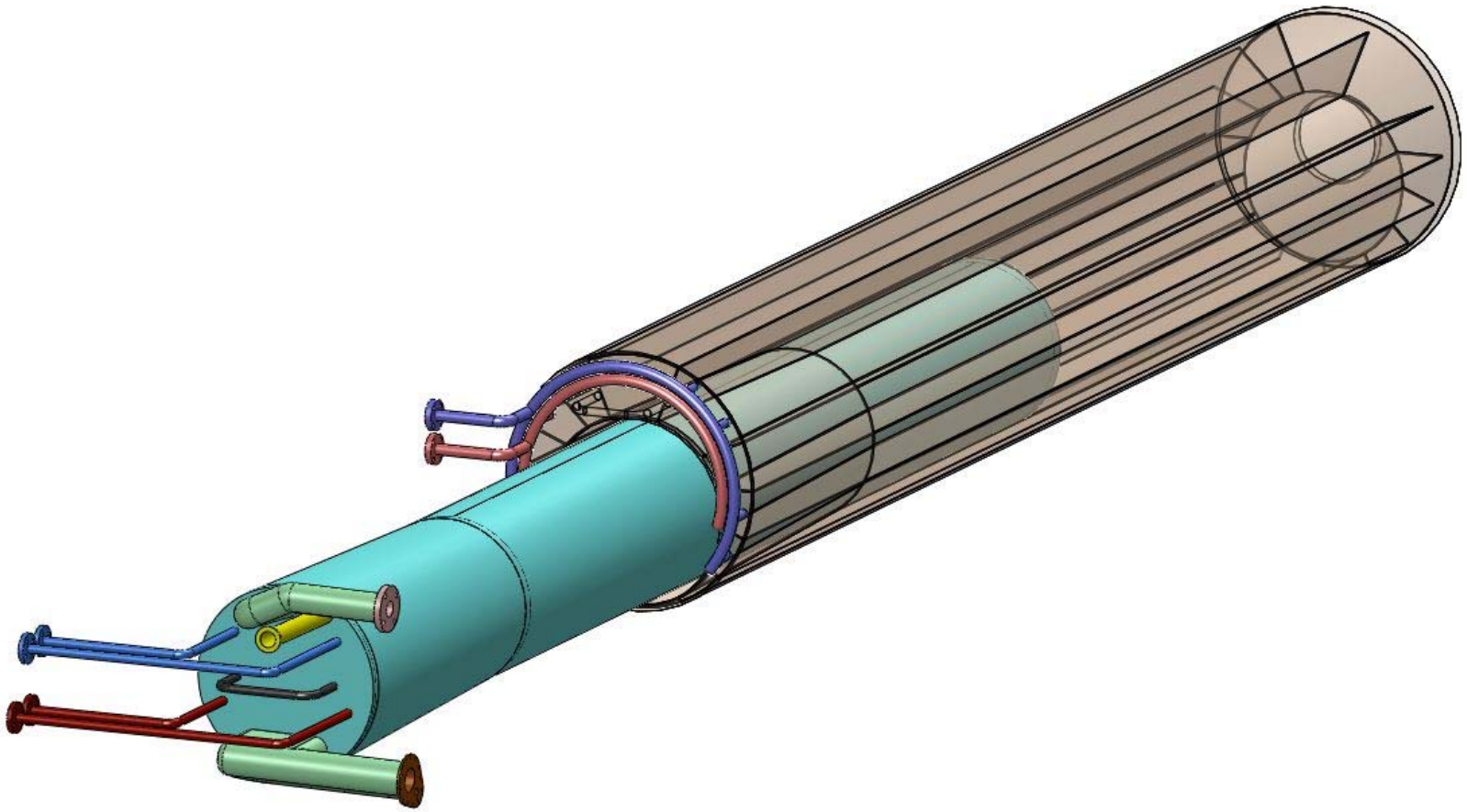
MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY

Review – Last Week's Concept

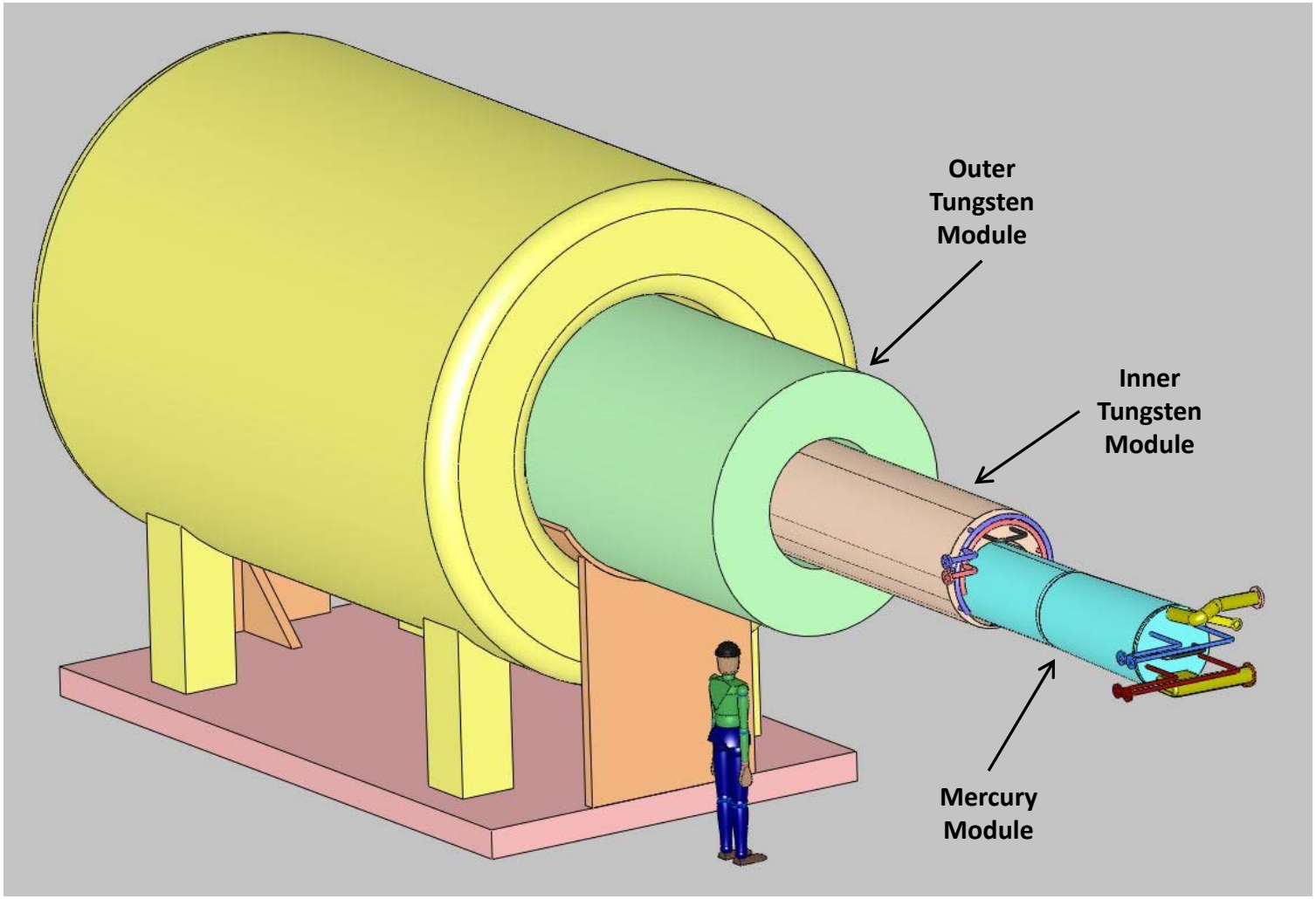


Double wall mercury containment inside tungsten shielding chambers

Review - Mercury Module Extraction

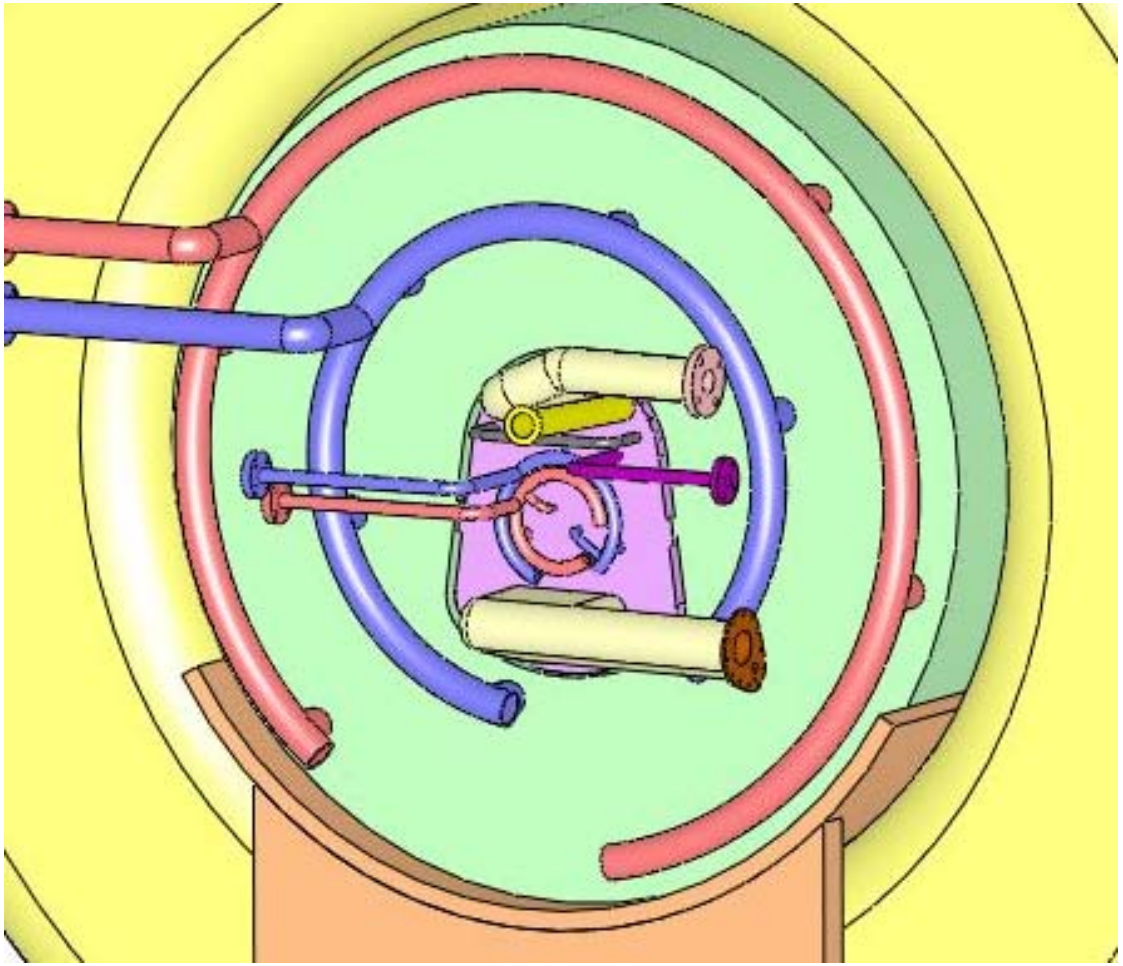


Review - Cryostat Modules

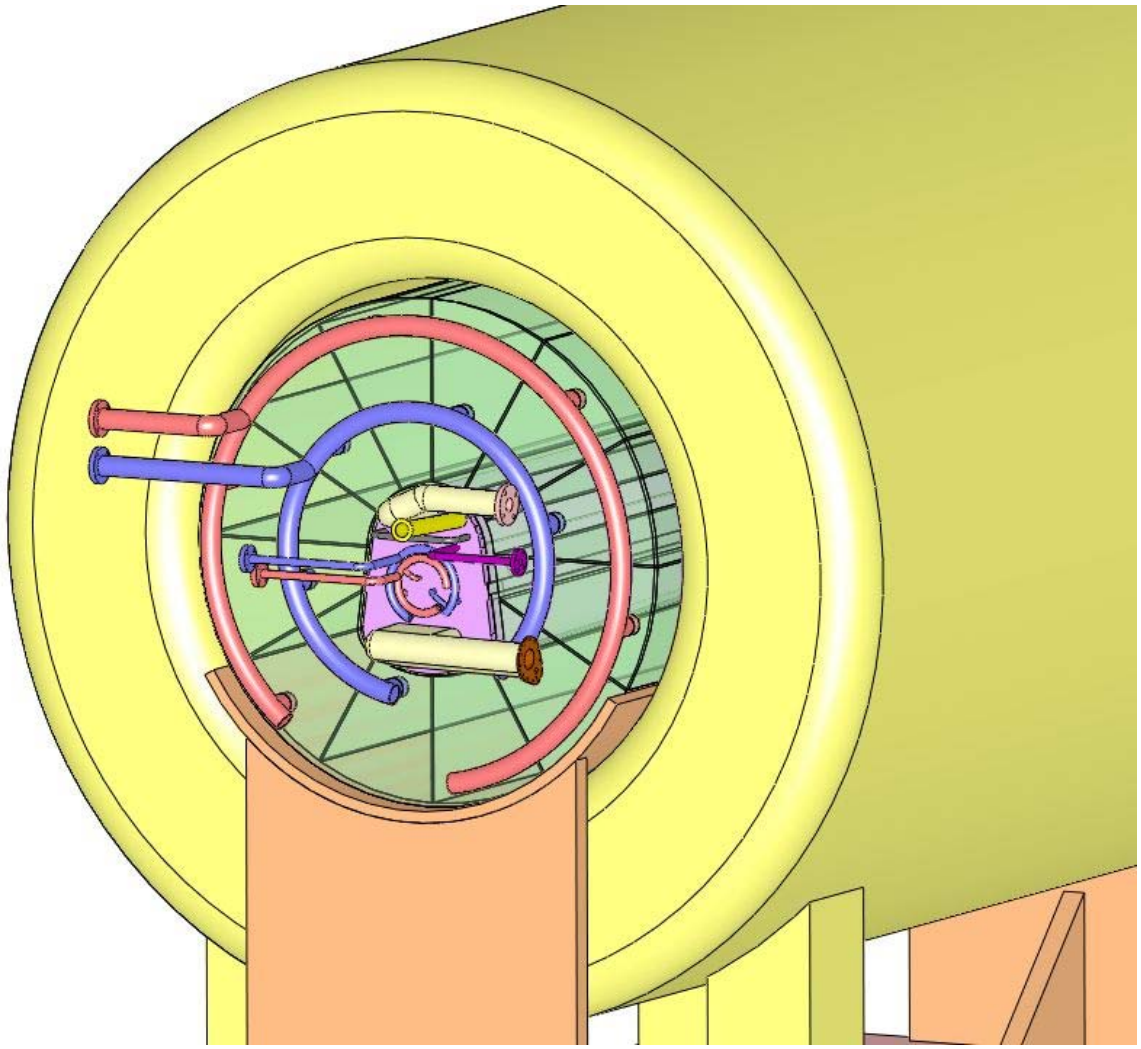


New Concept – Changed Shape of Mercury Module

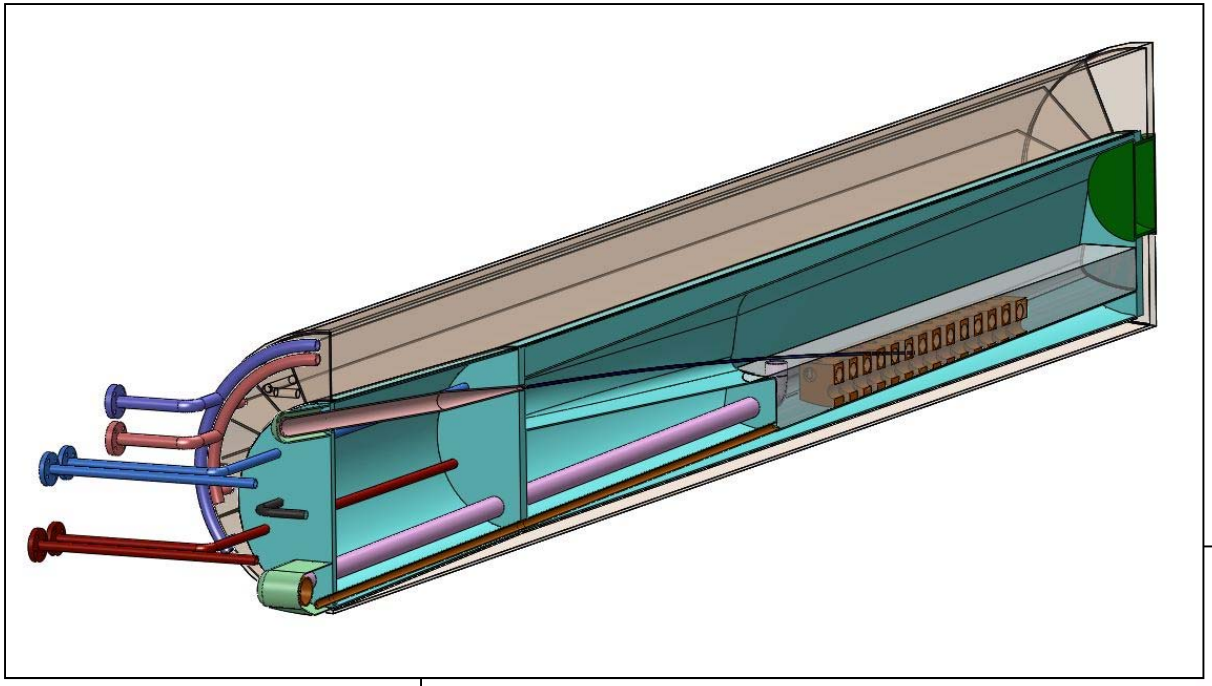
- Outer sleeve now bell-shaped to match inner Hg chamber
- Combined inner & outer tungsten shield modules

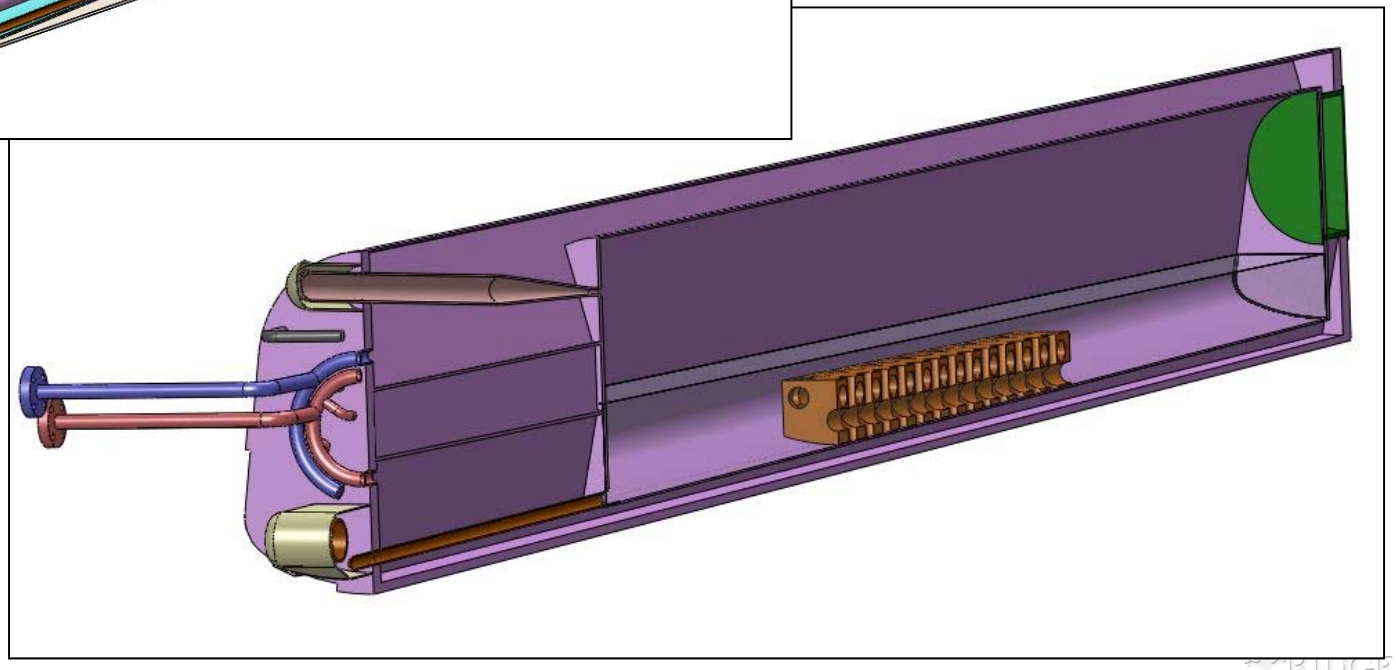


Cooling Channel Within Shielding Module



Mercury Module Comparison

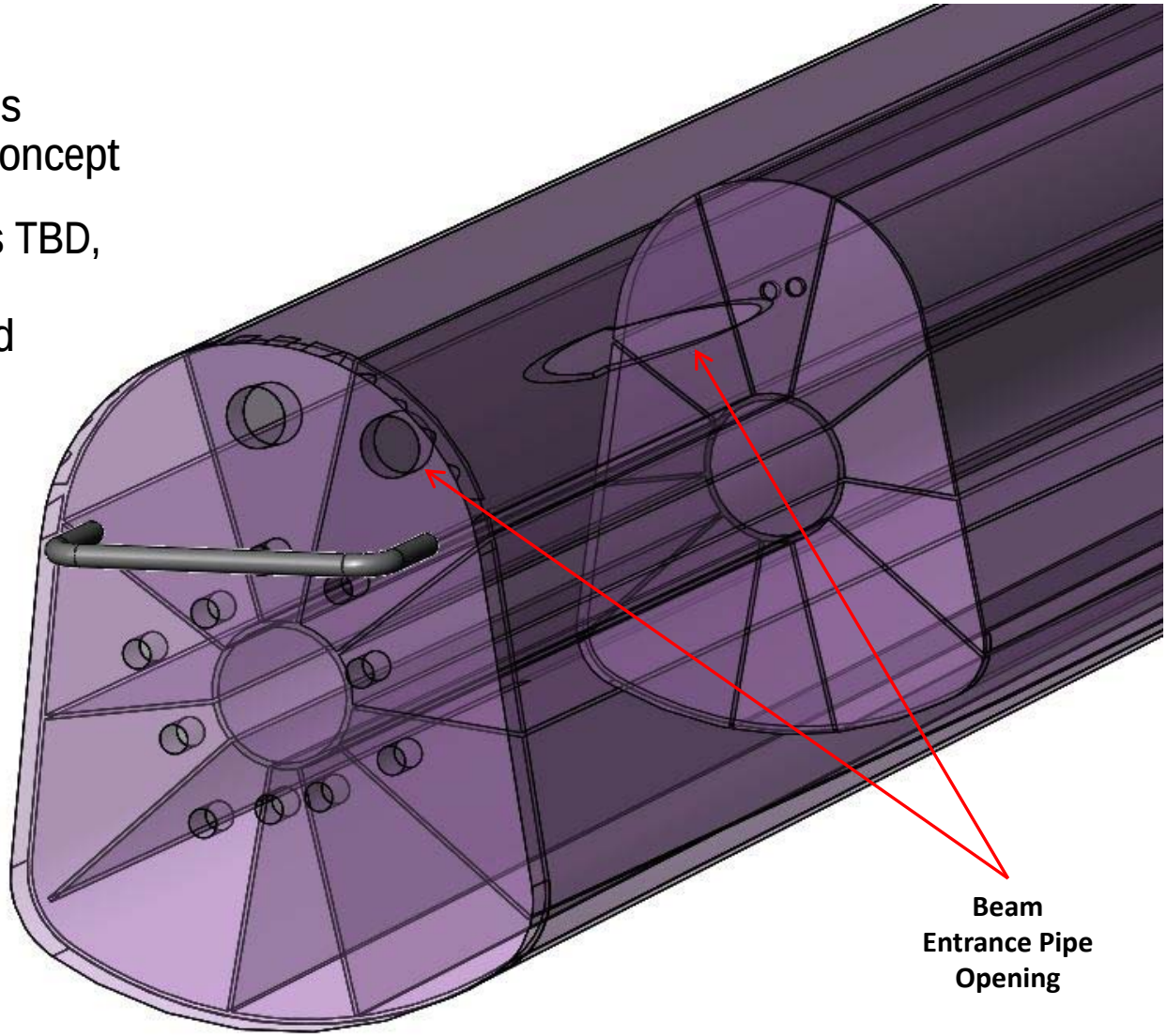




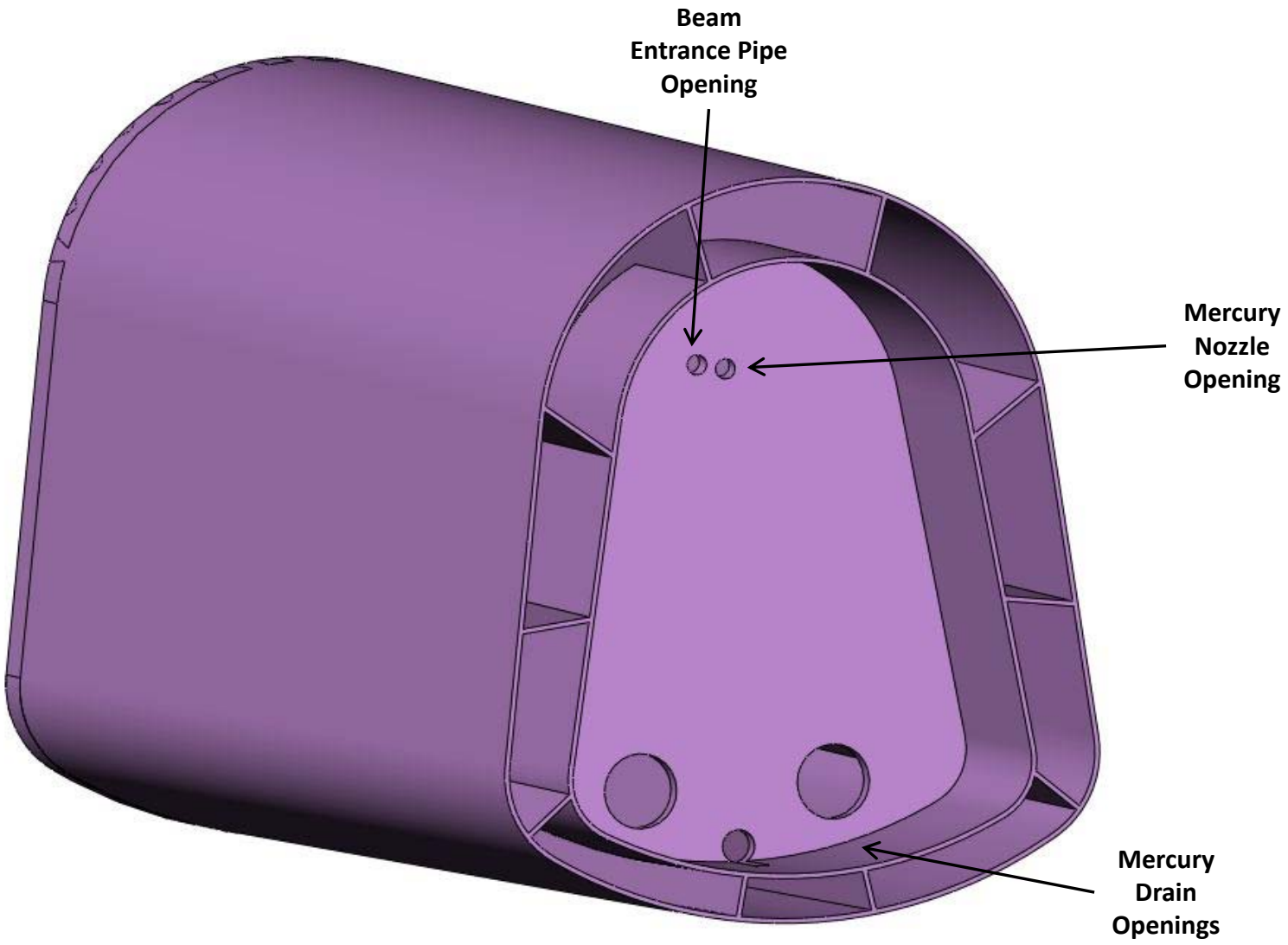
- Increased inner chamber size, simpler geometry
- Added segment vanes throughout interstitial space

Beam Entrance Pipe Complicates Interior

- Beam enters from side, passes through interior vane in this concept
- Number and location of vanes TBD, but this issue will worsen if additional beams incorporated

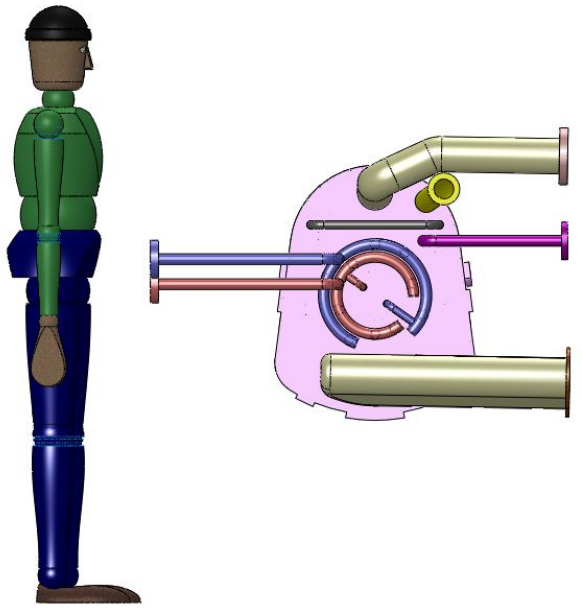


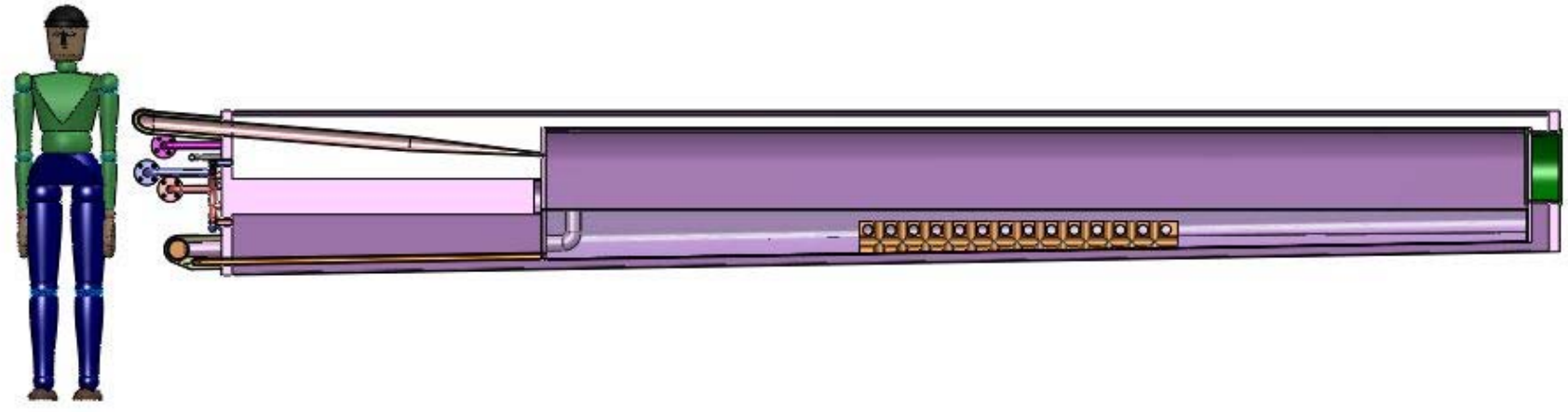
Upstream End of Mercury Chamber



Current Mercury Module

- Requires more mercury than before
- Top no longer matches beam pipe taper
- Provides room for additional side shielding
- Bottom slope incorporated in both walls for draining
- Downstream end can be shortened, assuming the window cooling is adequate

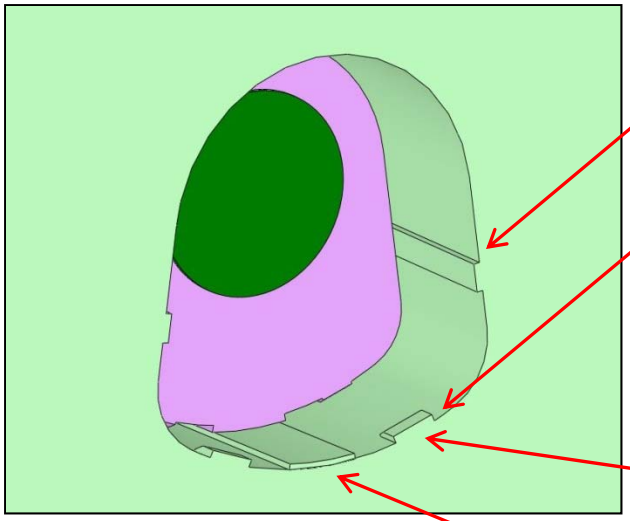




Remote Handling Features Incorporated

- Consideration given towards installing mercury module inside shielding module
- Accurate, repeatable final positioning required
- Assumes cryostat and shielding module are accurately located
- Added 2.5cm open space around mercury module (increased size of hole in shielding module)
- Incorporates “rough” and “precision” guides
- Adds features to both the mercury and the tungsten modules
- Assumes a handling cart/mechanism with minor vertical motion capability

Initial Guide Concept

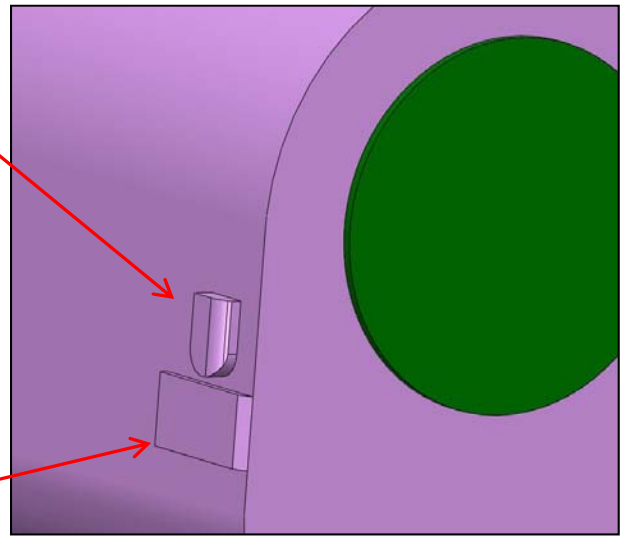


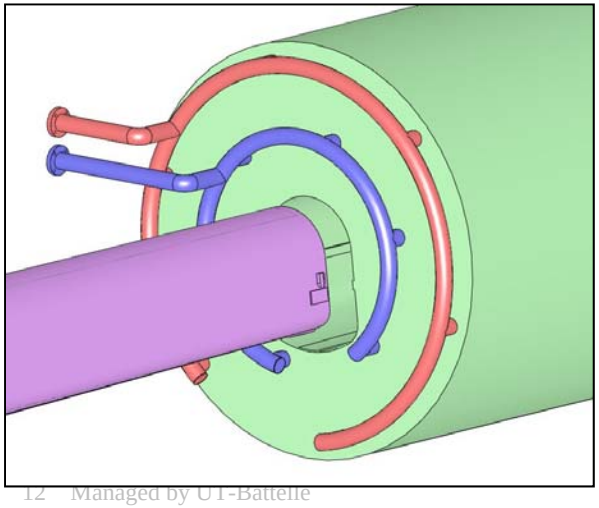
Rough Guides

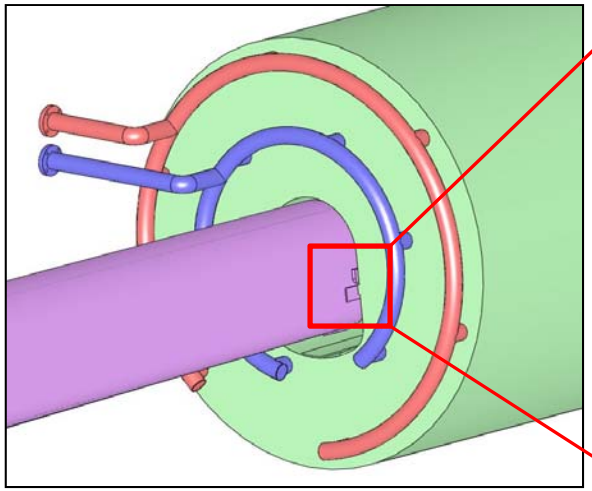
Module Support Pads

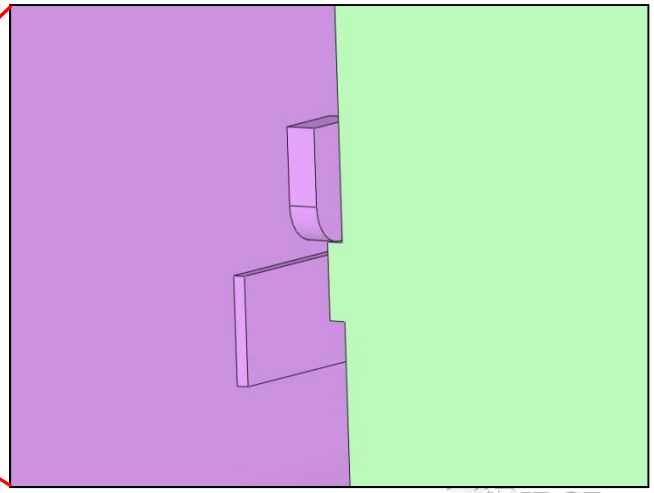
Precise Guides

Mercury Weight Support Pad









Summary

- Mercury Module now provides double-wall mercury containment with no leak path into tungsten cooling channels
- Module is independent, requires its own helium cooling capability
- No consideration yet for structural and/or cooling issues
- Initial look into schemes for precision location of module within tungsten shielding