Target Vessel Requirements

• Accurate jet placement
• Jet/beam dump pool
• Double containment of mercury
• Beam entrance port(s)
• Chamber ventilation
• Provisions for cooling
• Provisions for draining
• Additional SC coil shielding
Starting Point: Integrated with Resistive Magnets

- **Goal:** develop concept with no resistive magnets
- **Method:** start with solid cylinder of SS and remove material as required
Cylinder
Jet/Beam Chamber
Nozzle
Beam Pipe
Mercury Pool Trough
Draains
Vents
Downstream End Cap
Double Wall
Beam Window

- Could add flow channels to interstitial space for water or helium cooling
- Beam window becomes integral part of assembly
- Be/SS interface TBD
Cooling Channels
Comments

• These images were created to aid in discussion. No specific fabrication details were included.

• A machined billet will be more precise, rigid, and more accurately place the nozzle than a welded shell filled with tungsten beads.

• This concept still has numerous issues to be worked out. For instance, all fluid passages must be self-draining.

• Space on the upstream end is still a major concern. The small beam/jet angles cause significant mechanical issues.
**Tungsten Shielded Version**

- Develop concept for welded vessel filled with tungsten beads
- Start shielded portion at Z=nozzle, replace bored holes with pipes
- Initial geometry similar to earlier concept, but shorter. Assumed Stainless Steel.
Reconsider Interior Profile

- Clean up jagged edges, abrupt transition
- Match beam pipe but allow for wider pool
Mercury Vessel Profiles

- Vessel profile matches beam pipe only at the top. Shielding ability not symmetric around magnetic axis.

- Vessel profile expands in width & depth for pool. Shapes can be varied slightly.
Enlarged Profiles
Shell Geometry

- Start of deviation from earlier, solid concept
- Create region for tungsten shielding
Add End Cap for Beam Window
Add Tungsten

- Helium- or water-cooled beads
  - Would include multiple sectors for inlets/outlets
  - Water cooling requires slopes for drainage

- Tungsten not axi-symmetric

- Structural supports required
Double Containment Shell

- Interior module requires rigid confinement within exterior shell
Add End Cap and Beam Window

• **Hollow beam window for double-wall mercury confinement**
  - Be/SS interface

• **Could fill interstitial with water or helium for additional cooling**
  (beam window requires cooling)
Nozzle Piping

- Extends between vessels
  - Double pipe required outside secondary vessel
  - Upstream length determined by handling considerations
Drain Piping in a Similar Fashion

• Other pipes needed for beam(s), cooling, vents
• This becomes a single module for RH
• Flanged connections to external services
Comments

- Welded structure less precise than earlier, machined module
  - Could affect nozzle accuracy
  - Tungsten/mercury weight requires significant support structure
  - Target module location determined by guides/features inside SC shielding module