Hg Delivery System Nozzle Discussion

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During Hg delivery system design review, discussion initiated concerning nozzle changeouts at MIT

- Current design requires decoupling of delivery system from magnet bore to access nozzle
- Operationally preferable to have access to nozzle while inserted in magnet bore
Requirements & Desirables for Up-beam Access

- Change direction of access of mechanical fasteners
- Addition of a flange interface on the up-beam end of the system
- Removable secondary containment flange
- Accommodate plenum or non-plenum nozzle configurations
McDonald Flange

- Kirk provided sketch of intermediate flange concept designed to accept plenum & non-plenum configurations
  - Incorporates o-ring seals
- Conceptual models developed as discussion tool
  - Presentation based on subjective information
Conceptual Configurations

- Attaching plenum from up-beam end requires smaller diameter plenum

- Rigid supply tubing must bend towards center to accommodate flange bolt circle

- Non-plenum tubing requires Hg flow to bend away from center (adds 4 bends before 180-deg turn)
Removable Plenum Concept

- Adding exterior bolts reduces plenum ID
- Beam tube positioning will be problem
- Plenum wall thicknesses may not be representative
Secondary Flange

- Radial screws provide most clearance for removal of nozzle
- Secondary sleeve not thick enough for flat-head screws
  - Adding thickness reduces clearance for removing nozzle
- Requires fairly precise sleeve/flange fabrication to achieve proper sealing
My Opinions

- Intermediate flange bolt spacing probably not realistic
  - High pressure will require tight spacing
  - Preventing o-ring groove overlap may prove difficult

- In-line access to all bolts not possible, especially with non-plenum configurations
  - Magnet bore sleeve extension makes problem worse
  - Other magnet connections may not allow direct hands-on access anyway

- Radial attachment of secondary endplate difficult without reducing ID of secondary bore

- Mechanics of removable plenum creates severe space limitations
  - Wall thicknesses of plenum may increase to accommodate Hg pressure
  - Inlet effects into nozzle may be affected

- We are increasing potential leak paths & possible failure modes
  - My guesstimate for nozzle changeout in current configuration is 1-2 days

- Selection of plenum or non-plenum should be made ASAP (with Princeton water tests if possible), not try to carry both approaches through fabrication