UT-BATTELLE

MERIT Primary Containment Status

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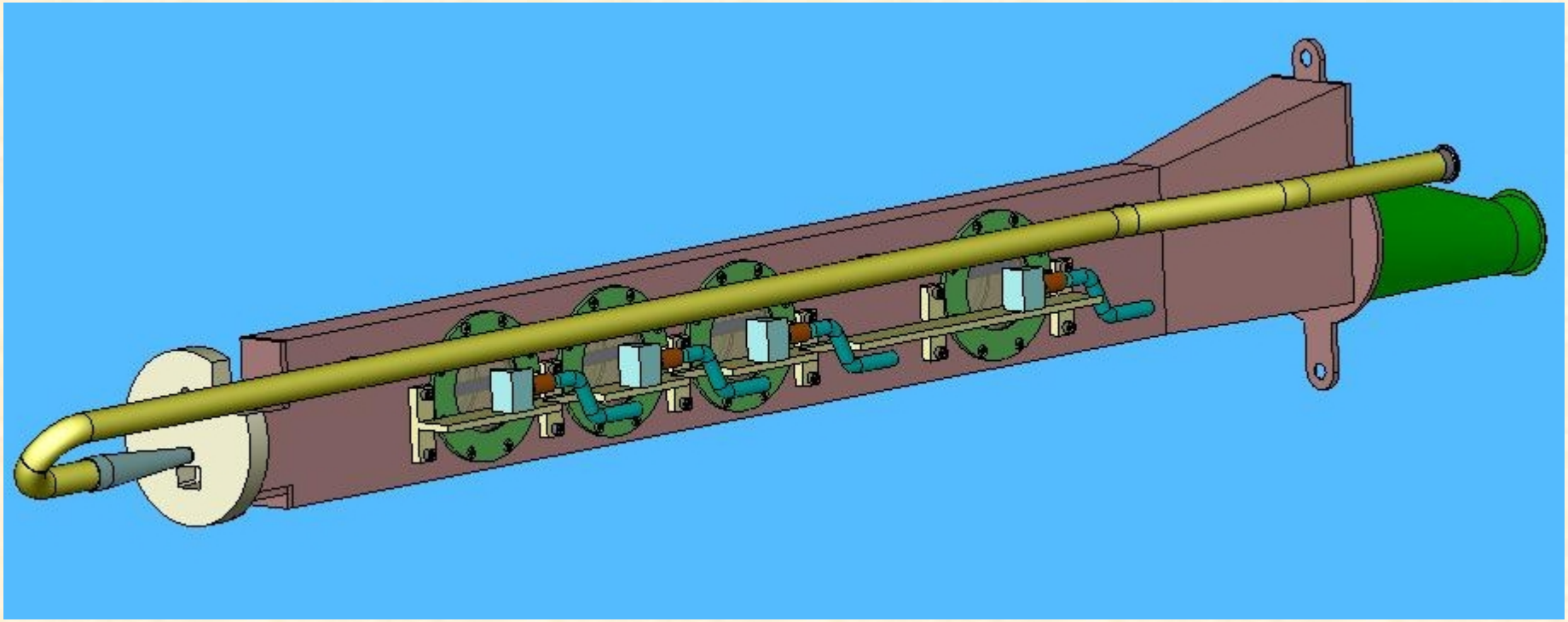
MERIT VRVS Meeting

January 25, 2006

OAK RIDGE NATIONAL LABORATORY
U. S. DEPARTMENT OF ENERGY

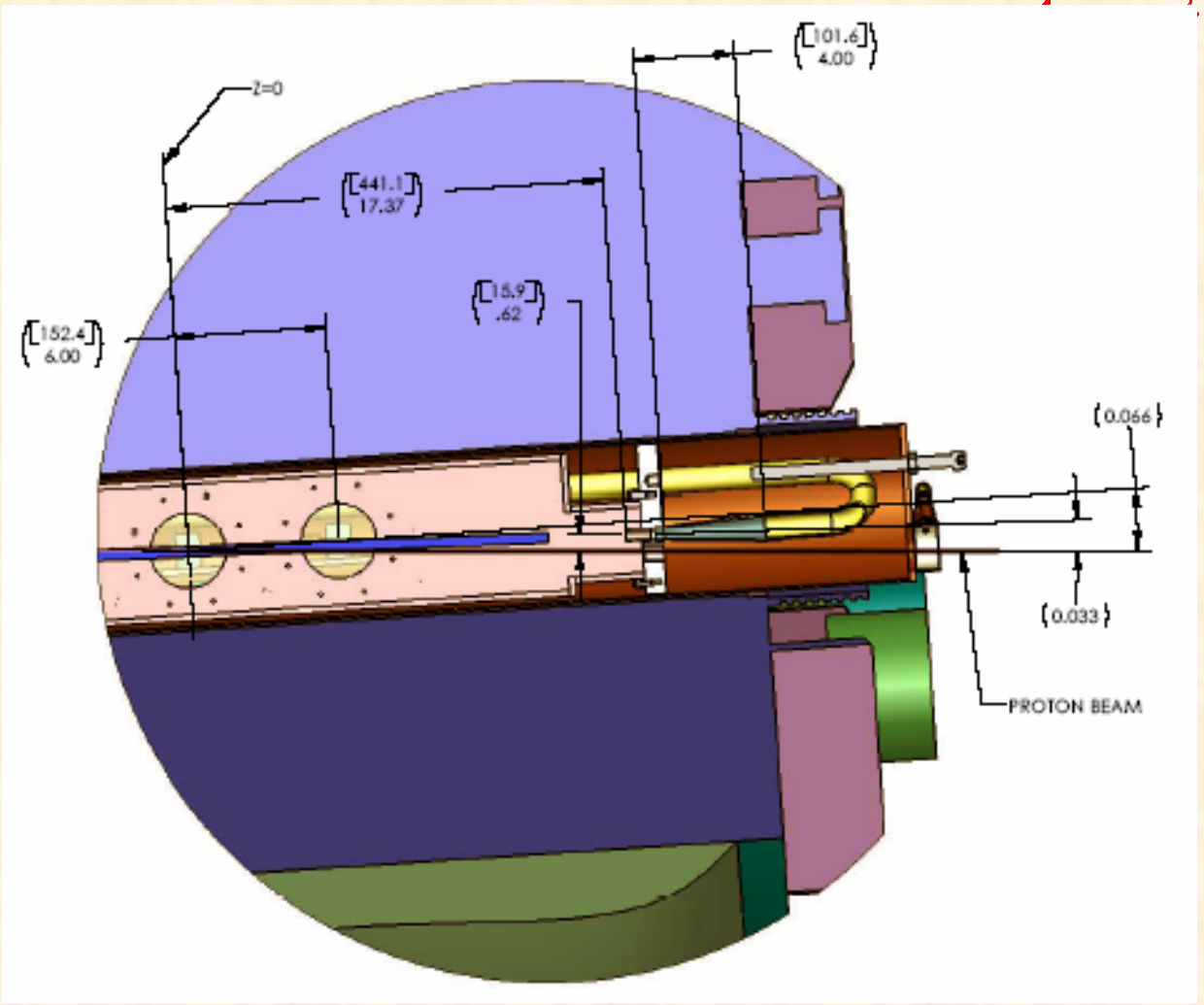
Two Topics for Discussion

- **Nozzle details**
- **Primary containment design changes**



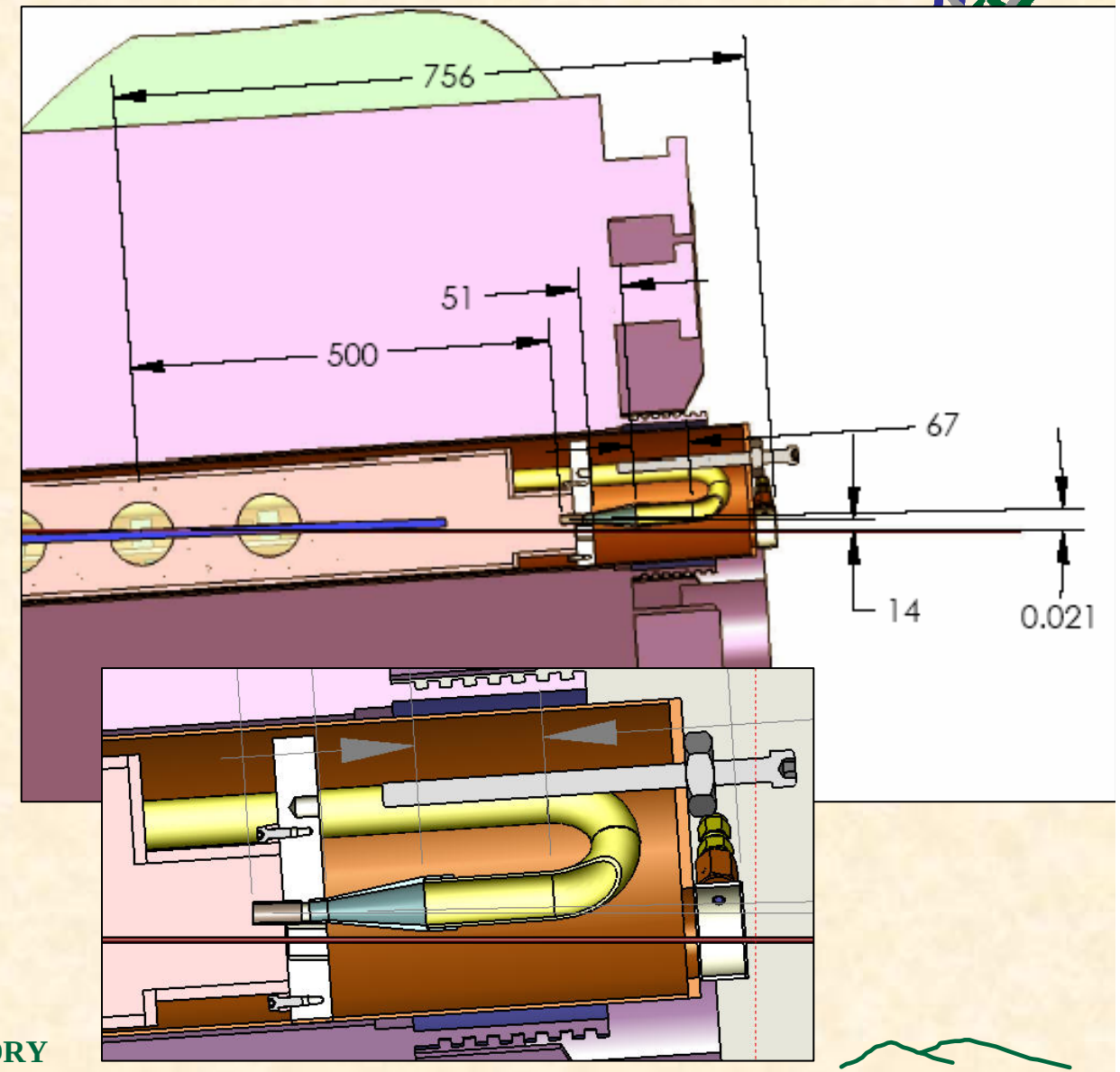
Nozzle Position – Previous Iteration

- **Start Z=-441mm**
- **Angle 33mrad**
- **Elevation 16mm above beam**
- **Reducer length 100mm**



Nozzle Position – Current

- **Start Z=-500mm**
  - **Nozzle flange position changed**
- **Angle 21mrad**
- **Elevation 14mm above beam**
- **Reducer length 51mm**
  - **Reducer clearance minimal**
- **Secondary window position unchanged**

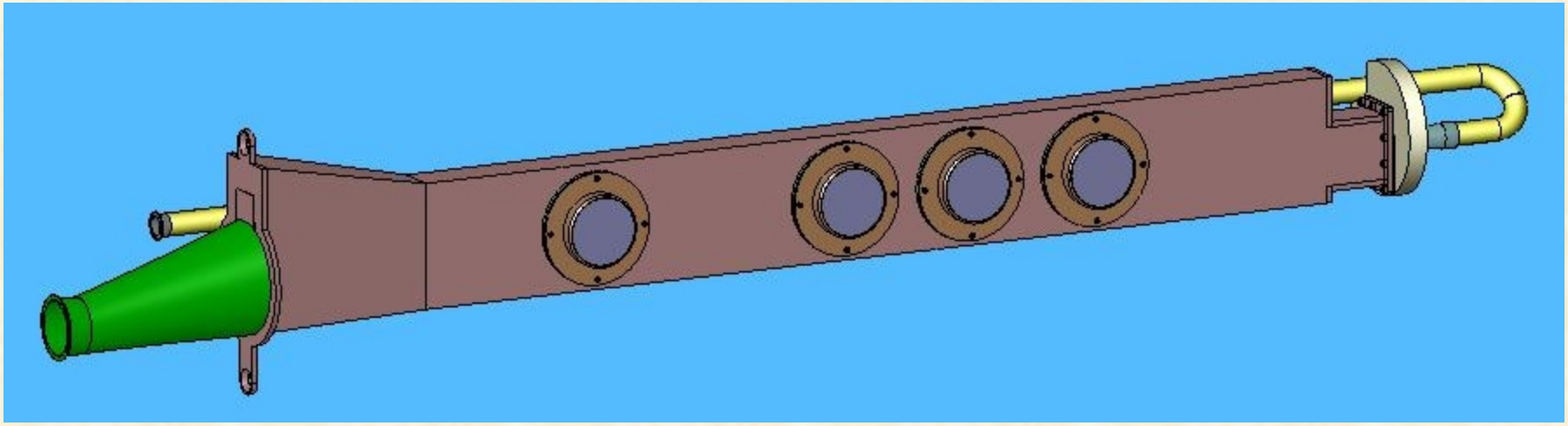


Issues with Nozzle Changes

- **Nozzle length unchanged, position shift obtained by lengthening primary containment**
  - **Reduces room available for 180 bend and length of funnel**
  - **Secondary containment near its length limit**
- **Subsequent nozzle changes occur at flange**
- **Clearance below funnel an issue, especially for beam scanning**
  - **This is not a new discovery, upward scanning not feasible**
- **Need to settle on nozzle parameters now!**

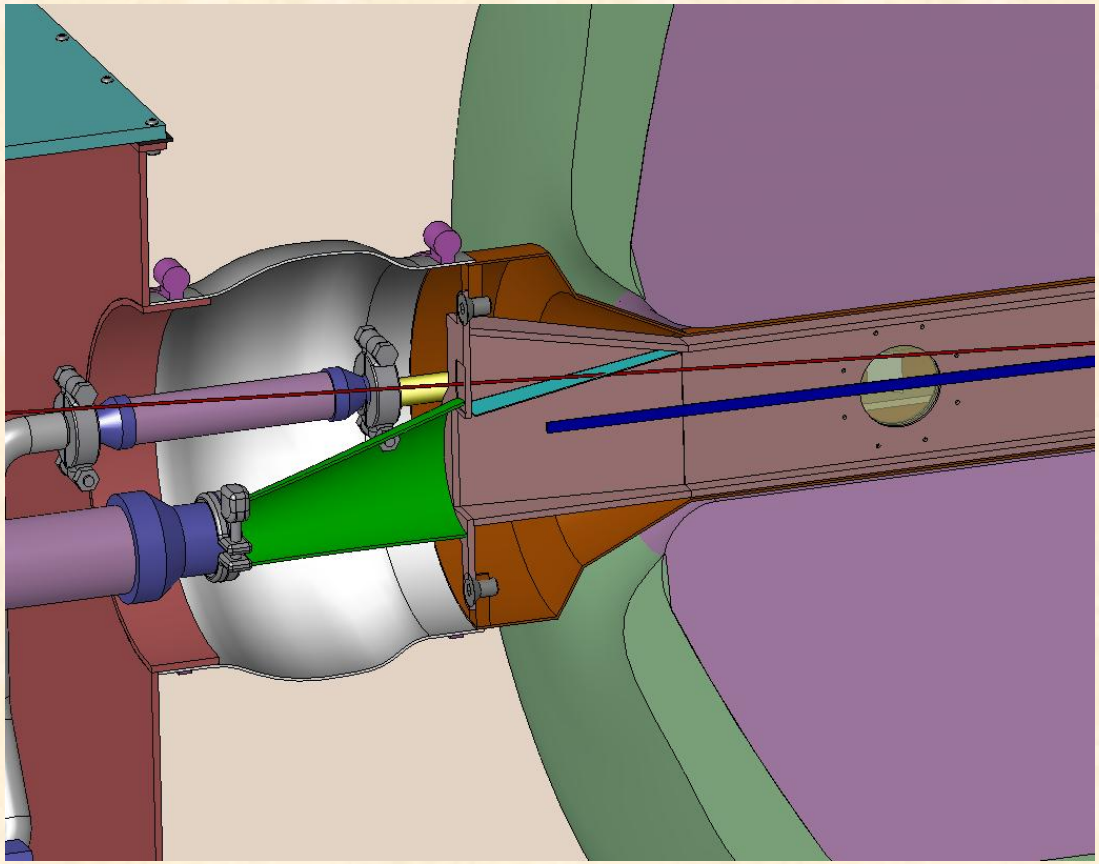
Primary Containment Module

- **Current design uses titanium or one of its alloys for all Hg wetted components in front of flexible hoses**
- **Replaceable section includes hg supply line (w/sanitary fitting) and nozzle flange**



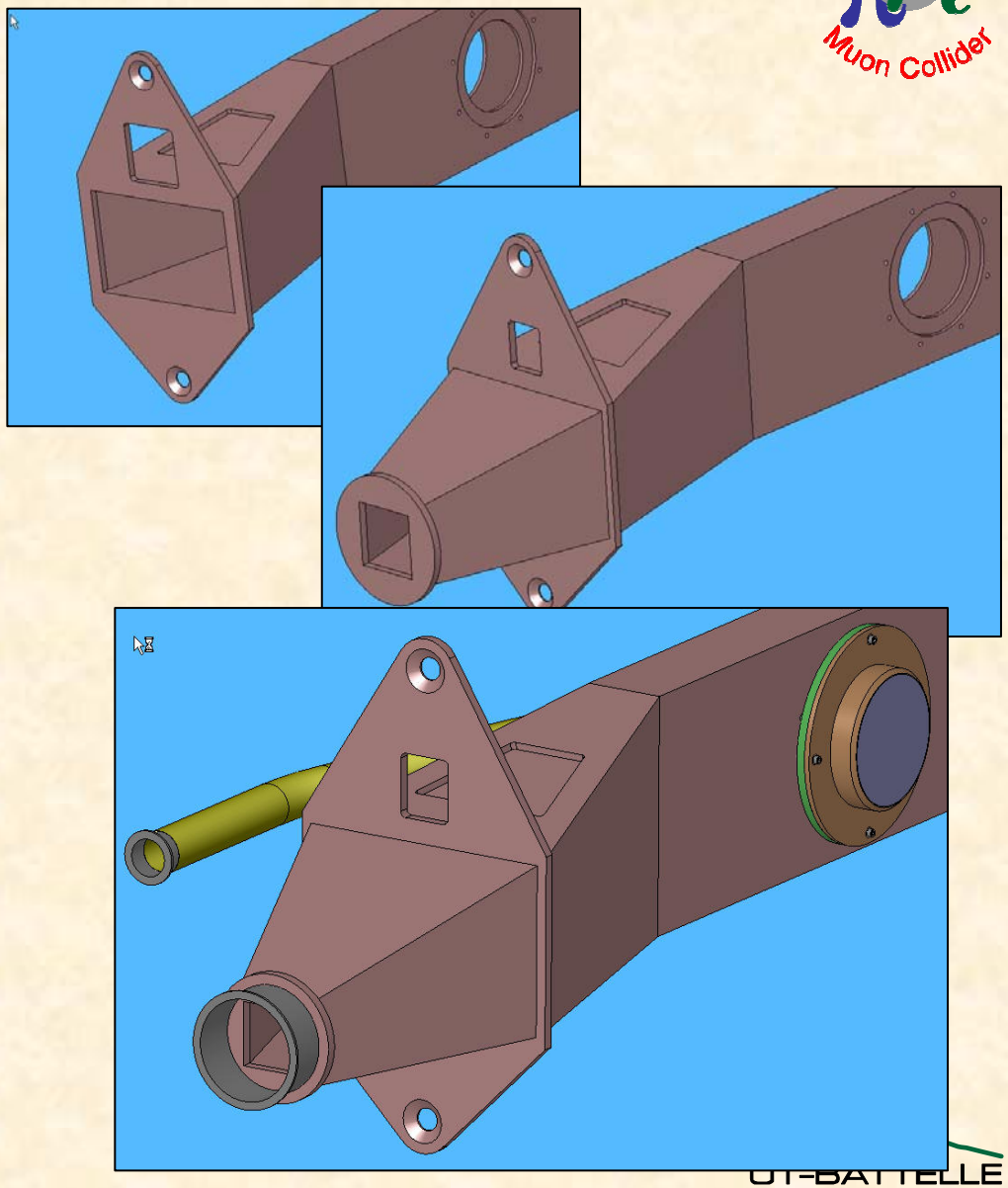
Downstream End Can Change

- **Consideration of all-Ti provided opportunity to refine downstream end of module**
- **Funnel was off-the-shelf item (SS) to transition from rect to round**
  - **Some interference with beam window noted**
- **Area above jet deflector not used**
- **Welding internal jet deflector not trivial**



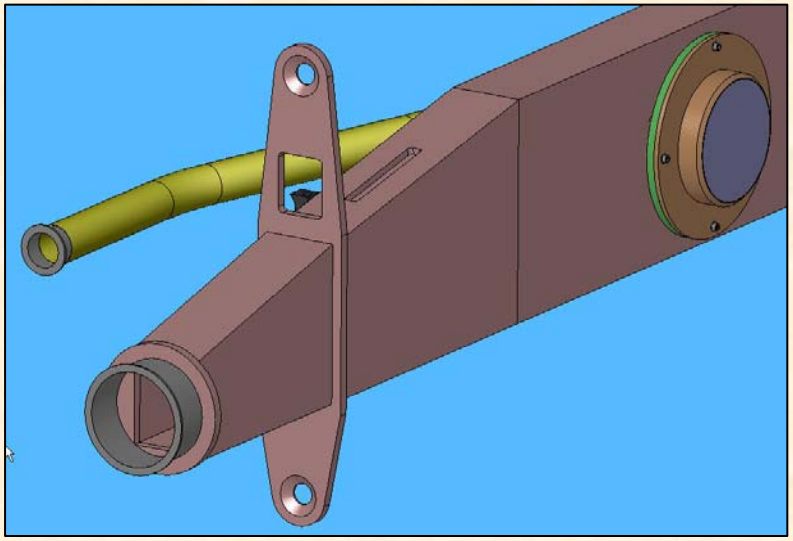
Value Engineering the Primary

- **Make the deflector the outer containment boundary**
- **2mm-thick plate serves as beam window (beam path will be 2/sinθ = 11mm for θ=10°)**
- **Replaces funnel with Ti weldment**
- **Custom-machined Ti sanitary flange also required**



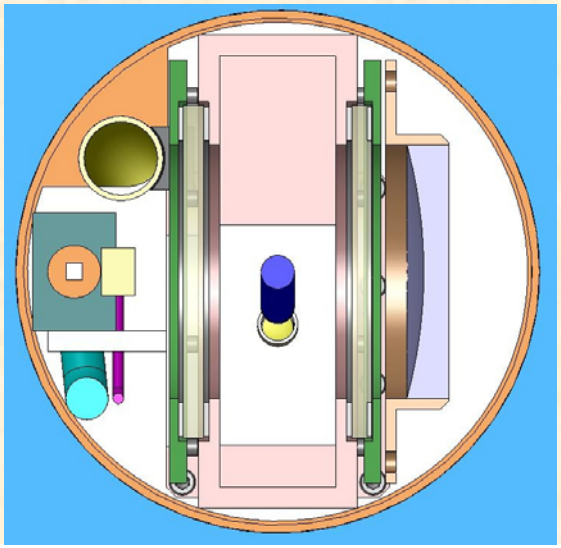
Can Reduce Mfg Costs by Eliminating Flare

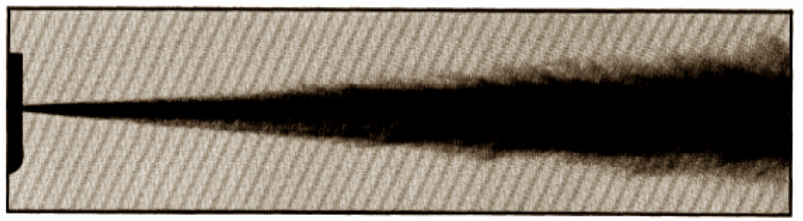
- **Titanium fabrication probably more expensive than SS**
- **Straight sides & bottom makes for relatively simple weldment**
- **Tabs can be added to interface with secondary containment**
- **Hg backsplash is major concern!**
  - **Interior walls are smooth except for viewport edges**
  - **Spray collisions & sloped ceiling will delay Hg exit, but how much?**
- **If water tests show major problems, back end could be removed and flare added before adding Hg, at the risk of schedule slippage**
  - **Magnetic field may alleviate spray issues**



No-Field Jet Quality May Be Poor

- **Minimal side clearance inside primary**
- **Spray may be an optical issue but not a Hg backup problem, so exit flare may not be beneficial**
- **Hg jet primarily horizontal with above-beam position**
  - **Majority of Hg might miss deflector in current design**
- **Only concerned with Hg jet prior to pulse (could be 2-10 sec)**





(*a*) Spark source; parallel transmitted light ($\frac{1}{2}$ μs exposure); pressure 600 atm.

(*b*) Flash-tube source; diffuse transmitted light (2 μs exposure); pressure 600 atm.

How Much Risk Are We Willing to Take?

- **Don't have time/funding to rebuild primary containment if backsplash occurs at MIT**
- **Don't have funding to complete two designs**
  - **Flared approach less risky but more costly to fabricate**
- **Have to select an approach and move forward quickly to complete fabrication drawings**
- **Which way do we go?**