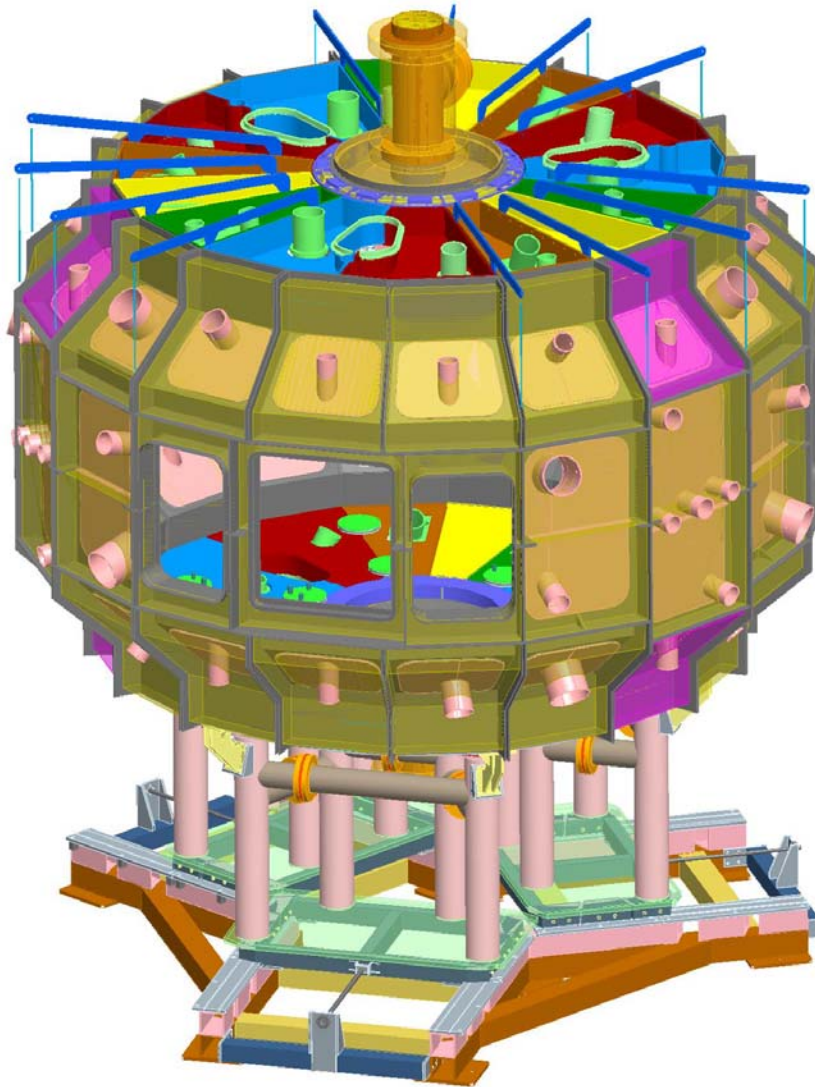


# Cryostat Architecture WG

March 15, 2007

- This is not a design review.
- This is a “free thinking” session.
- A concept will be shared.
- PLEASE improve it with your ideas.
- PLEASE leave your managerial roles at the door.



It's complicated.

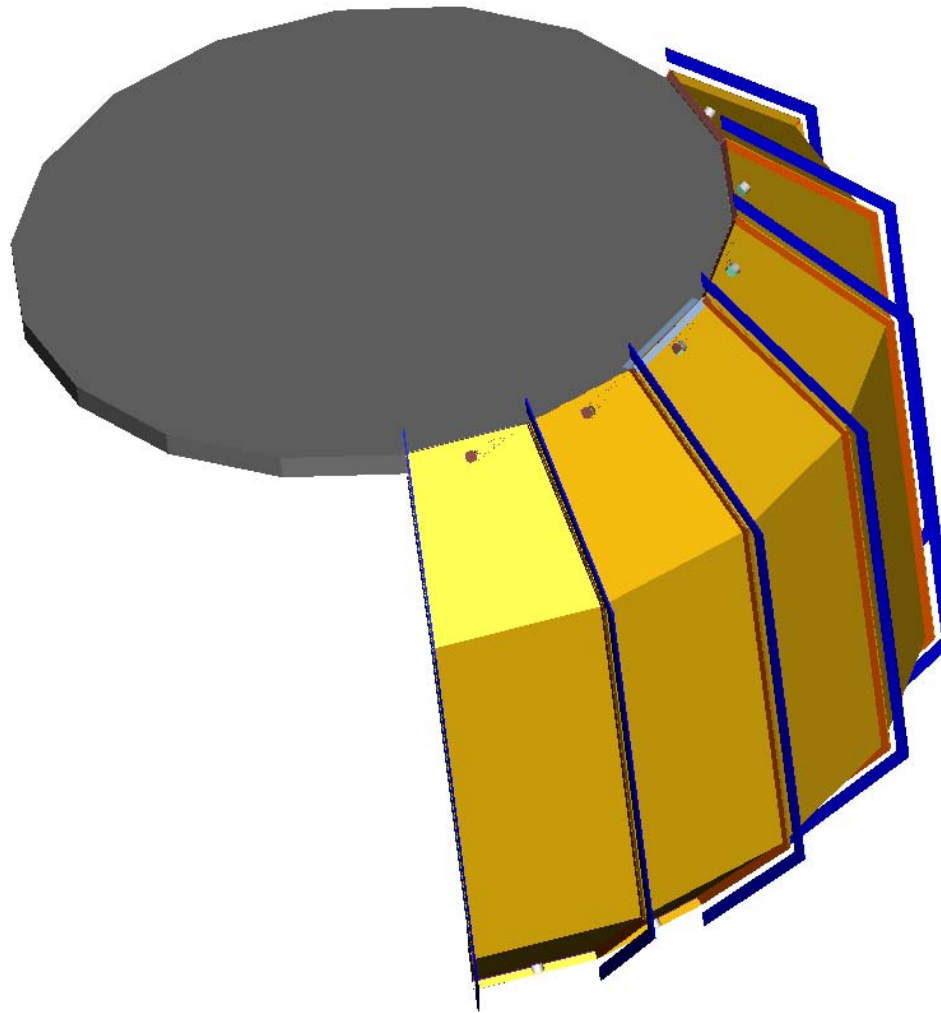
It's expensive.

The volatility factor for this estimate must be huge.

There were only seriously weak responses to the FedBizOps disclosure.

Note: Panel covers and insulation are not shown

## A Better Approach?



Rushinski, Zarnstorff, and Gettelfinger have been wrestling with “bags” of loose insulation bridging between upper and lower disks of urethane foam.

This design assumes no port extensions at TF coils.

Panels (bags) are made of thermo-sealed urethane with integral Kevlar or Nylon mesh.

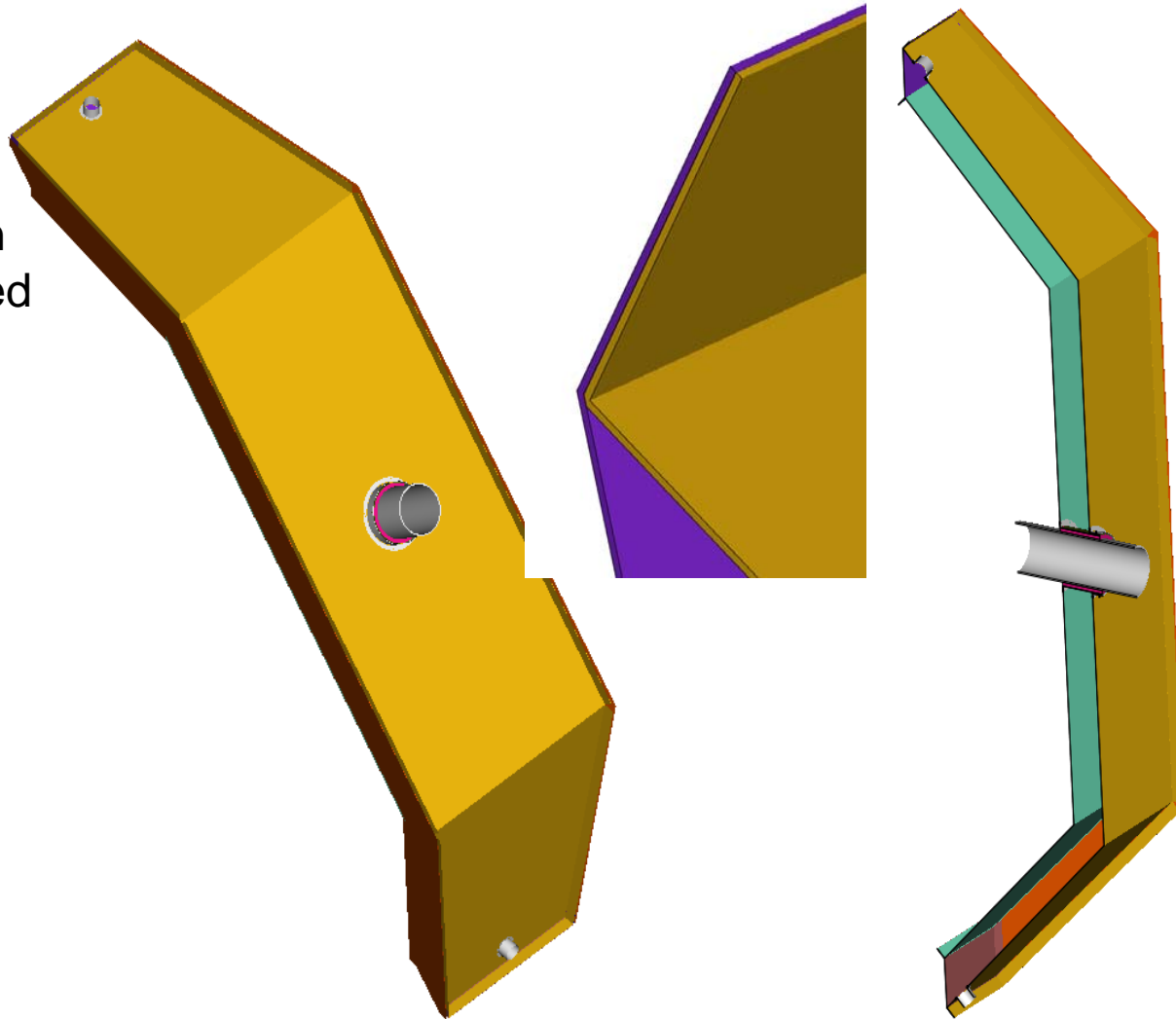
This is a seasoned, Mil-Spec industry.

Fabric has survived “Ho Ho” dunk test; joint scraps are “in the mail” for testing



6" gap is filled  
with loose  
insulation.

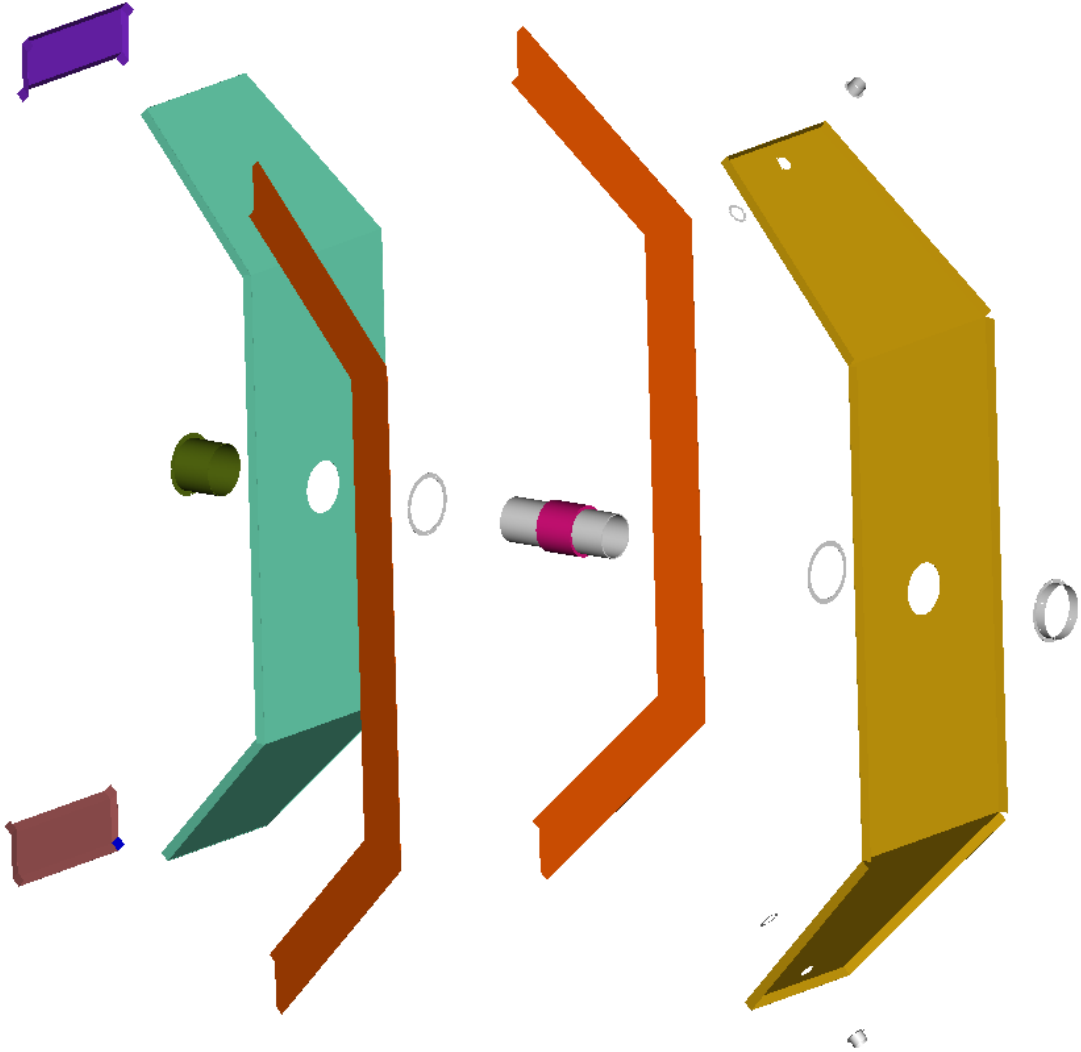
Internal tension  
ties are provided  
to maintain 6".



- k stagnant 77K gas - 7.23 mW/m-K
  - Damn good if you can keep it still
- k aerogel 280K - 18 mW/m-K
  - Best solid insul you can buy
- k urethane foam - 33 mW/m-K
  - bad CTE (Space Shuttle)
  - PPPL techs have developed laminating/shingling method that accommodates the cracking problem
- Cabot Nanogel
  - Used to insul LNG supertankers
  - NCSX's 14 m<sup>3</sup> is a “small” quantity
  - \$4.5k/m<sup>3</sup> for non-IR coated
  - \$9.0k/m<sup>3</sup> for opacified IR transmission-resistant version

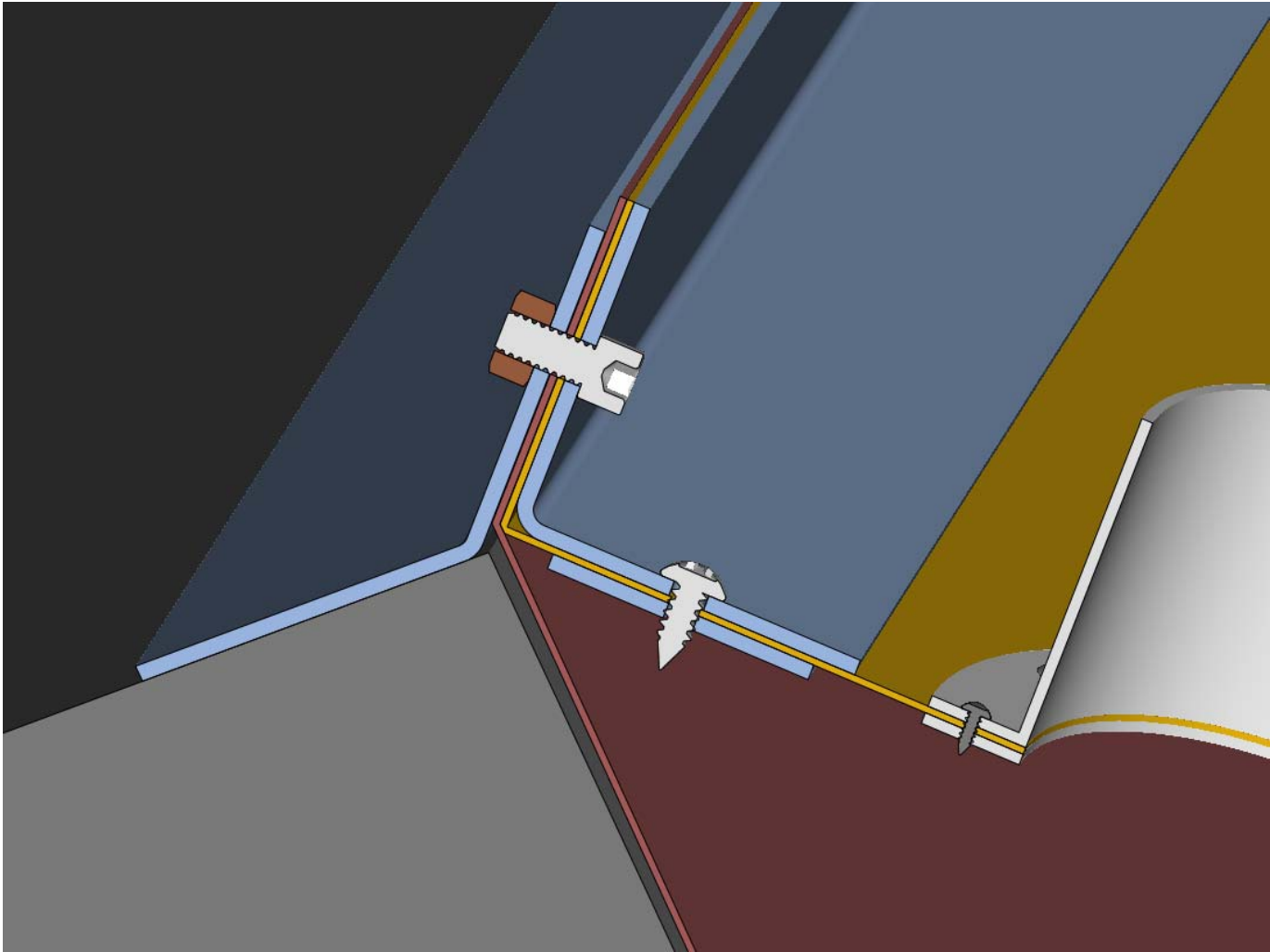
# Exploded View

NCSX



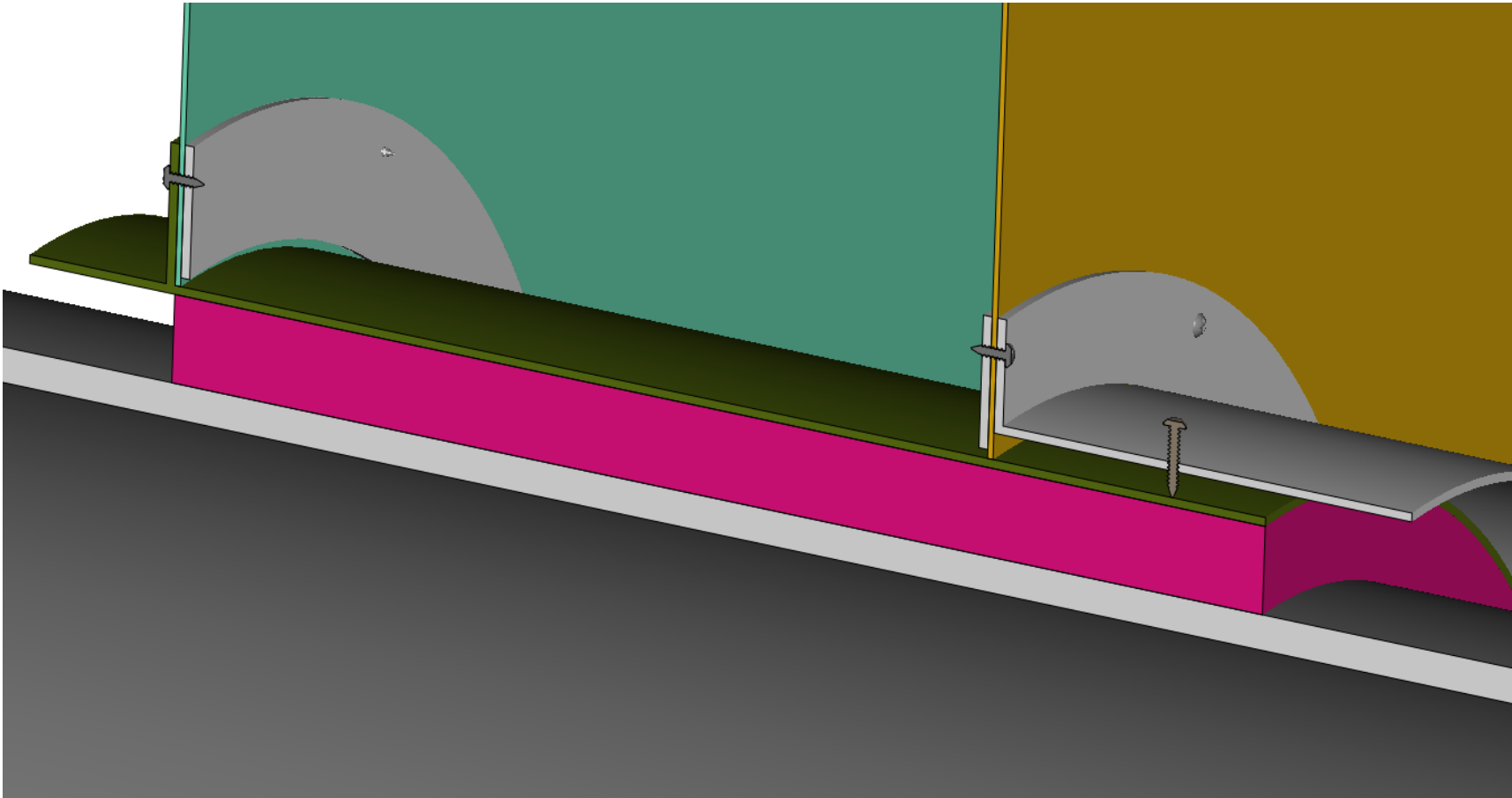


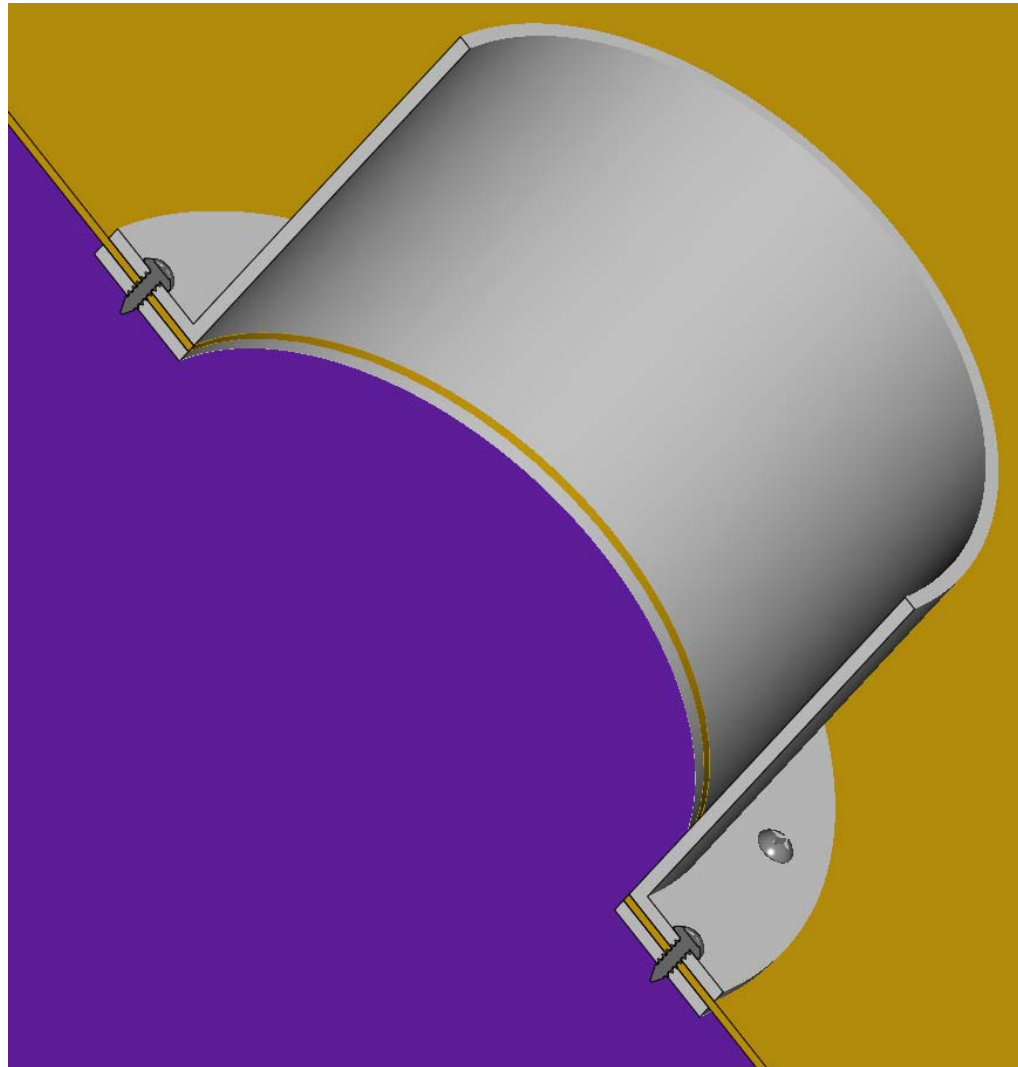
# Upper Joint to Disk



- The pressure generated by an 18' high column of cold gas is about 1
- Two strips of 3"-wide Velcro conductance limiter is planned a each panel-panel and panel-disk interface
- Simple mechanical clamps will be the outboard gas seal with stagnant gas across the 6" panel interfaces
  - Panel-panel clamps will react weight into ribs
  - Insul is 70 kg/m<sup>3</sup> or 110 lbf per panel
- The differential pressure (flow) across the Velcro will be zero unless faults develop.

# Generic Penetration





# Penetration Comments

- Penetrations can be installed as required.
- Thinwall FG wet exhaust tube is fine.
- Why not FG in non structural apps? Seemed fine in CTF.
- Project must generate listing of port extensions, bus, pipes, and instrumentation feedthroughs for rebaselining estimate.
- Penetrations are sealed with Solimide foam and outer seal.

- 3' cube with a few penetrations should be funded for test