NSTX

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Neutral Beam 2 Interface

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NSTX Upgrade Project
Conceptual Design Review
LSB, B318
October 28-29, 2009

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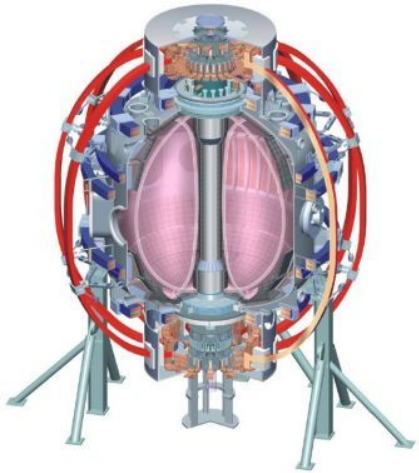
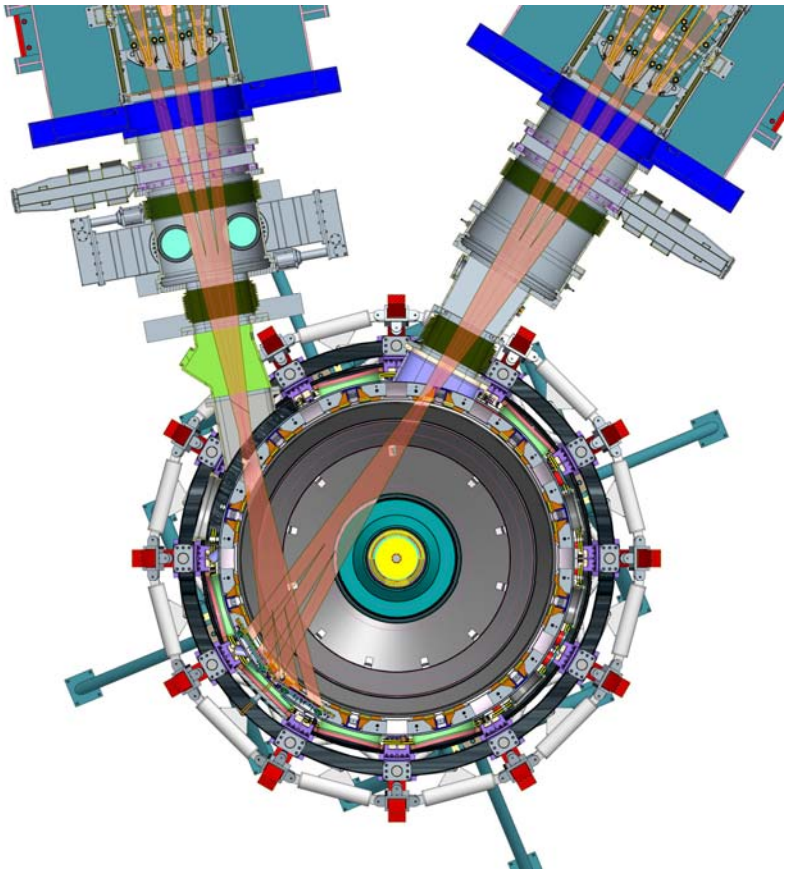
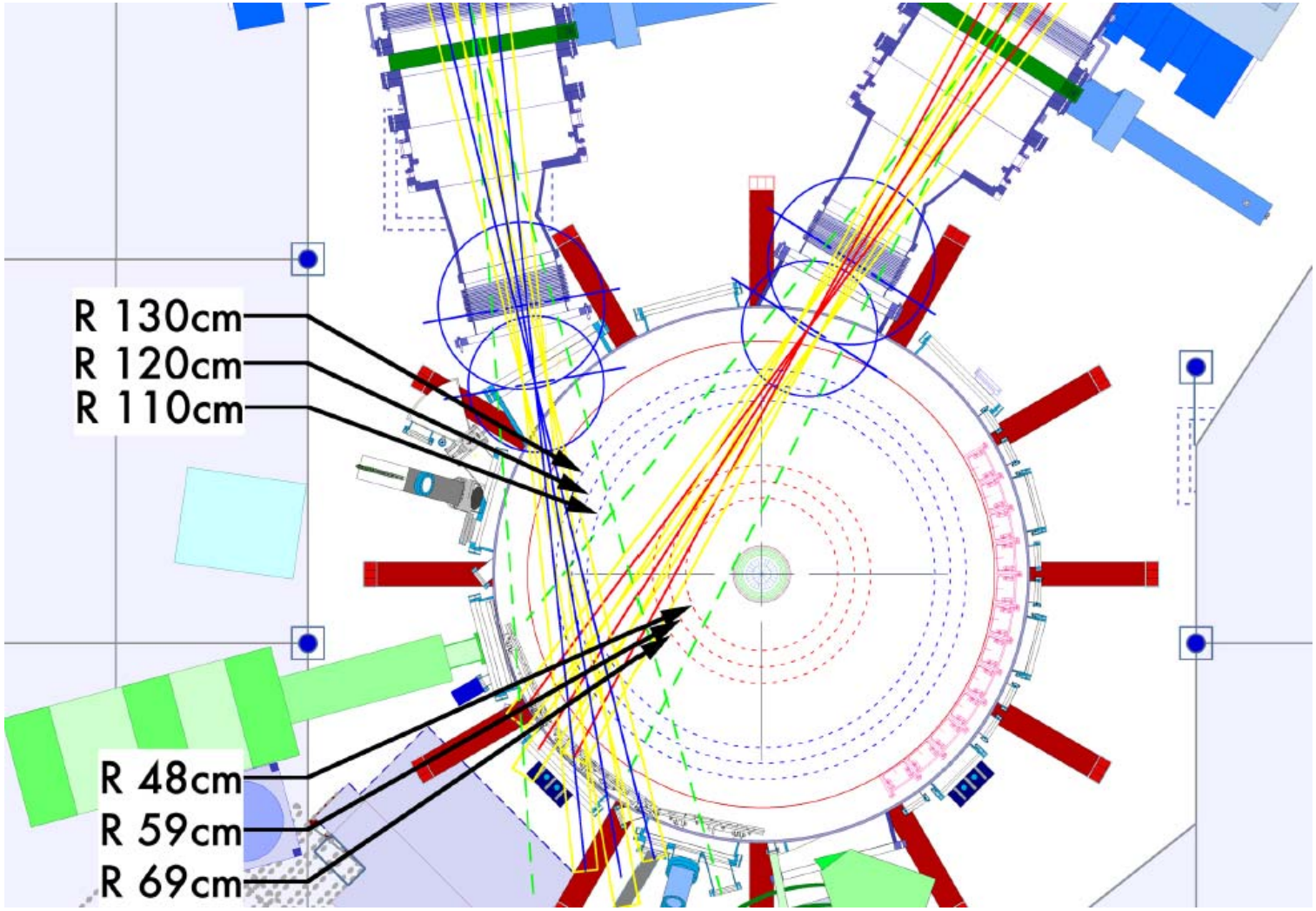


Neutral Beam 2 Interface Overview



- NB2 Transition Duct
- NSTX Vessel Modification
- Torus Vessel Pump Duct

Project Background



Vessel Structural Issue

NODAL SOLUTION

SUB =1
TIME=1
SEQV (AVG)
DMX =.002647
SMN =.195E+07
SMX =.201E+09

Magnetic Loads Analysis on NSTX VV

MAY 27 2009
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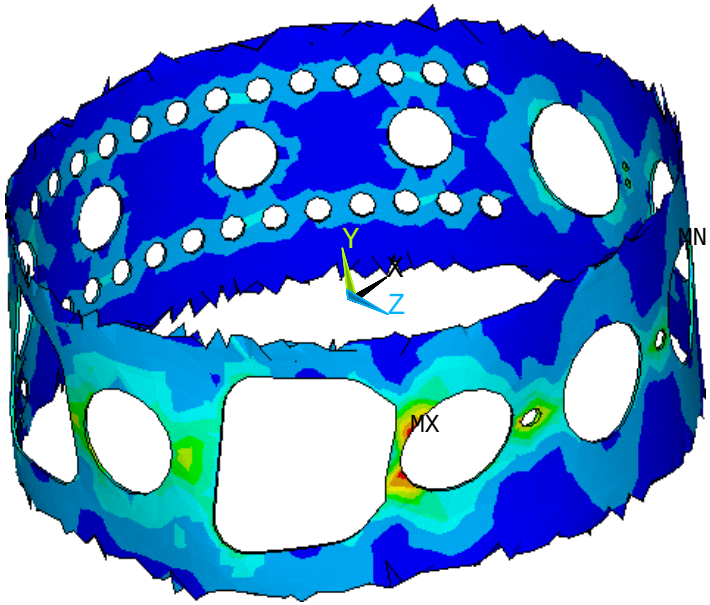
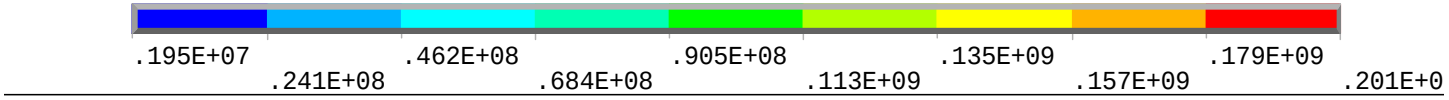
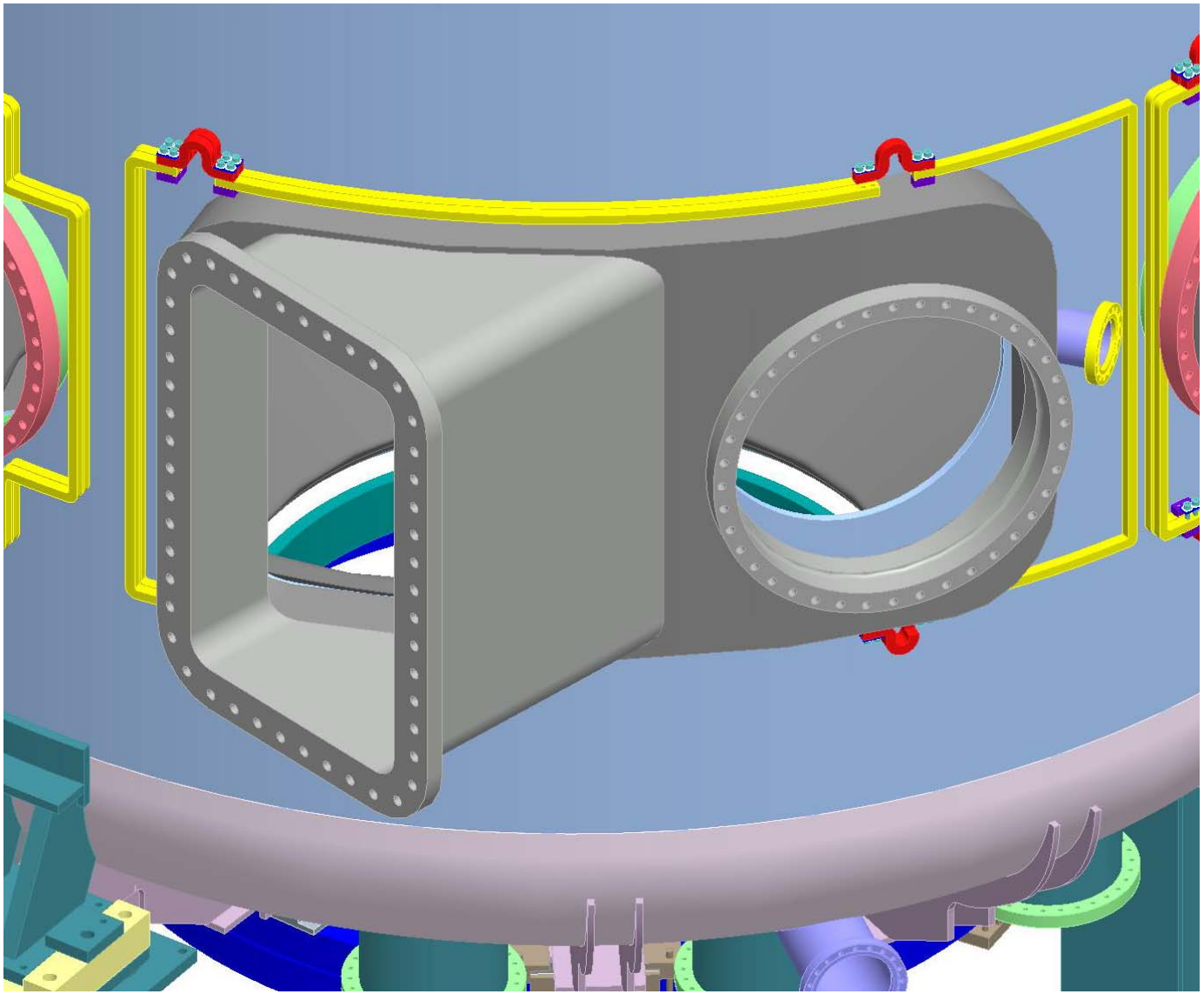


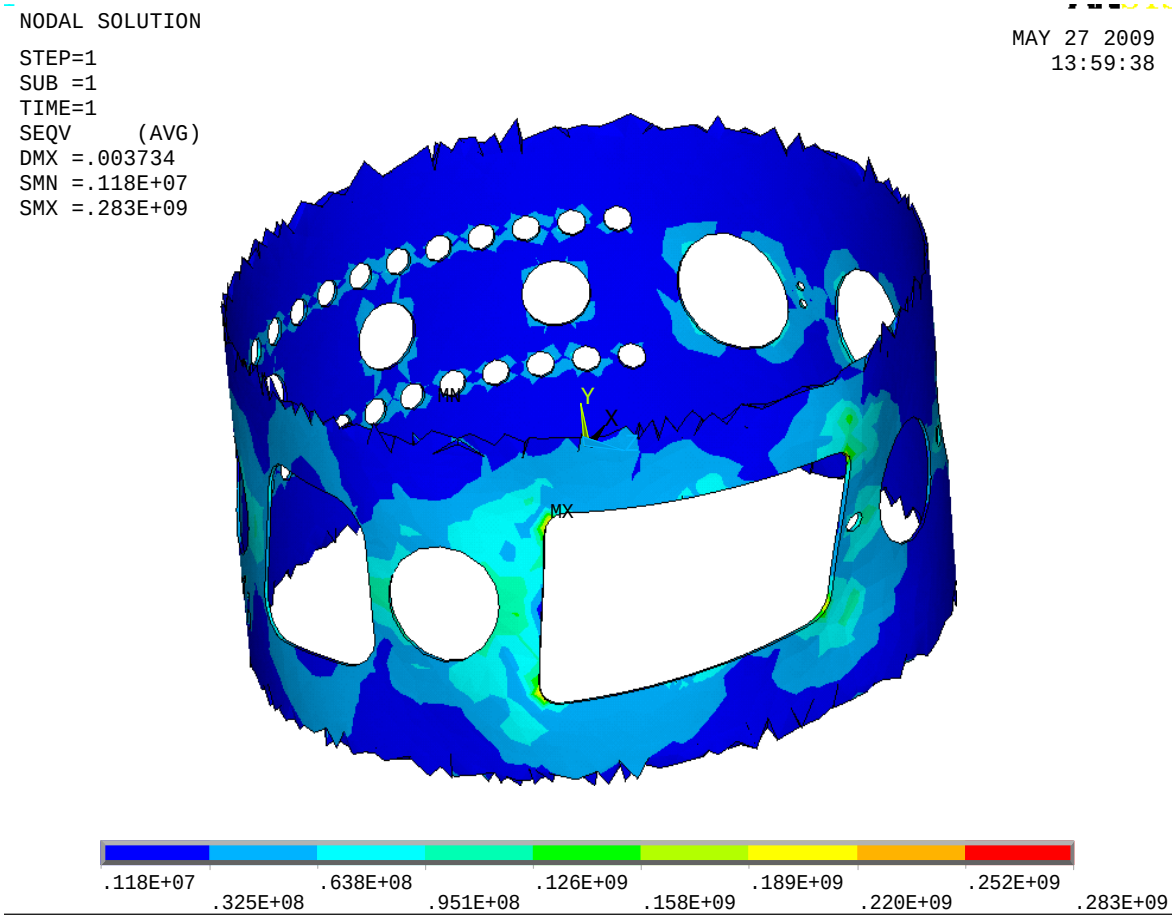


Cap/Plug Concept

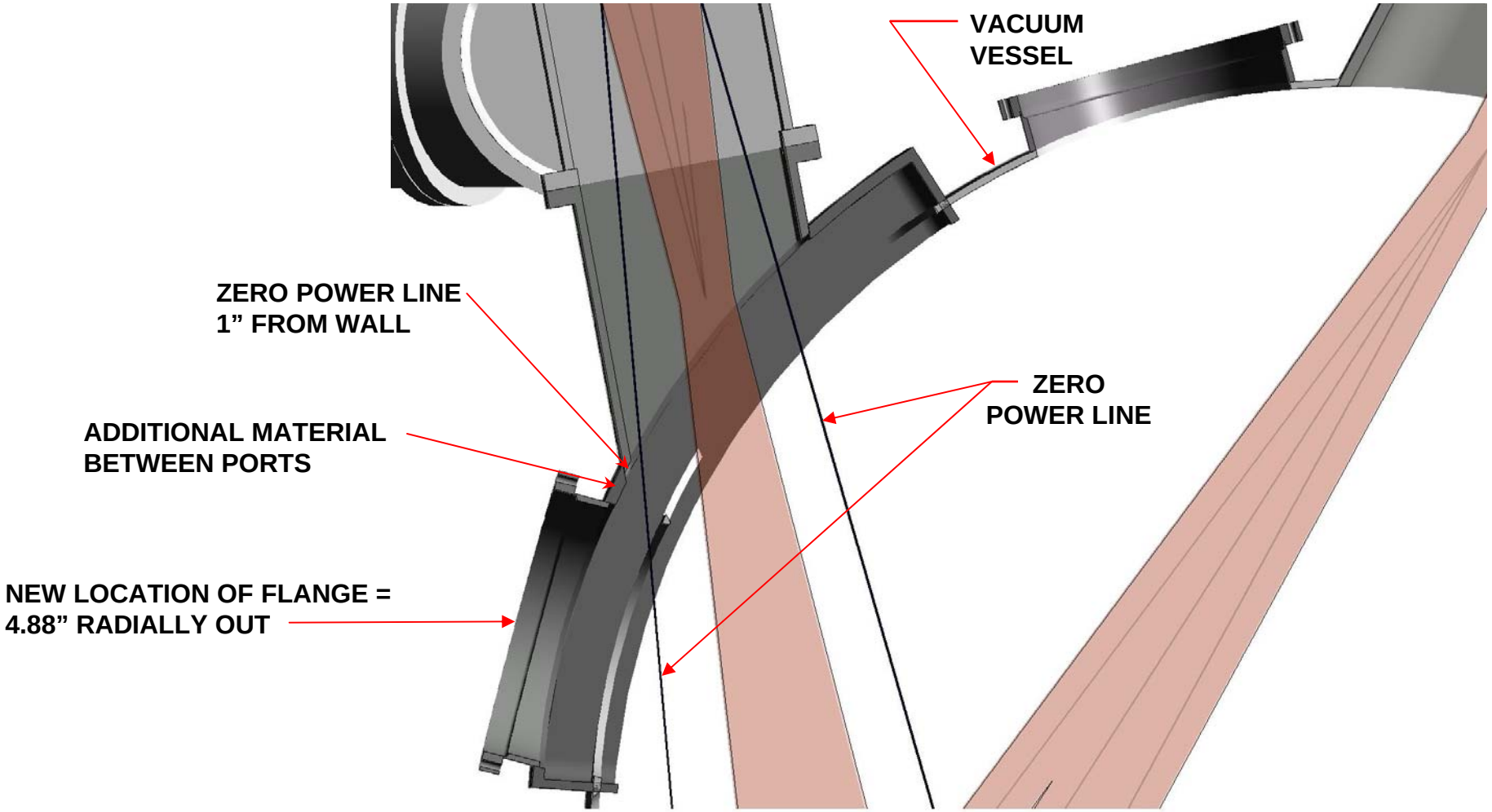


Vessel Cap Shunts Stress Around Opening

Magnetic Loads Analysis on NSTX VV

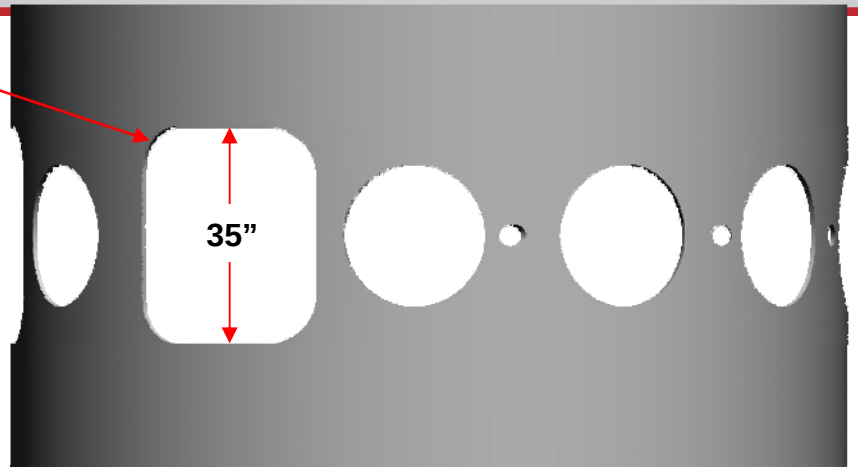


Cap Design Considerations



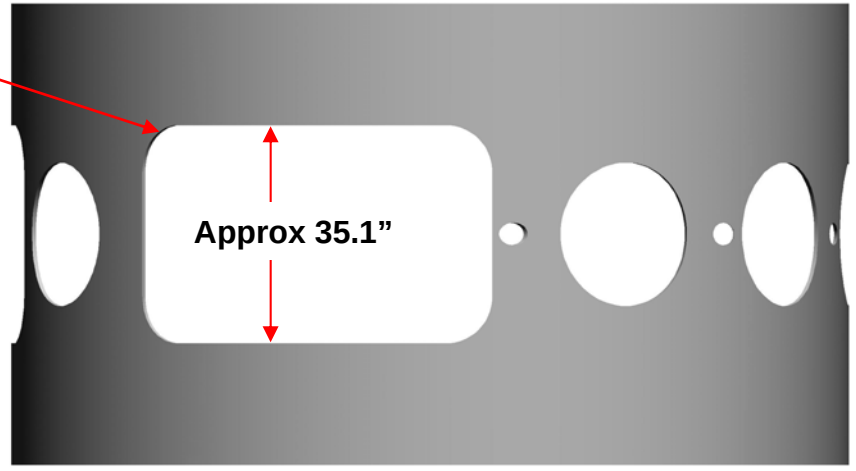
NSTX Vessel Modification Required

EXISTING CUTOUT ON
THE VACUUM VESSEL
35”H x 32.3”L



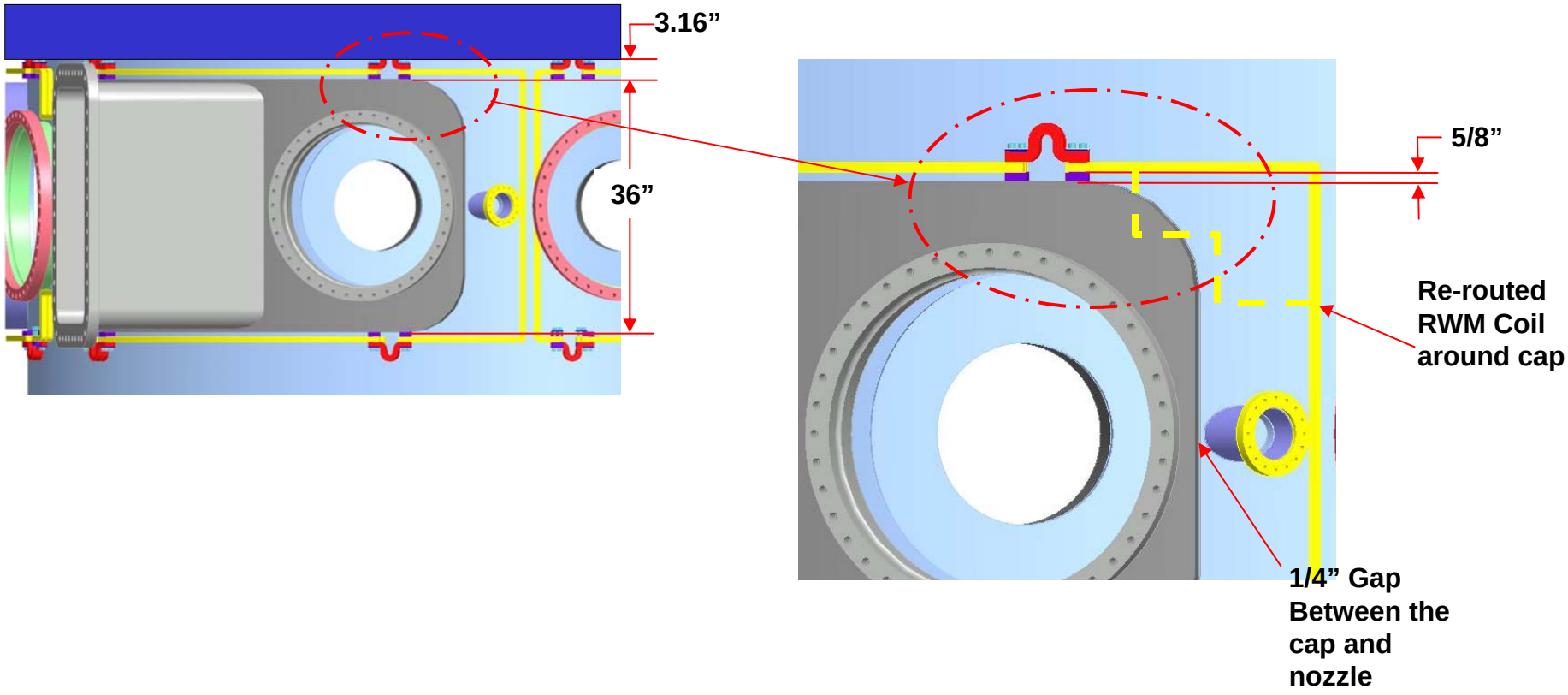
EXISTING CUTOUT

EXISTING CUTOUT WILL
BE EXTENDED AS SHOWN
(Approx. 26.5” Longer)



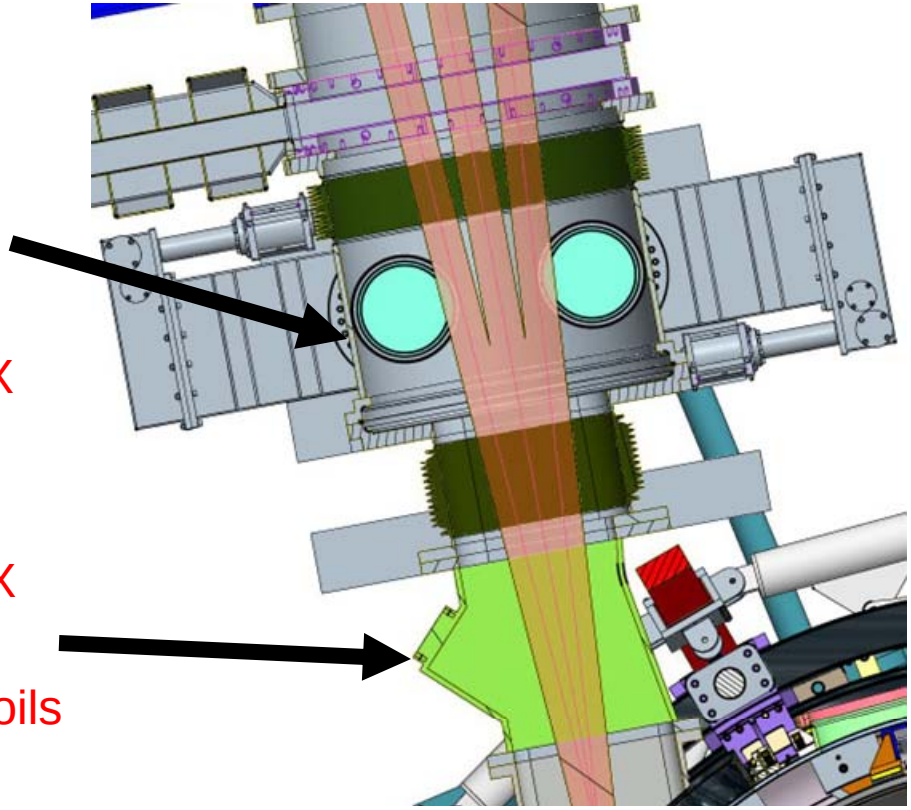
MODIFIED CUTOUT

External Vessel Considerations

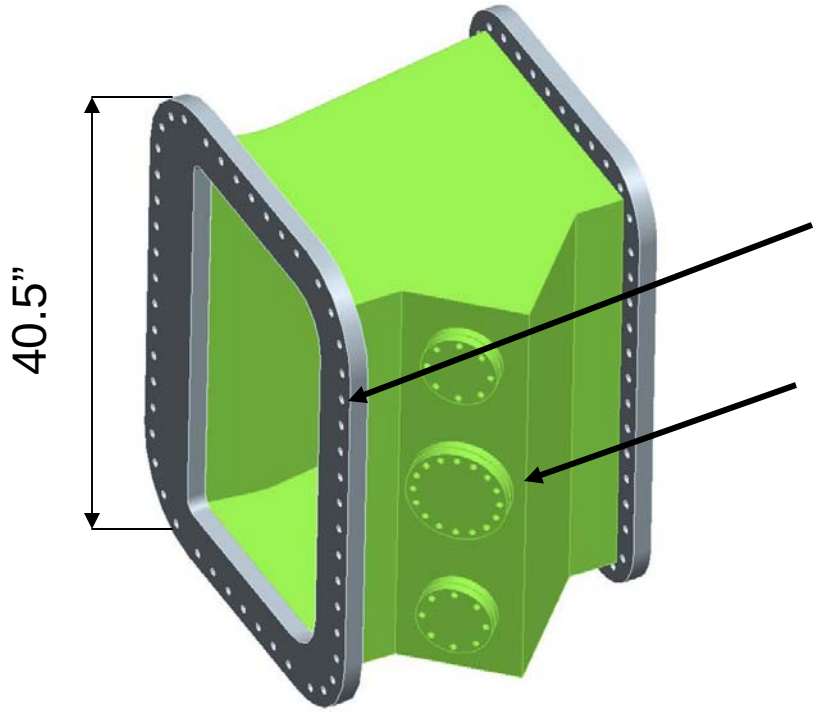


NB2 Transition Duct

- Two Piece Design
  - Transition Duct
    - Adapts from 1m TIV to NB rectangular flange
    - Contains bellows and ceramic break similar in design to NSTX NB1
  - Port Extension
    - Permanently bolted up to NSTX
    - Extends NB2 Duct and Vessel Pump Duct interface past TF coils

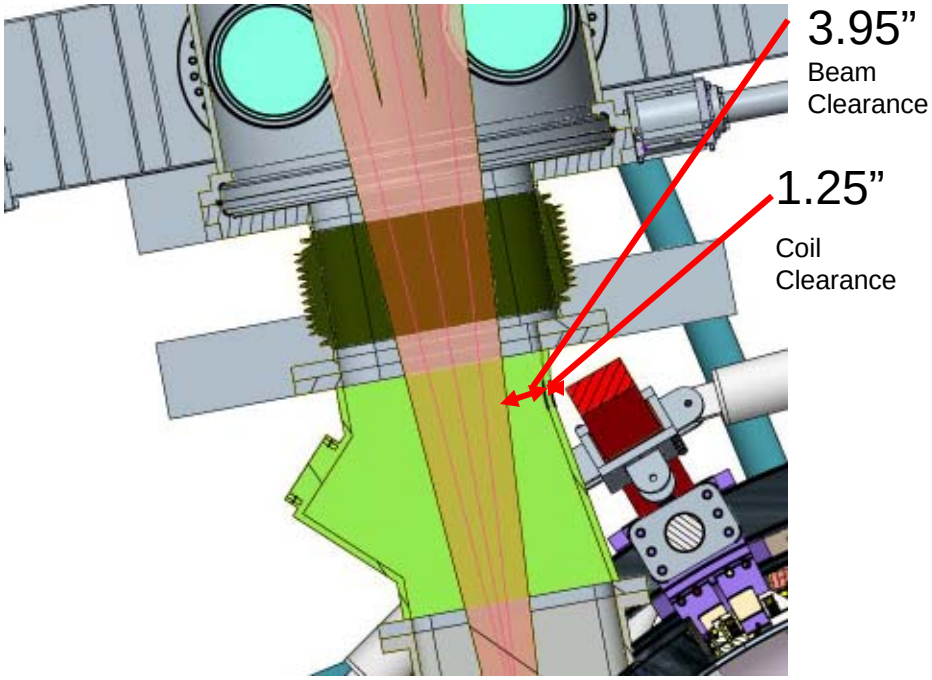


Port Extension Features

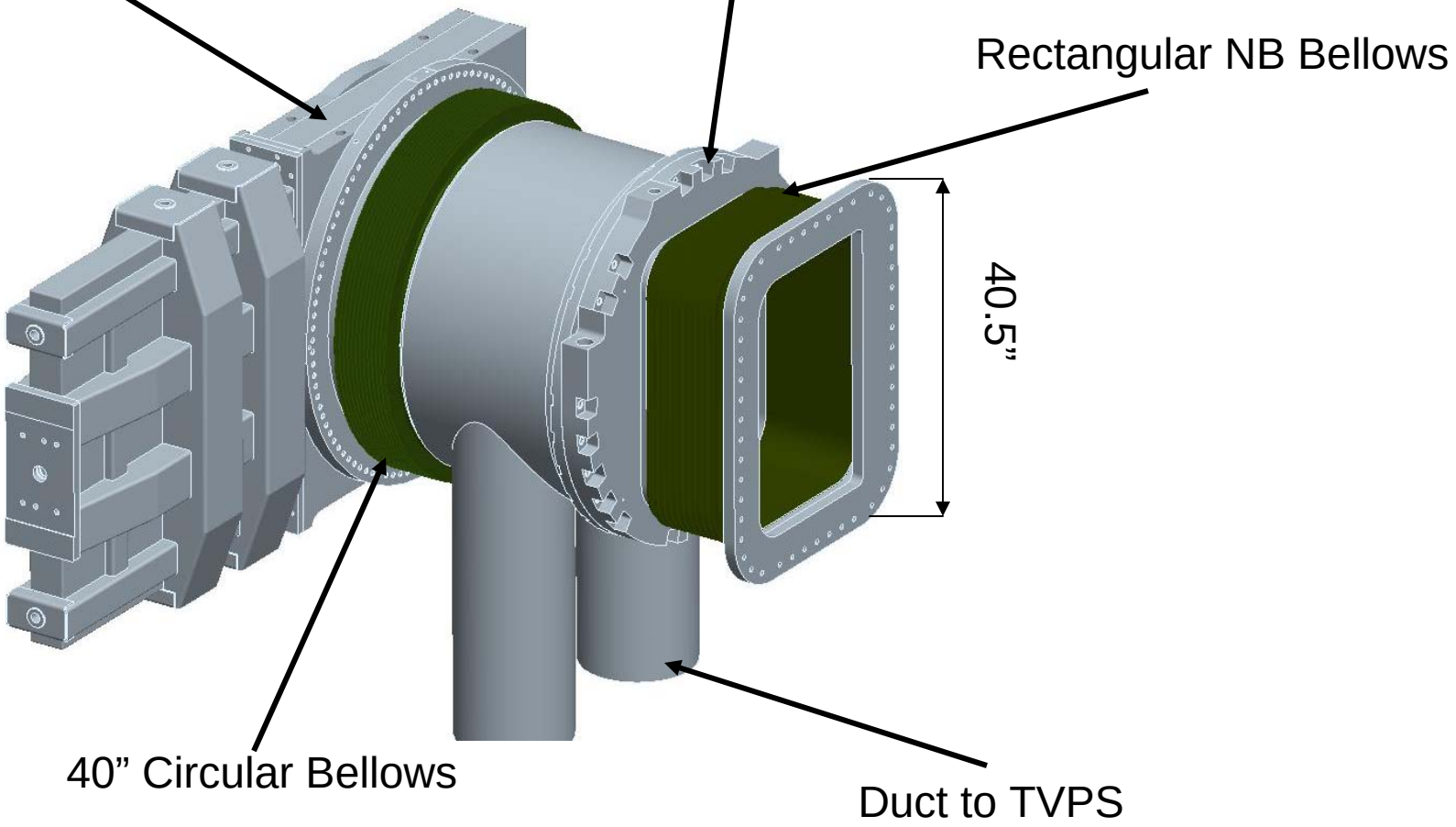


Mass: ~ 1500 lbs.

TF Coil and Beam Clearance

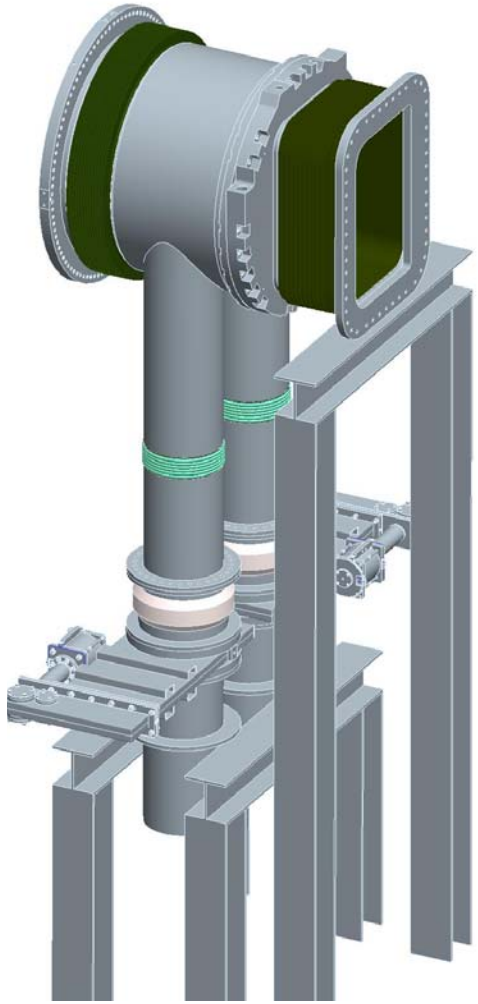


Transition Duct Features

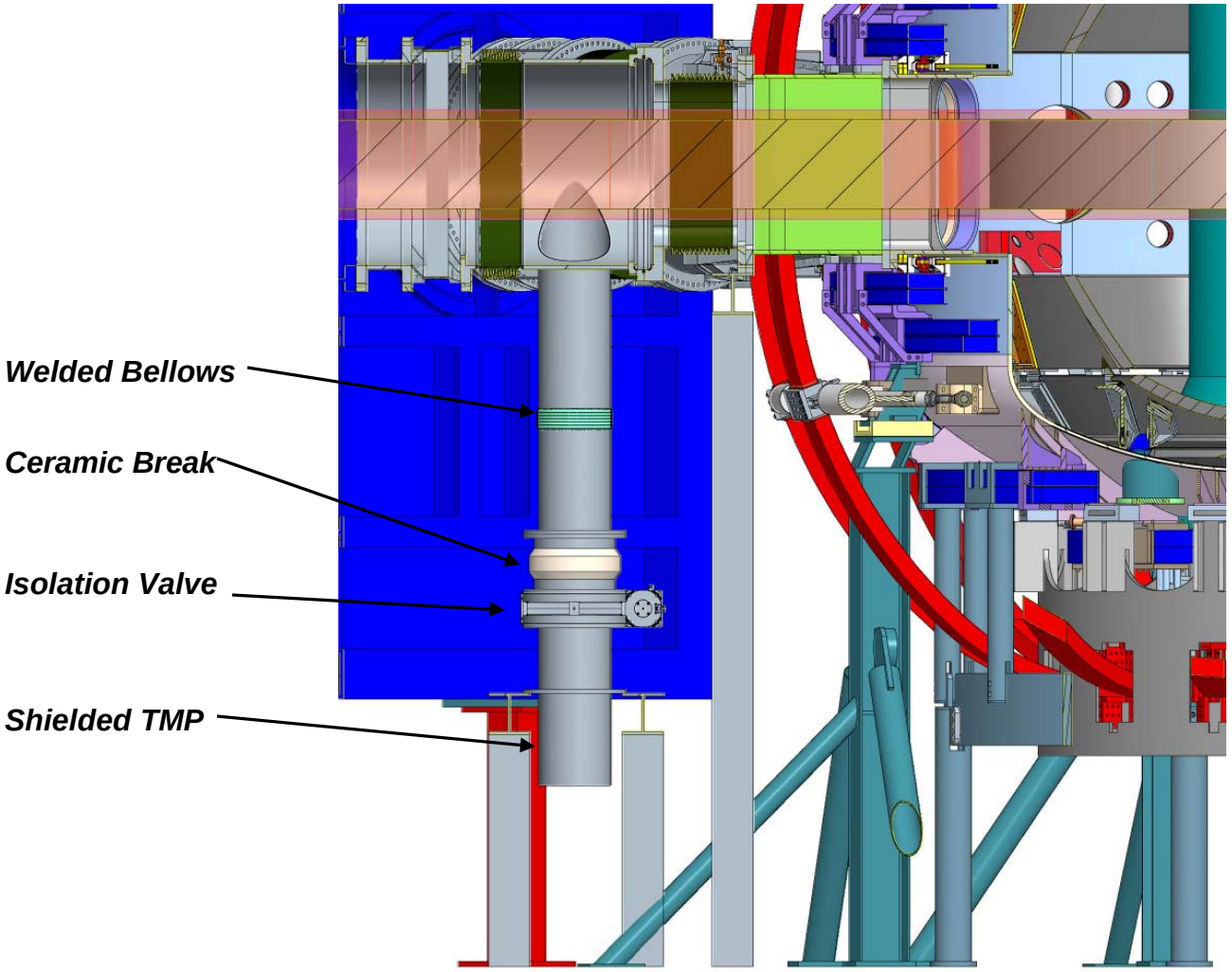


Torus Vessel Pump Duct

- **Design Requirements**
  - Mounted below mid-plane (allows neutral beam/diagnostic sightlines)
  - Allows removal of beam duct
  - Independent of beam line pumping

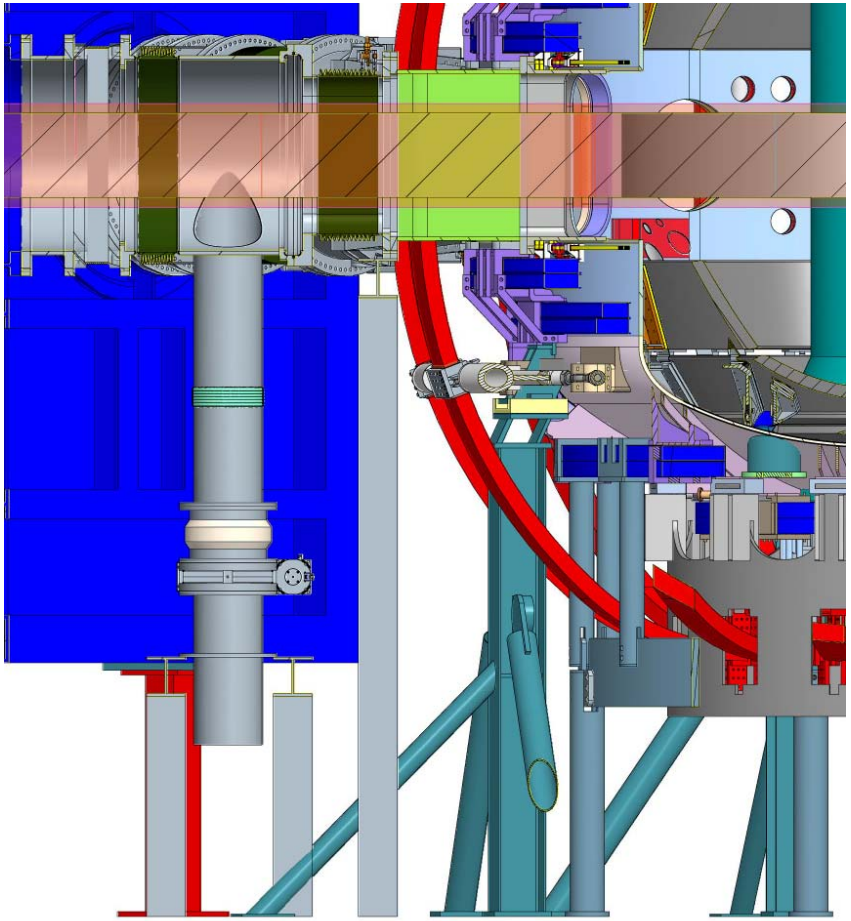


Torus Vessel Pumping System Design



Vessel Pumping Design Summary

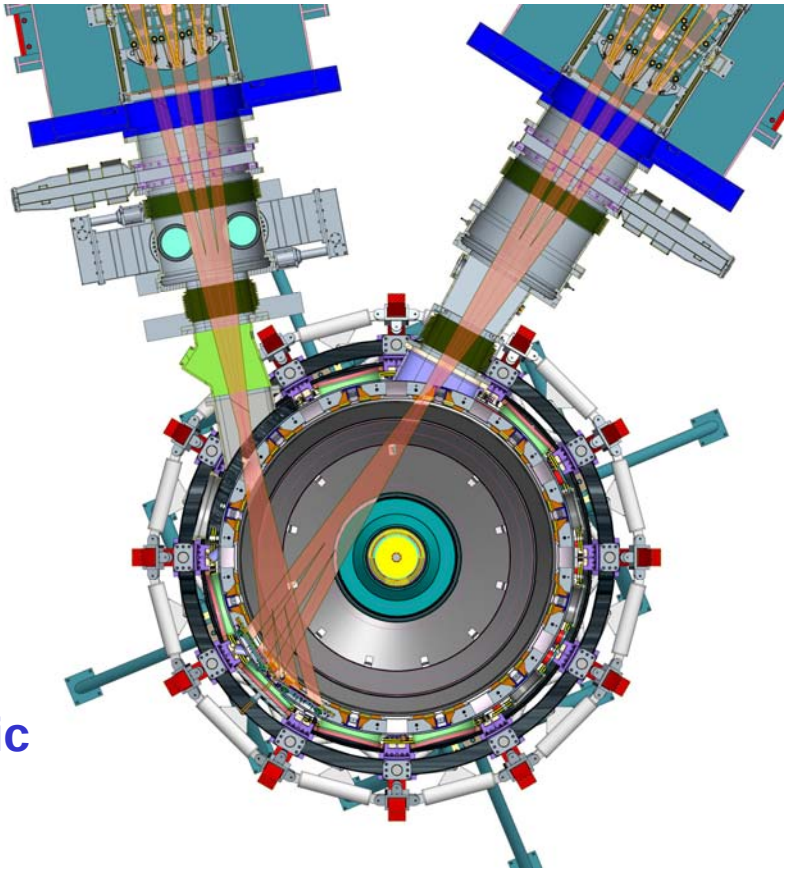
- **Advantages:**
  - Not conductance limited
  - Smaller foot print
  - Smaller, more commercial components
- **Disadvantage:**
  - Will require magnetic shielding of TMPs due to close proximity to NSTX
    - easily accomplished with a Mu-metal shell

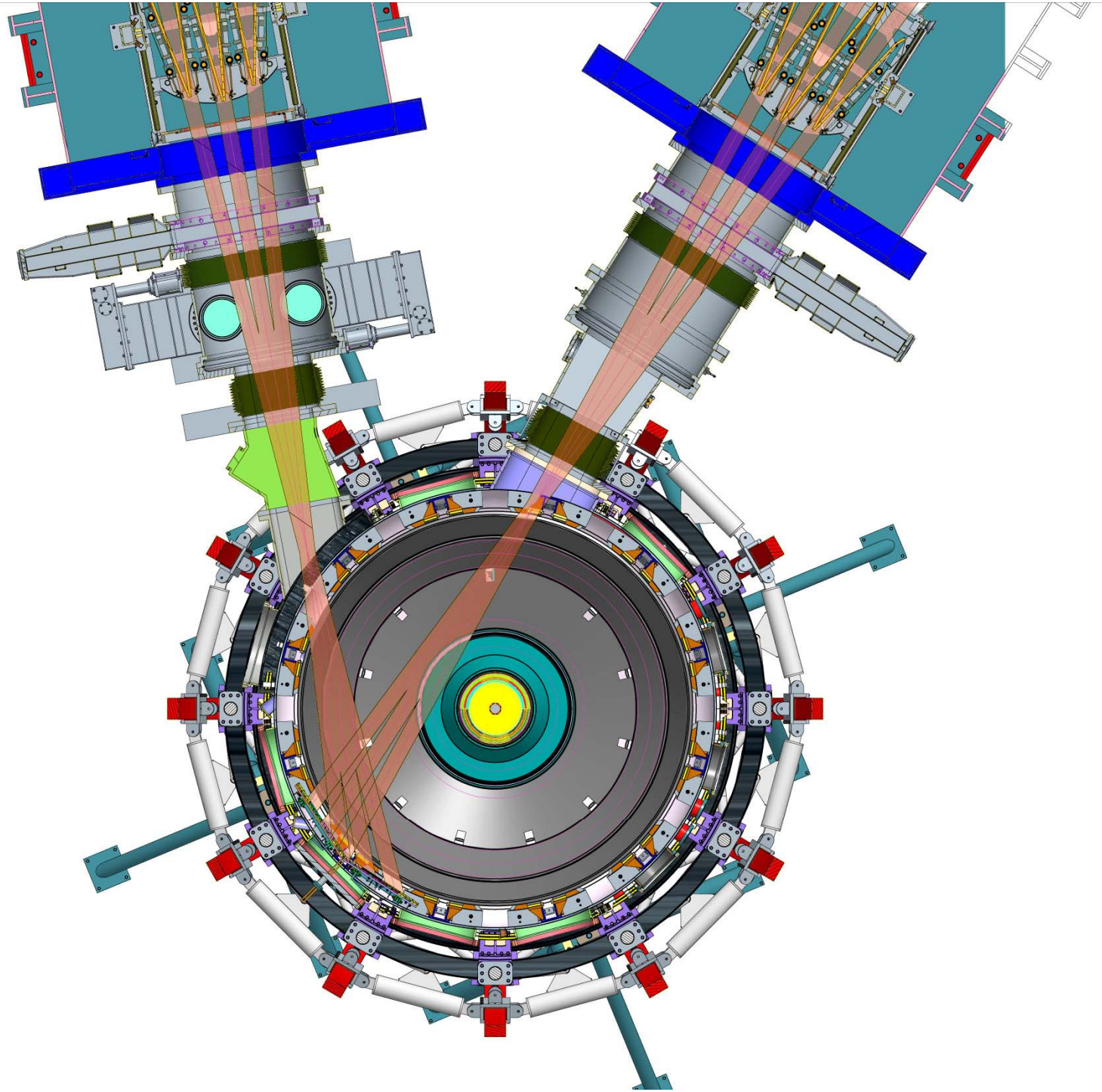


Neutral Beam 2 Interface Conclusions

We're Making Great Progress!

- **Vessel Cap**
  - Achieves required tangency radii
  - Provides structural reinforcement of vessel in Bay J-K area
- **Beam Duct**
  - Provides for vacuum isolation of NB 2 (TIV)
  - Provides mechanical and electrical isolation from Torus Vessel (bellows, ceramic break)
- **TVPS**
  - Relocation of TVPS frees up diagnostic space
  - TVPS ducts provide mechanical and electrical isolation from NB systems
  - Increase in torus pumping speed due to higher conductance





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