

# pfRICH Mechanical Design & Prototyping

Alex Eslinger (JLab)

7-25-24

## Electron-Ion Collider

**BROOKHAVEN**  
NATIONAL LABORATORY

Jefferson Lab



U.S. DEPARTMENT OF  
**ENERGY**

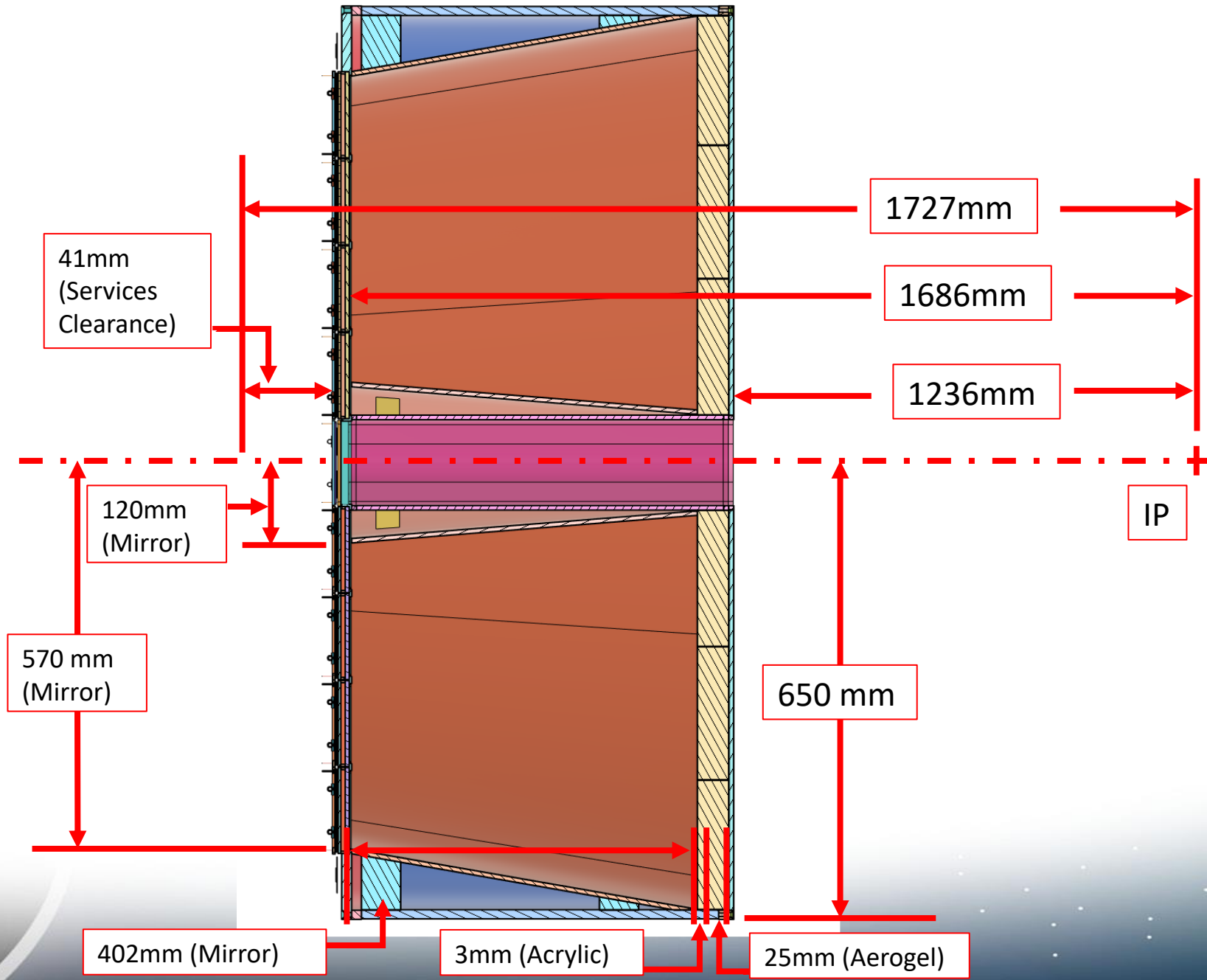
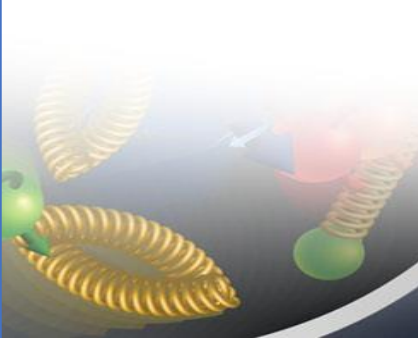
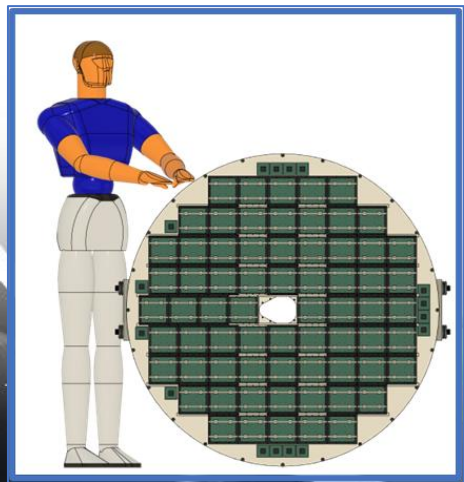
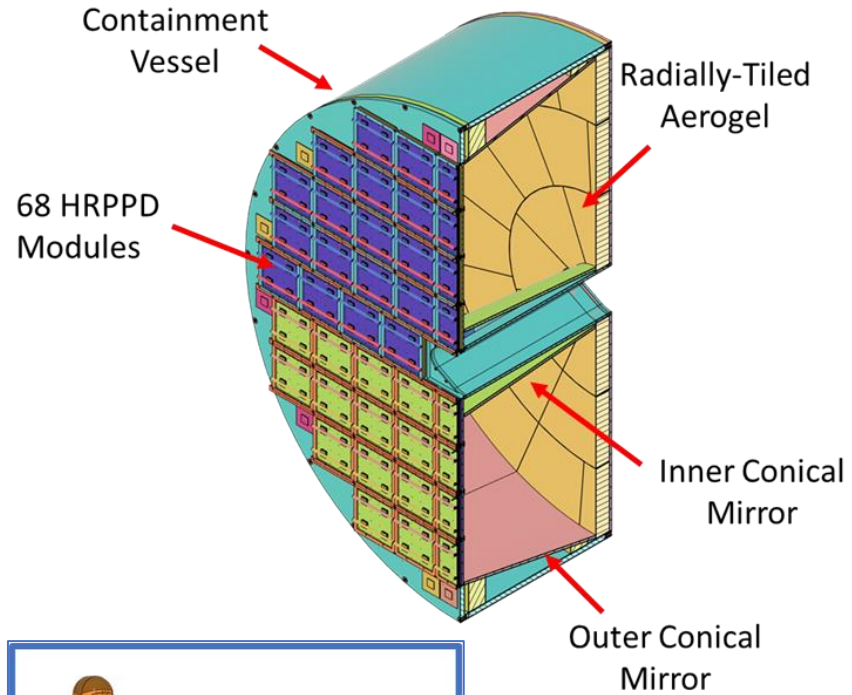
Office of  
Science

# Discussion Points

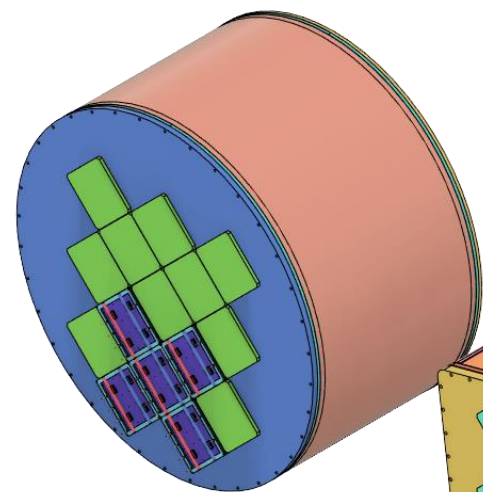
- Overall look at the pfRICH designs/concepts
- Differences between prototype and final designs
- Purdue Work
  - End Rings
  - Mirror Substrates
  - Sensor Plane
- Stony Brook University (SBU) Work
  - Vessel Construction
- Future Work/Summary



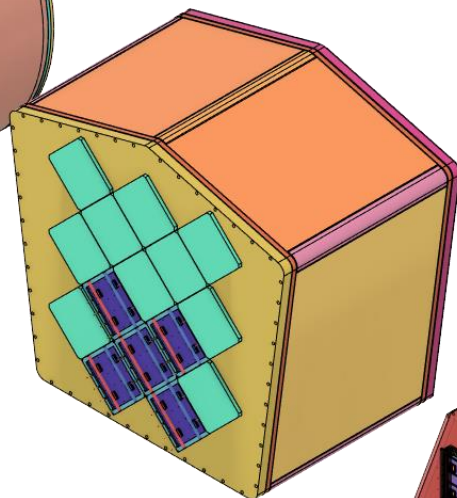
# Overall pfRICH Design



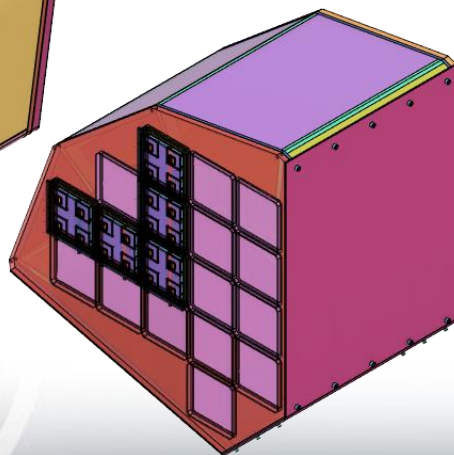
# Prototype Design Evolution



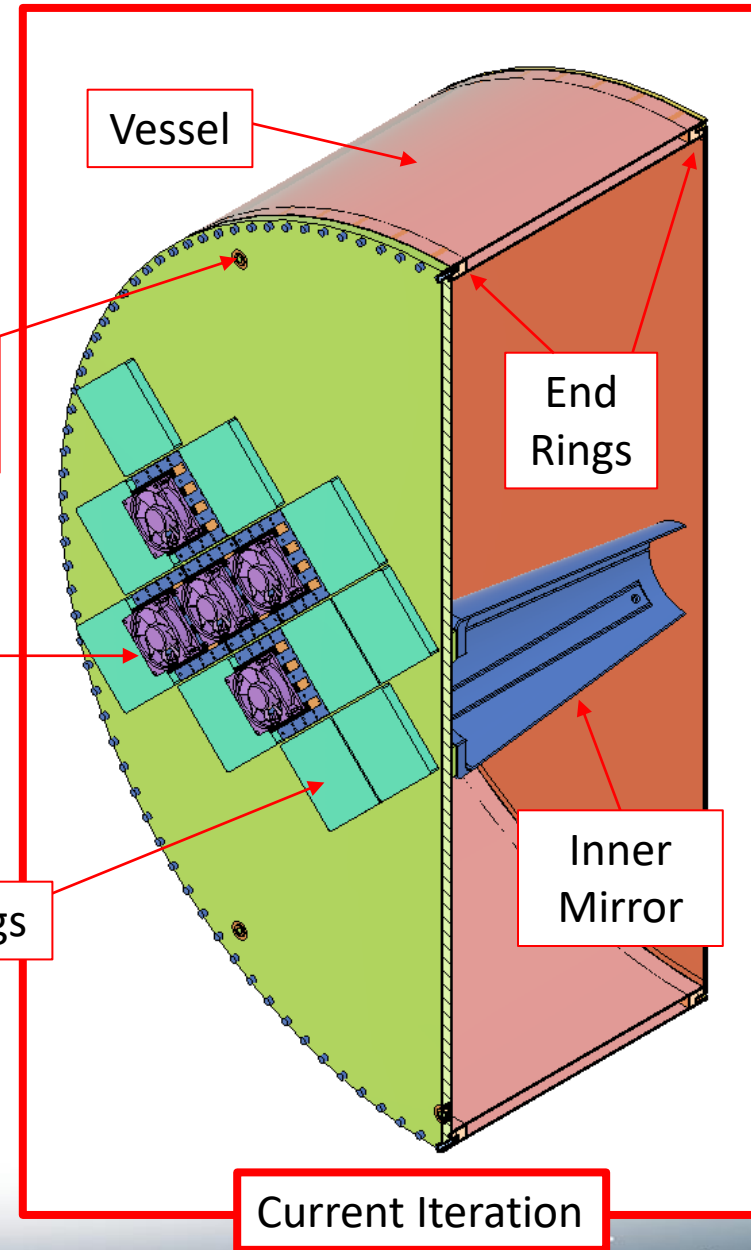
Third Iteration



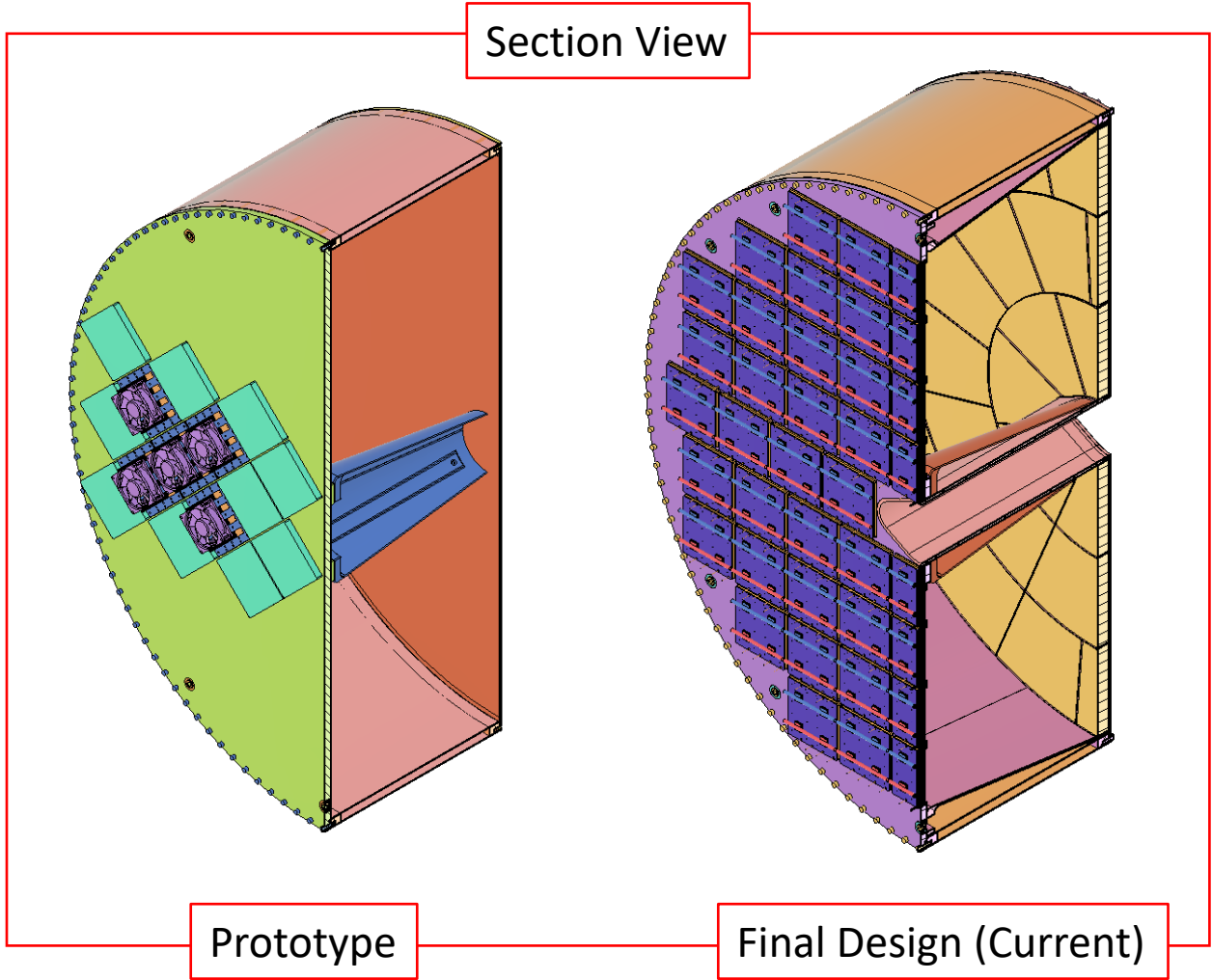
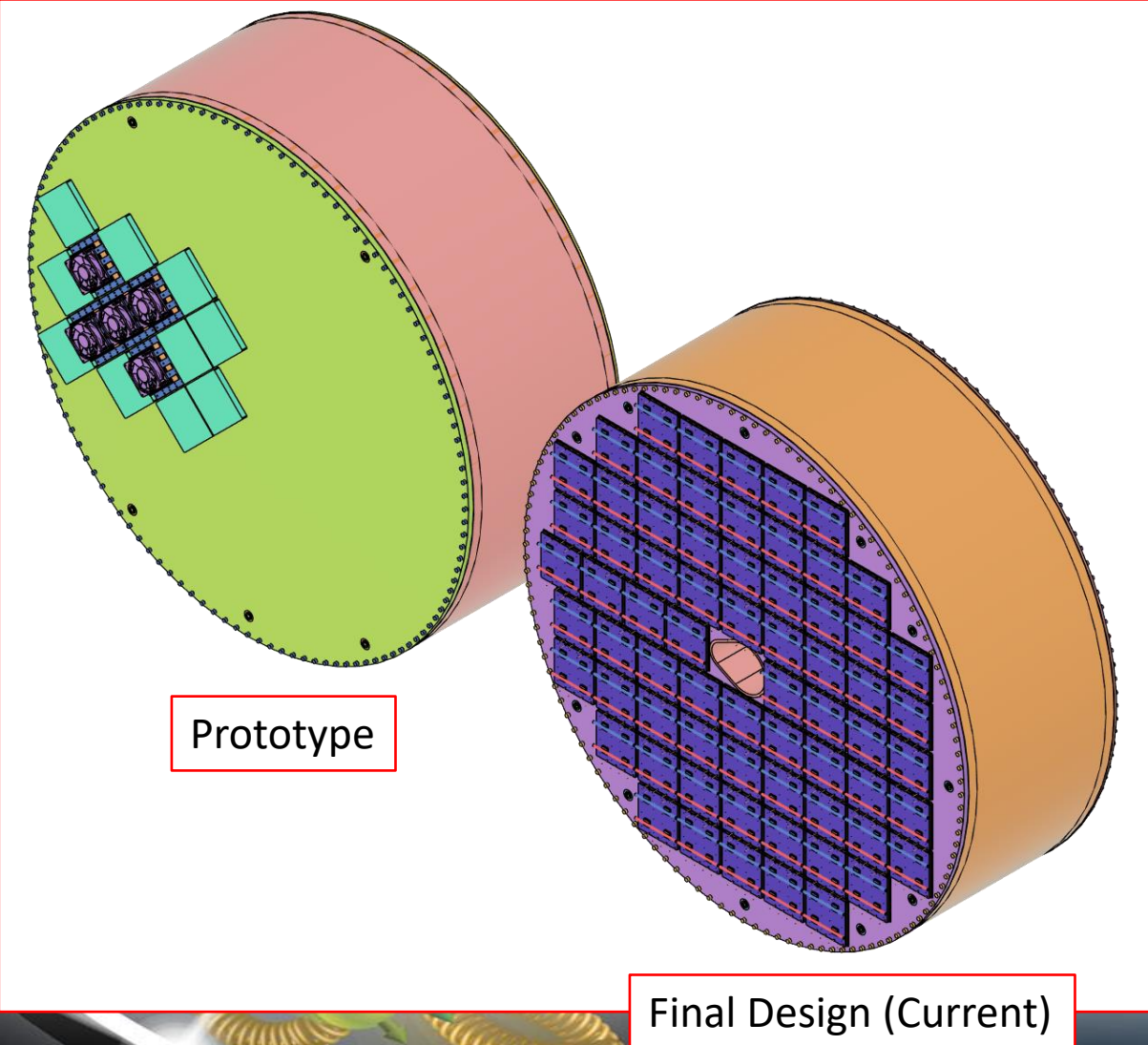
Second Iteration



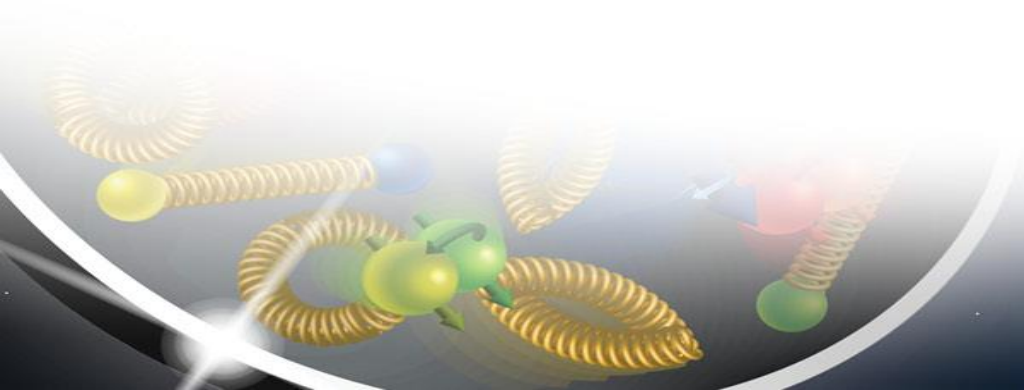
First Iteration



# Final vs Prototype

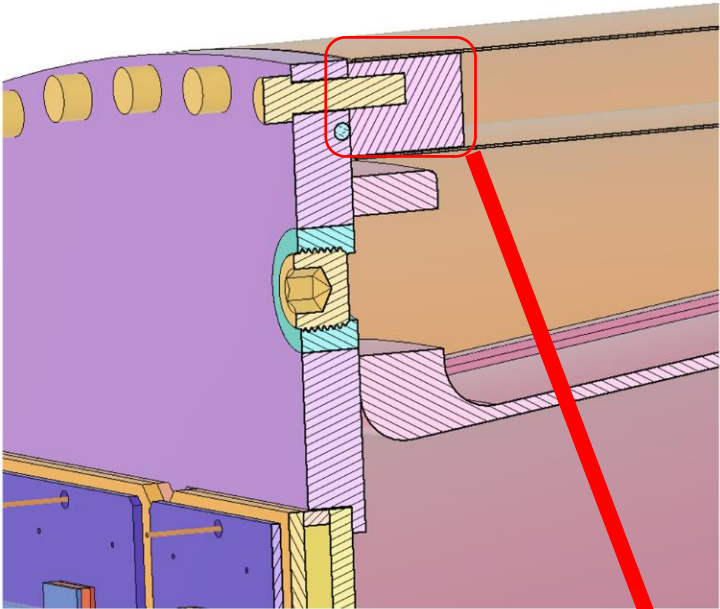


# Purdue Work

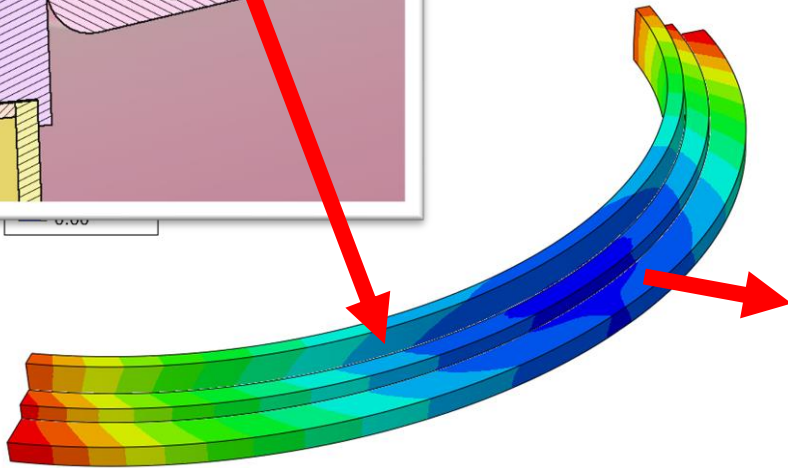


# Purdue: End Rings

1 End Ring Design



2 Mold Compensation/Analysis



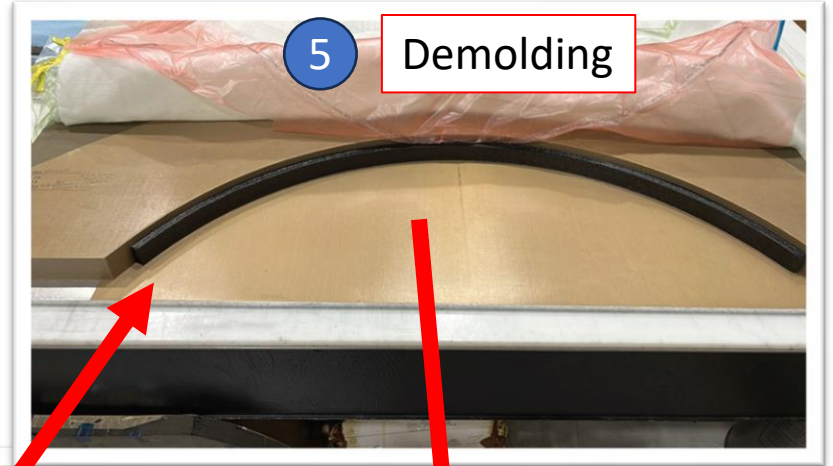
3 Ply Cutting



4 Layup



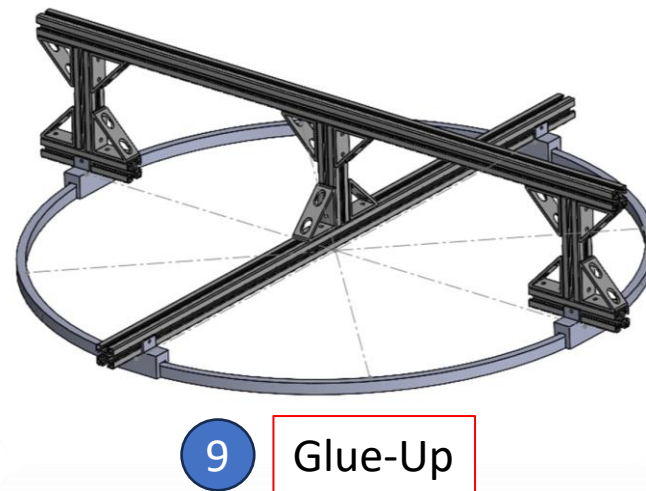
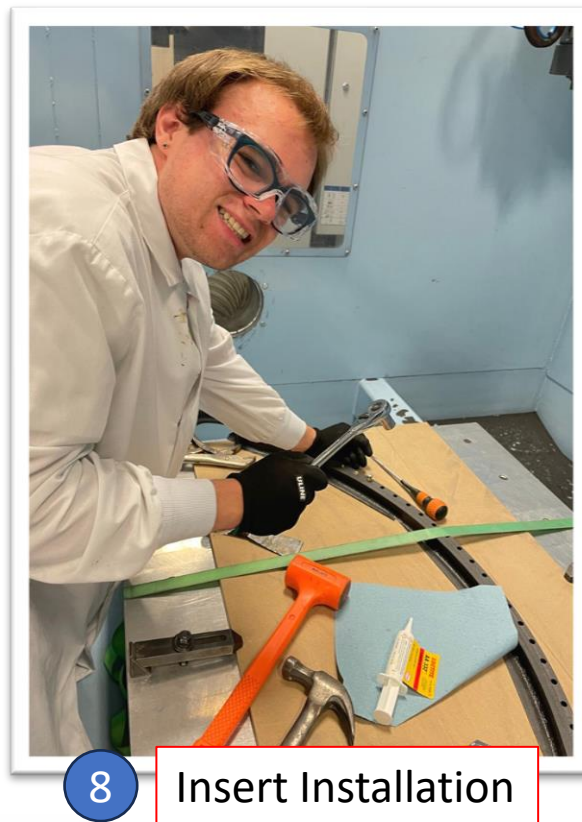
5 Demolding



6 Quarter Sections

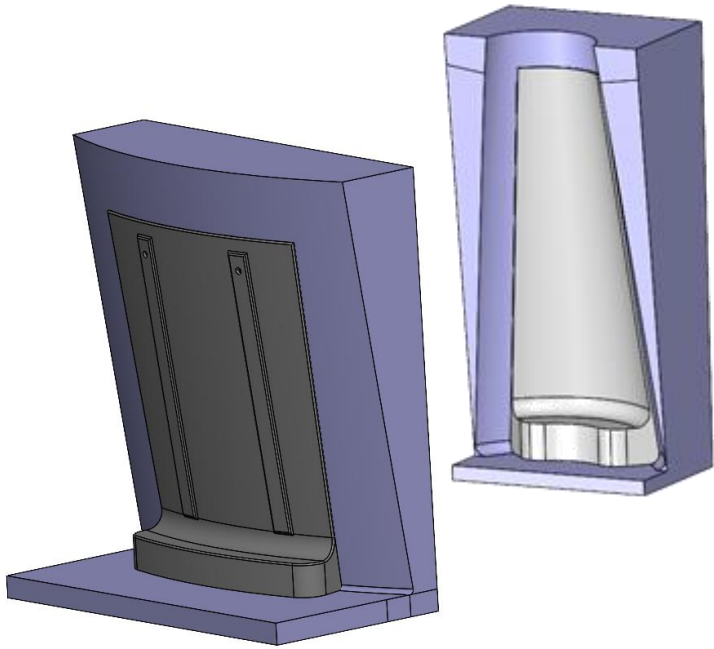


# Purdue: End Rings





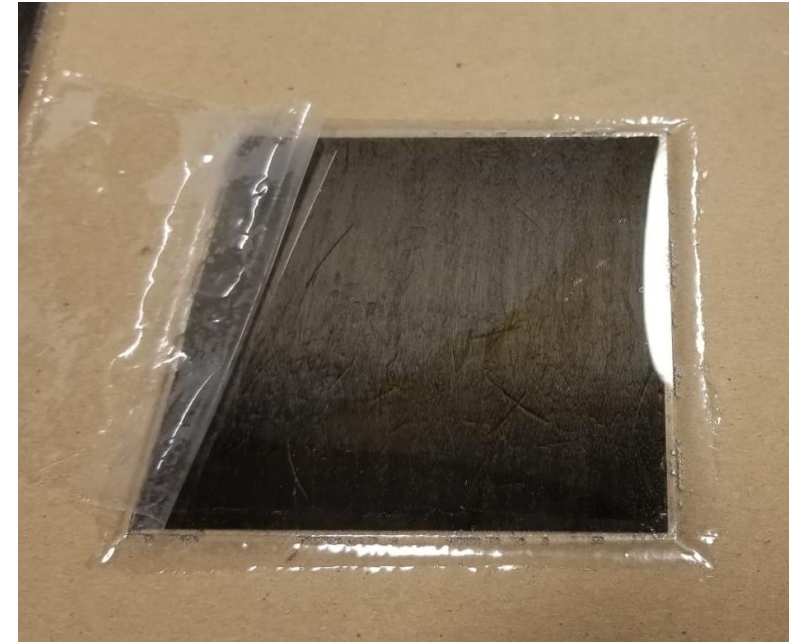
# Purdue: Mirror Substrates



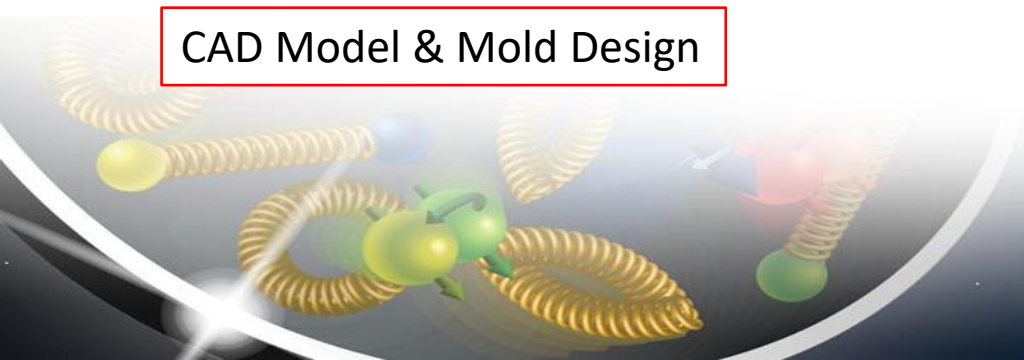
CAD Model & Mold Design



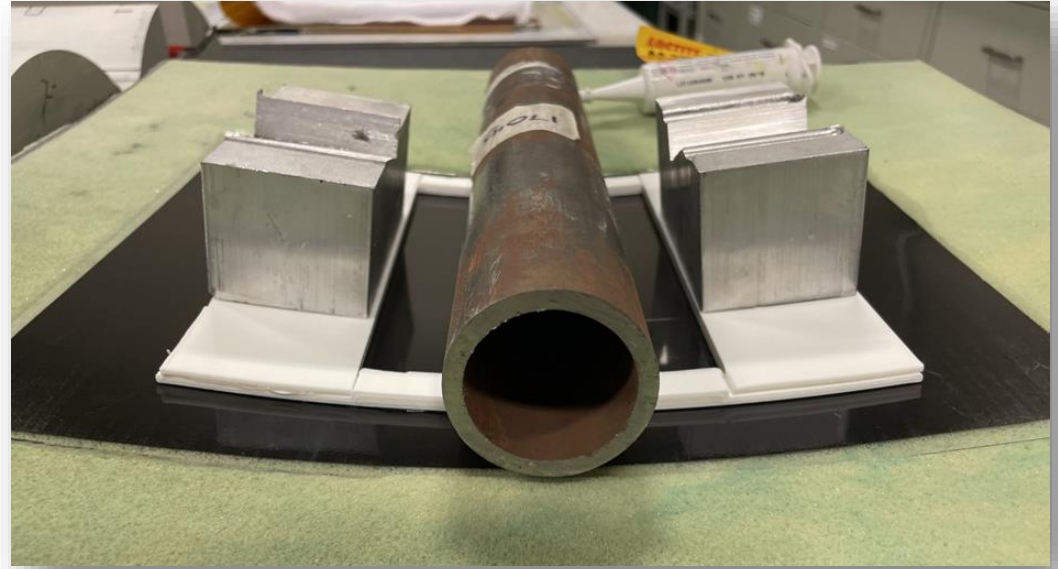
Polished CF Sheet



Acrylic Bonded to CF Substrate

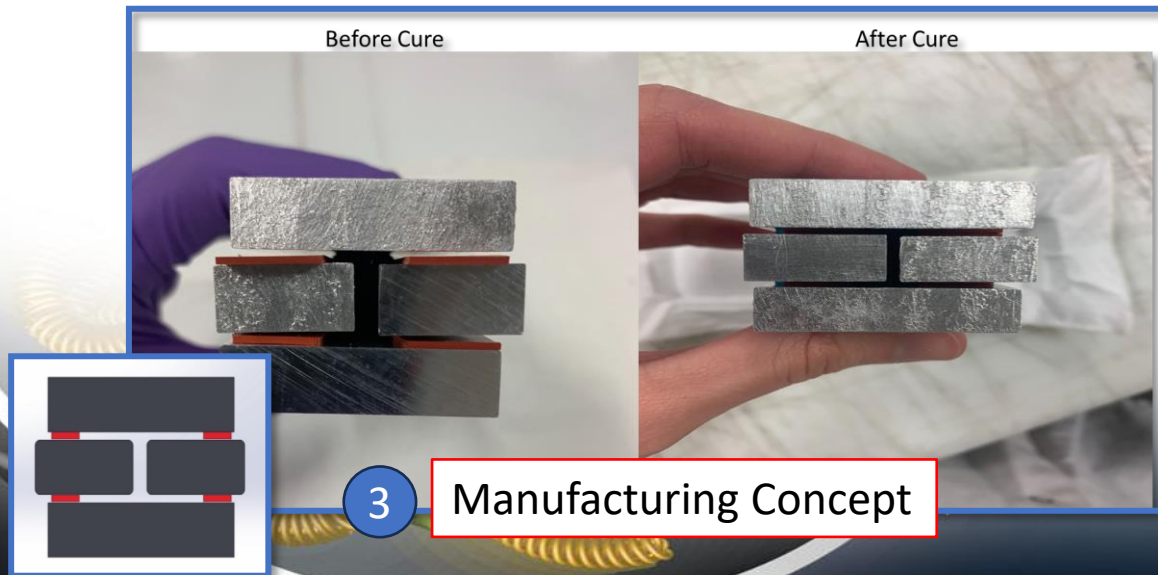
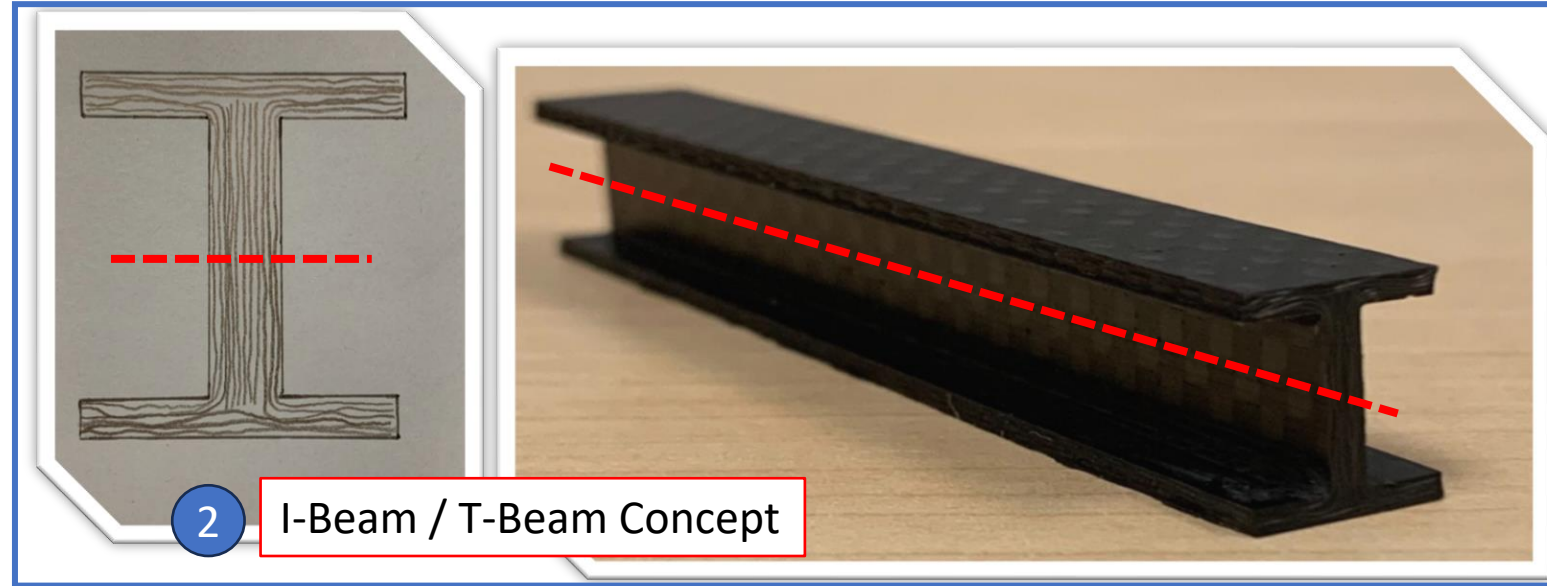
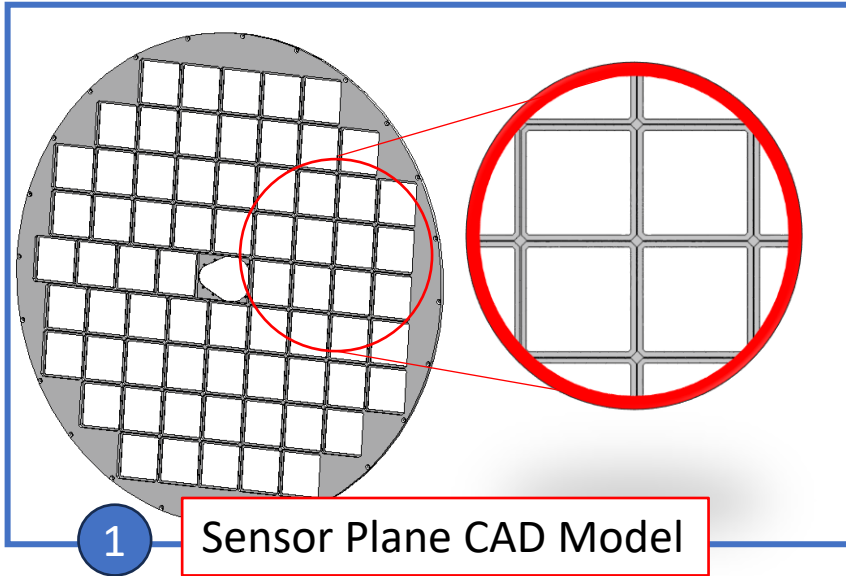


# Purdue: Mirror Substrates

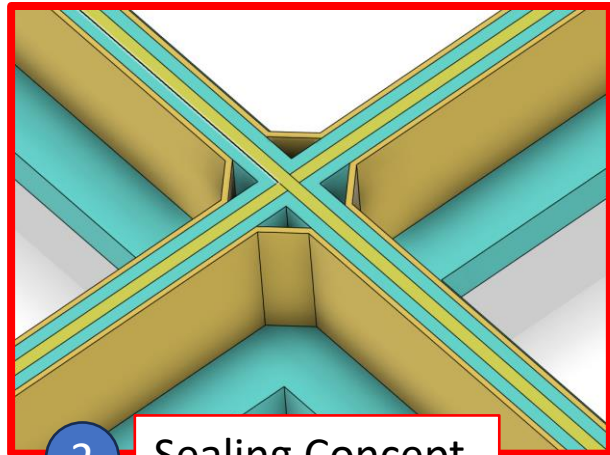


Development of curved and conical mirror substrates is ongoing

# Purdue: Sensor Plane

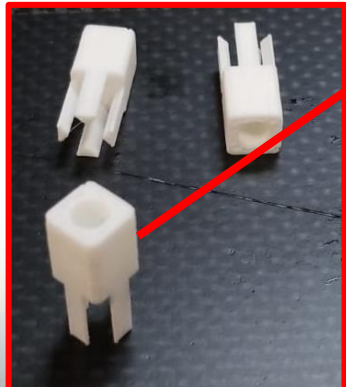
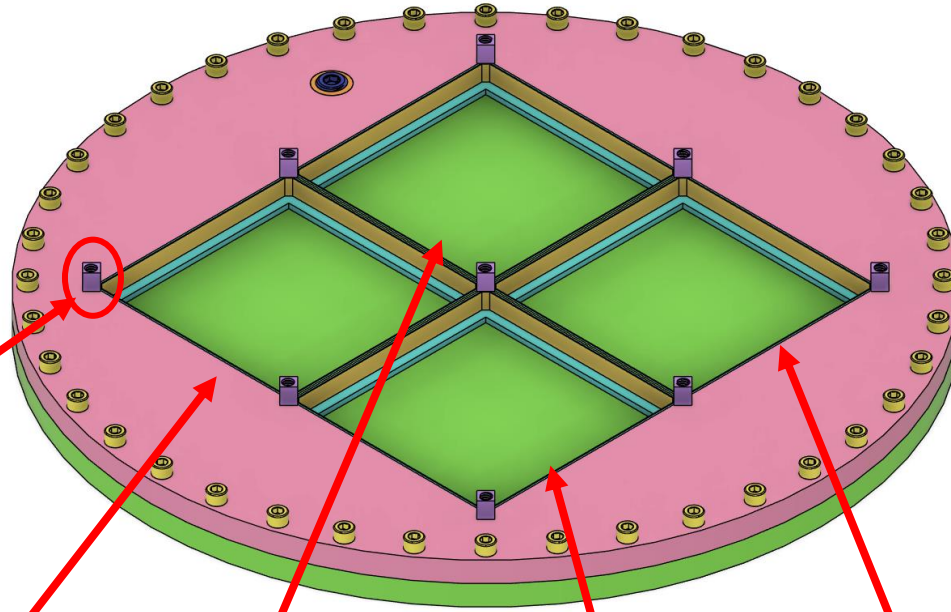


# Purdue: Sensor Plane

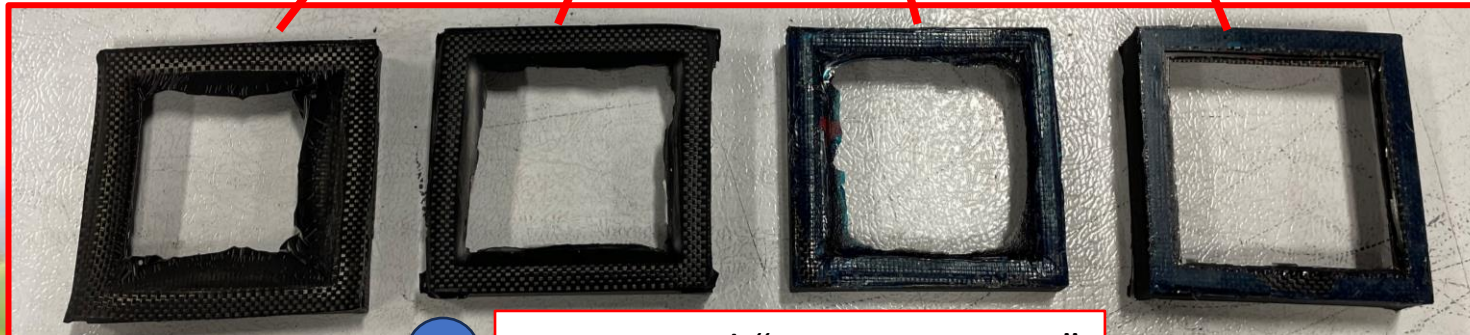


2 Sealing Concept

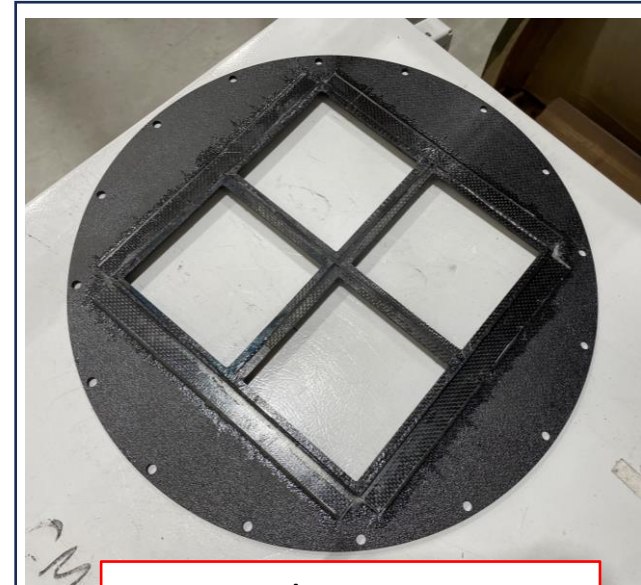
1 "New Style" Sensor Plane CAD Model



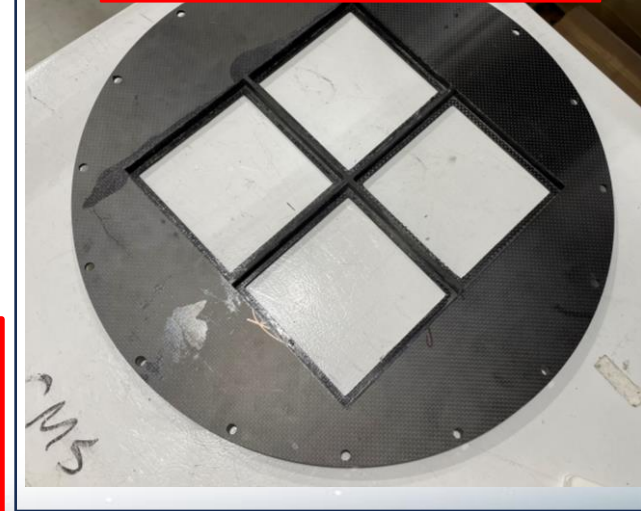
3 Mounting Concept



4 Untrimmed "Picture Frames"



5 Sensor Plane Prototype (Sealing Mock-Up)



# Purdue Team



**Thank You!**

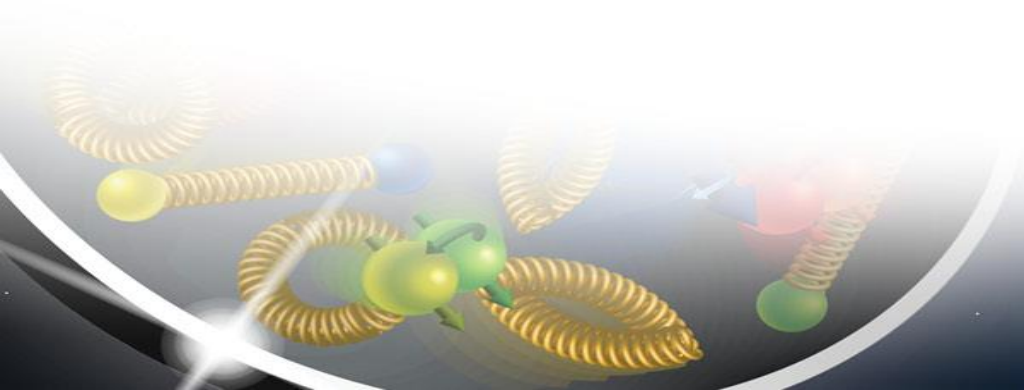
Andreas Jung & Sushrut Karmarkar

Undergrads: Simon Snyder-Smith, Samuel Langley-Hawthorne, Matthew Sanford, Xuli You, Lexing Xu, Ian Holda, Ethan Haynes, Hannah White, Matthew Campbell

Graduate Student: Pau Simpson-Crusafon

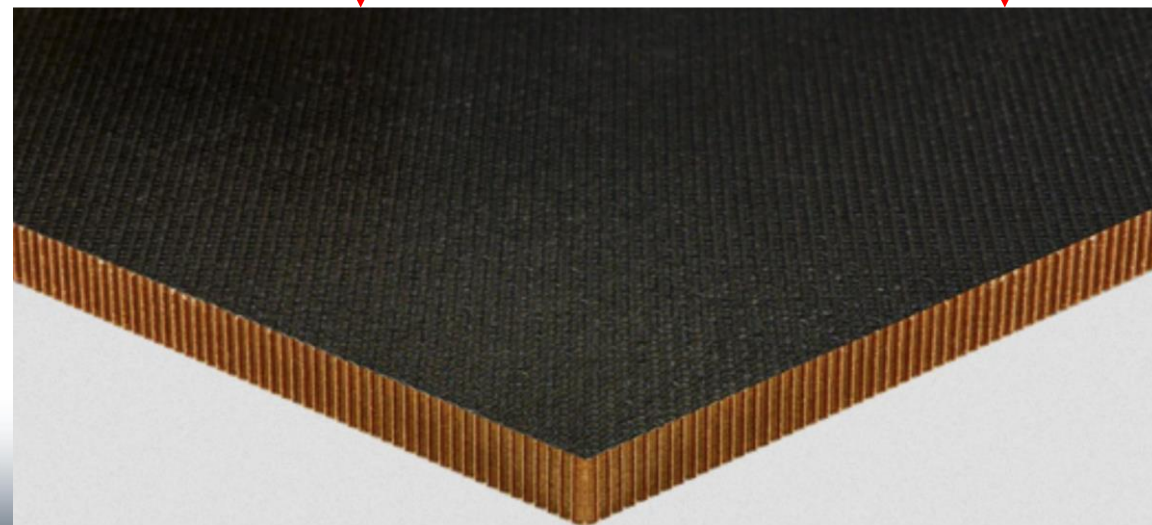
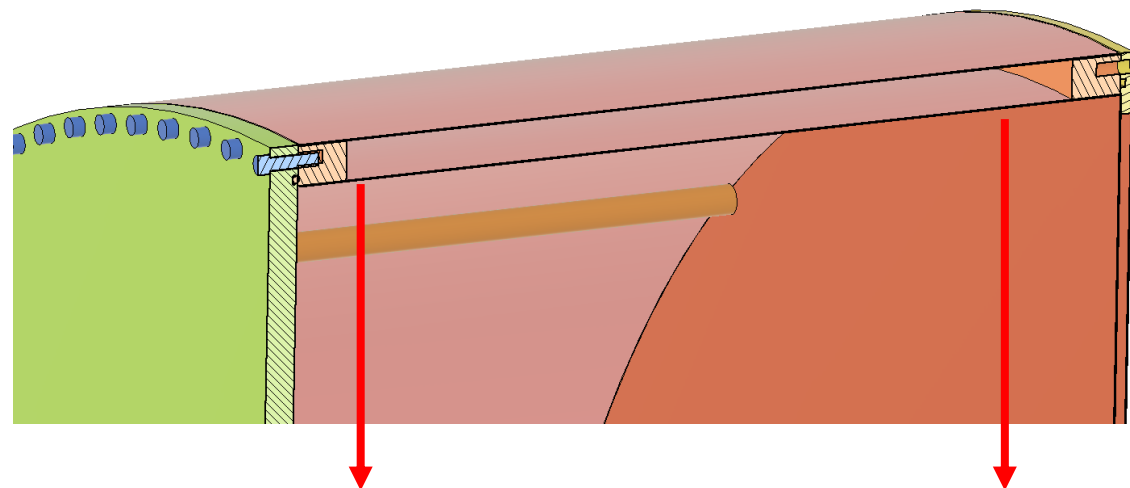


# Stony Brook (SBU) Work



# SBU: Vessel Construction

- Tasked with creating a cylindrical shell for the pfRICH
- Use of carbon fiber sandwich material for a light, stiff, gas- and light-tight vessel wall.
- Scheduled to be completed by end of August (dependent on end rings)



# SBU: Vessel Construction

80/20 structure

Foam milling



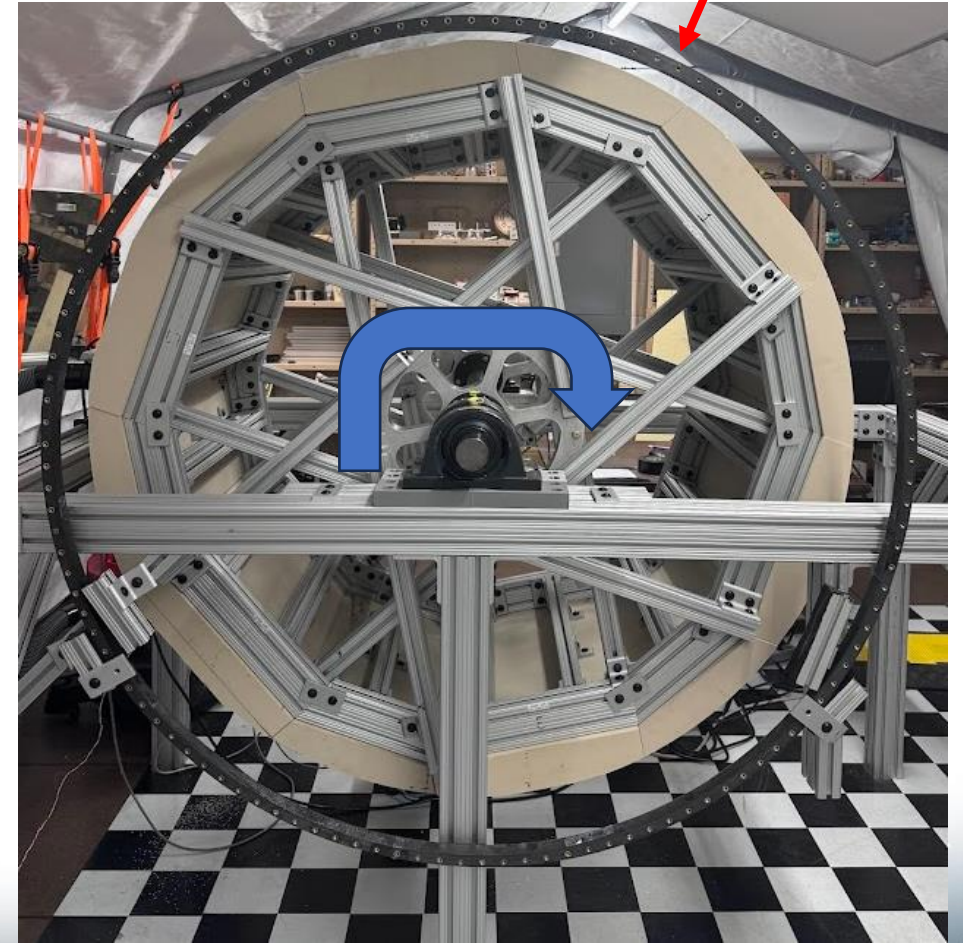
Foam installation



# SBU: Vessel Construction



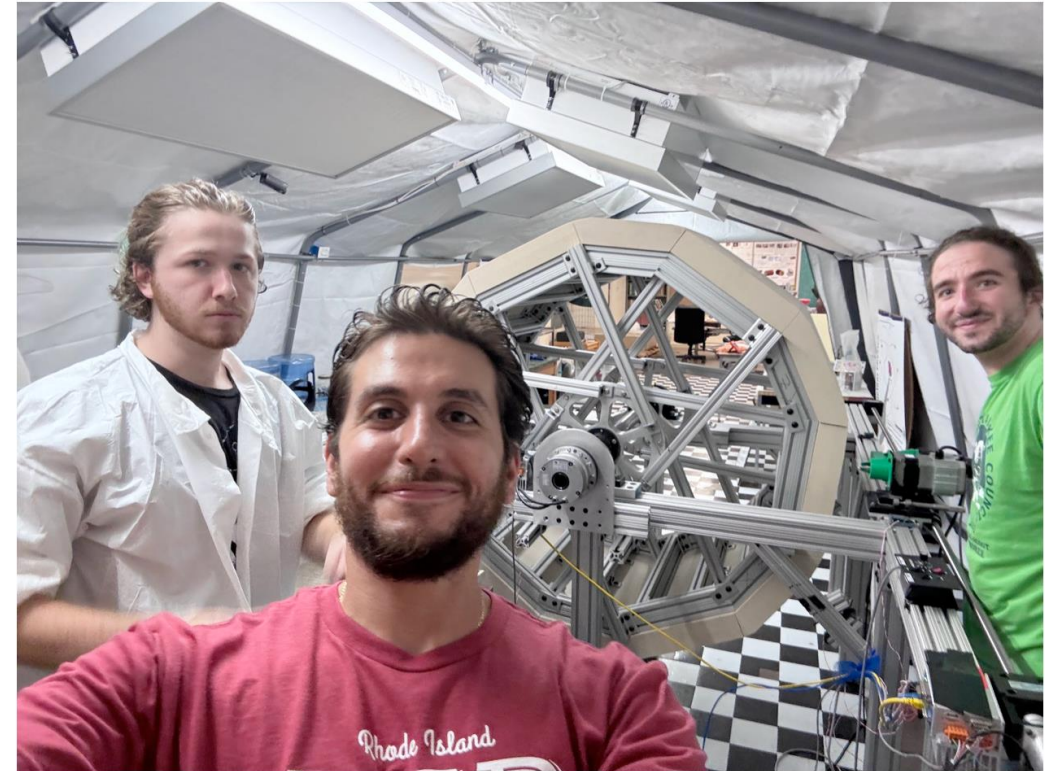
Milling attachment on a linear guide



End Ring

# Follow the Production

- Vessel Production Team (Thank You!):
  - C-J. (“Charles) Naim
  - Julian Driebeek (Graduate Student)
  - Emmett Gebb (Undergraduate Student)



[Google Photos Progress Album](#)

# Future Work / Summary

- Light monitoring system work is on-going (slides presented later)
- Substrates manufacturing is still being investigated
- Coatings are continuously on-going (slides presented later)
- Aerogel tiling scheme needs to be finalized based on manufacturer and simulation data (size & location)
- More learning and experience from prototyping and manufacturing



# Questions?

