The vessel at Stony Brook
pfRICH project

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on behalf of the Stony Brook team

Center for Frontiers in Nuclear Science

pfRICH group meeting
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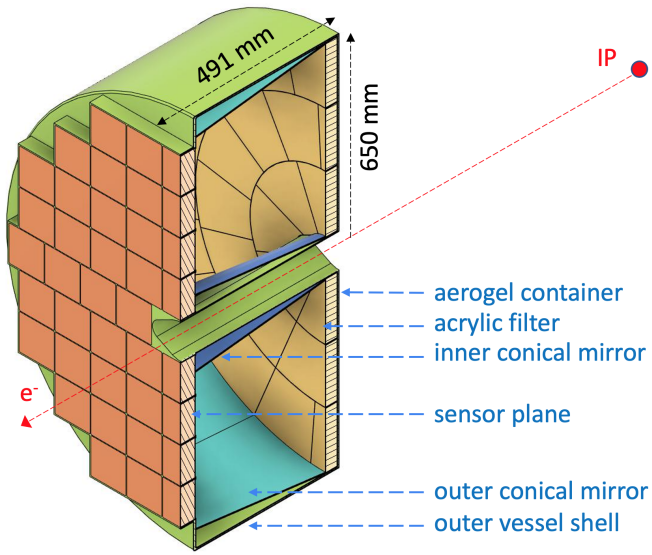
Introduction

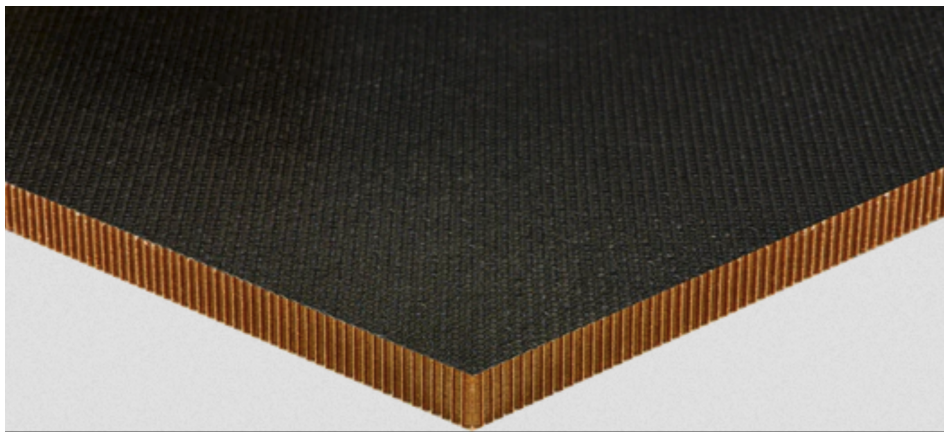
- **Key feature**: Cylindrical vessel outer shell.



- Engineering aspects need attention for DOE reviews in 2024-2025.
- Outer shell construction crucial for light and gas-tight enclosure.

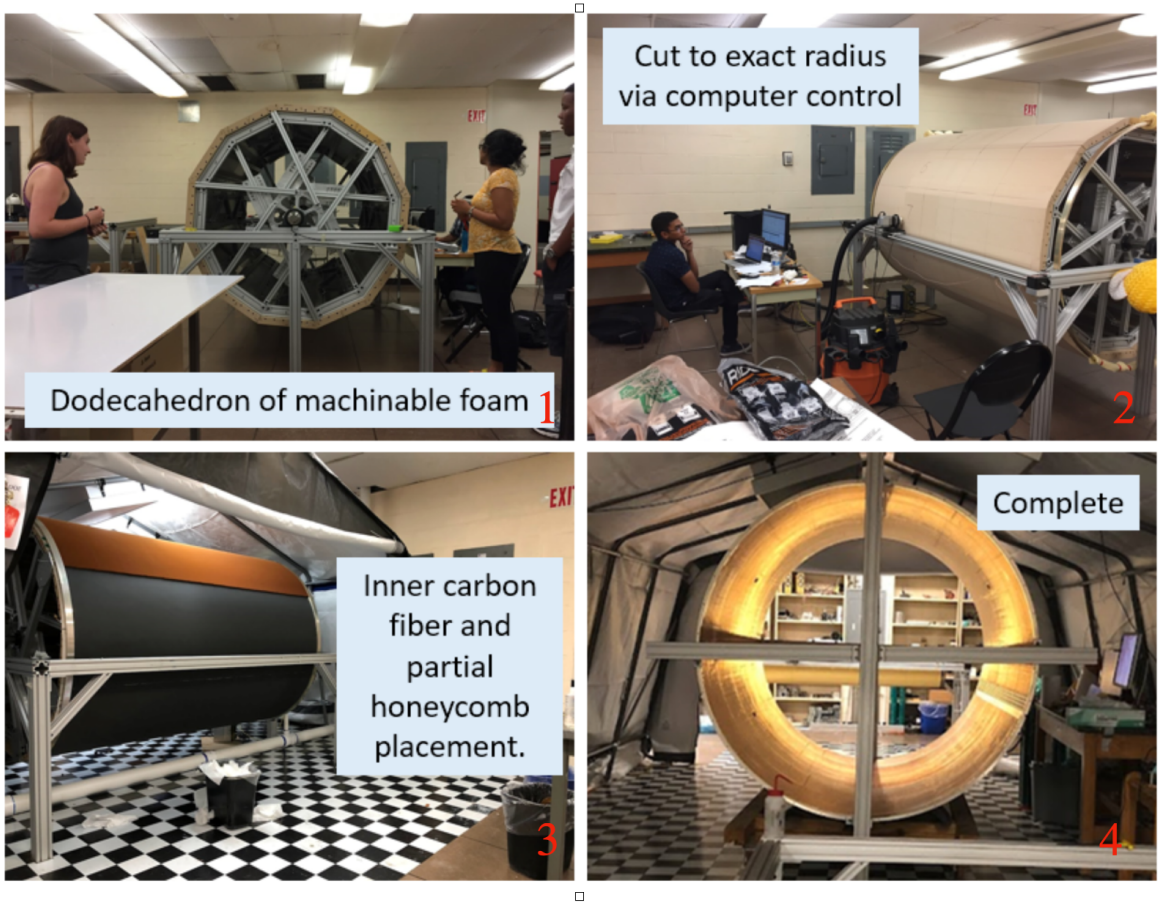
Vessel dimensions: measurements

- **Shape**: 1/2" thick cylinder (12.7 mm)
- **Outer Diameter**: 1300 mm
- **Length**: 491 mm
- **Precision**: $<$ 1 mm radius and length
- **Technology**: Carbon-fiber composite material with nomex honeycomb core.



Vessel materials

- Outer shell designed with carbon fiber honeycomb sandwich technique.
- Mimics the successful sPHENIX TPC construction method.
- Construction steps identical to sPHENIX TPC outer field cage.



Building the Cylindrical Honeycomb Shell

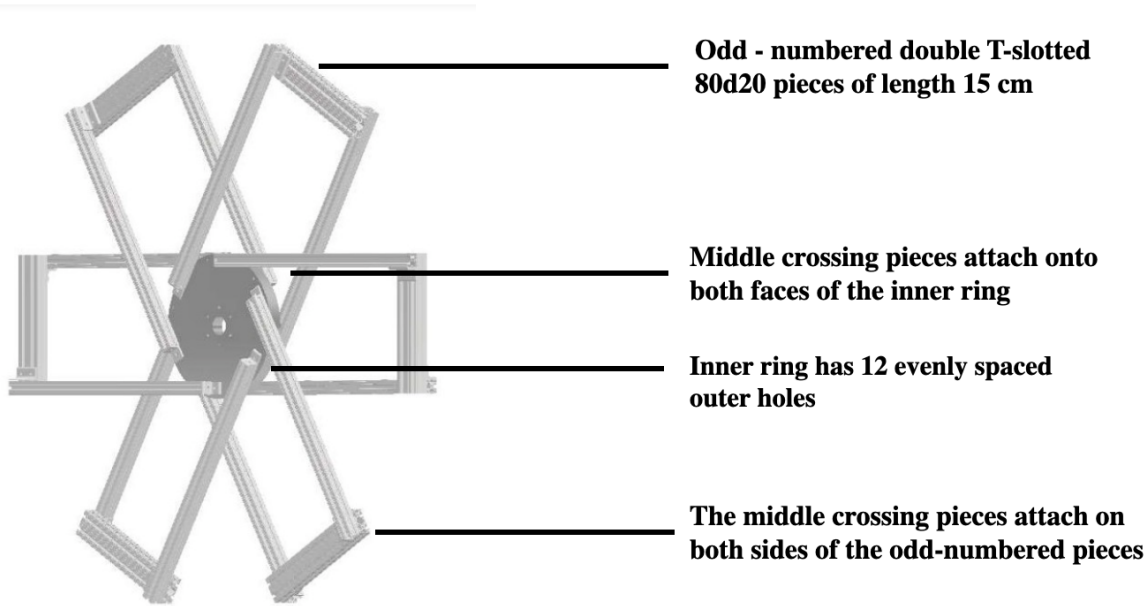
- **Start:**
  - Craft a dodecahedron base from machinable foam.
  - Ensure the foam is of appropriate size.
- **Precision Shaving:**
  - Utilize computer-controlled machinery for exact radius.
  - Guarantee uniformity and precision.
- **Carbon Fiber Application:**
  - Apply fine carbon fiber selectively incorporating a honeycomb structure.
  - Add structural rigidity while maintaining a lightweight design.
- **Final Assembly:**
  - Ensure proper bonding and curing for carbon fiber and honeycomb layers.
  - Inspect for imperfections or areas requiring reinforcement.

Steps and Milestones

- **Milestones**:
  - Mandrel Completion: February 1, 2024
  - Shell Completion: April 1, 2024
- **Deliverables**:
  - Completed outer shell by April 1, 2024.

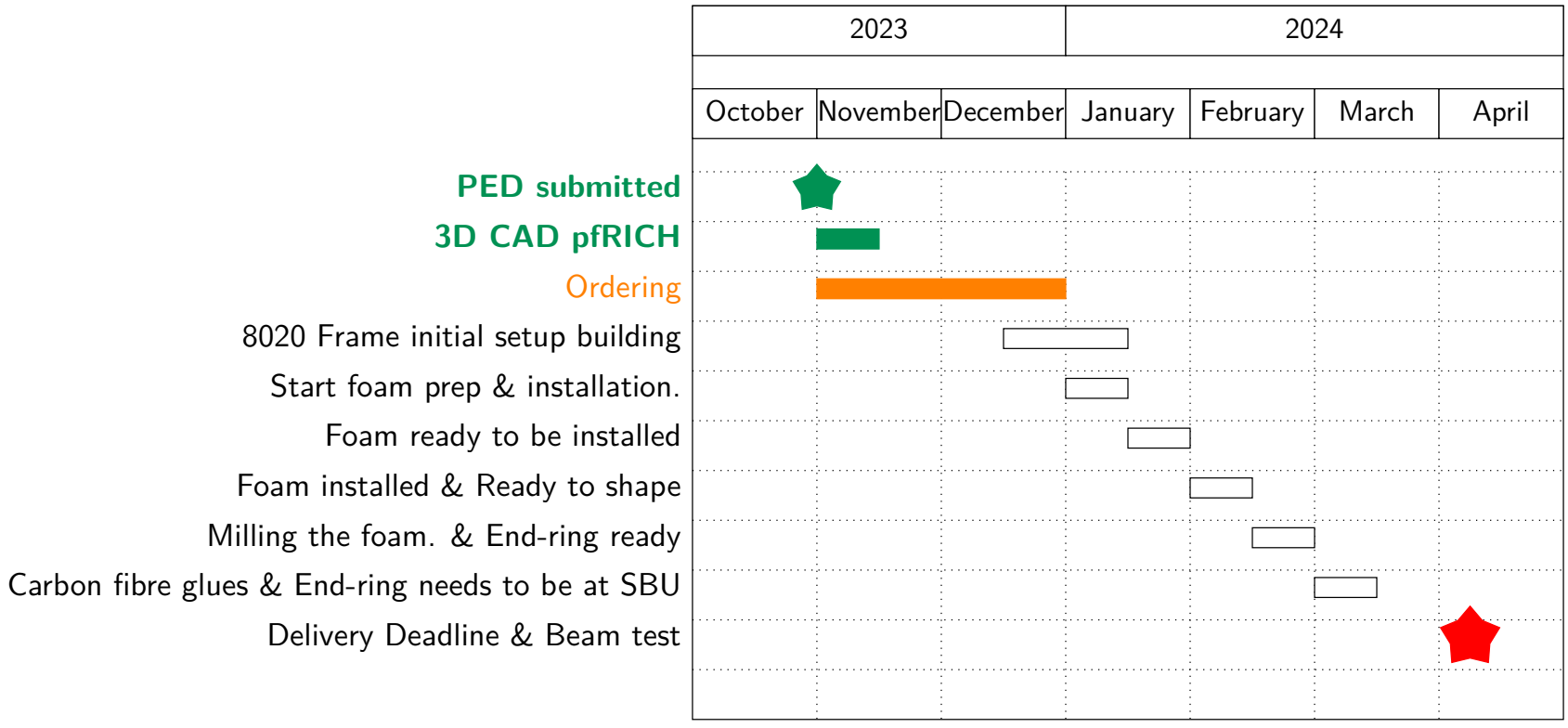
Computer-Aided Design (CAD)[1]

- Developing a scalable CAD program with a 65 cm radius.
- The chosen radius is closer to the vessel's maximum diameter of 130 cm than the initial 81 cm.
- This adjustment aims to establish a preliminary correlation among different ring components.
- The choice considers the uncertainty surrounding the final diameter of the vessel.



[1] From E. Gebb and S. Madishetty

Project Timeline

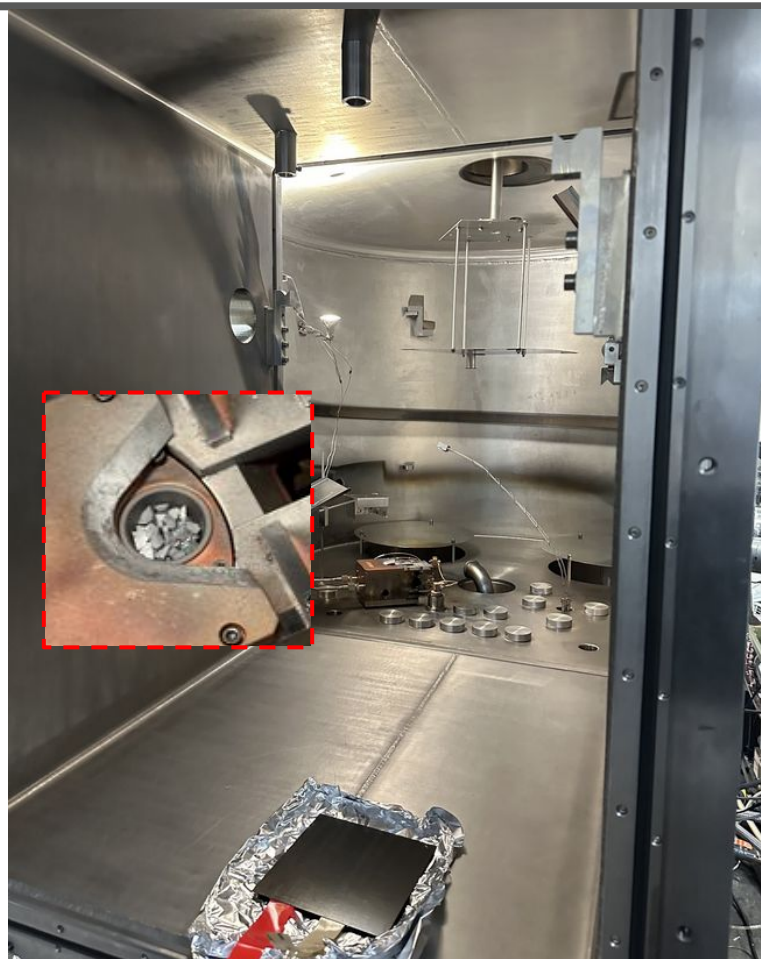


Mirror Coating Updates

Nov 16, 2023

Where are we? How ready are we?

- **Water cooling system Stability** ✓
  - 24 hour continuous operation
- **Vacuum quality** ✓
  - $3x10^{-6}$ Torr (current configuration limit)
- **Tape stability** ✓
  - Stickiness and outgassing test
- **Rotation Motor** ✓
  - Continuous 1 hour operating ~ 1 rev/s



Documentation

- **Coating Documentation:**
  https://docs.google.com/spreadsheets/d/1qd2DJs3Ms1QuVJTnB4B2kjaaJST8t2qY7ZGq4mlvHr0/edit?usp=sharing

- **Coating Plan:**
  https://elog.cfnssbu.physics.sunysb.edu/SoLID/17

- **elog to keep track of the progress:**
  https://elog.cfnssbu.physics.sunysb.edu/SoLID/

- **First coating preparation:**
  https://elog.cfnssbu.physics.sunysb.edu/SoLID/

Next Step

- **First coating projected at Friday morning Nov 16th.**
- **Reflectivity measurement at BNL will follow.**
- **Tighten up the protocol on “clean” coating condition.**
  - We are coating in a dirty environment
  - Requested PED fund to help with this.
- **Practice and optimize the coating parameter**

Sincere Gratitudes for SPhenix Colleagues

- To **Ross Corliss** and **Vassu Doomra** for their patience and guidance in preparing and setting up the evaporator.