SoLID

SIDIS Heavy Gas Cerenkov

Part I: Update on Optics Optimization

Duke University

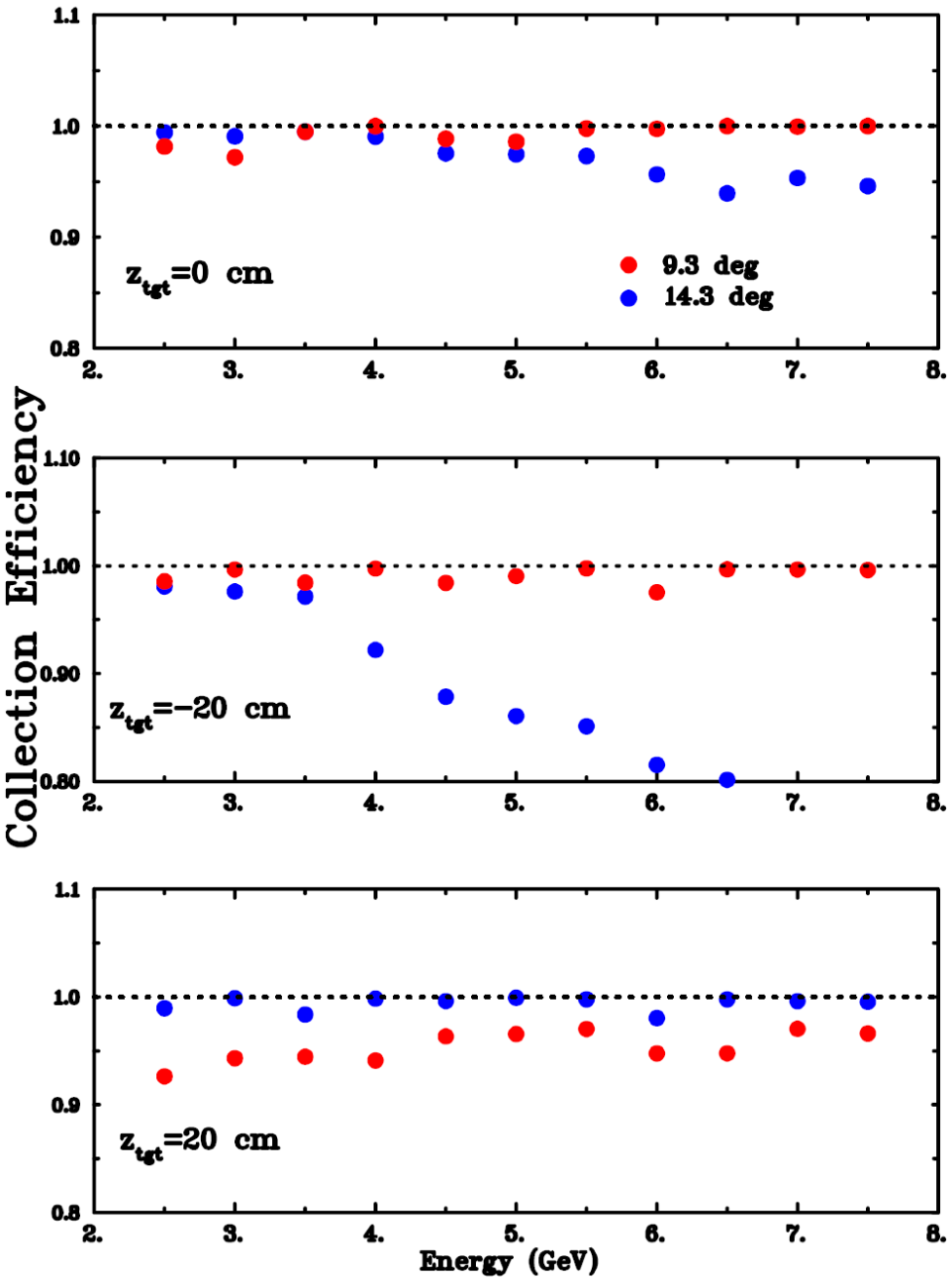
M. Meziane

Optics Optimization

- Use CLEO II layout.
- Use CLEO II field map.
- Keep mirrors and cones+PMTs assemblies at the same position as in BaBar magnet. (slight rotation up by 0.5deg for fine tuning)

Optics Optimization

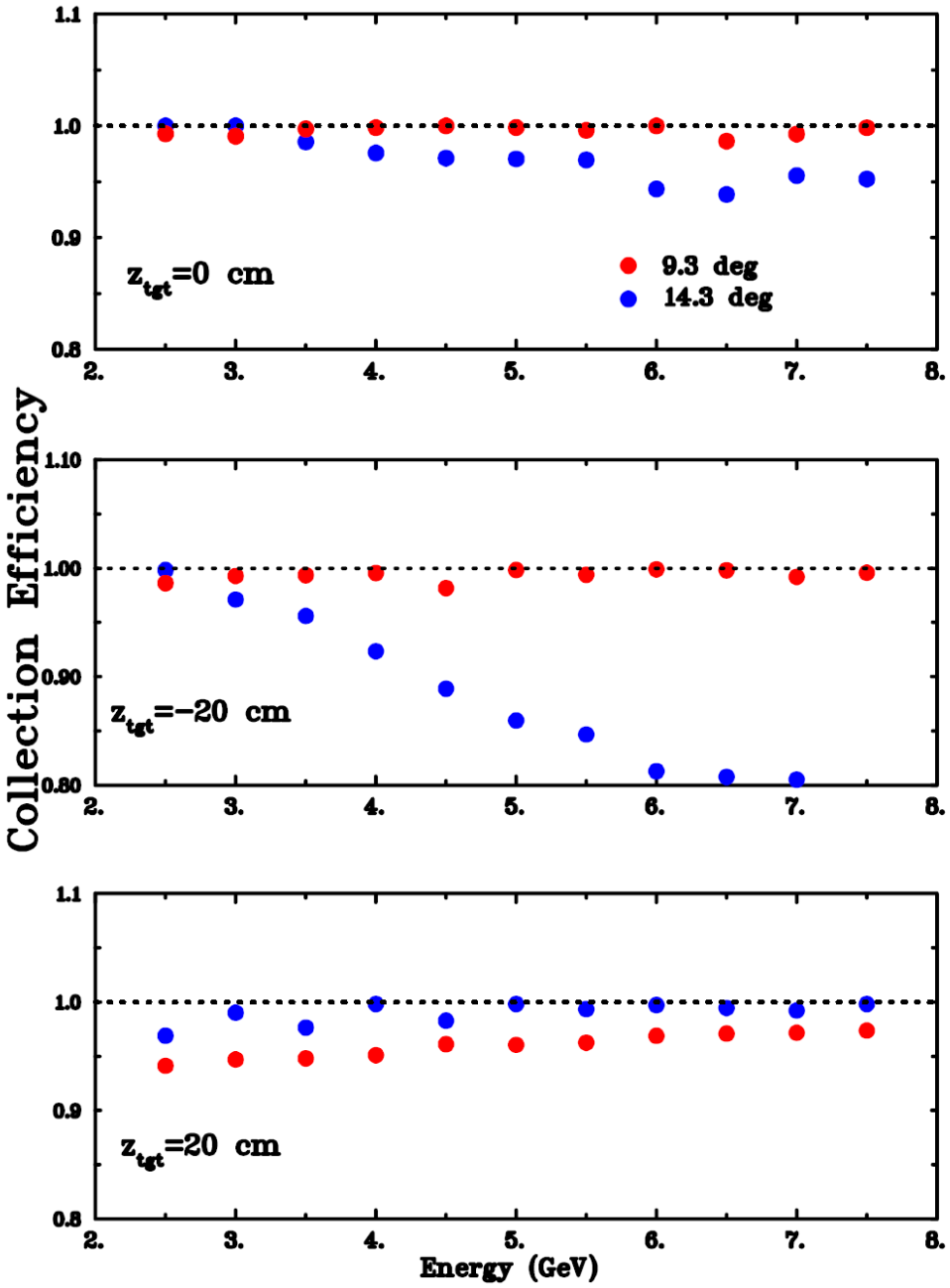
π+ case



Preliminary

Optics Optimization

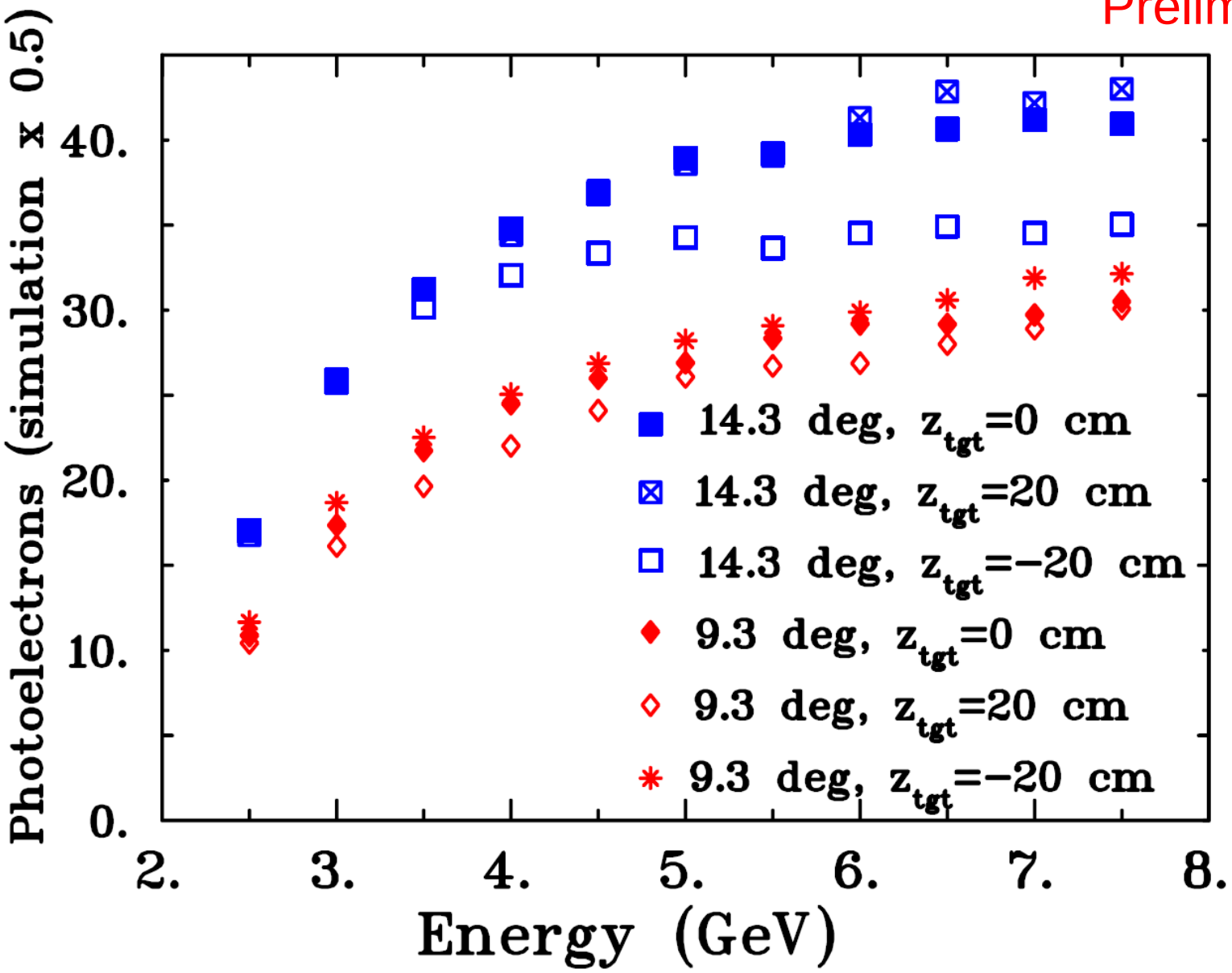
π- case



Preliminary

Optics Optimization

Preliminary



Optics Optimization Status

- Preliminary results looks similar than Simona's numbers with Babar magnet

  → In progress: Full ϕ dependence of the PMT collection efficiency for a consistent comparison with Simona's results

- Extend the study to the full angular coverage of CLEO II layout and fine tune the positions of the different elements accordingly

- Based on Simona's new PMT field test results contact Amuneal for an updated shield box design. (important parameter in Gary's design)

- So far in the conceptual design the PMT support sticks out of the allowed space:

  - moved the cones+PMTs more upstream by 2cm

  → - collection efficiency drops already by ~6% in extreme cases (large angle, high momentum, downstream part of the target)

  - keep this sweet spot would be desirable

- Simulation including the support structure

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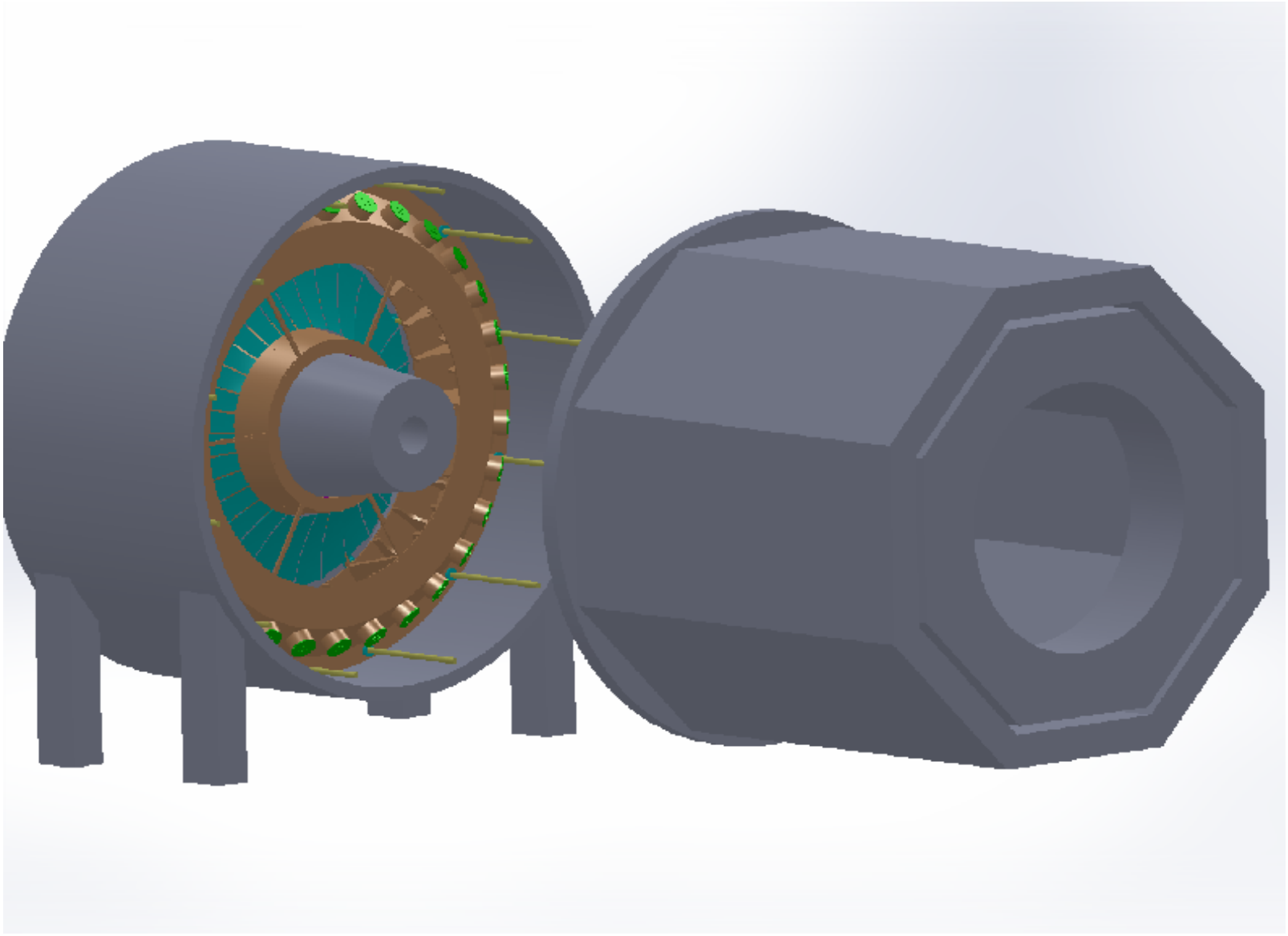
Part II: Detector conceptual layout - adapted from BaBar geometry for Cleo2 magnet concept

Duke University

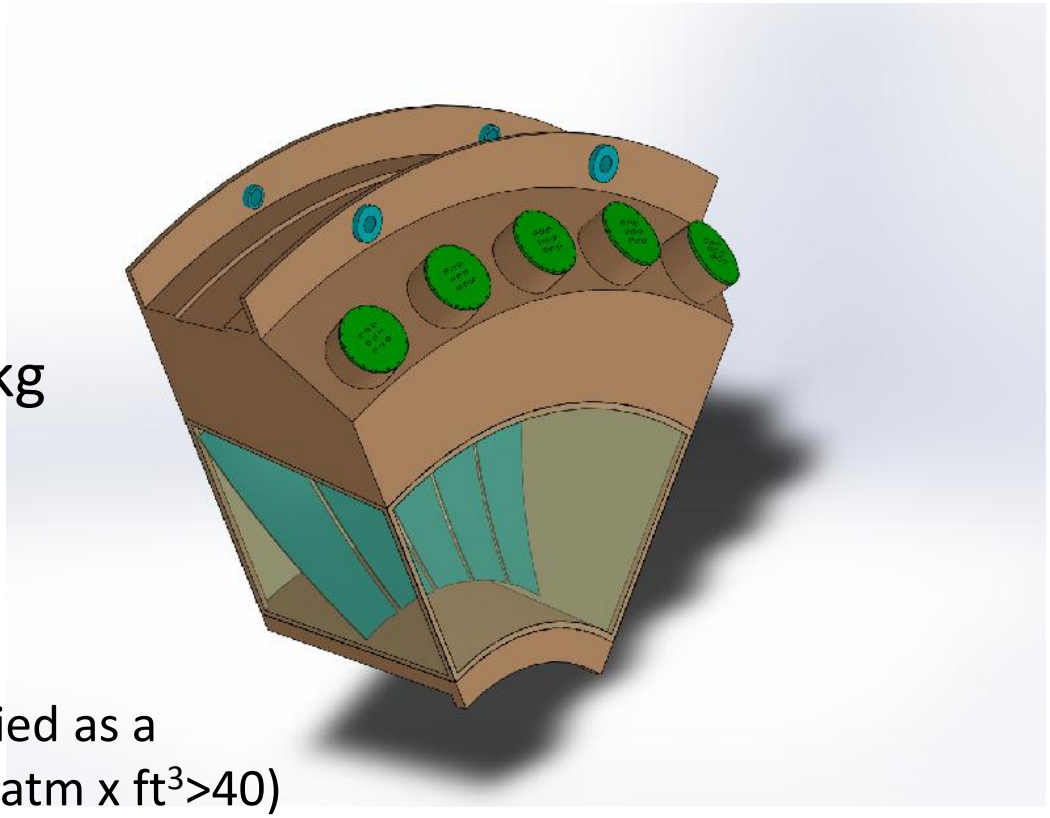
G. Swift

Installed in pole extension for Cleo2



Assembled as a 60 deg sector
with 5 sets of:

PMT modules
Conical Mirrors
Spherical mirrors

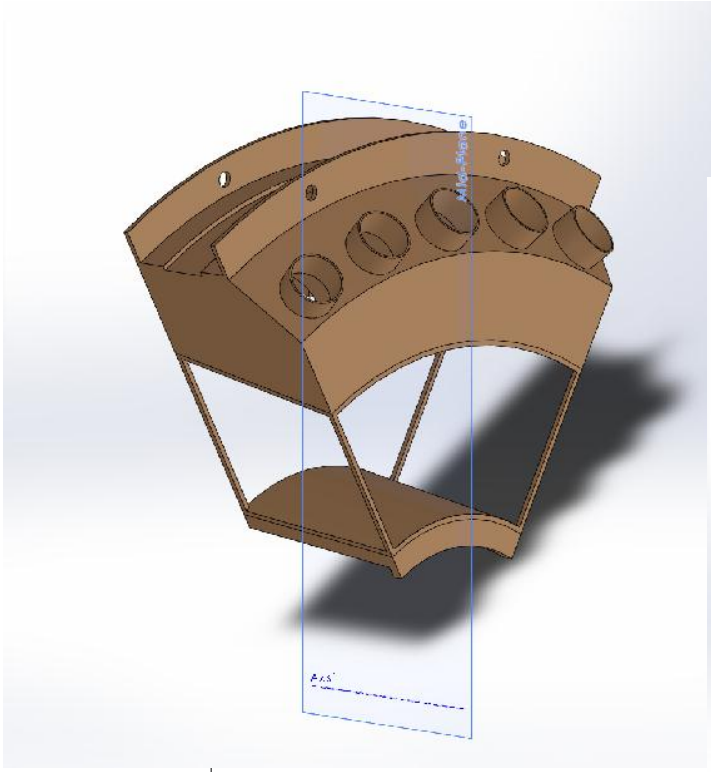


Wt./sector ~ 1000 kg

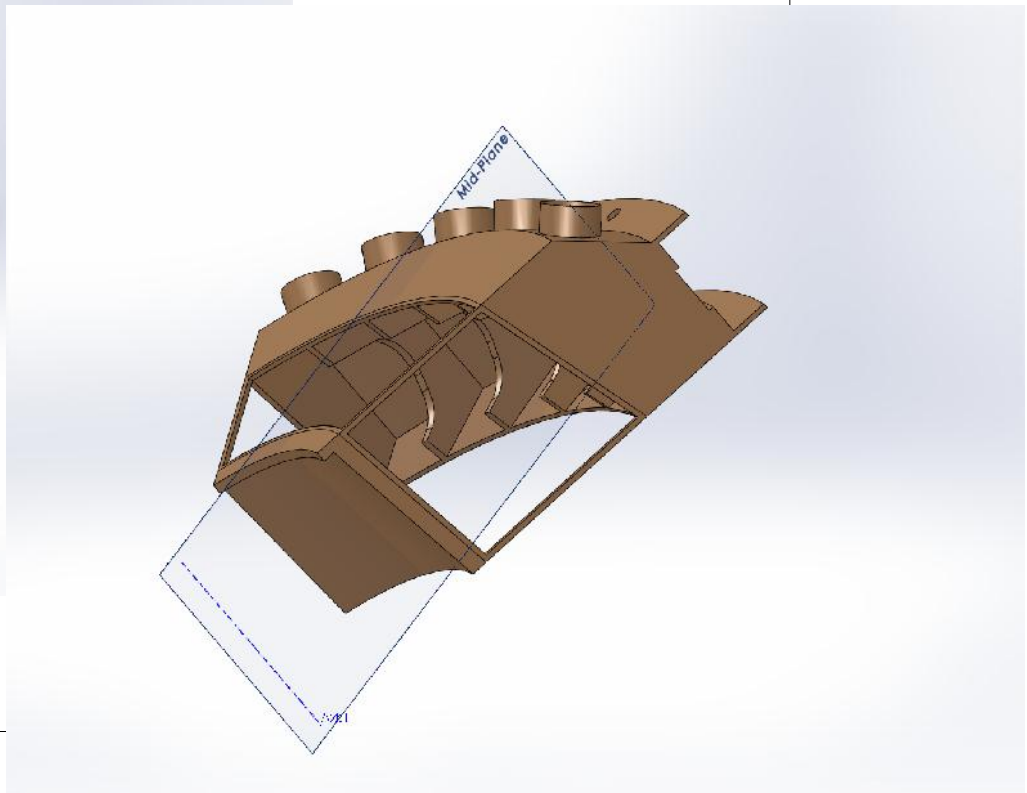
Internal vol ~ 2 m^3

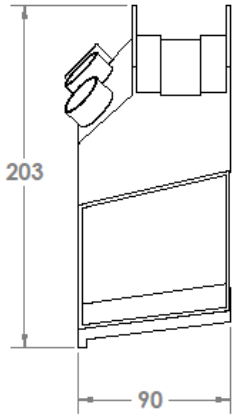
76 ft^3 x .5 atm = 38
this might not be classified as a
class B Pressure Vessel (atm x ft^3>40)
but it will be very close

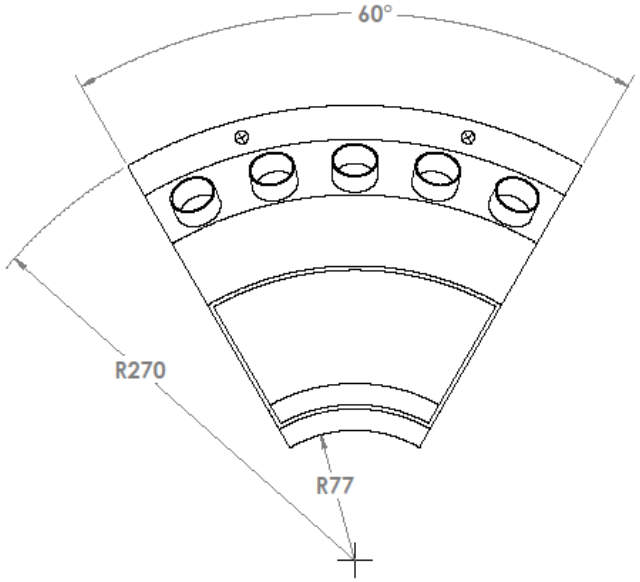
Shell Weldment

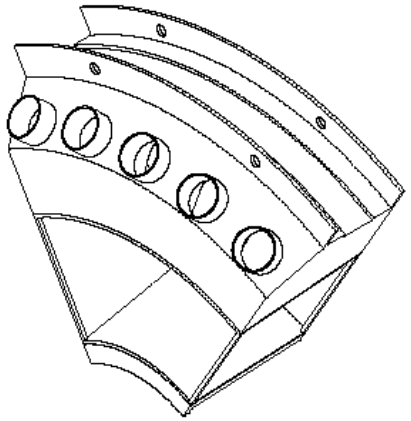


6061-T6 Alum
Welded and precision machined

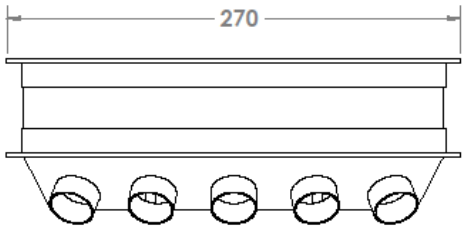




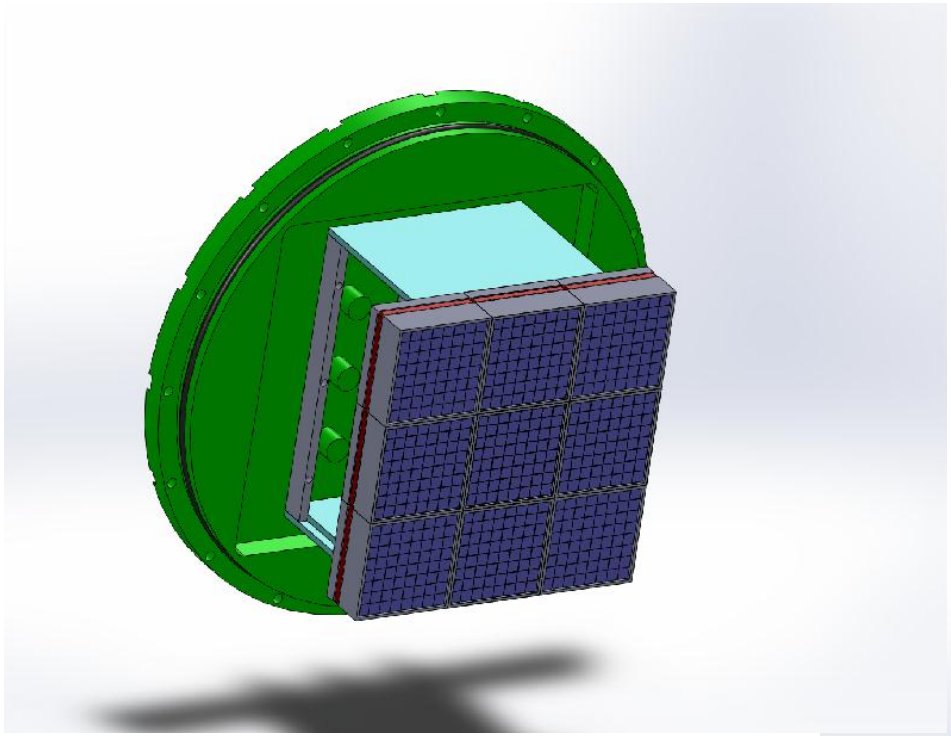


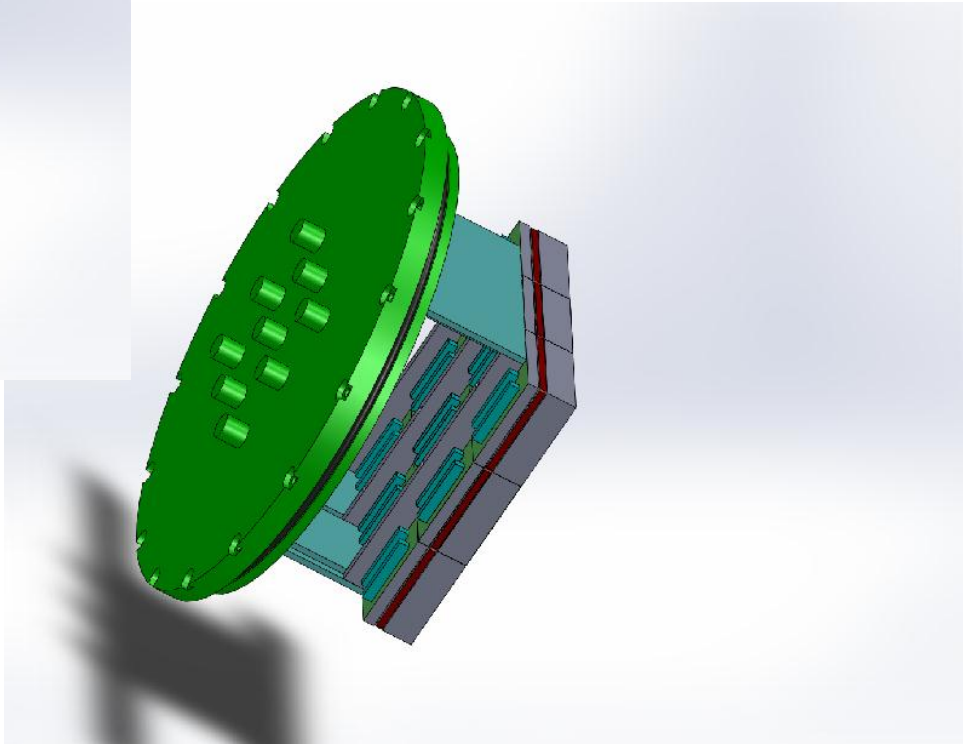


Dim in cm

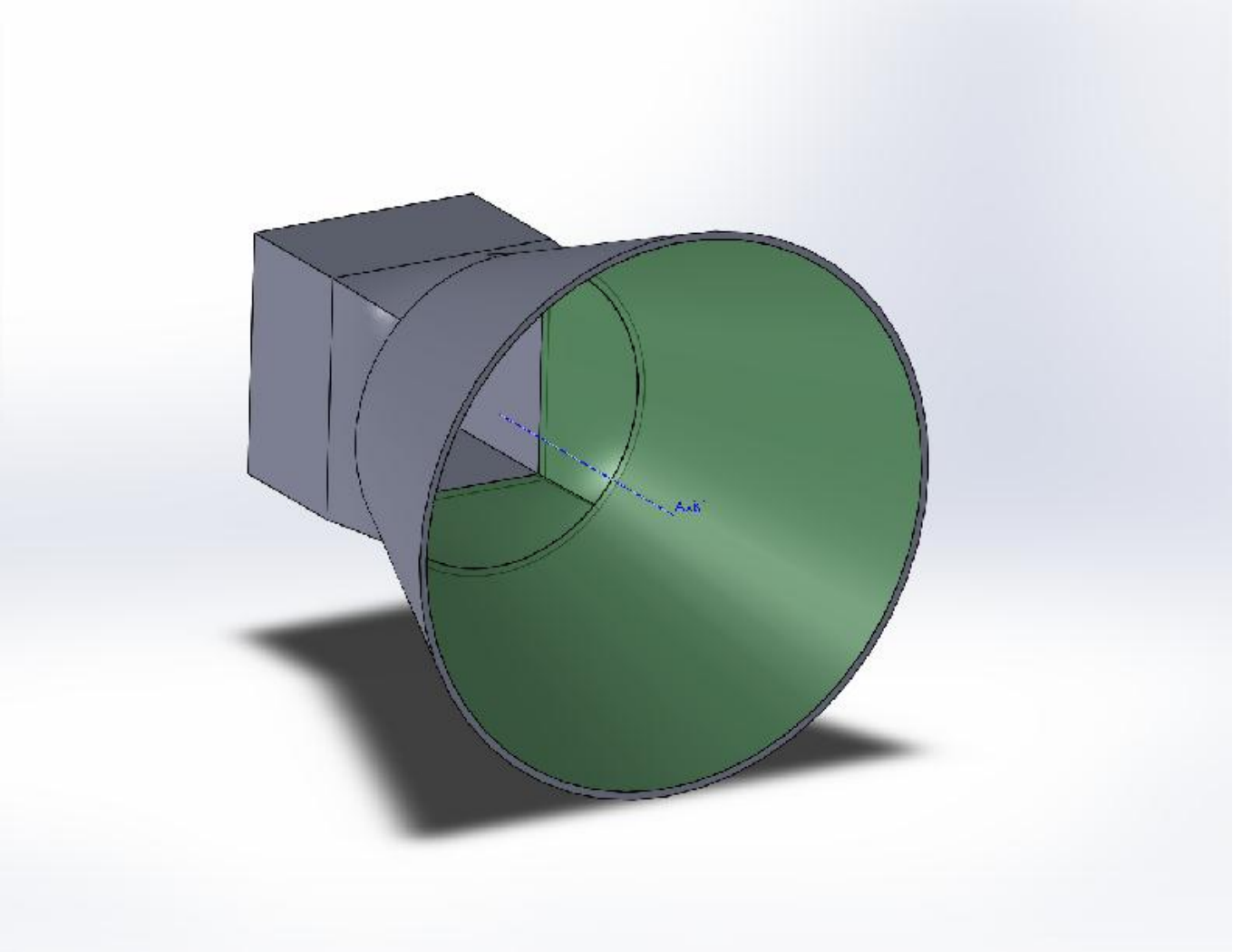


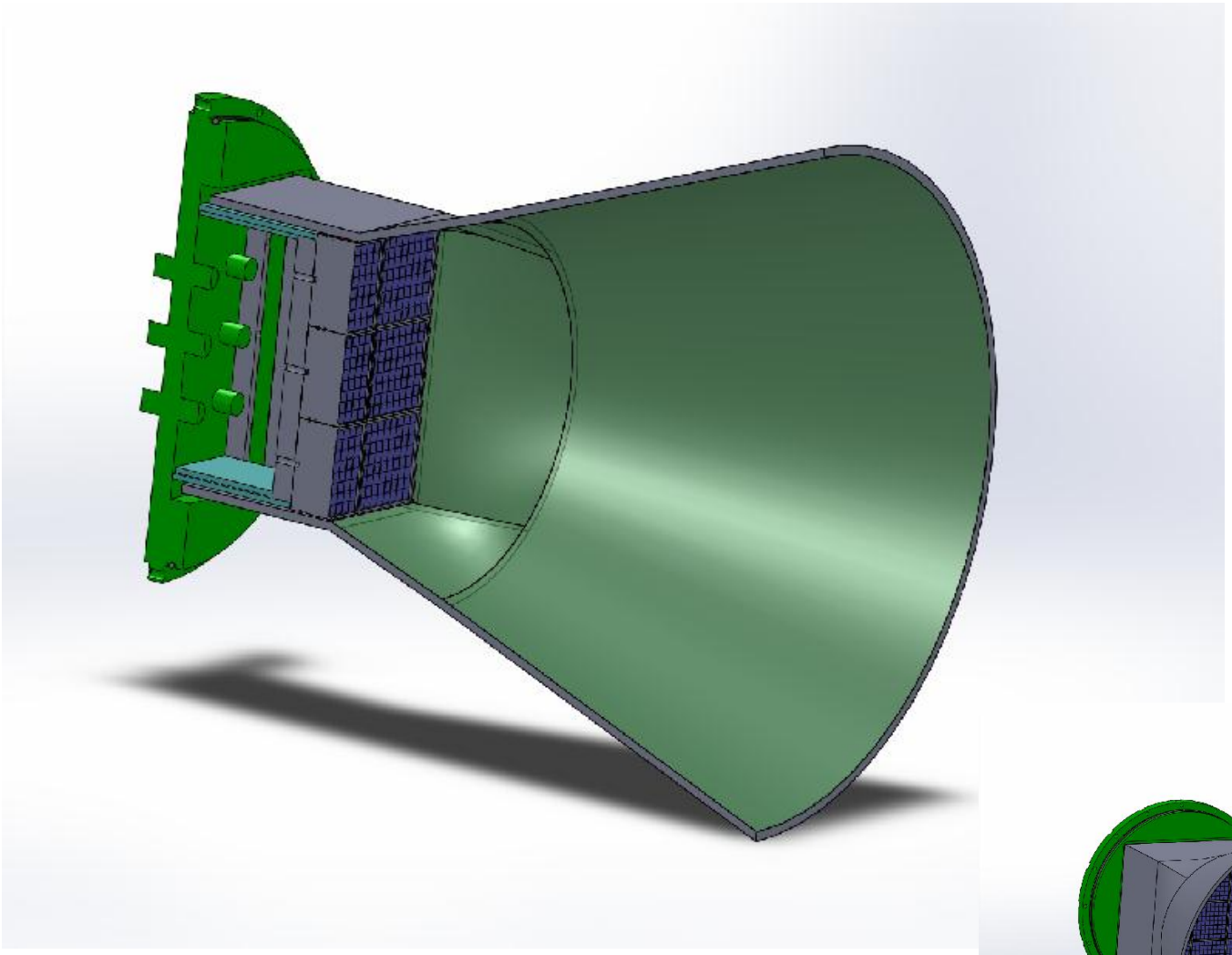
PMT Module

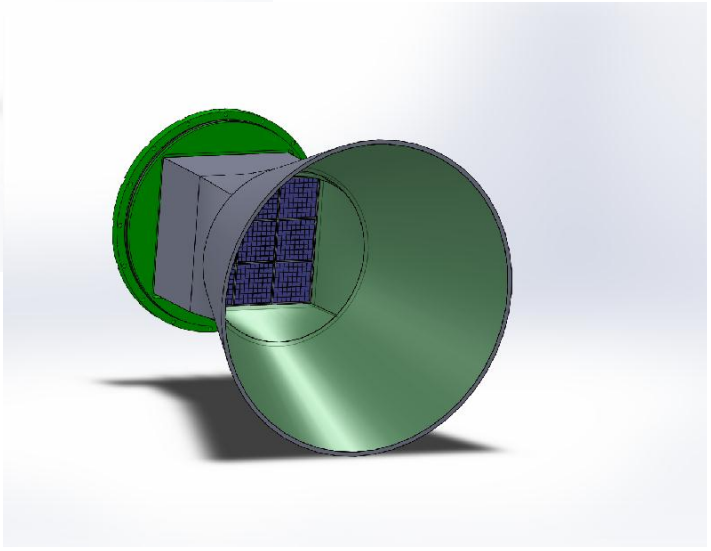




Reflecting Cone – Magnetic Shield

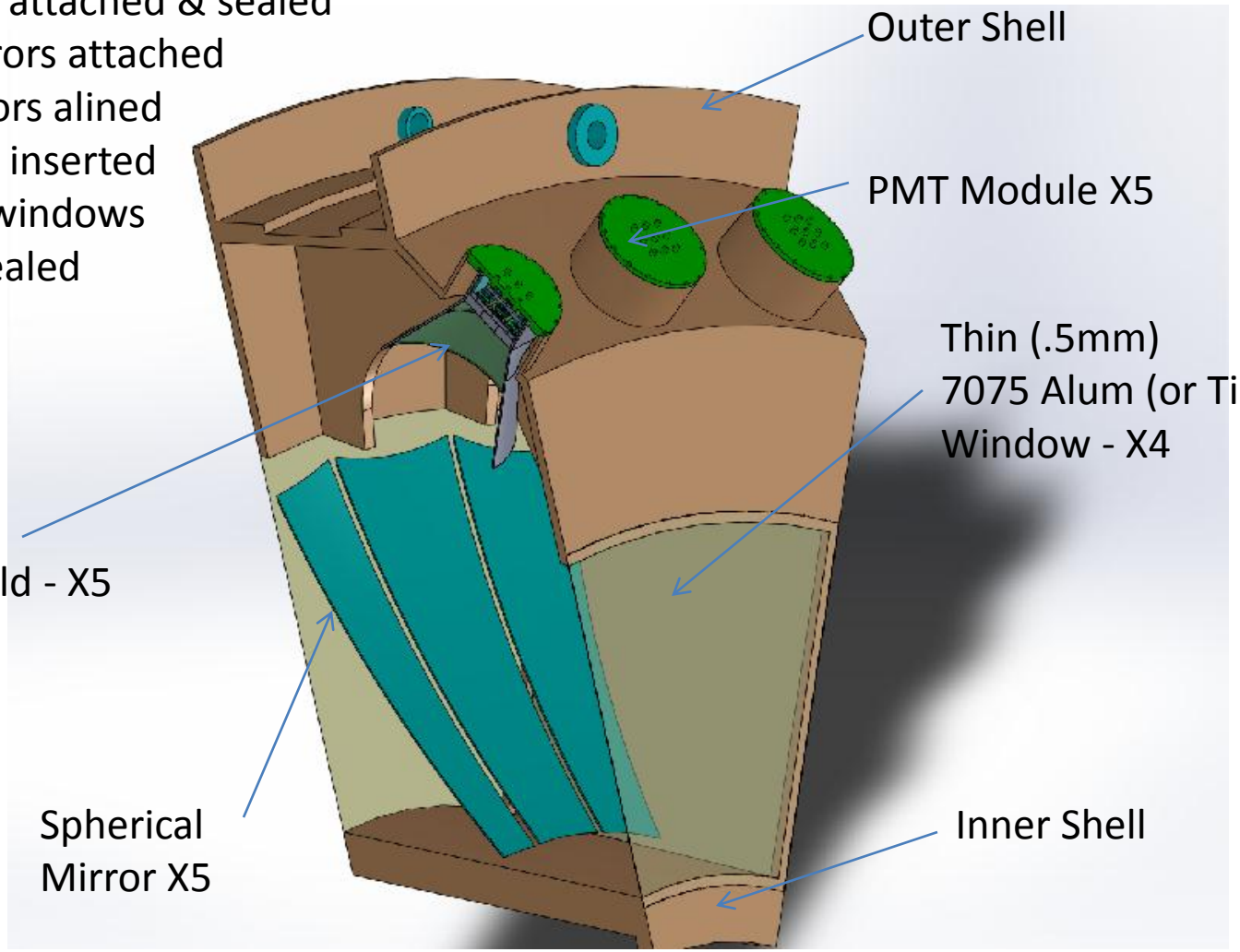




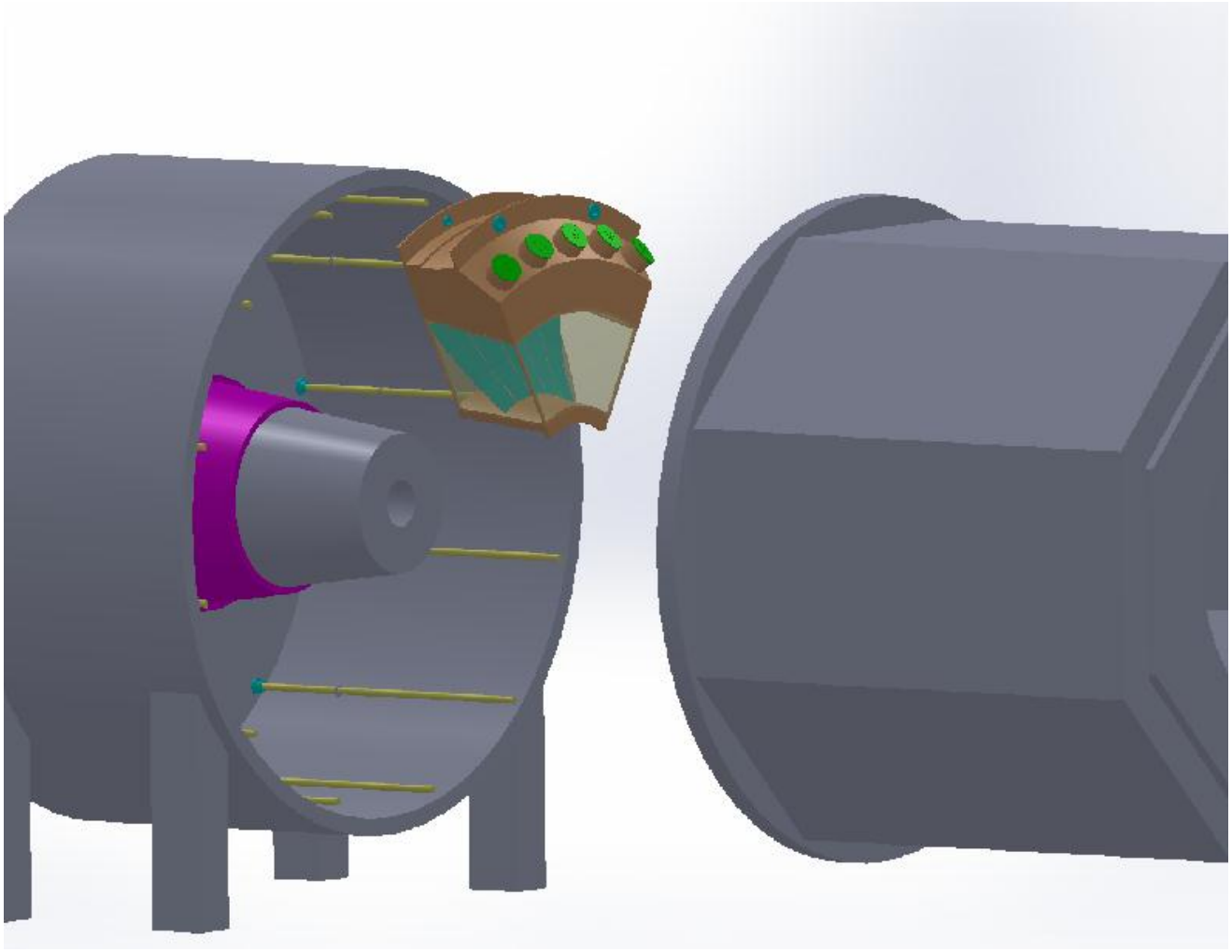


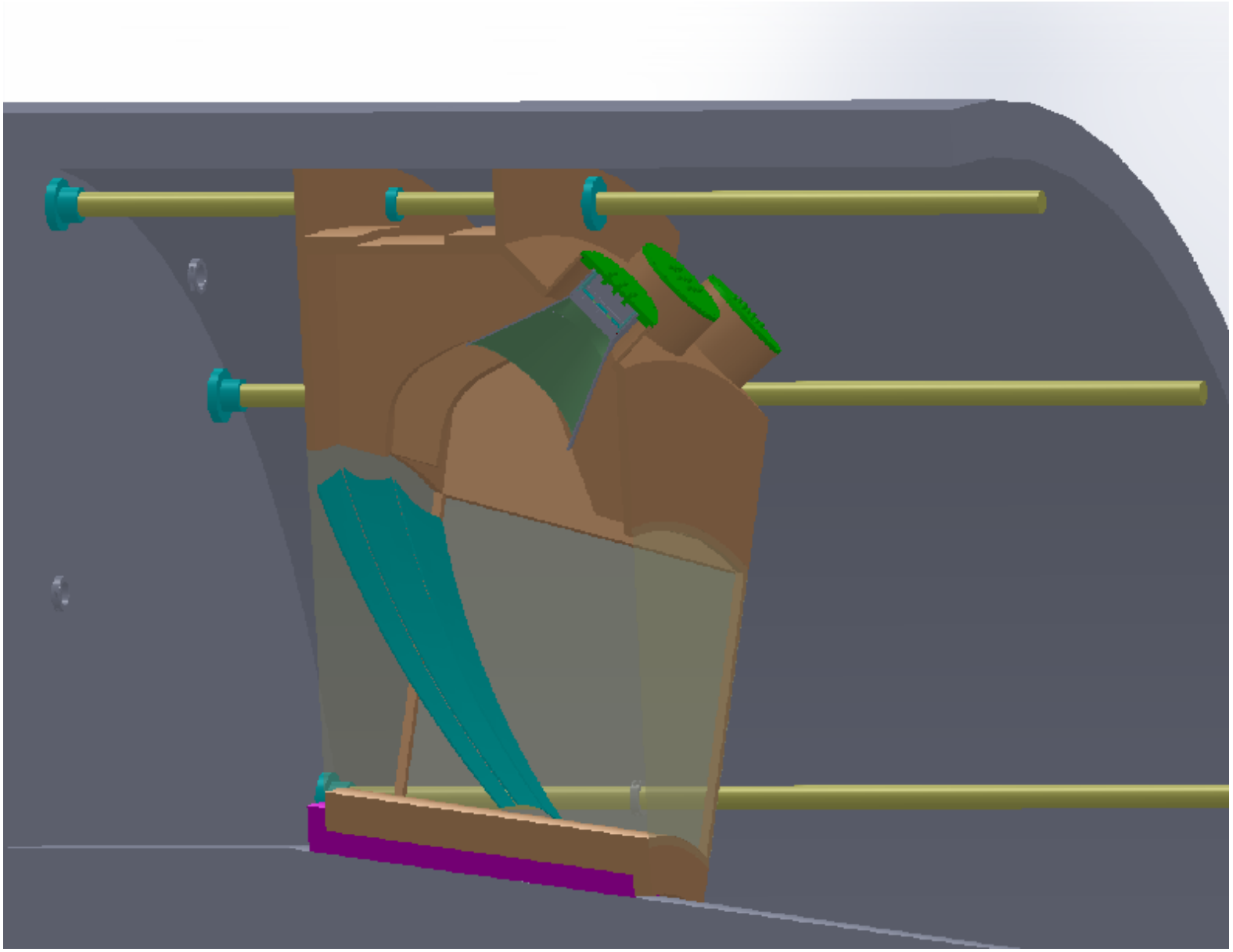
Assembly

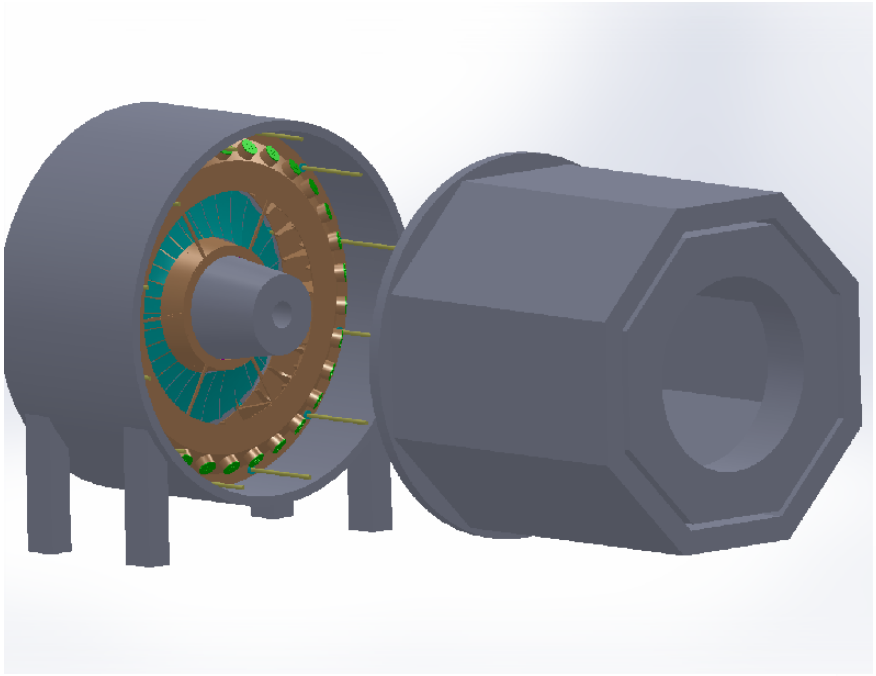
1. Mirror Cones attached to Shell
2. Side windows attached & sealed
3. Spherical mirrors attached
4. Cones & mirrors alined
5. PMT modules inserted
6. Back & front windows attached & sealed

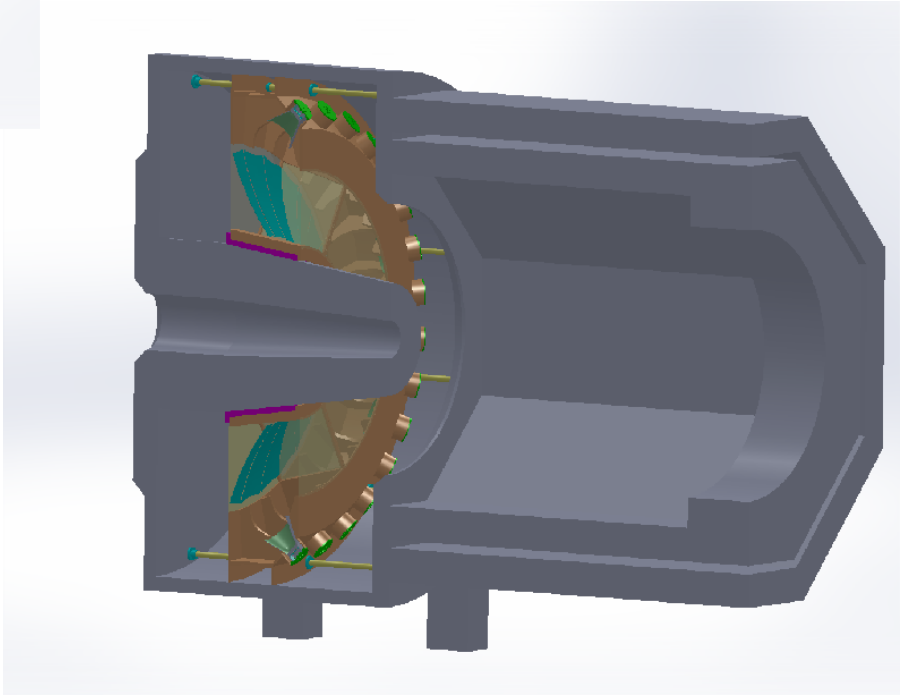


Assembly into magnet extension









Pressure Issues

Since the detector sectors are pressurized to .5 atm with C_4F_8O:

- The gas system needs to maintain an equal pressure in all 6 sectors. Connect the sectors with ½ to 1” dia tubing manifold.
- The side windows should be self supporting.
- The front & rear windows will require support to hold ½ atm.
- Could the rear window by supported by the Calorimeter?
- The front window could be strung with Kevlar fiber (or Ti wire), like a tennis racket, after installation in the magnet.

To Do

- Incorporate these features in to the conceptual layout:
  - Cleo2 mirror, cone and PMT geometry
  - Revised Spherical mirror w/ mounts
  - Gas distribution
  - Improved magnet mount details
- Determine best window material
- Determine best detector to magnet mounting scheme
- Accurate structural analysis of the shell & windows