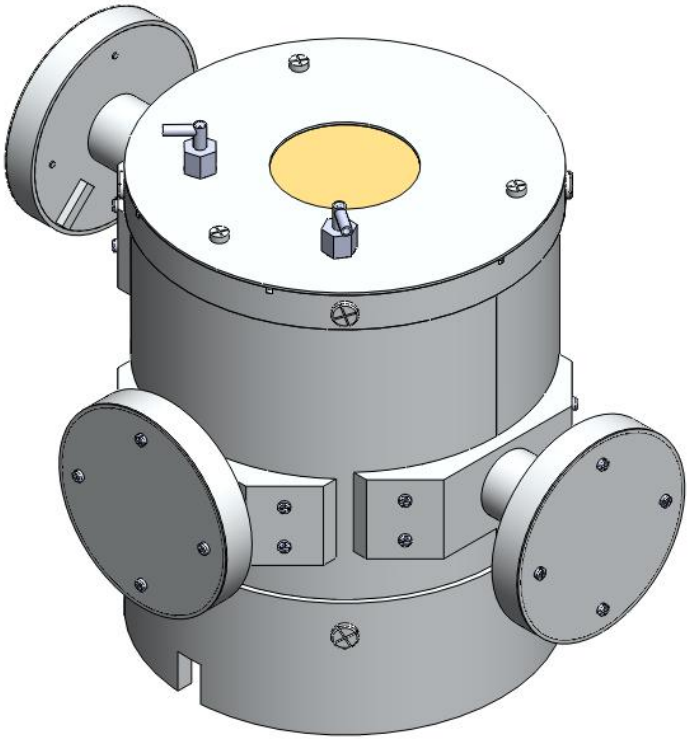
PICAP

Design review

Brendan Bickford

Outline

- Advisors
- Background
- Design specifications
- Concept Instrumentation
- Design Assemblies



Advisors

Advisors:

- Dr. May-Win Thein
- Dr. James Connell
- Dr. Clifford Lopate

Grad student:

Dan Tran

Background

Positron Identification by Coincidental Annihilation Photons

- New design for detecting and distinguishing energetic particles (positrons & negatrons)
- Project goal: Build and test a proof of principle prototype telescope

Design Criteria and constrains

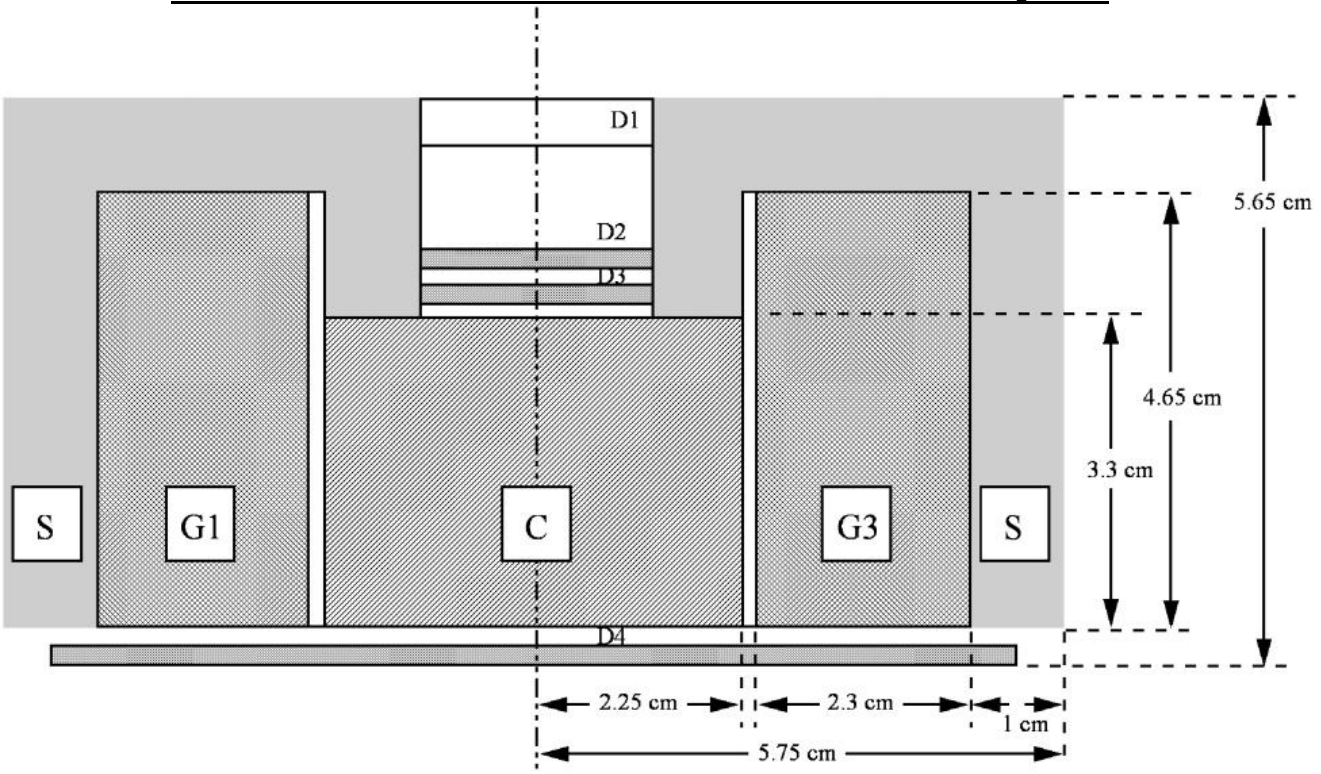
- Minimize mass within design constraints
- Specific placement and size for solid state detectors and scintillation material
- Provide efficient particle detection (structure limitations)
- Provide a working proof of principle prototype for this new detection method

- This means
- Faraday cage required
- Eliminate cross talk between scintillators
- Exclude light
- Purge ports for solid state detectors

Flight vs. Prototype

- Conductive epoxy simple pieces rather then machine complex pieces from stock
- Custom off the self parts
- Minimize weight within budget, knowing this could be reproduced with less weight but at higher cost

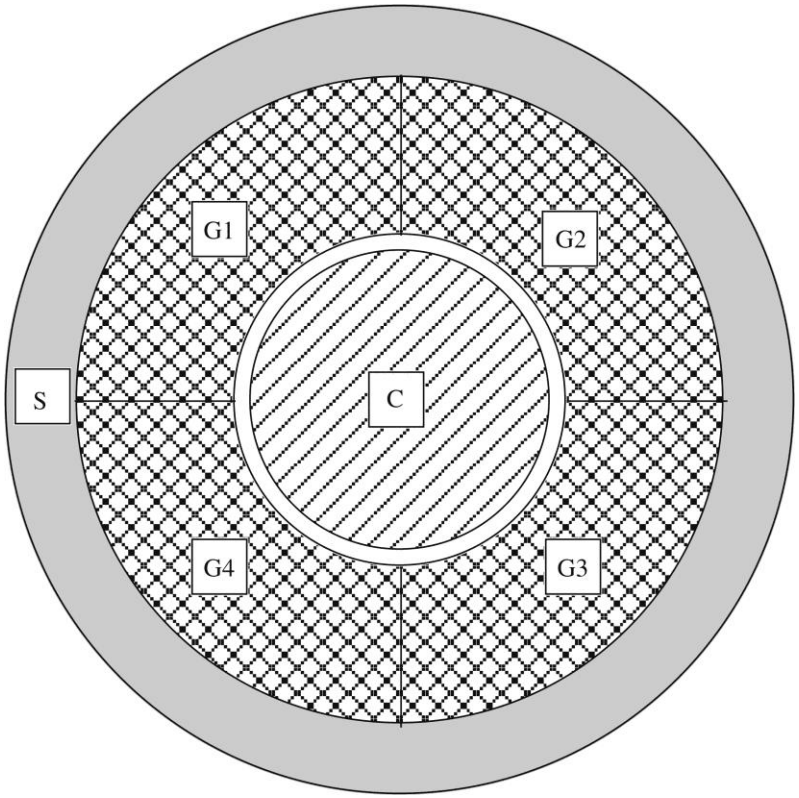
Instrument concept



Cross section view of proposed design

- C- Plastic scintillation material
- G- Heavy scintillation material
- D- Solid state detectors
- S- Plastic scintillation material

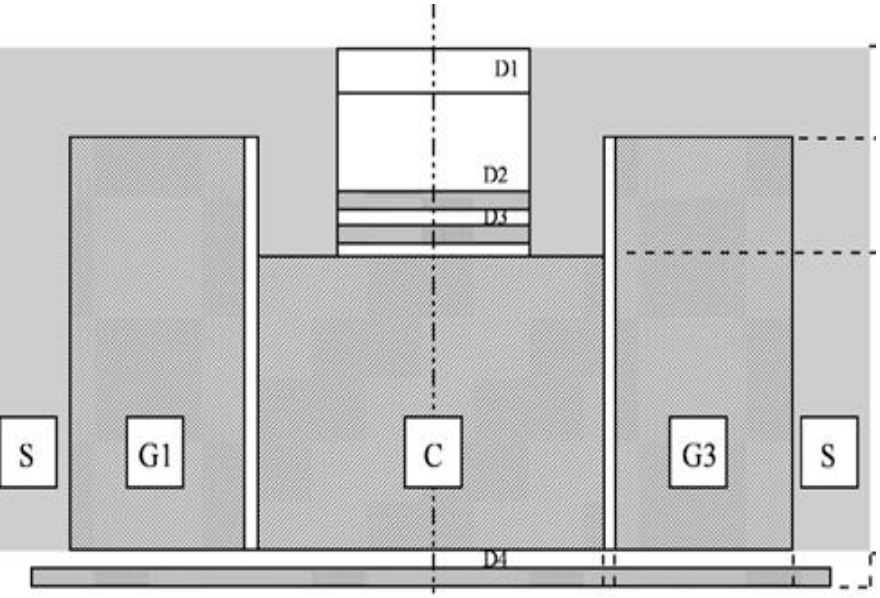
Instrument concept

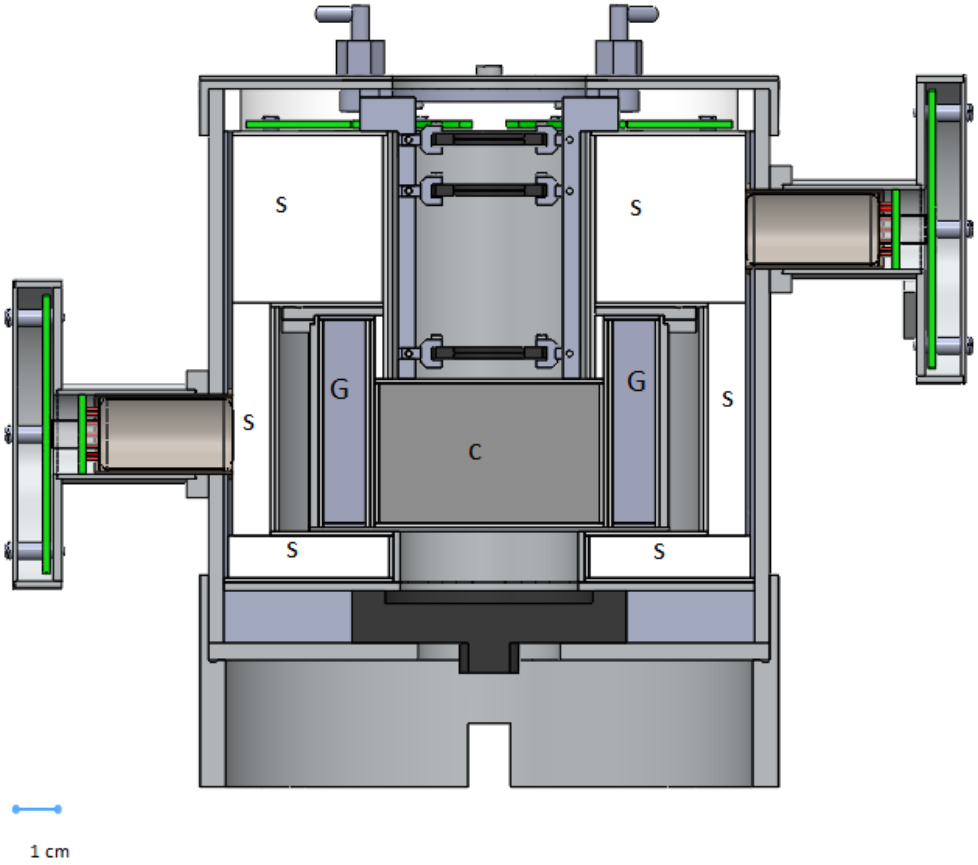


Top view proposed design

- C- Plastic scintillation material
- G- Heavy scintillation material
- D- Solid state detectors
- S- Plastic scintillation material

Concept vs. Design

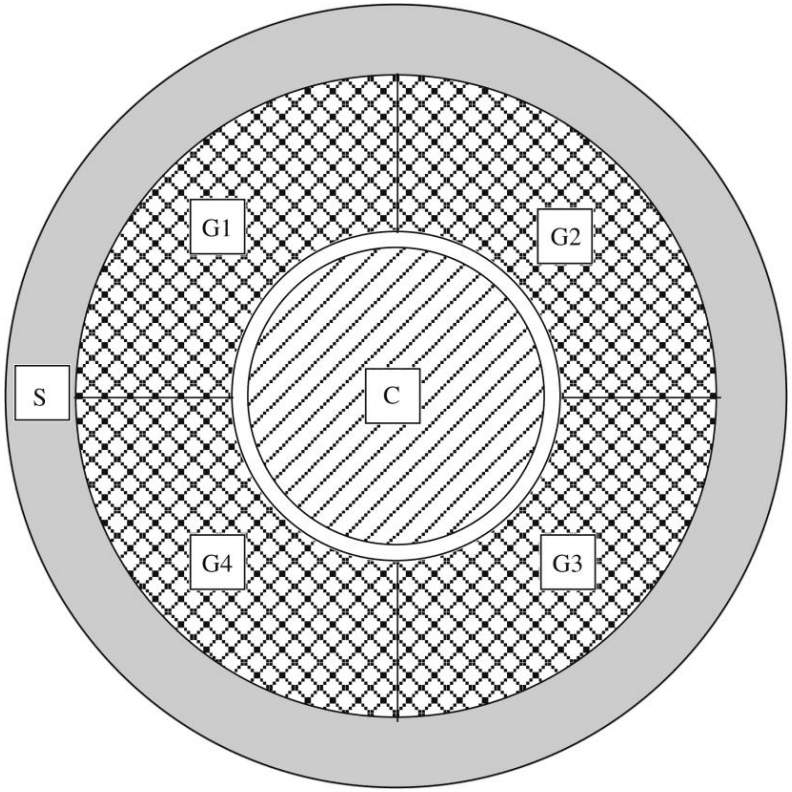


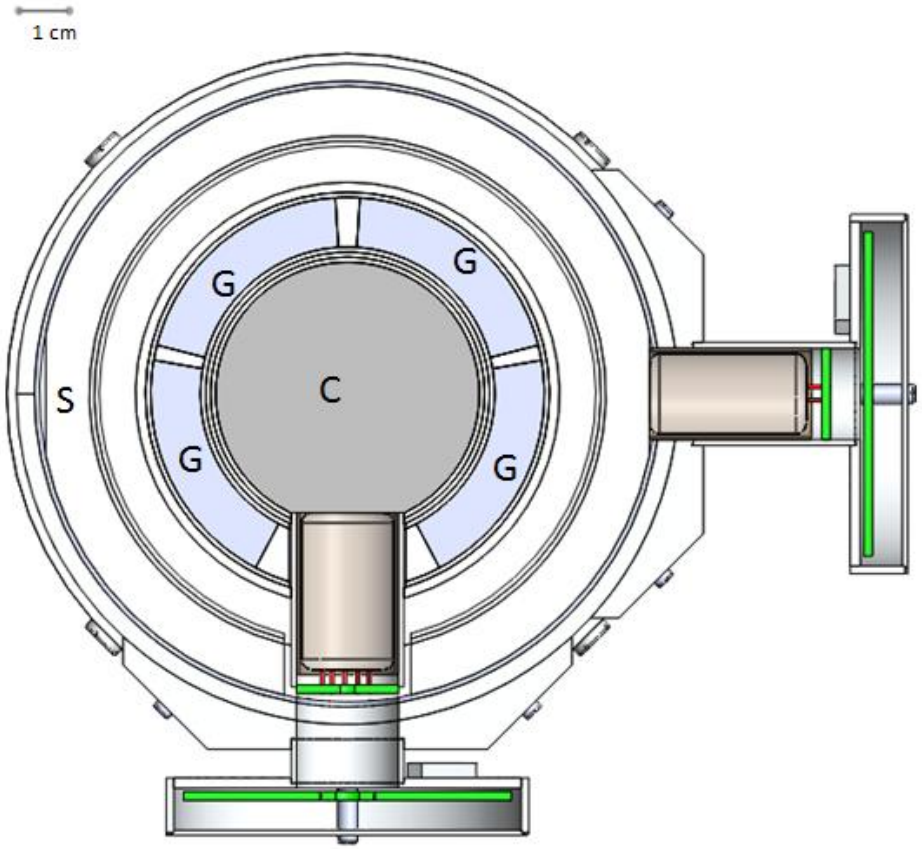


Cross section view

- C- Plastic scintillation material
- G- Heavy scintillation material
- D- Solid state detectors
- S- Plastic scintillation material

Concept vs. Final design

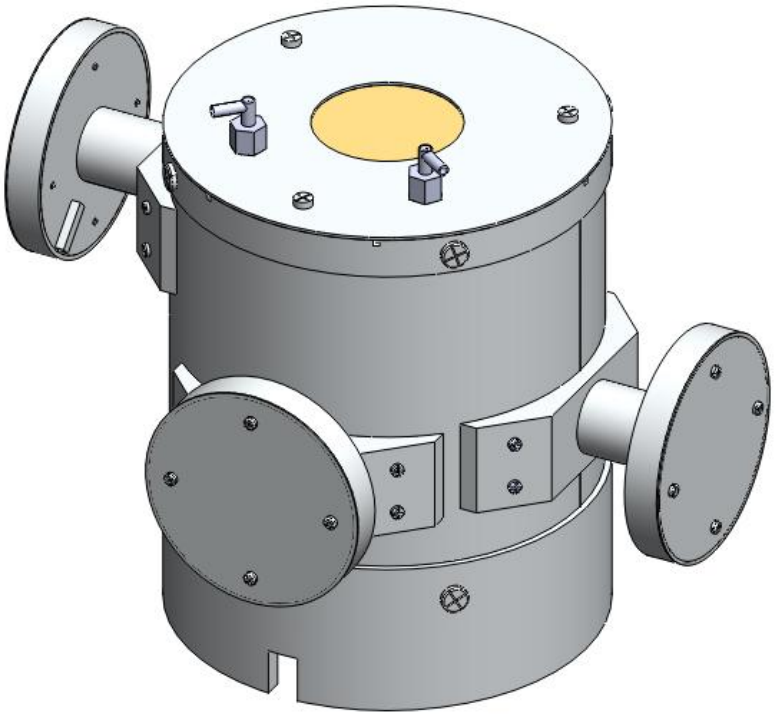




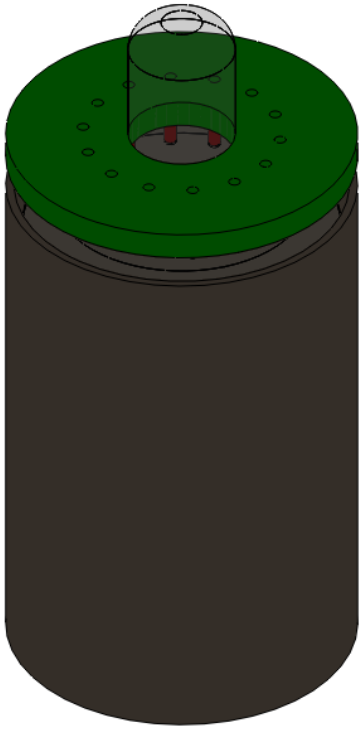
C- Plastic scintillation material
G- Heavy scintillation material
D- Solid state detectors
S- Plastic scintillation material

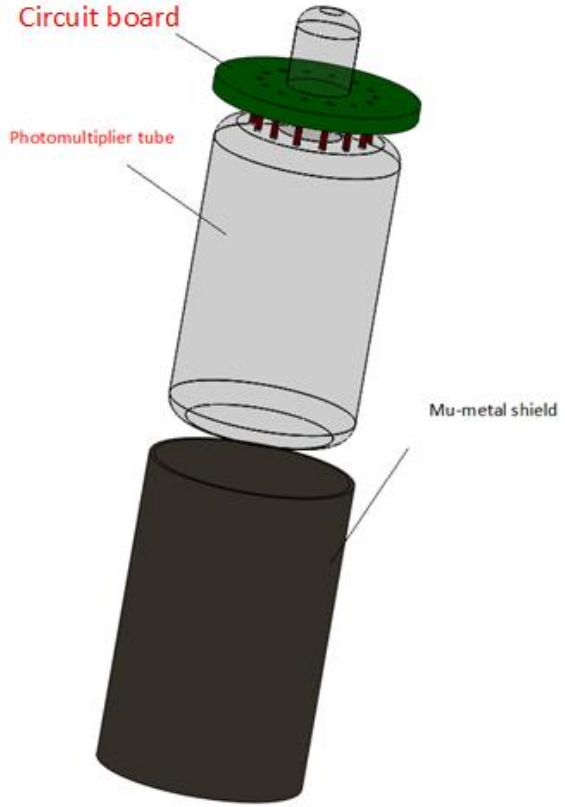
Dimensions

Total Height	16.78 cm
Total width	22.47 cm
Total mass	3.3 kg
Total Volume	1985 cm^3



Photomultiplier tube assembly



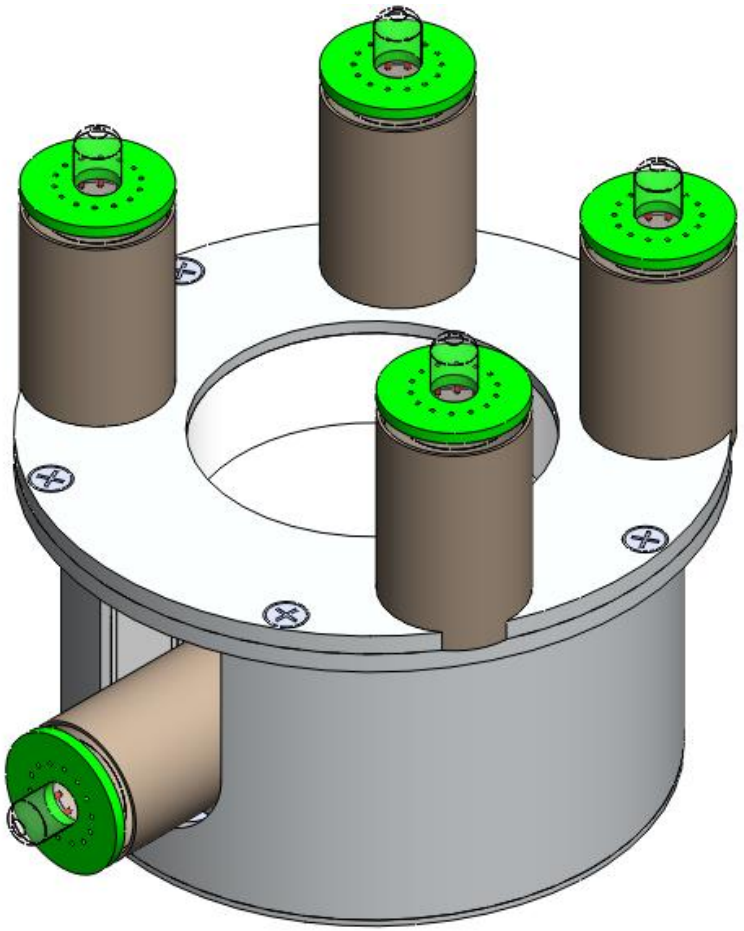


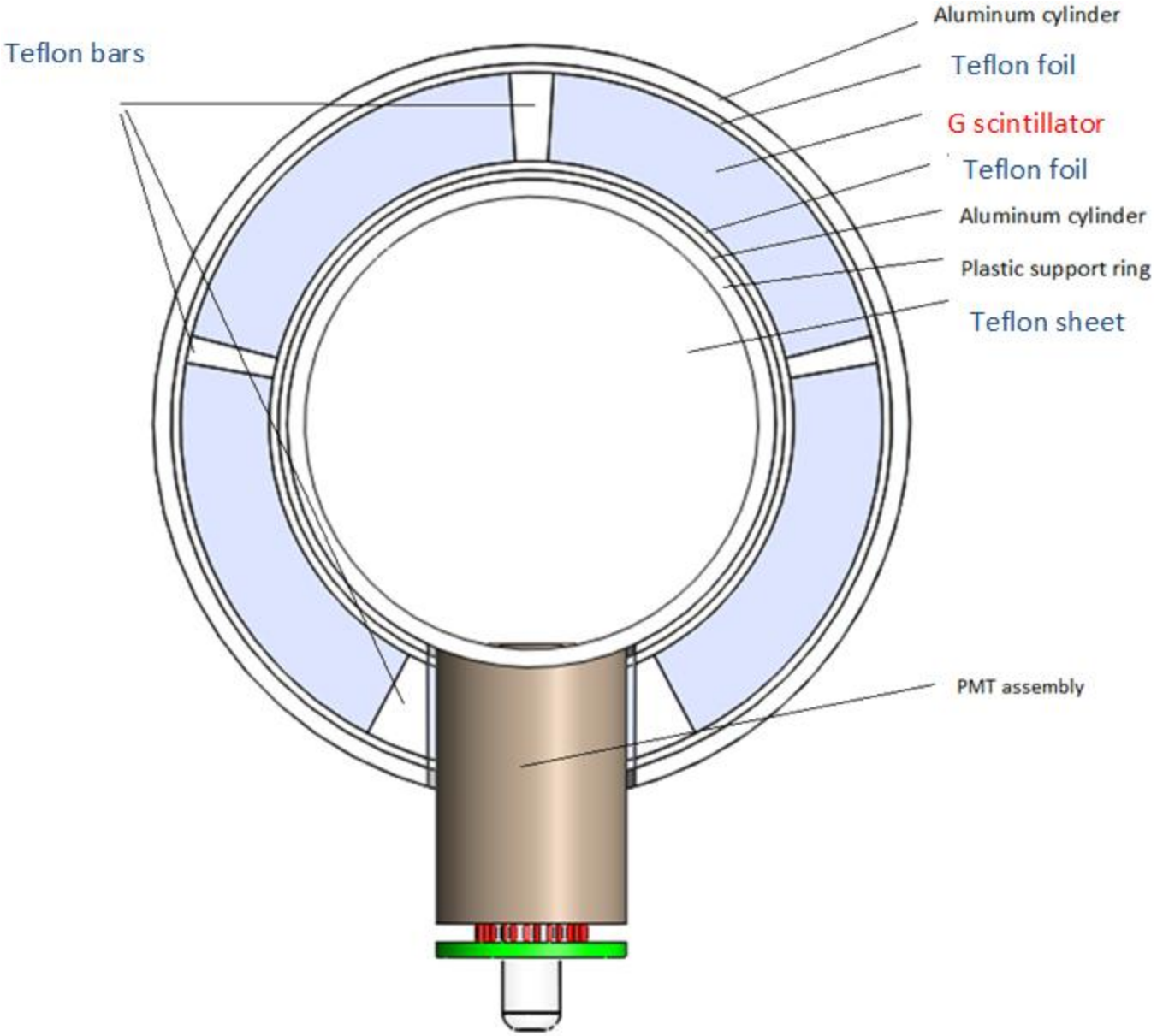
Red- Active components

Blue- Teflon

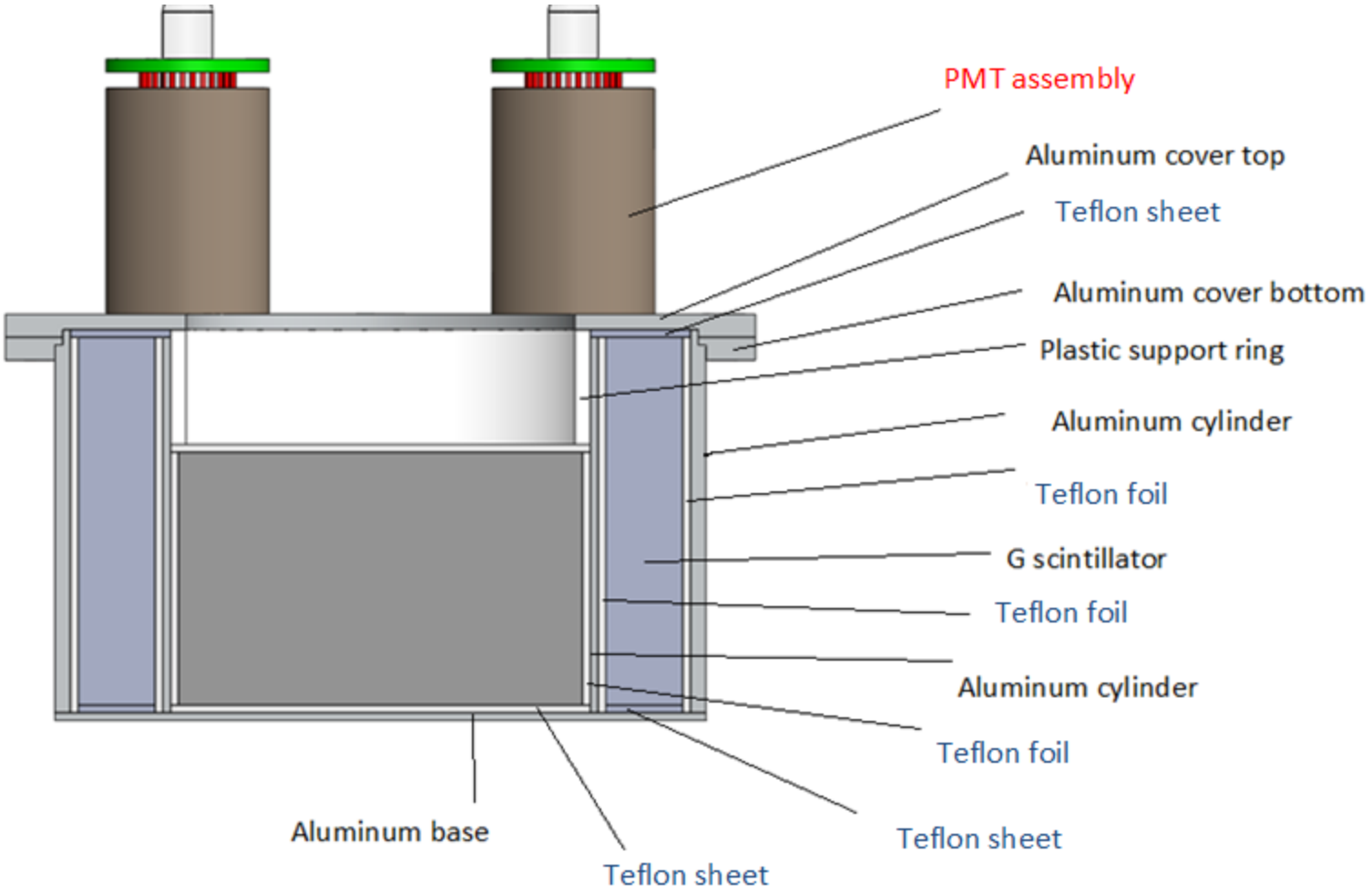
Black- Other

Scintillator assembly



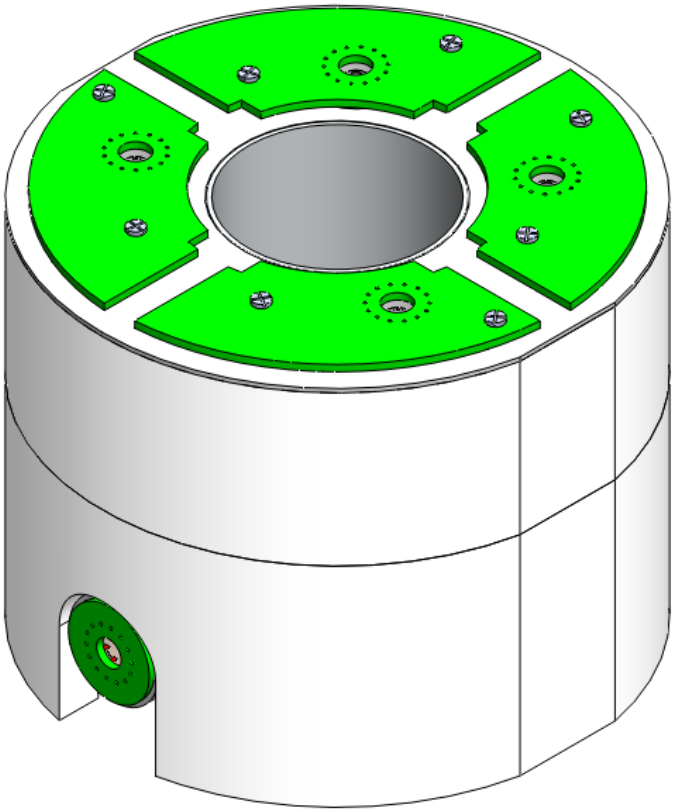


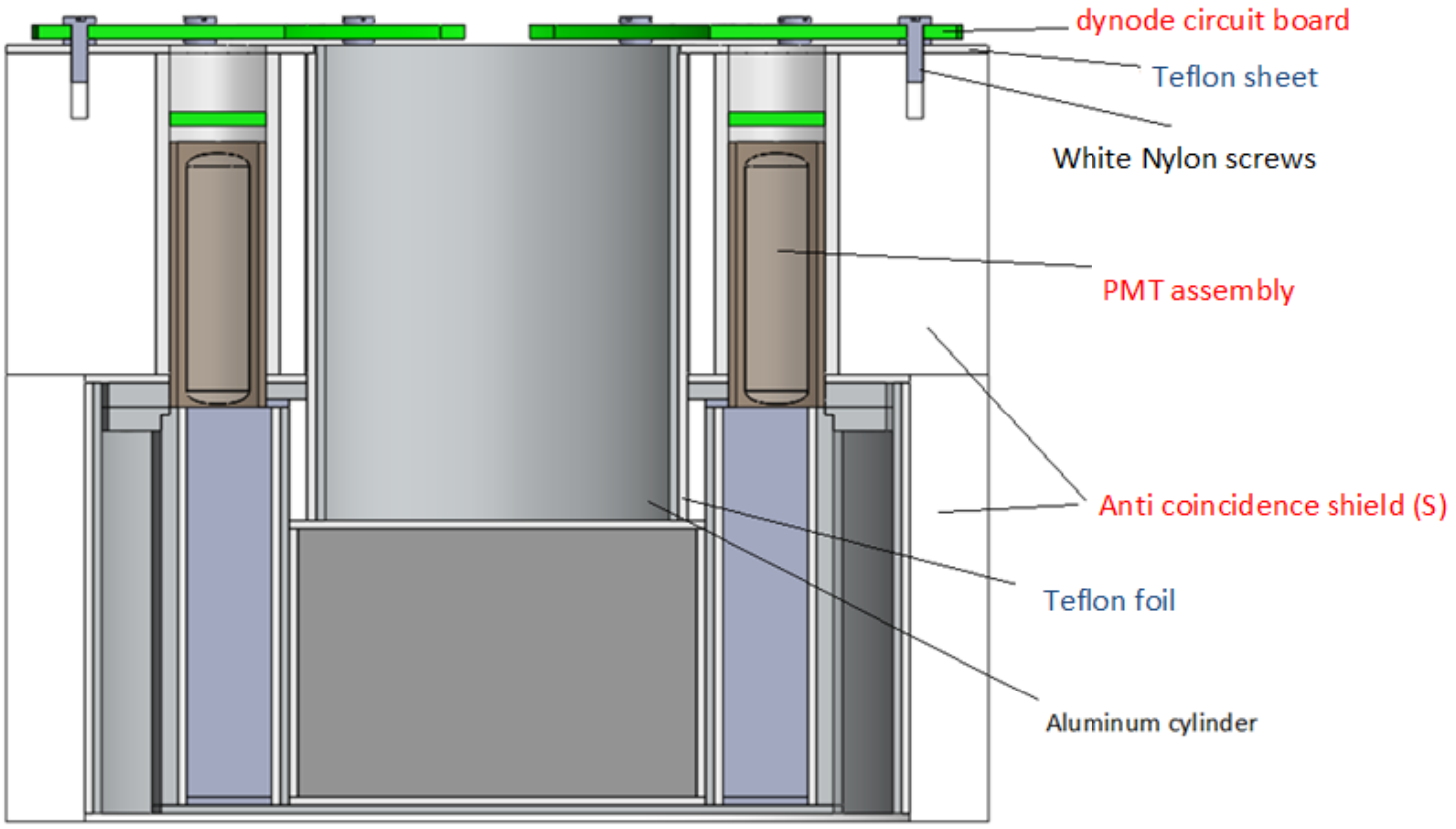
Scintillator assembly - top view cross section



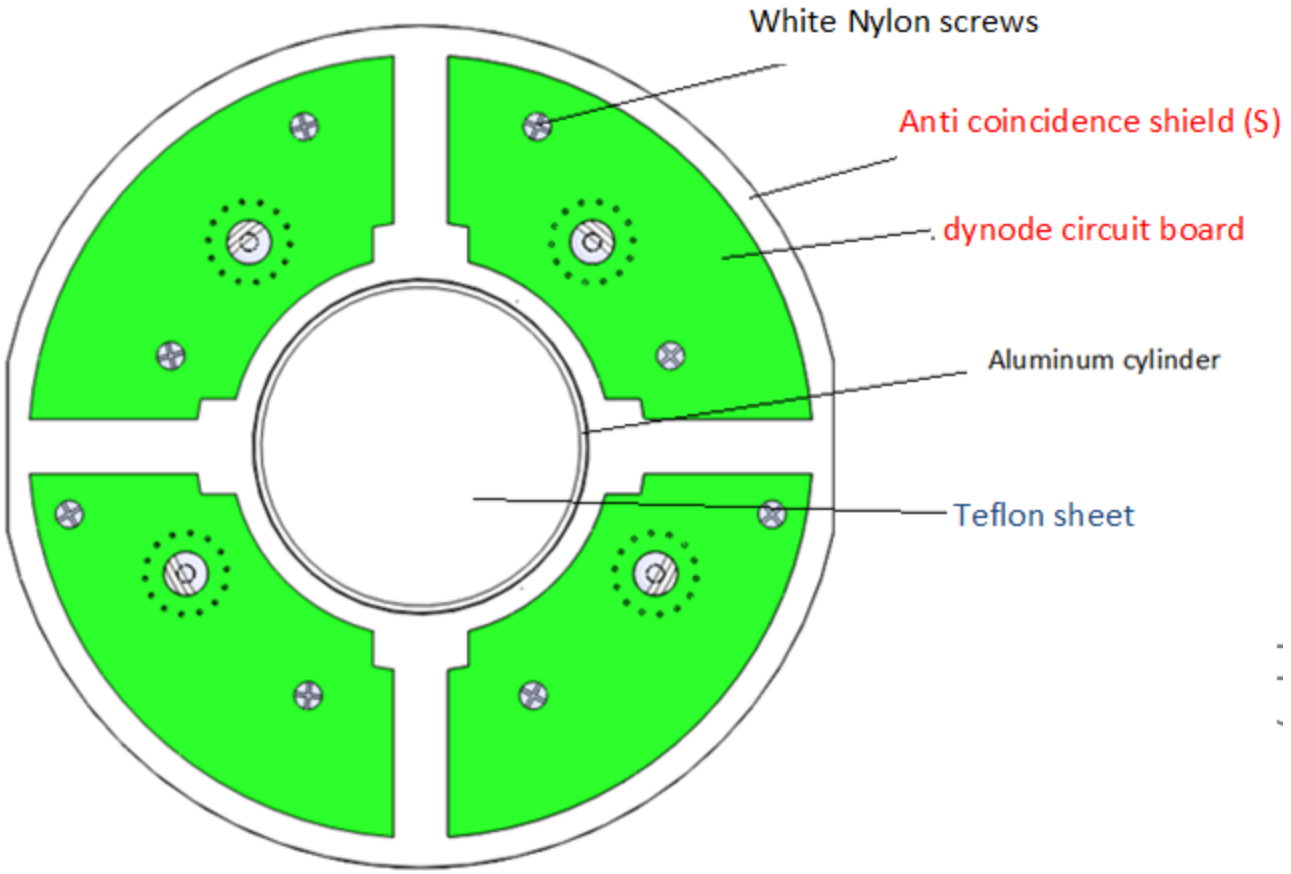
Scintillator assembly - center cross section

Top Anti coincidence shield



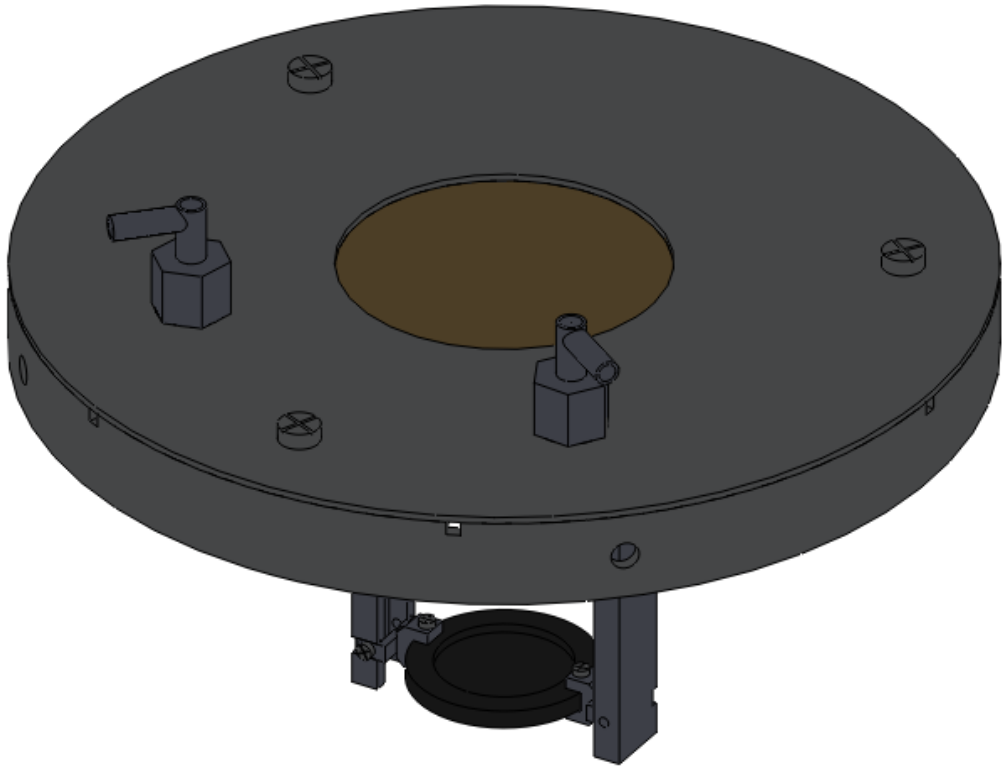


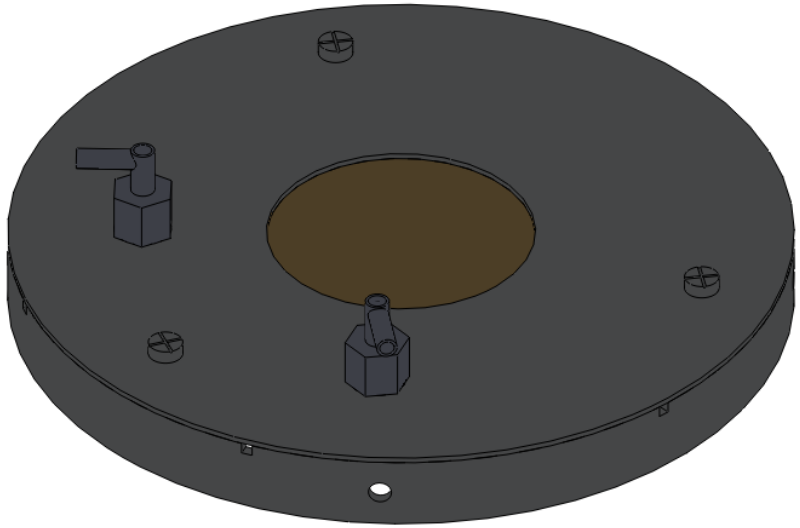
Anti coincidence shield – center cross section



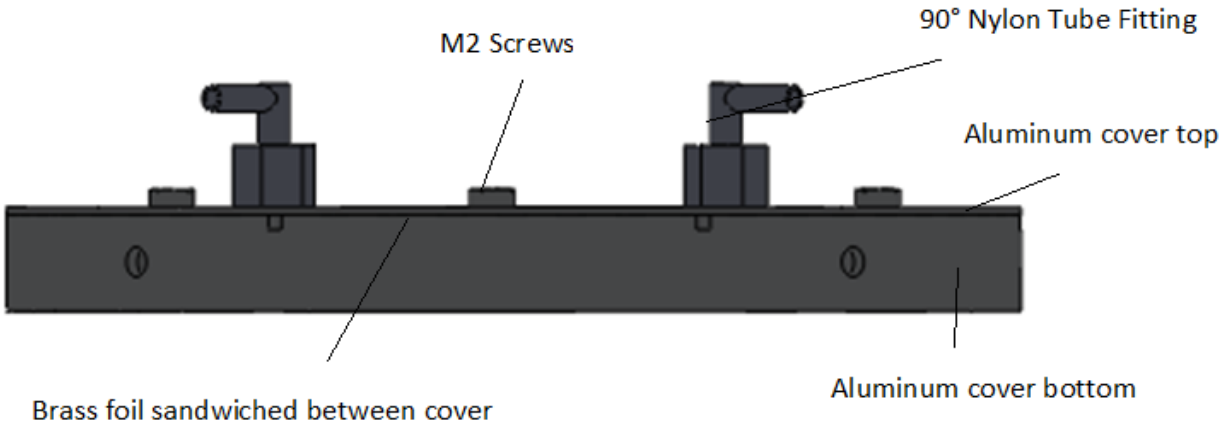
Anti coincidence shield - top view

Cover assembly

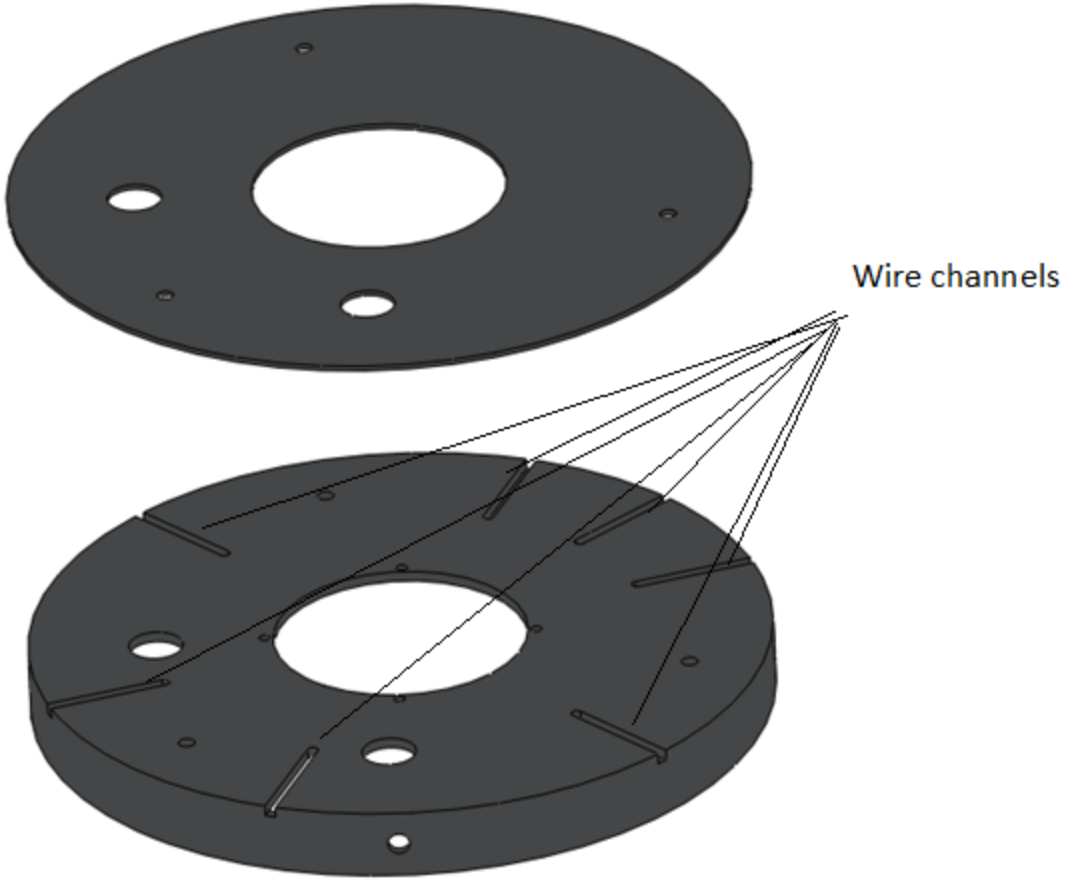




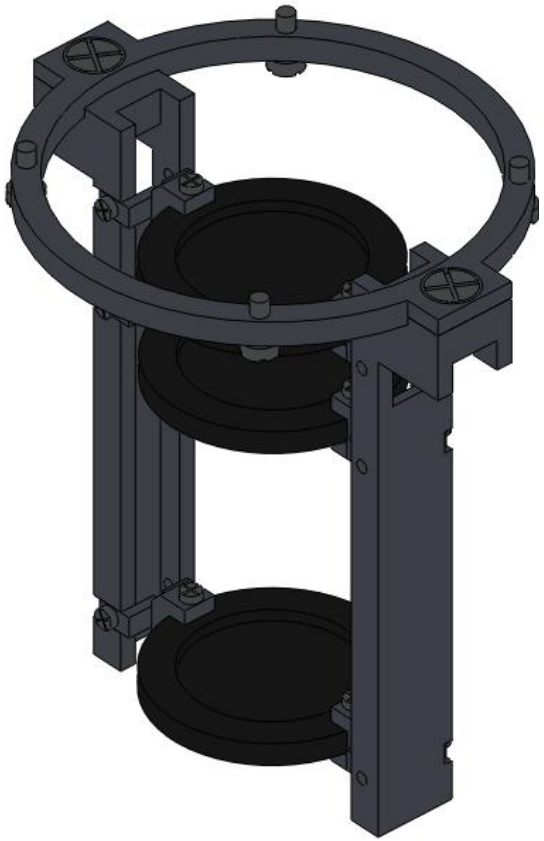
Cover and brass foil



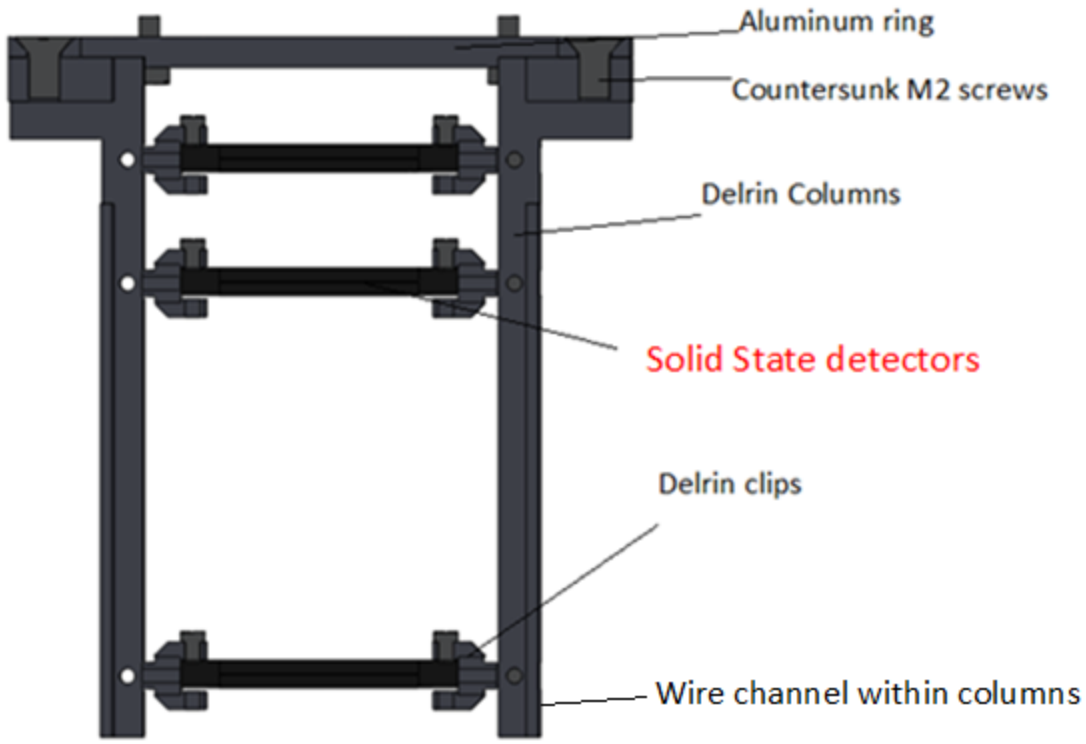
Cover and brass foil - side view



Cover - exploded view

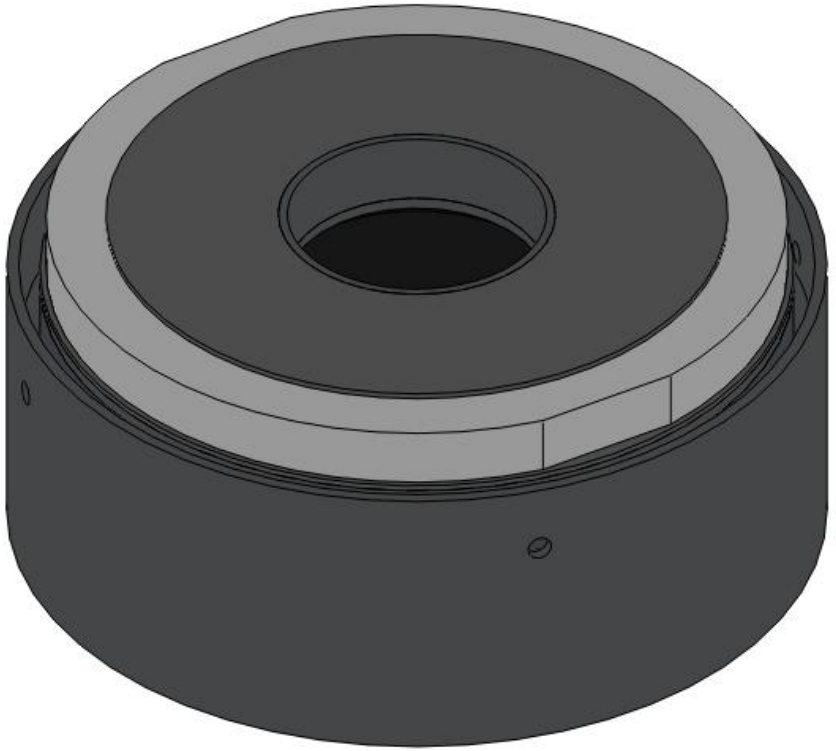


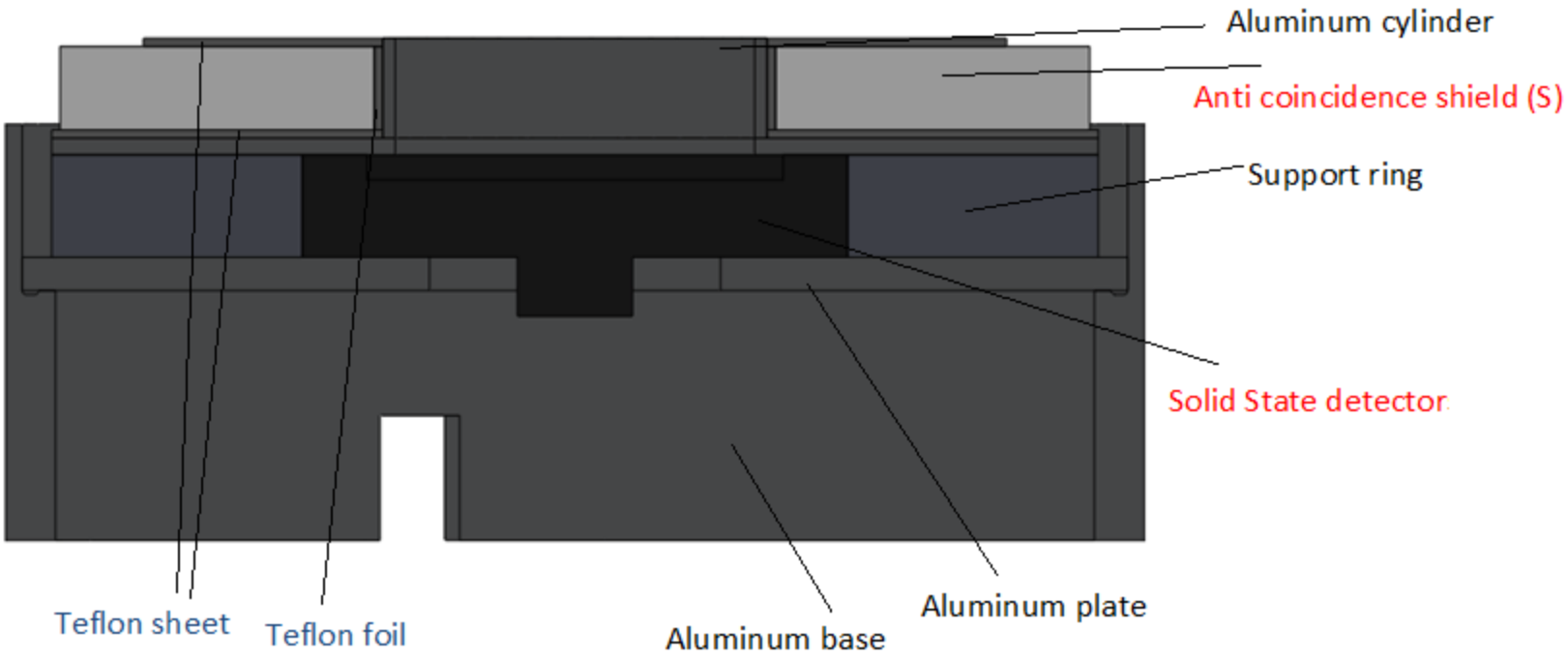
Solid state detector column assembly



Center Cross section

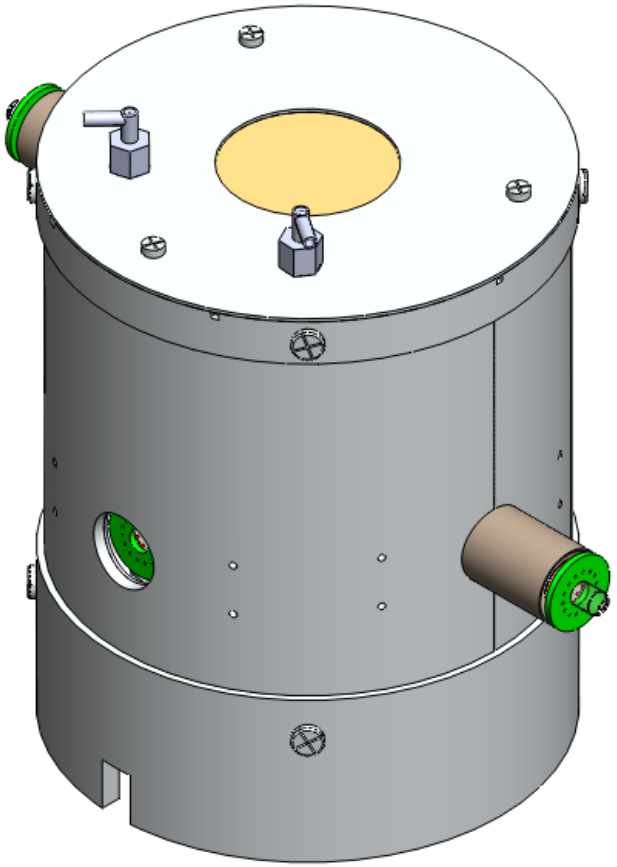
Base Assembly

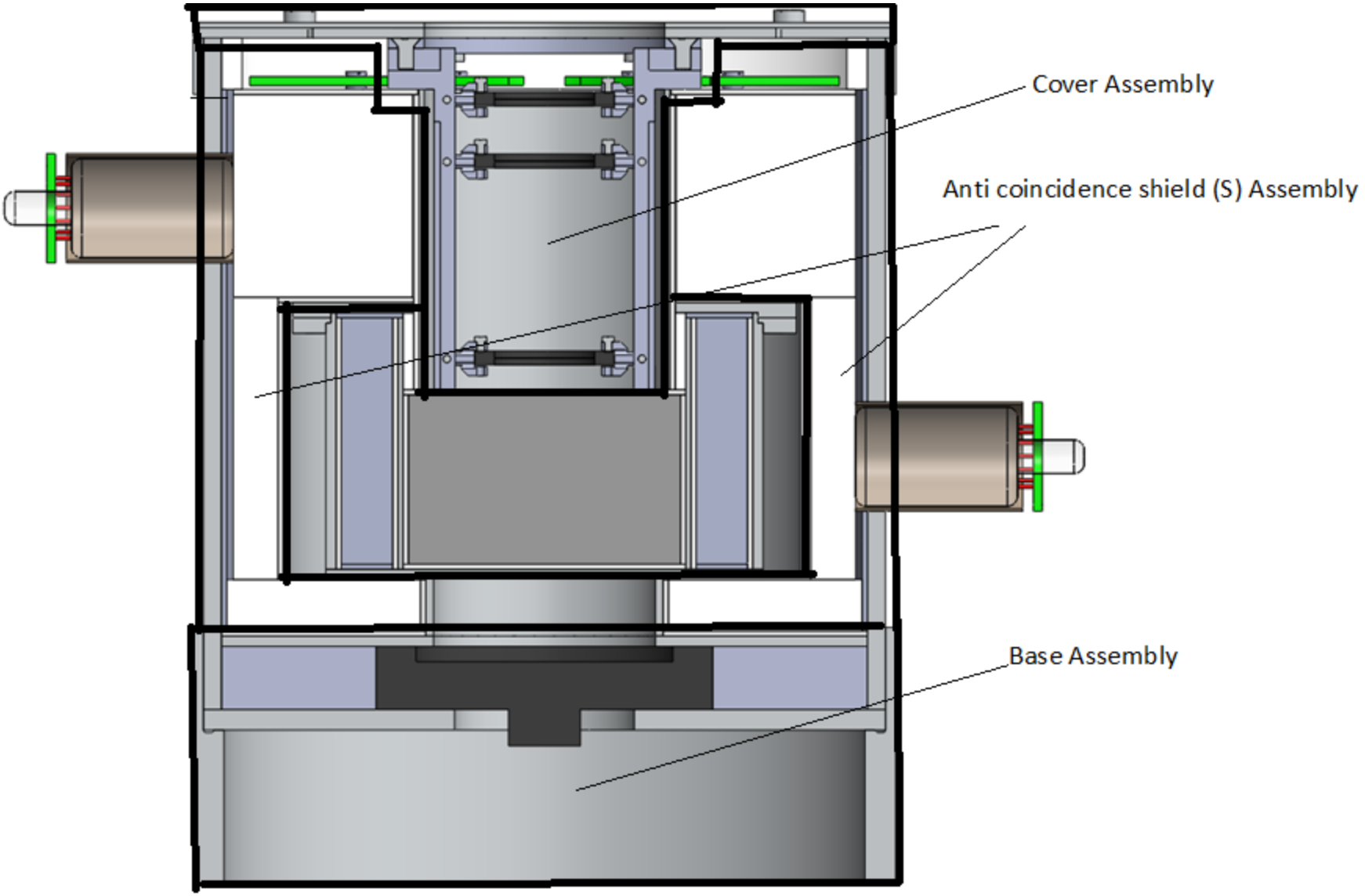




Base Assembly - center cross section

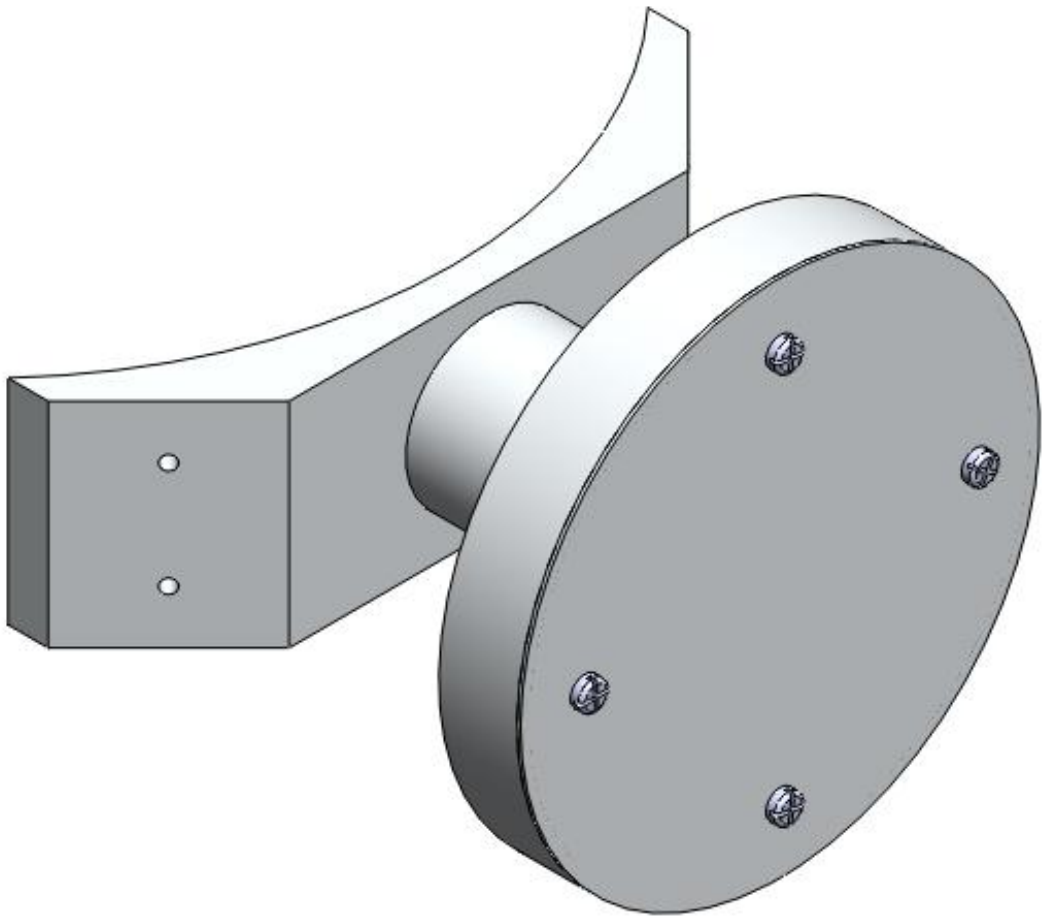
Cylinder assembly

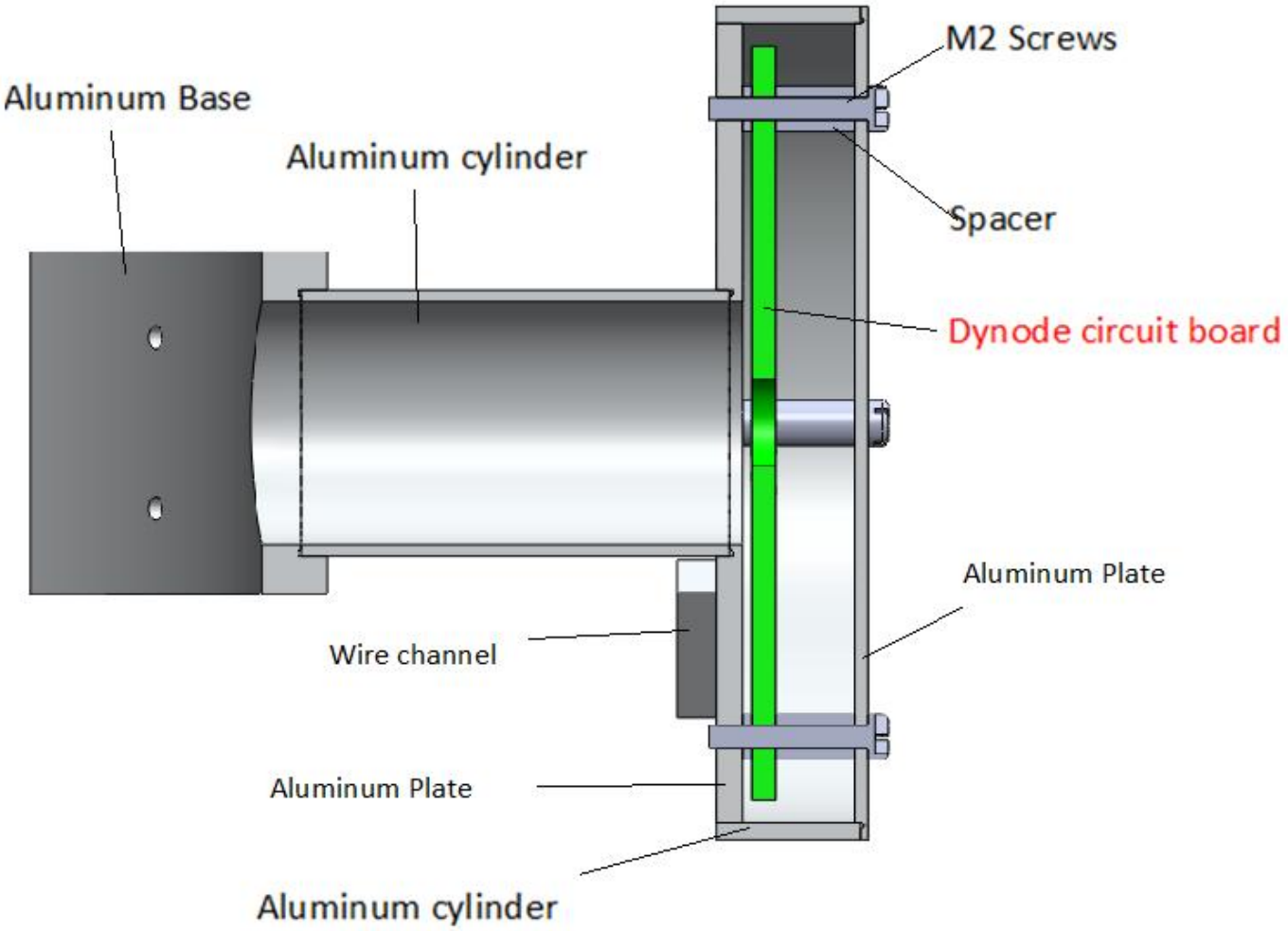




Cylinder assembly - center cross section

Photomultiplier tube support assembly





Photomultiplier tube support assembly – Center cross section

Final assembly