FLORIDA TECH

Design, Prototyping, and Construction of a Cylindrical μ Resistive-WELL Detector

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for the EIC eRD108 Consortium

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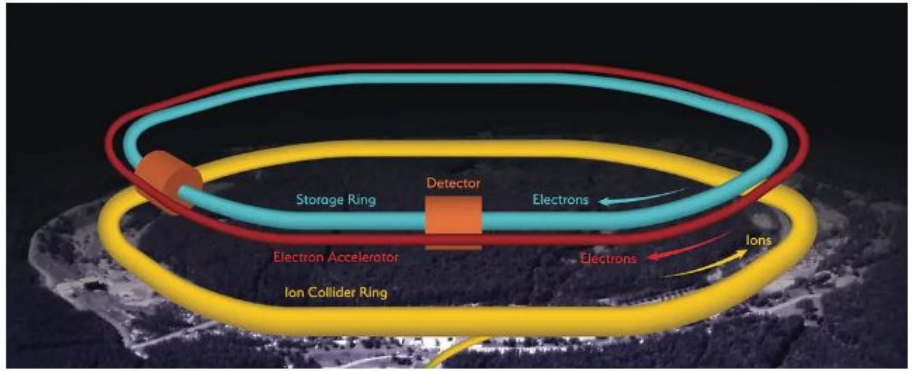
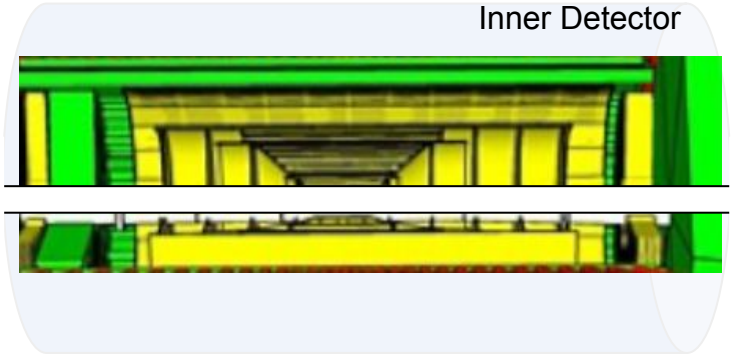
Motivations for a Cylindrical μ-RWELL Detectors



Experiment scheme. (Brookhaven National Lab/Flickr/CC BY-NC)



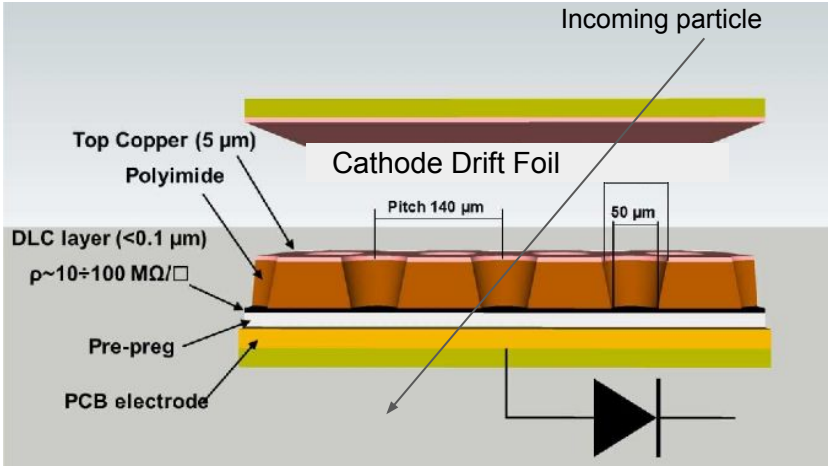
MPGD (yellow) DIRC Detector (green) Calorimeters (light blue)

eRD108 has been working on central tracking with Micropattern Gaseous detectors (MPGDs) for EIC and Future Detectors

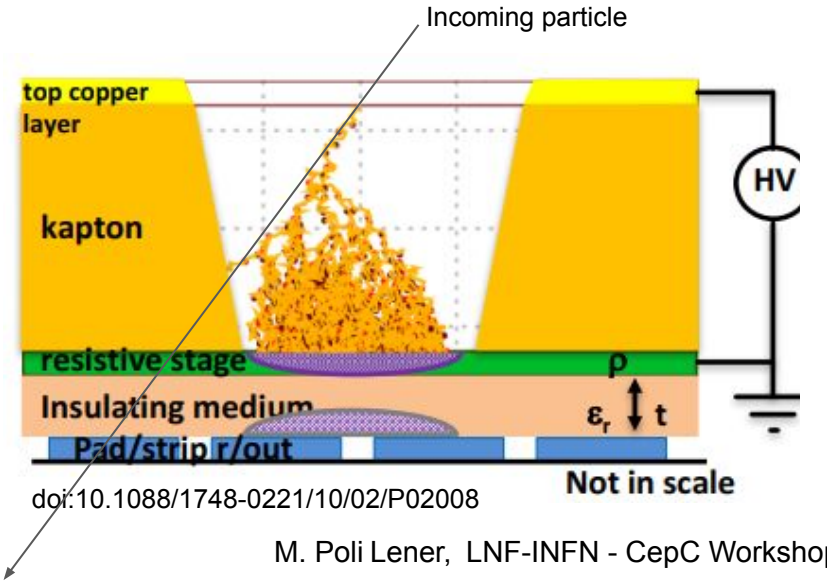
The AIM :

The R&D on MPGD type called μ-RWELL will serve as a proof of concept for future detectors

How a Planar Micro-Resistive-Well (μRWELL) detector works



10.1088/1748-0221/14/05/P05014



doi:10.1088/1748-0221/10/02/P02008

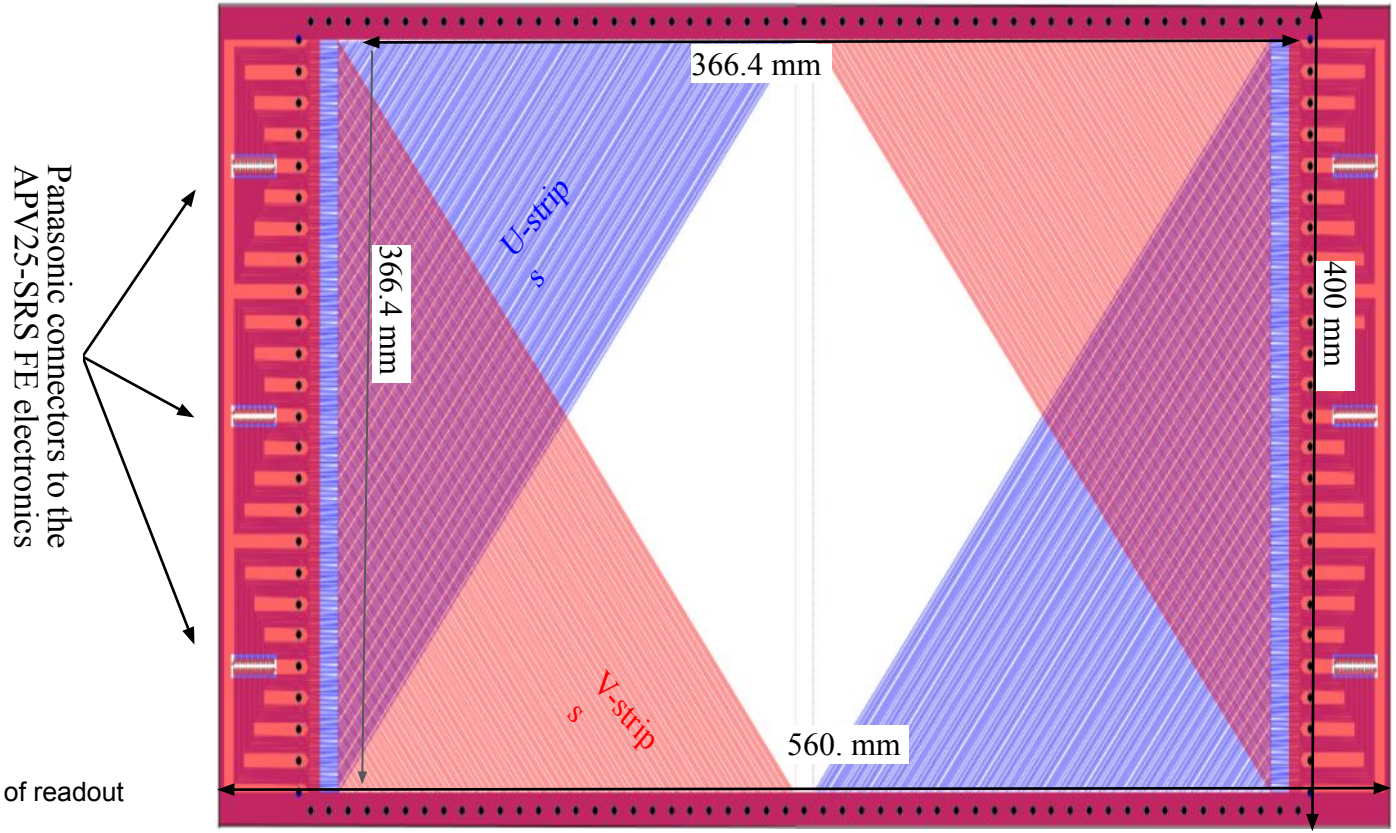
M. Poli Lener, LNF-INFN - CepC Workshop

The μ-RWELL is composed of two elements the μ-RWELL-PCB and Cathode

The μ-RWELL-PCB couples a

- -“well pattern” kapton foil as the amplification stage
- -a resistive layer for discharge suppression
- -PCB for readout

Design of uRWELL / 2D readout Composite foil structure

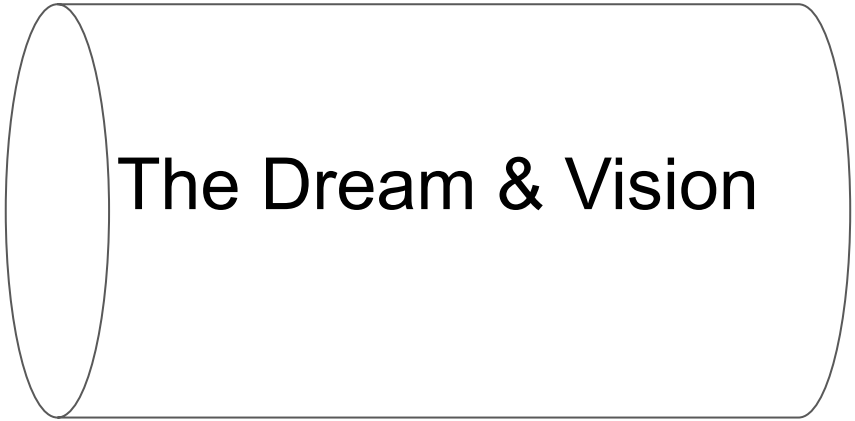


Different types of readout

Single foil design, same µRWELL amplification, two different U-V readout structures

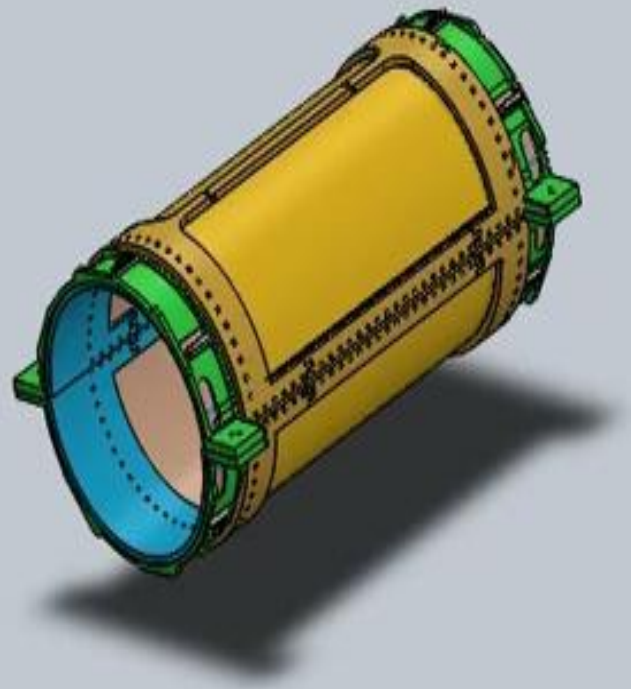
- 2D zigzag readout @ BNL and Capacitive-sharing straight strip @ JLab

Common readout template design : Strip pitch: 1.35 mm ^2 total of 768 strips / half cylinder



Thinking outside of the square and into a cylinder

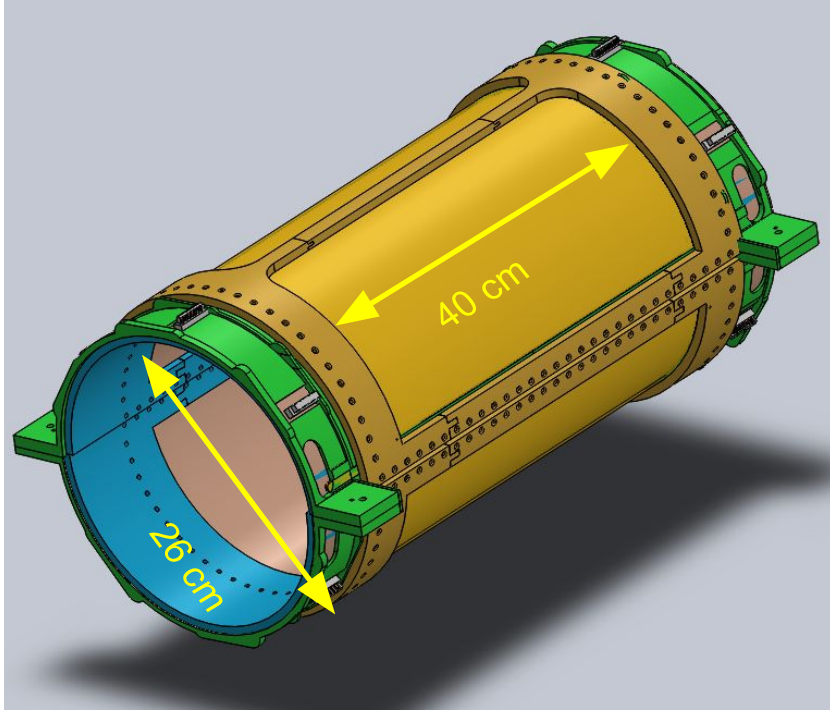
Design Of A Cylindrical μRWELL

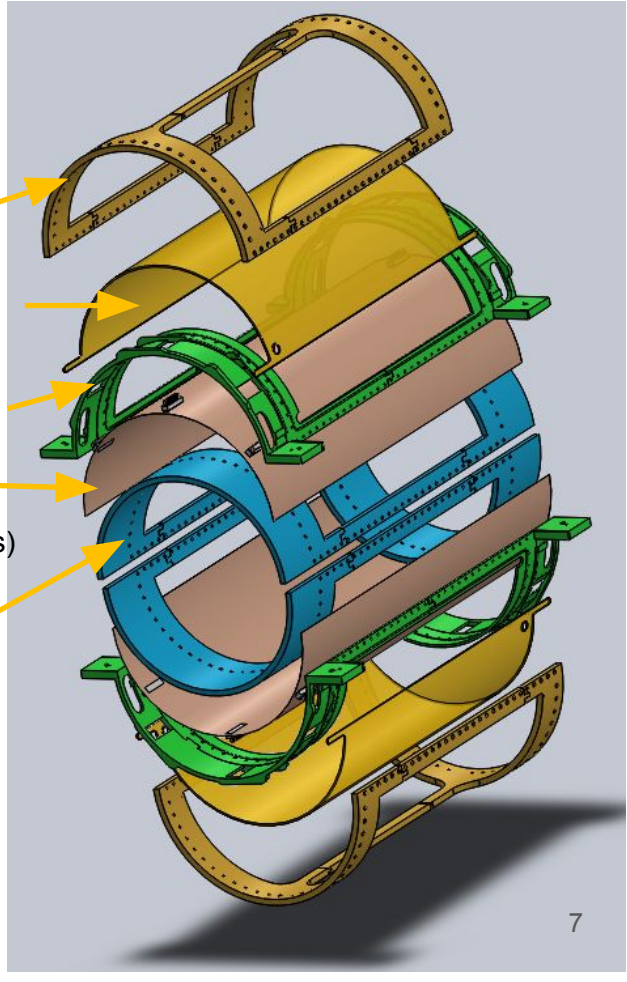


Design Of A Cylindrical μRWELL

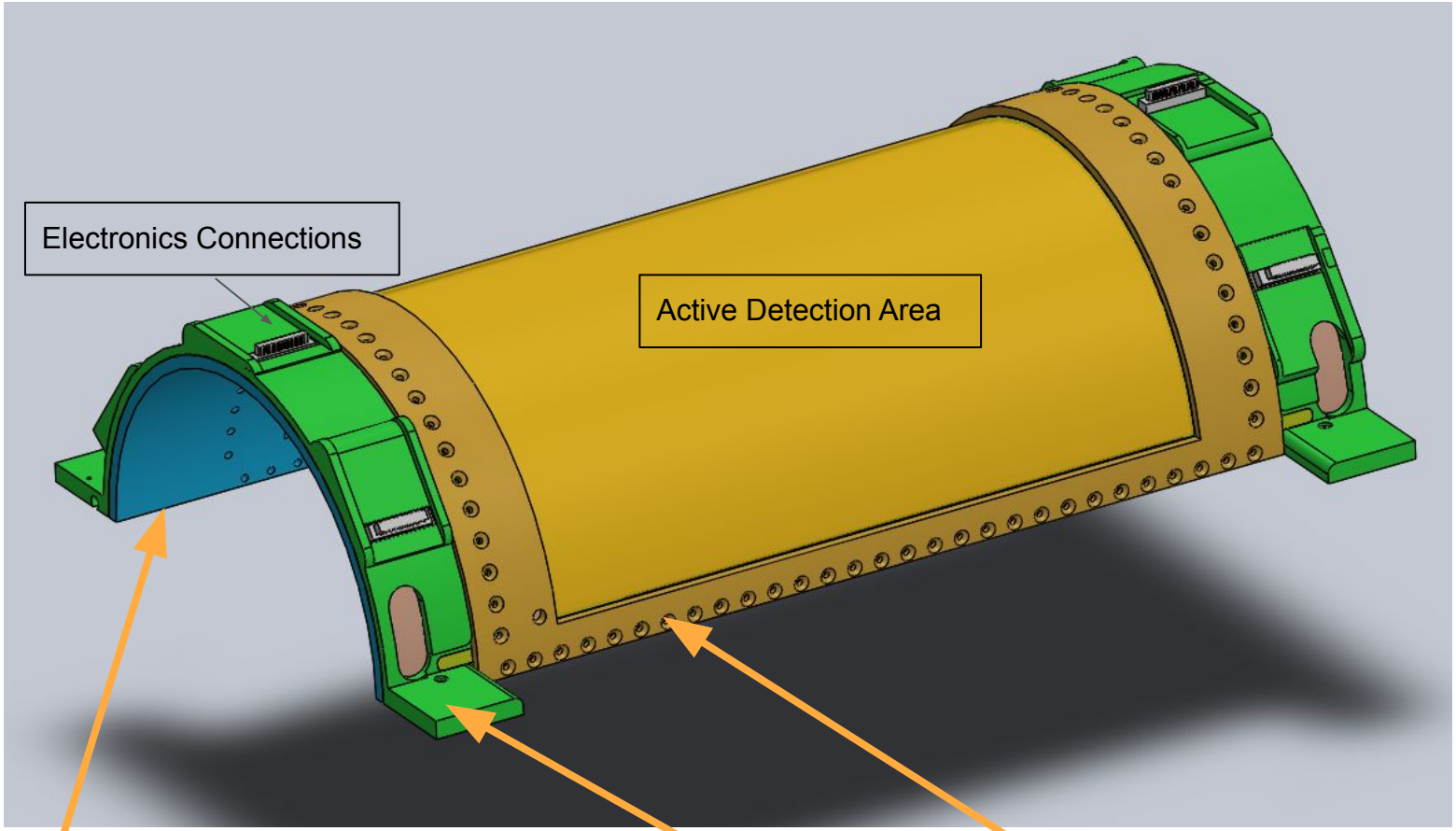
Prototype consists of 2 half-cylinder chambers with different readout structures

Set of three support frames per half-cylinder (main frame + 2 clamps)

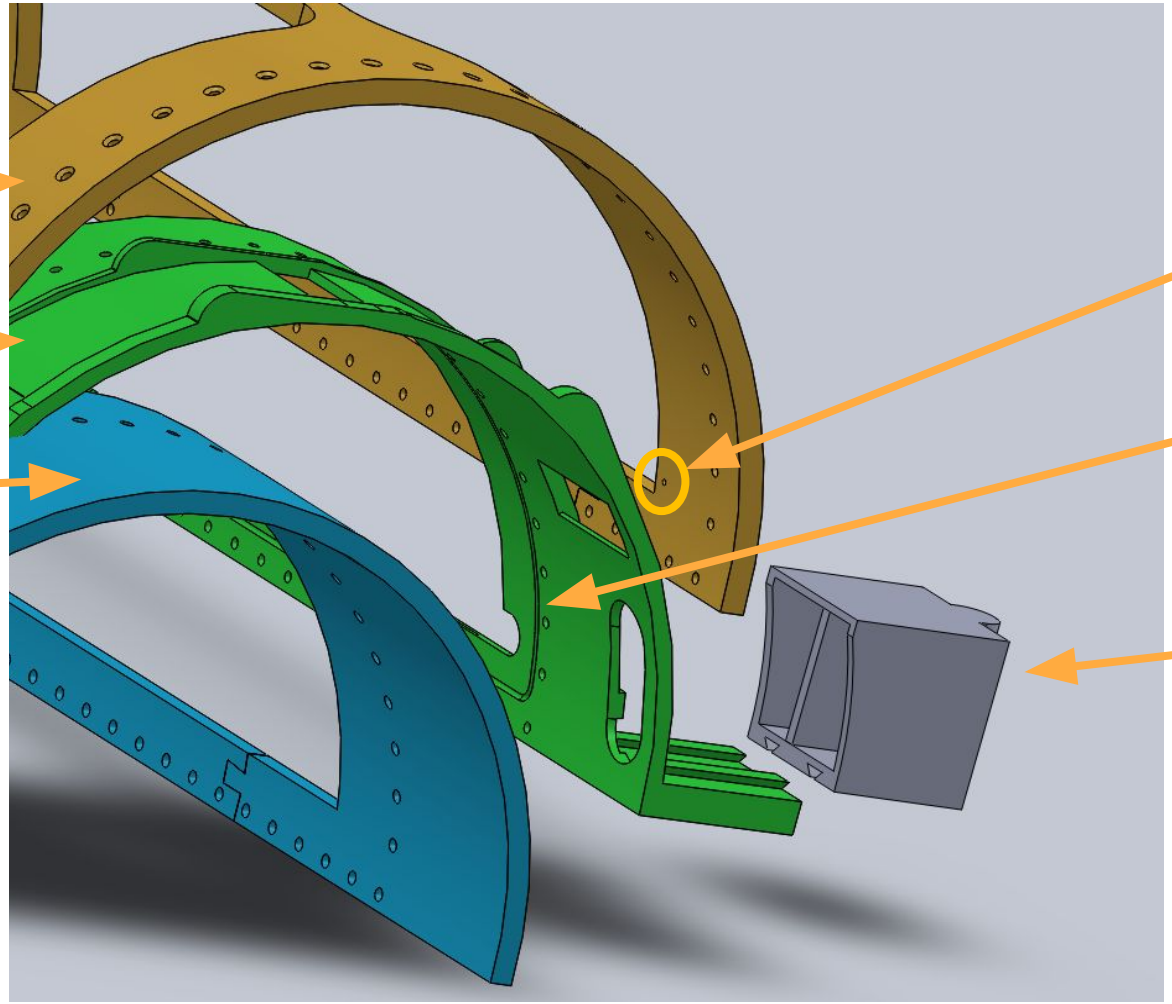




Half -Cylinder Design



Features: Gas, O-Ring, High Voltage Box



Part C: Outer

Part B:Main Frame

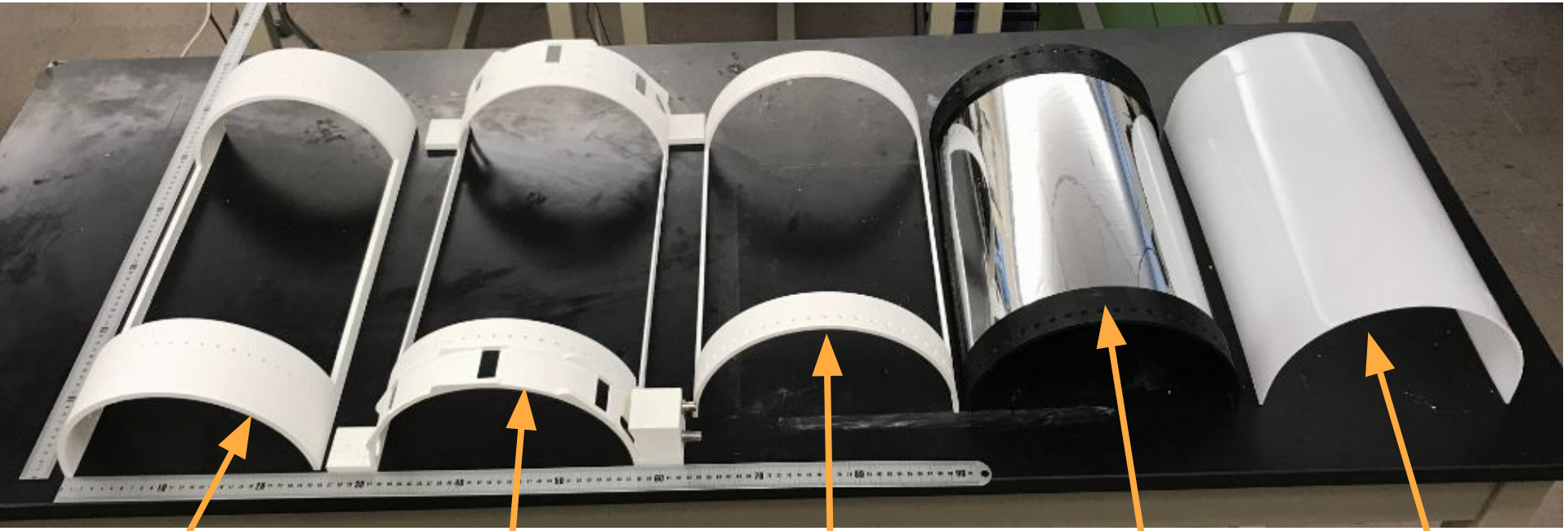
Part A: Inner Clamp

Gas Inlet Hole

O Ring Groove

Electrical HV Box

3D-Printed Prototype Parts



Part A: Inner Clamp

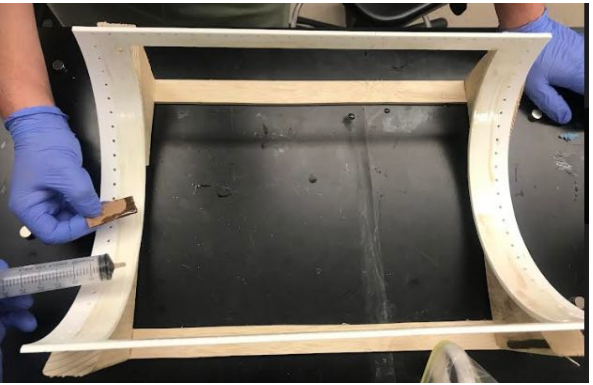
Part B: Main Frame

Part C: Outer

Part C: Mylar Foil

HV Shield Cover

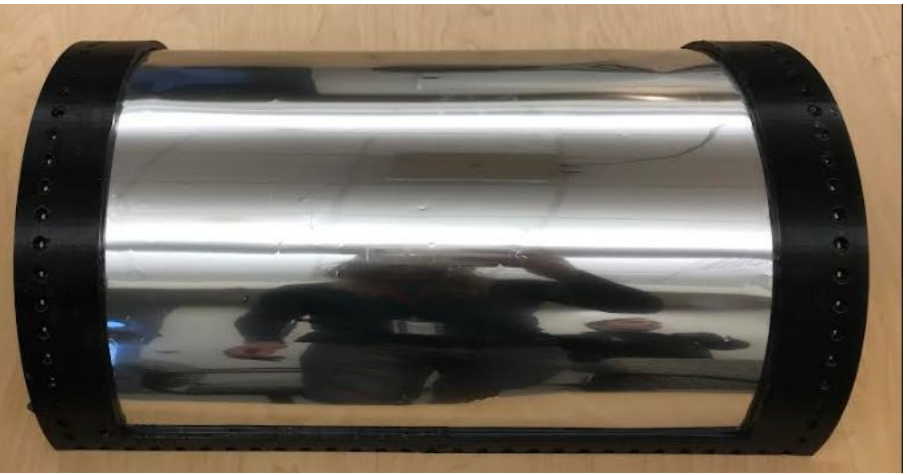
Cathode Drift Foil Assembly



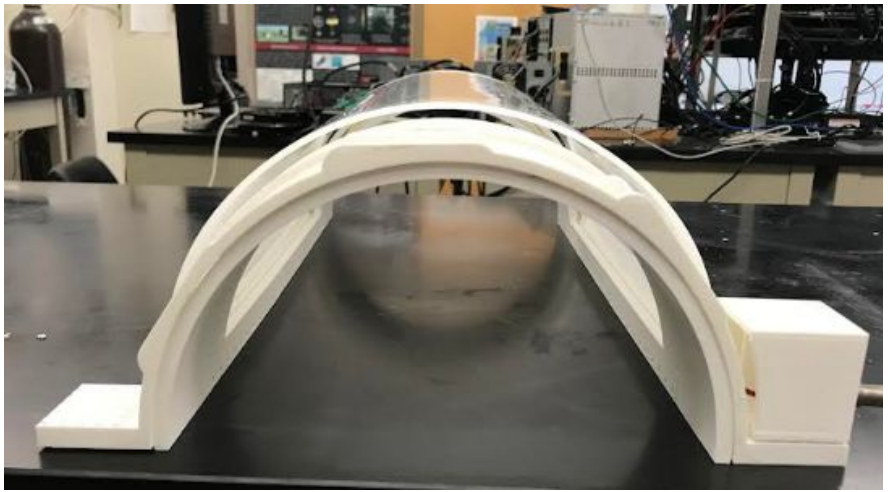
Pre-Gluing Frame

25 micron unstretched

Stretching

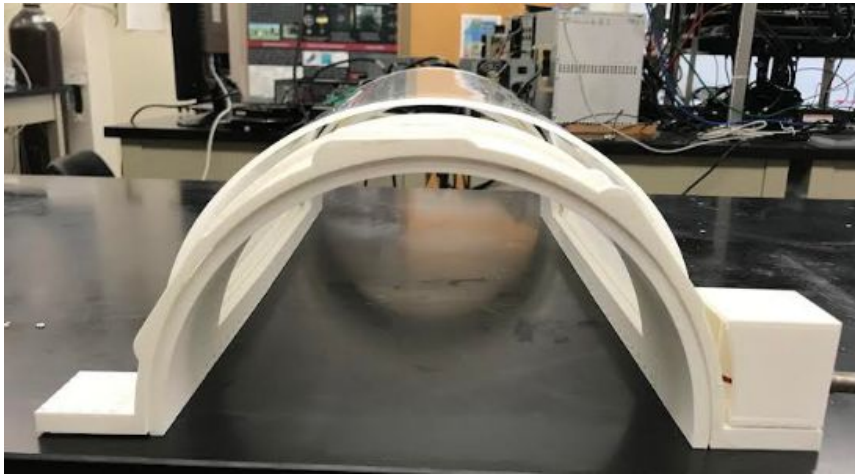


125 micron Aluminized Mylar foil



Assembly

Conclusion:



- A prototype cylindrical micro-Resistive-Well (μRWELL) detector, has been developed !
  - Components include kapton drif foil, a main frame (provides a 3mm drift gap), inner, and outer frame, μRWELL/readout foil
- Designing & prototyping was rather tricky with 3d printed frames yet successful
  - Plans to minimize material and scaled up version
- Plans to go to Fermilab Test beam on June 21st 2023 !

The End

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M. Poli Lener, LNF-INFN - CepC Workshop

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