

Scintillating Fibers for Electromagnetic Calorimeters FDR

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EIC

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Electron-Ion Collider

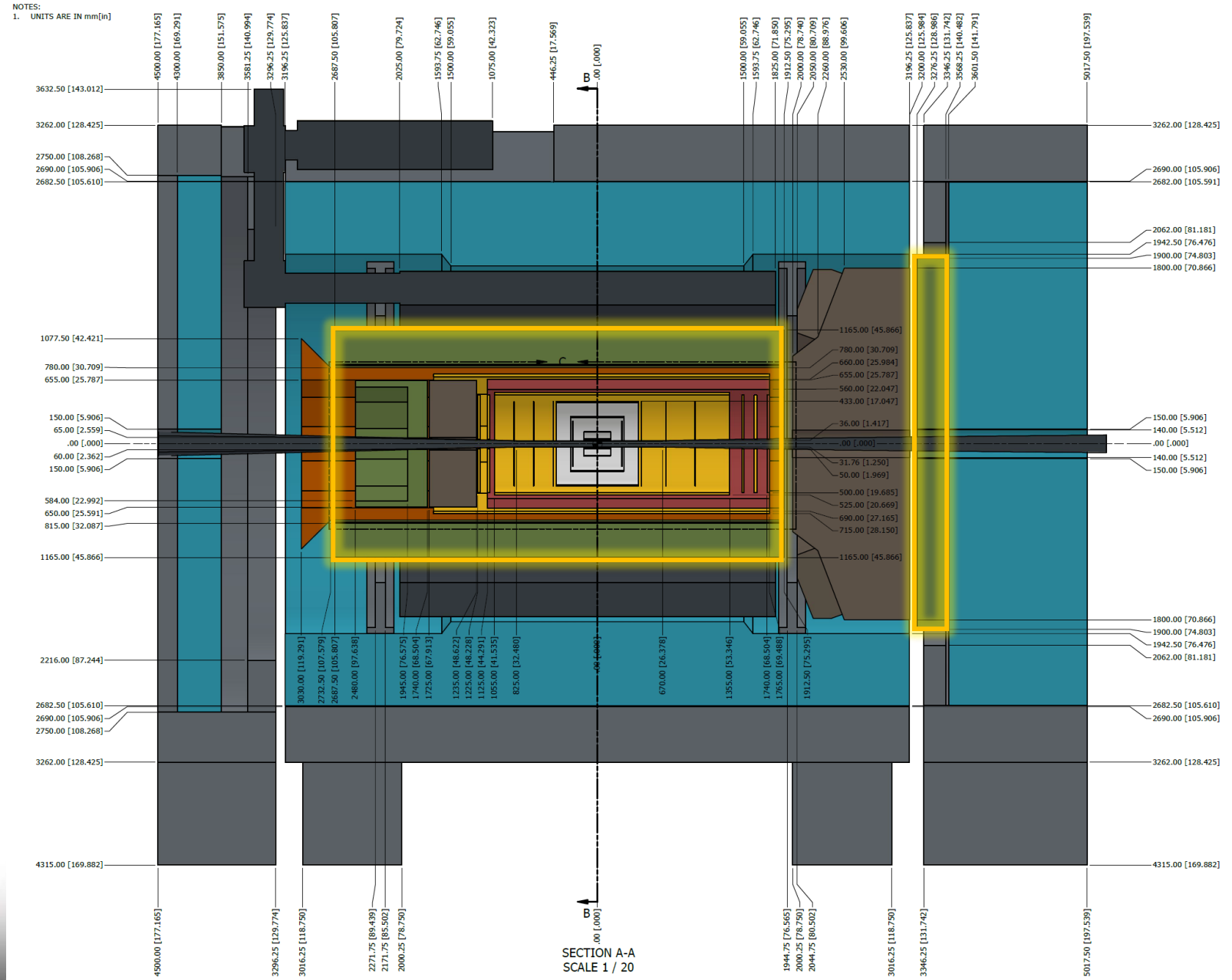
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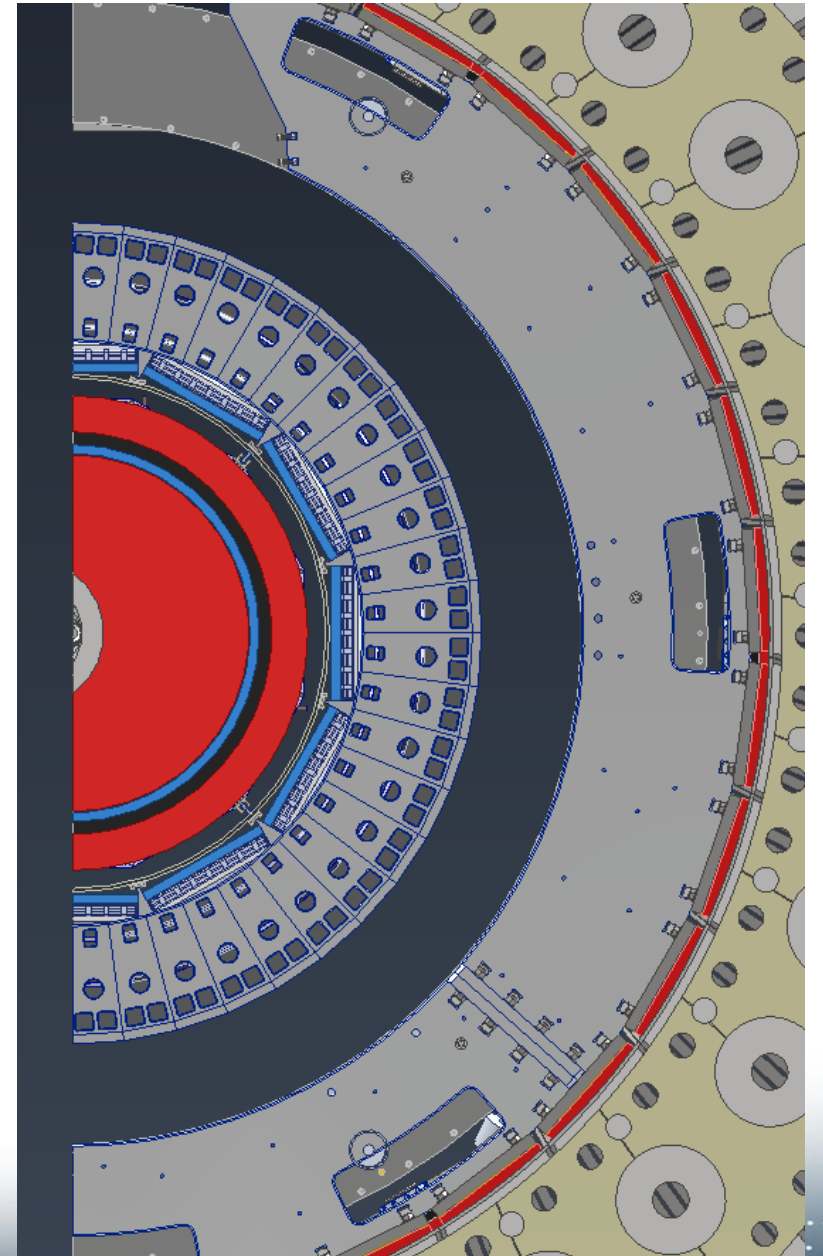
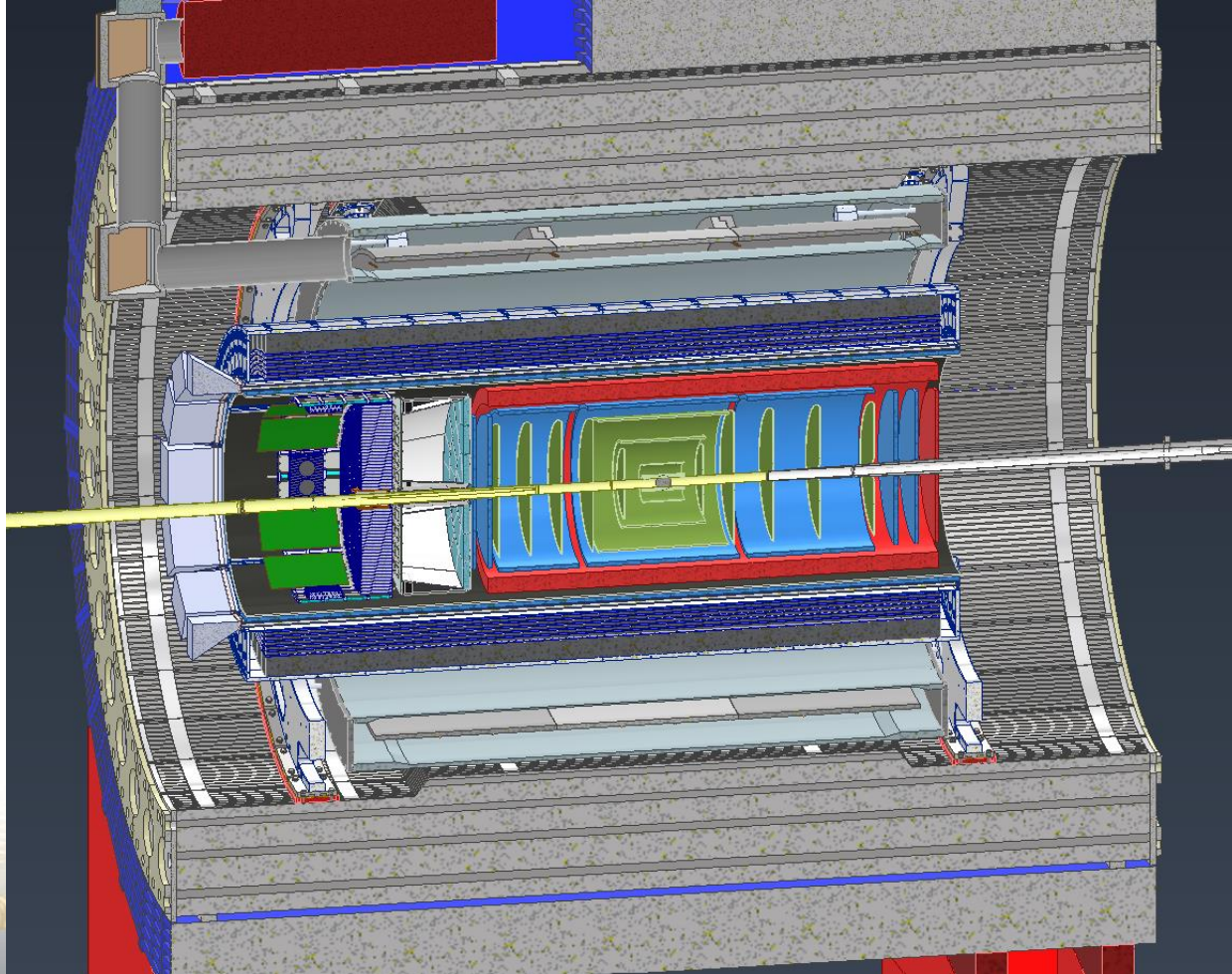
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Outline

- Barrel EMCAL Models
 - Dimensions
 - Model overviews
 - Installation
- Endcap Models
 - Model overviews
 - Dimensions
 - Placement of blocks
 - Testing
- Next Steps

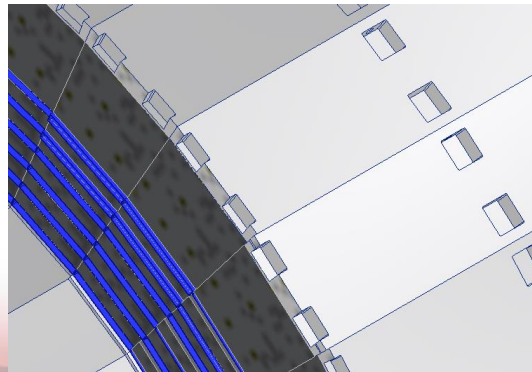
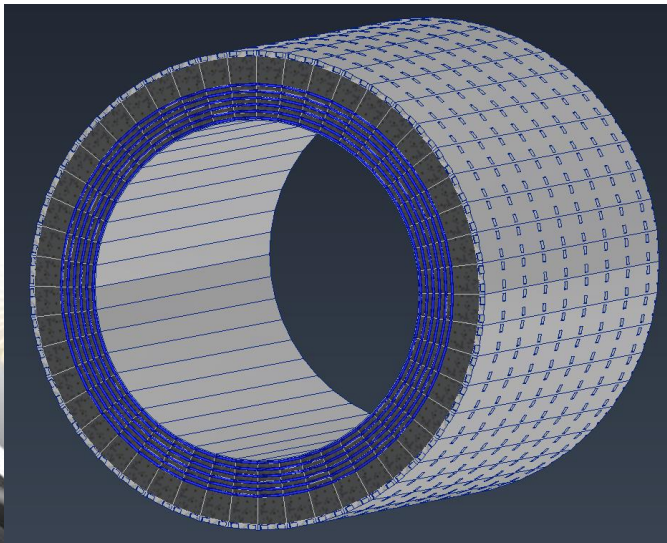


Detector Overview



Barrel EMCAL

- Based off a similar design used for GlueX
- Made up of 48 sectors
- Overall 37cm thick radially
- Each sector will be attached to its neighbors, forming a self-supporting structure



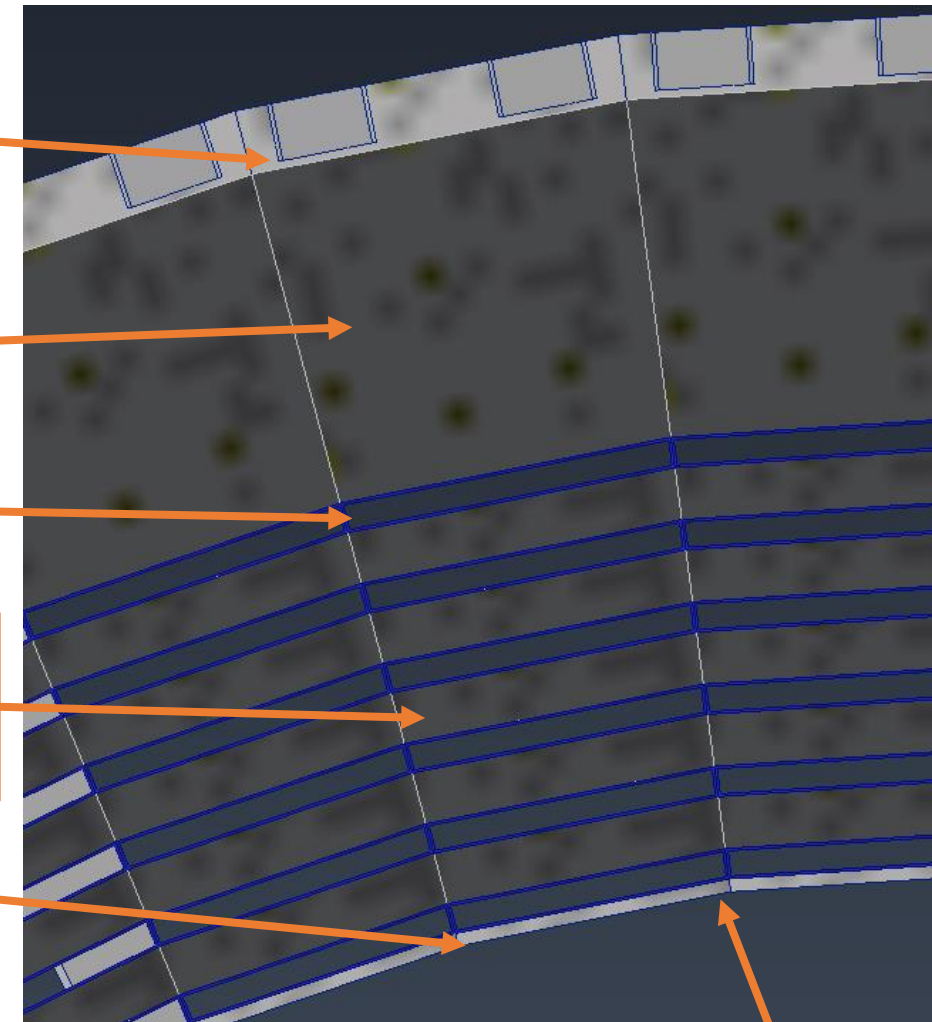
2.5cm
Aluminum
plate

14cm
PbSiFi

(6) 1.5cm
Astro-Pix
Shelves

(5) 2cm
PbSiFi
layers

0.5cm
Aluminum
plate



81cm
inner
radius

Model Overviews

- **Support Rings:**

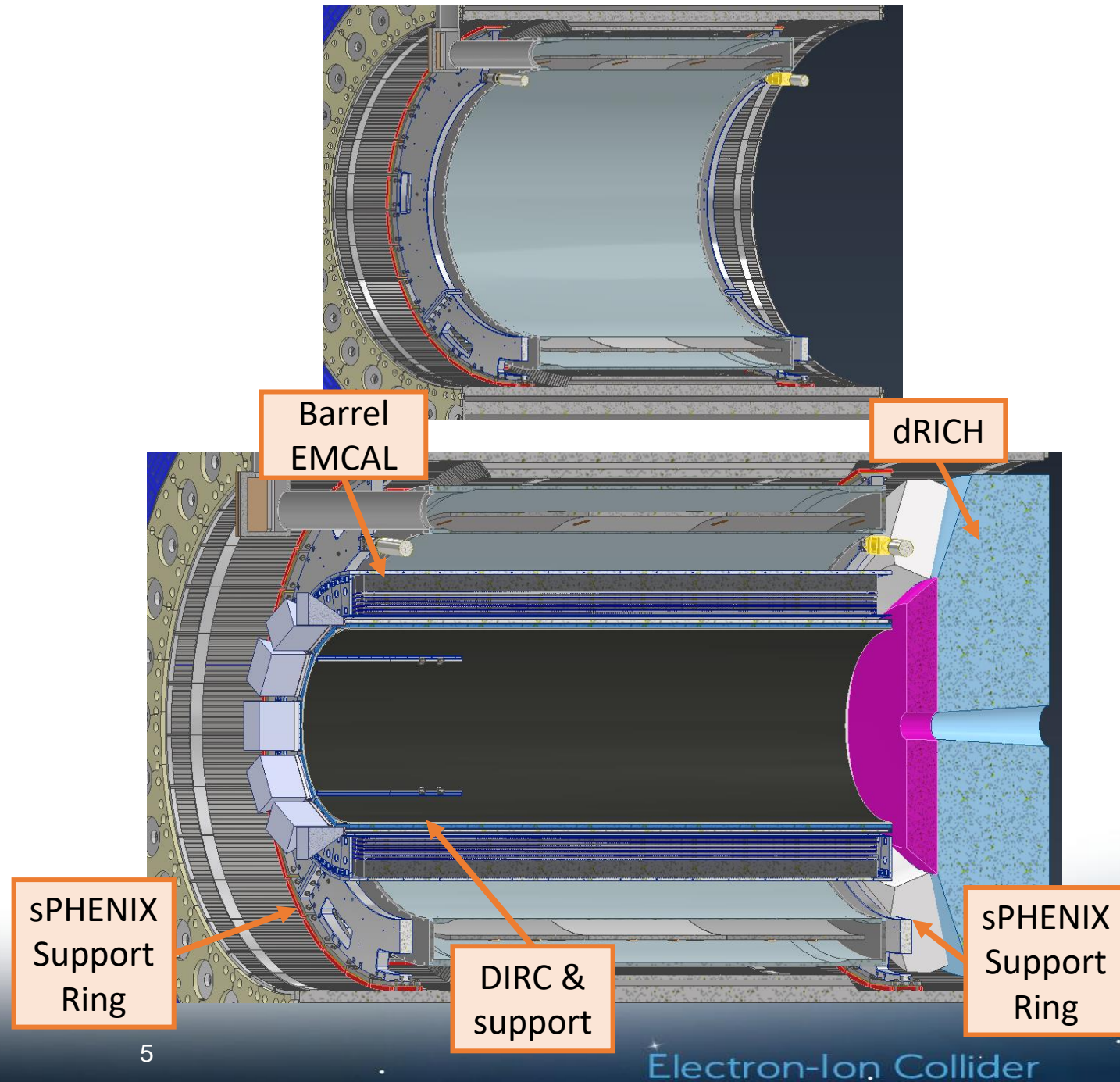
- Reusing the sPHENIX support rings
- To be altered slightly to accommodate end rings for the barrel EMCAL supports

- **EMCAL:**

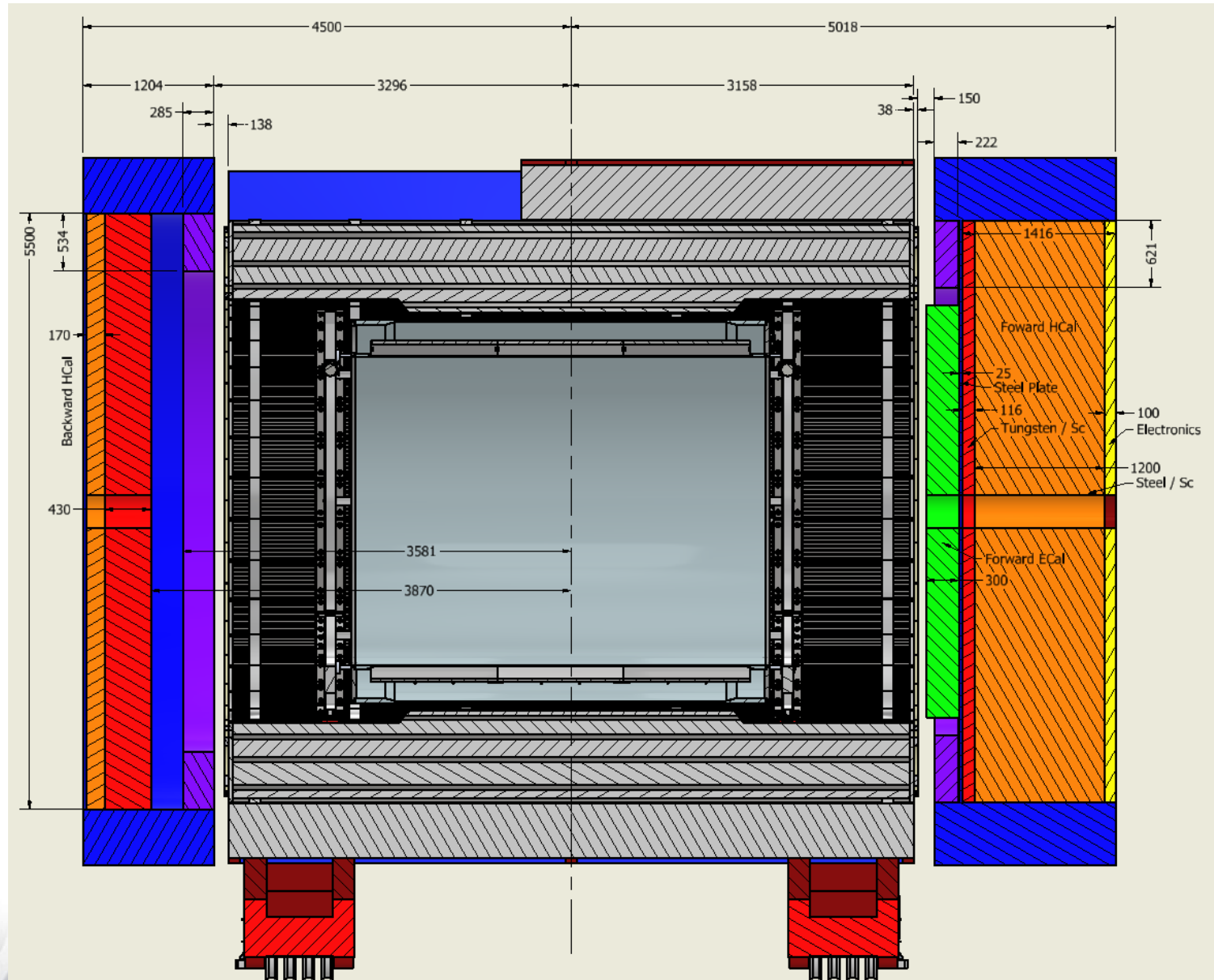
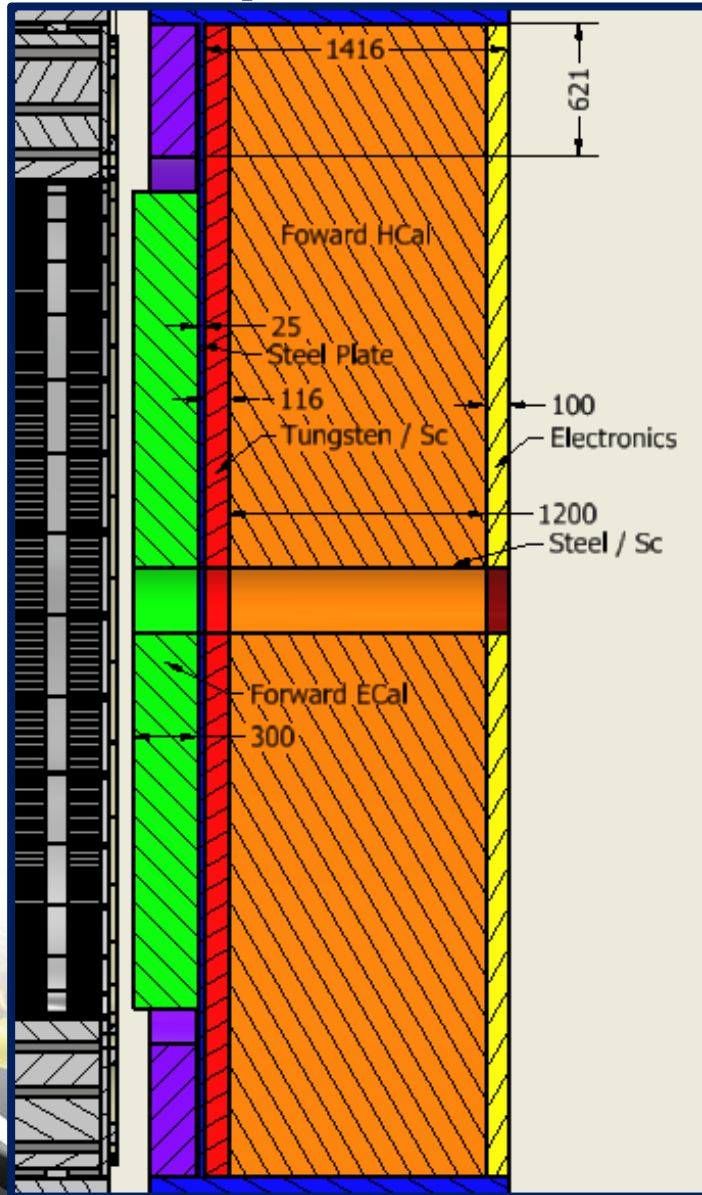
- Will be supported by the inner support rings from sPHENIX
- There will be end rings that will mount the EMCAL to the support rings

- **DIRC & Support:**

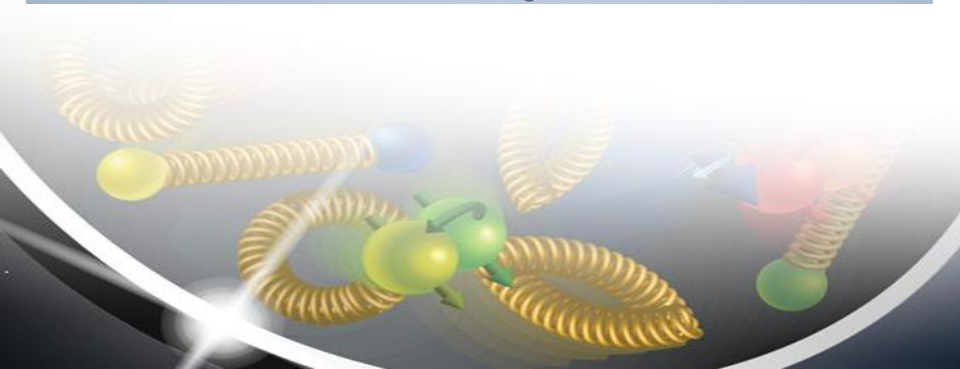
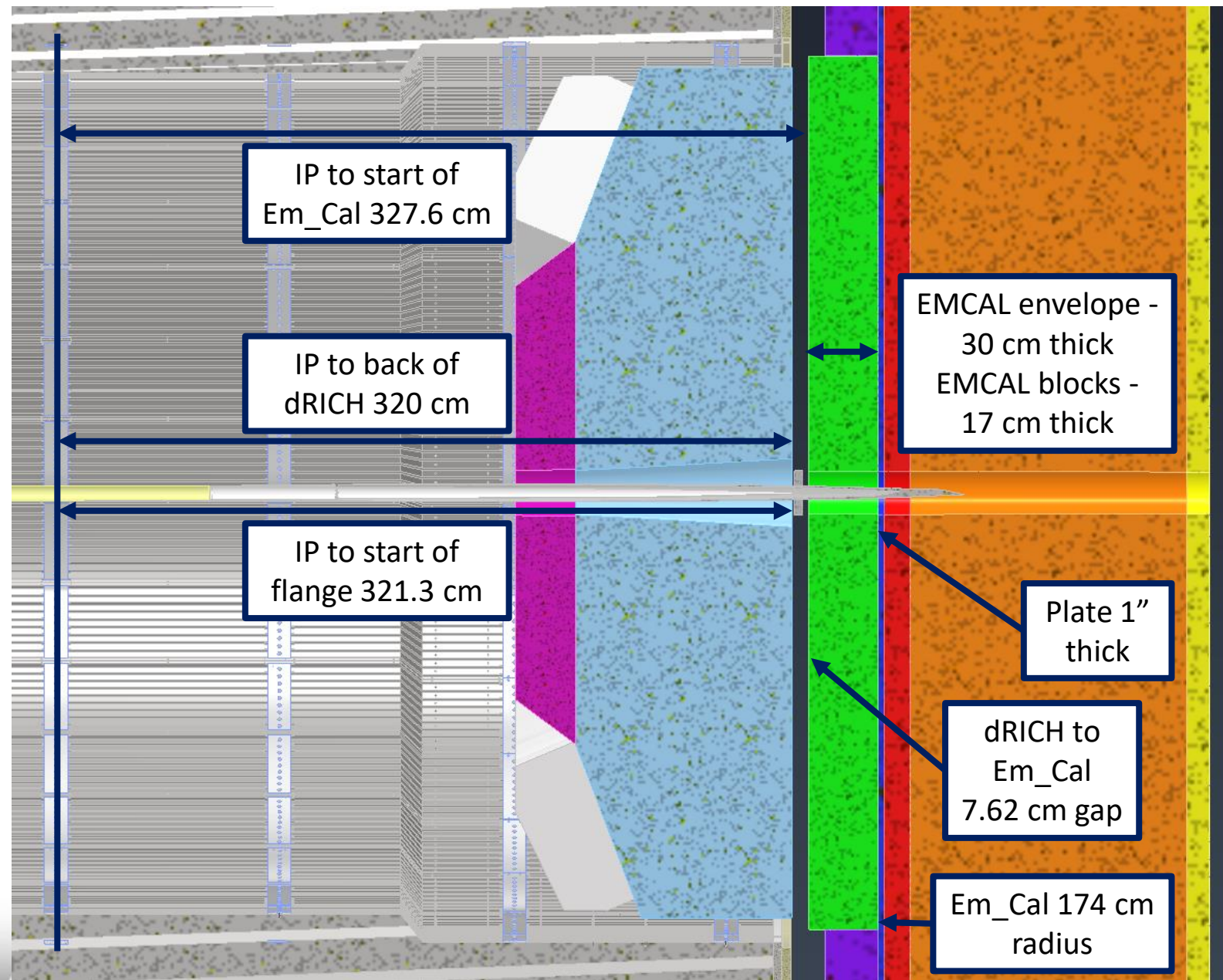
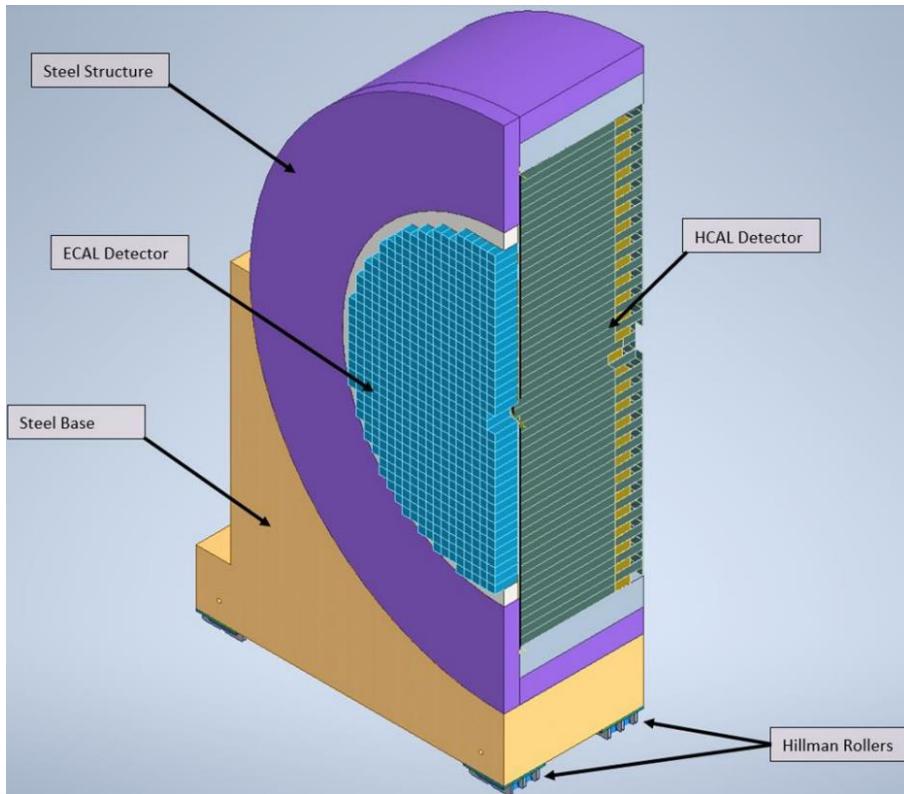
- Still being developed and is being modified heavily as constraints change
- Will use the Barrel EMCAL



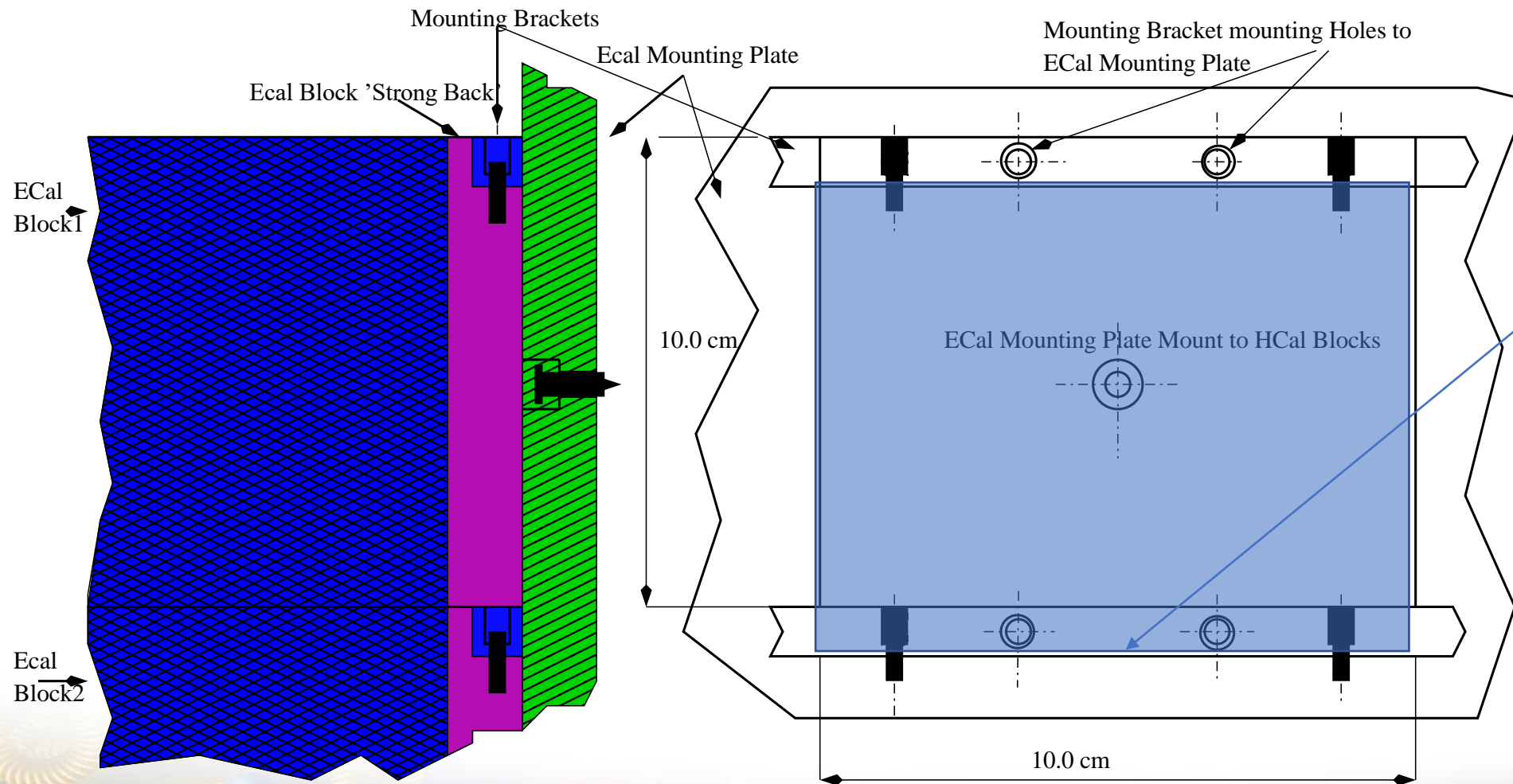
Endcap Overview



Endcap Overview



Block Mounting

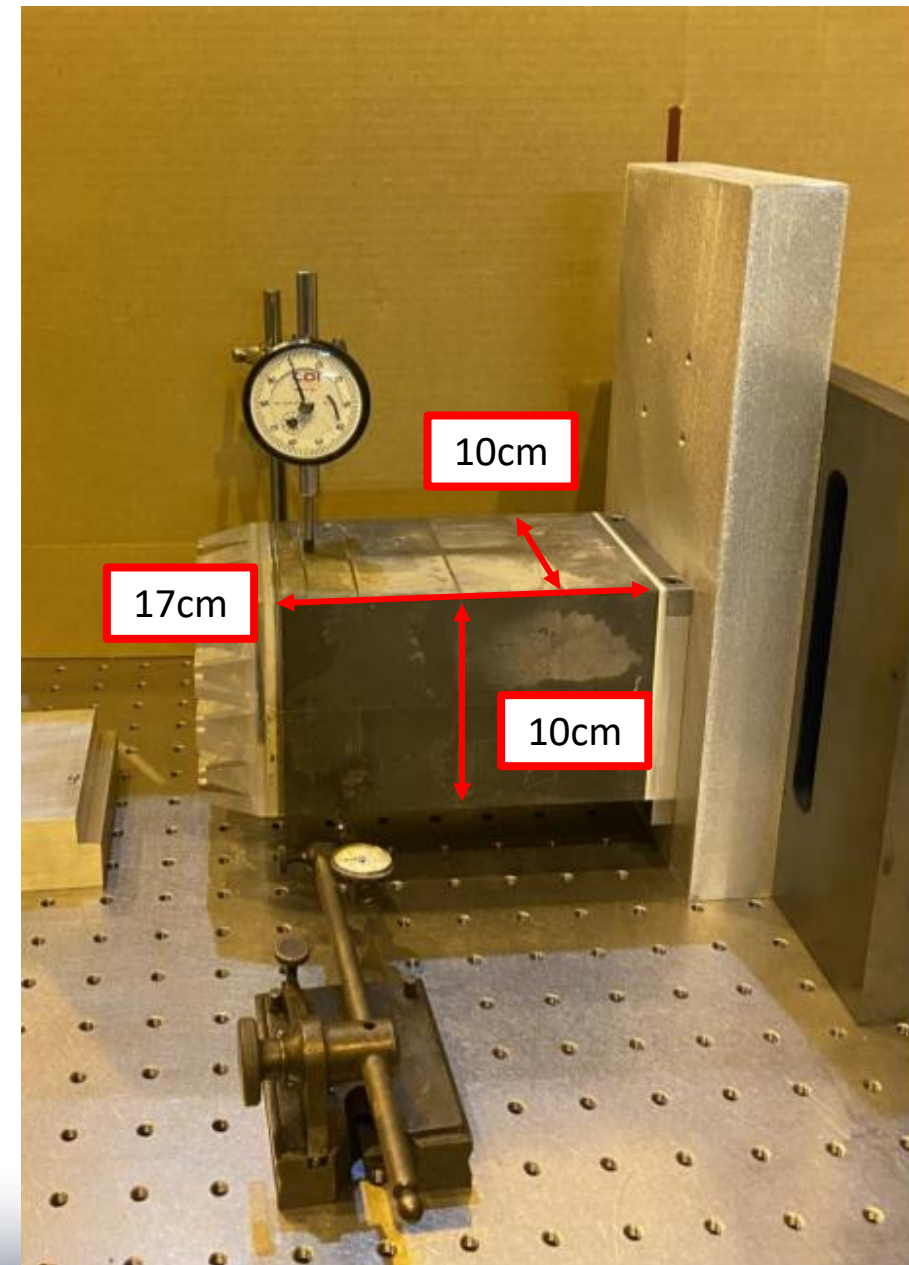


A spring-loaded pin in bottom bracket may be needed.

Seismic analysis
For BNL it is 0.25g
horizontal.

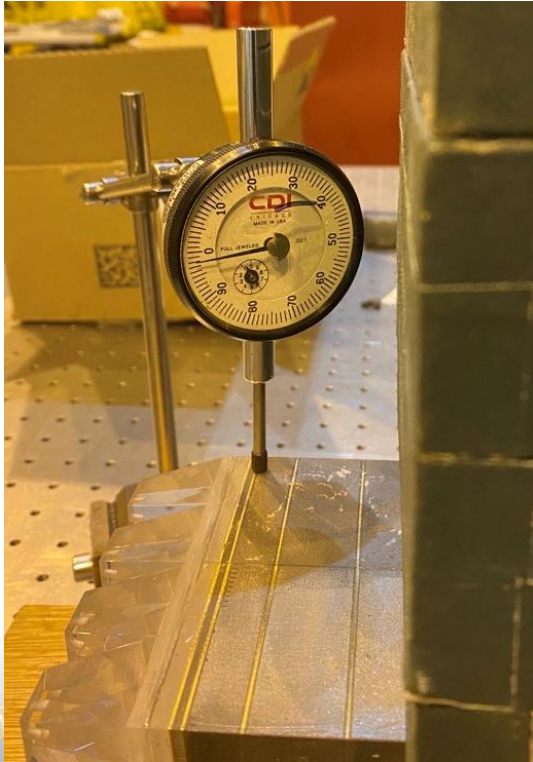
Forward EMCAL Testing

- Final installation block for forward EMCAL
- Tested with the weight of 4 additional blocks on top to get a 5 times safety factor
- Max deflection was 50 microns
- Gap between blocks will be 100 microns
- Passed all mechanical stress tests
- Beampipe protector design in progress



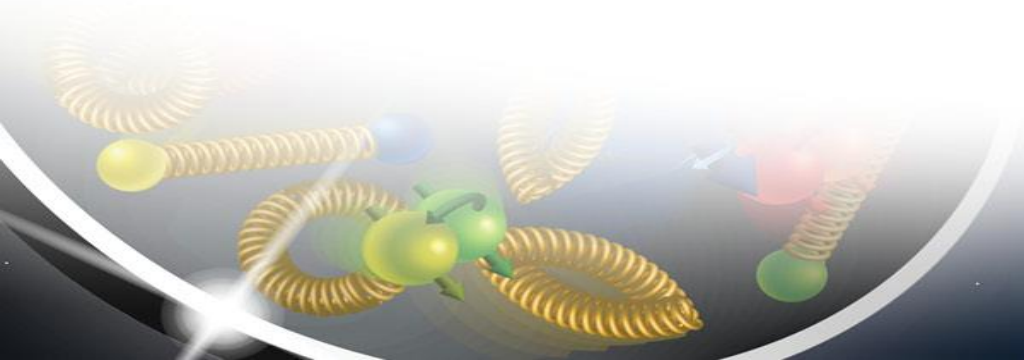
Forward EMCAL Testing

- Preforming long term testing with it under load for 2 weeks so far

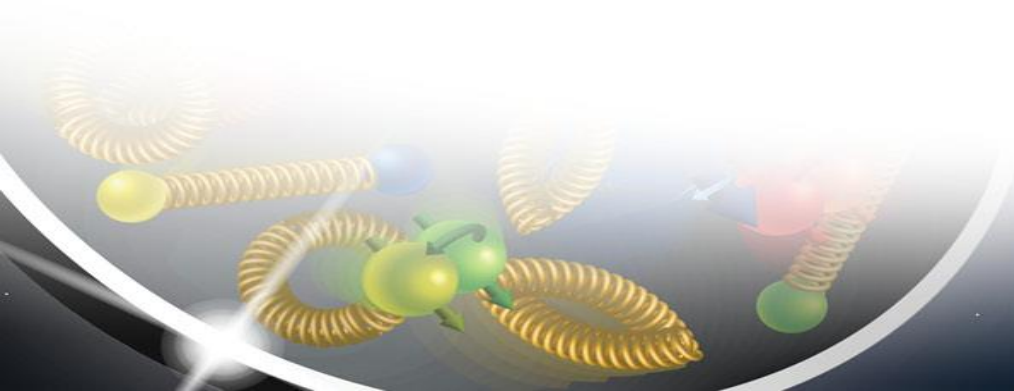


Summary / Next Steps

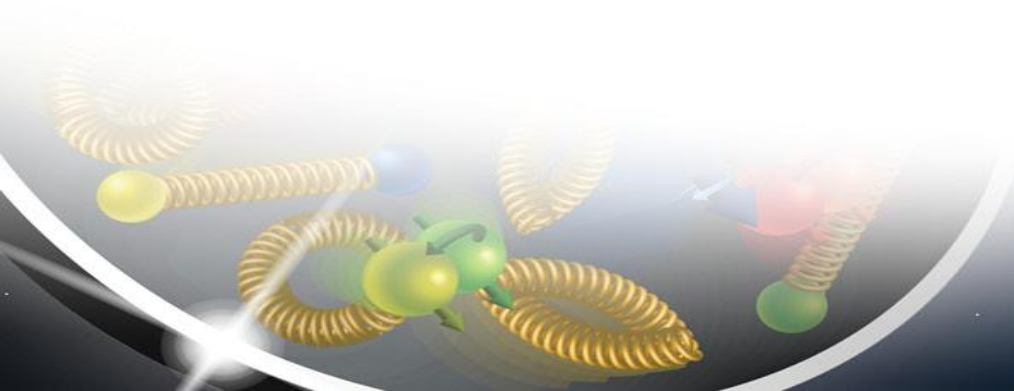
- Mechanical sizes are known and set
- Only remaining work is finalizing support structures
 - All future work has no impact module sizes
- Continuing to design the DIRC support & Silicon Tracker support
- Developing the barrel EMCAL support system and incorporating the support rings into the design
- Working on the design and analysis tasks for both sets of endcaps



End – Questions?

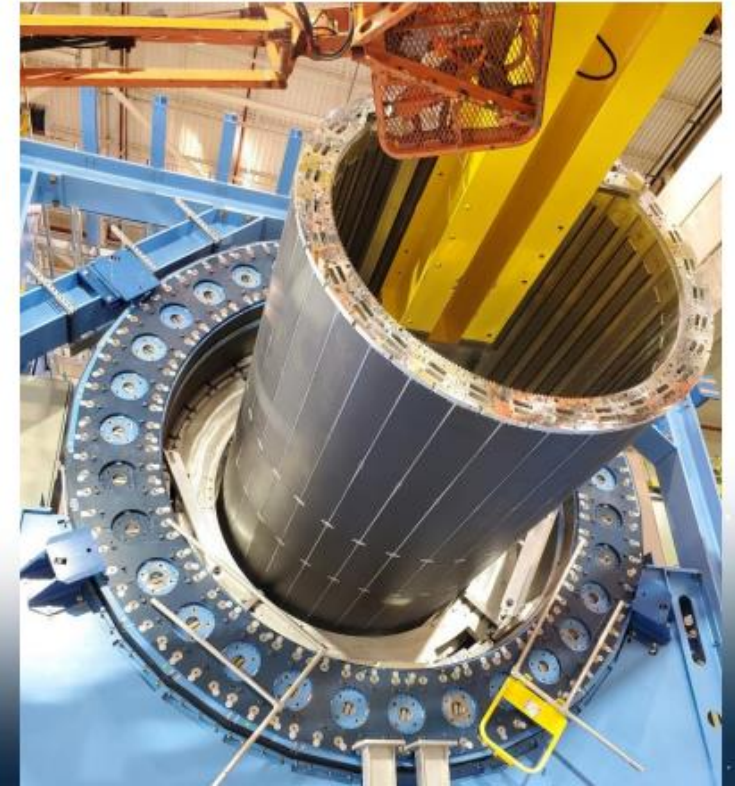
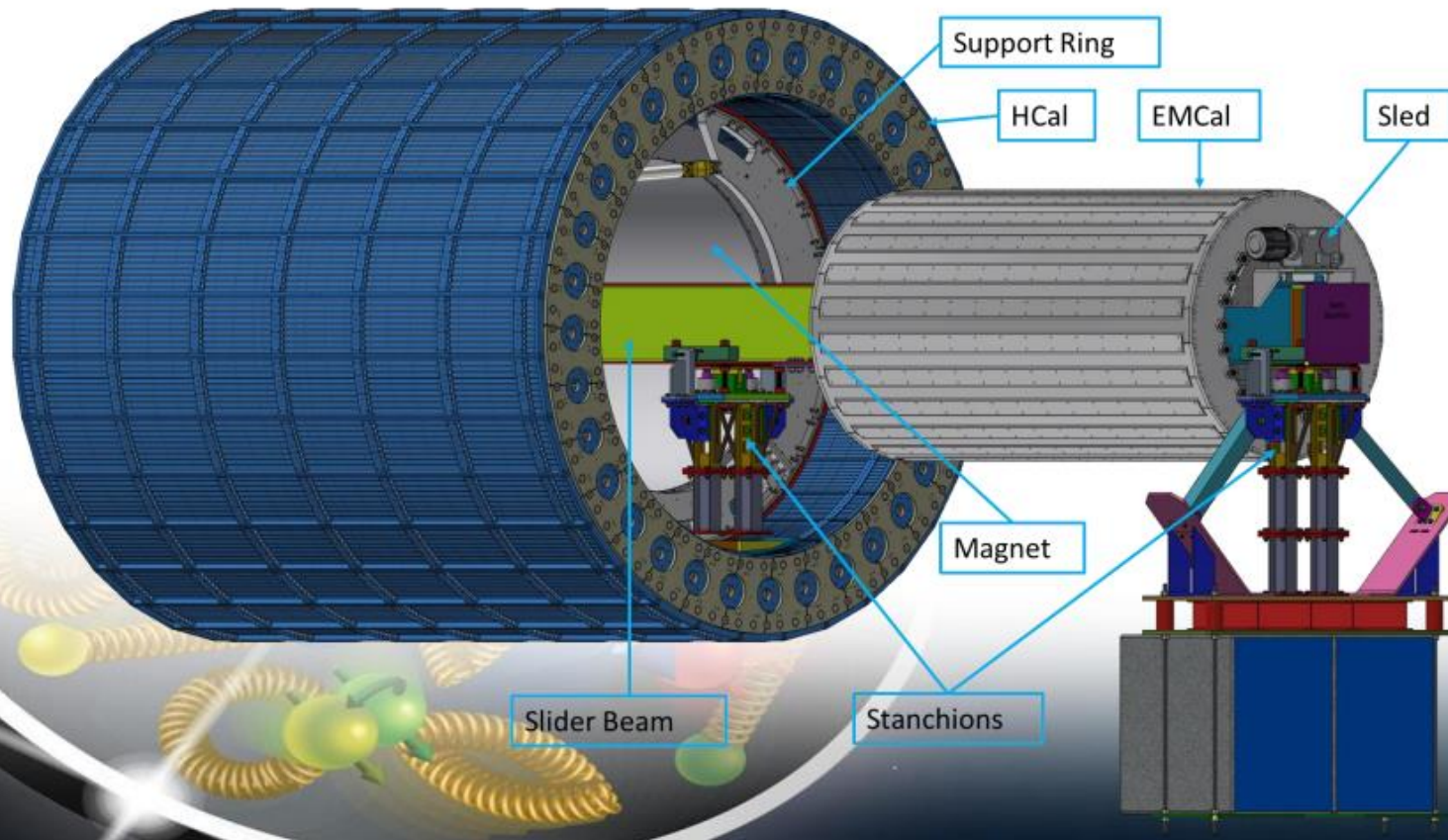


Backup slides



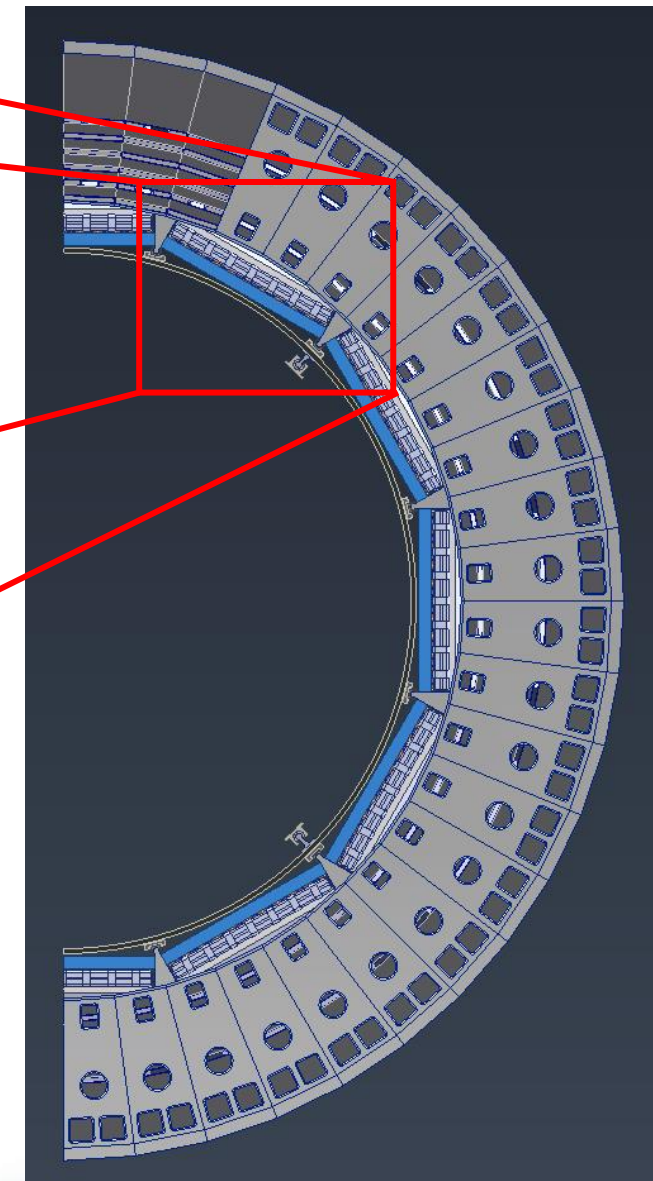
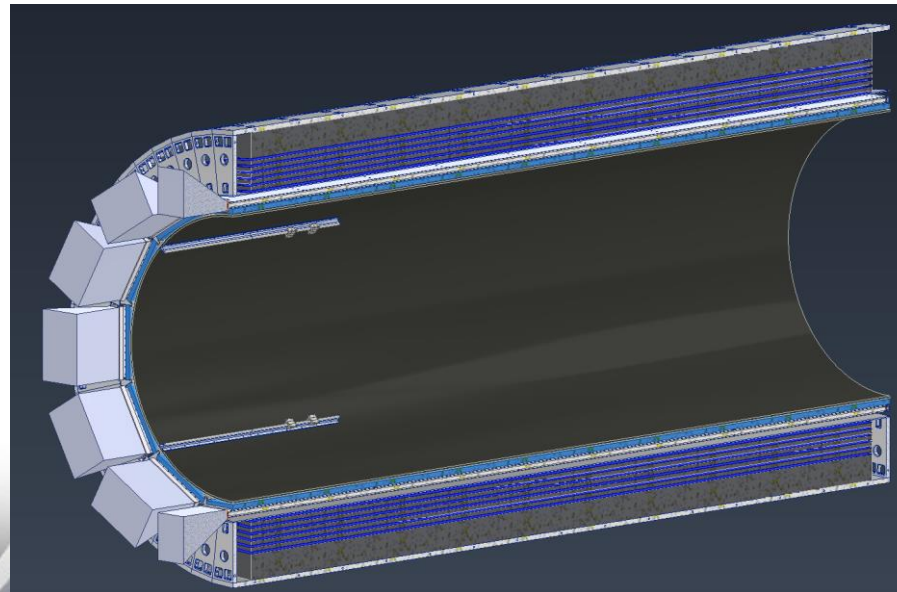
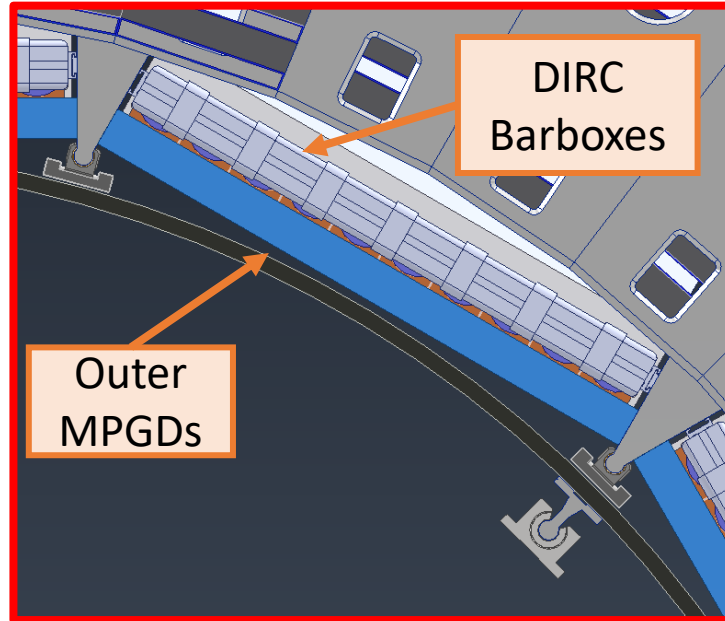
Barrel EMCal Installation

- We plan to use existing installation tooling from sPHENIX that was used to install Inner HCal as shown in photos
- Assemble Barrel EMCal on sled, A-frames and section of I-beam.
- The I-beam is inserted into the HCal and supported on stanchions.
- The Barrel EMCal is rolled in via the sled on the I-beam.
- The Barrel EMCal is attached to the support rings.
- The I-beam and stanchions are removed.



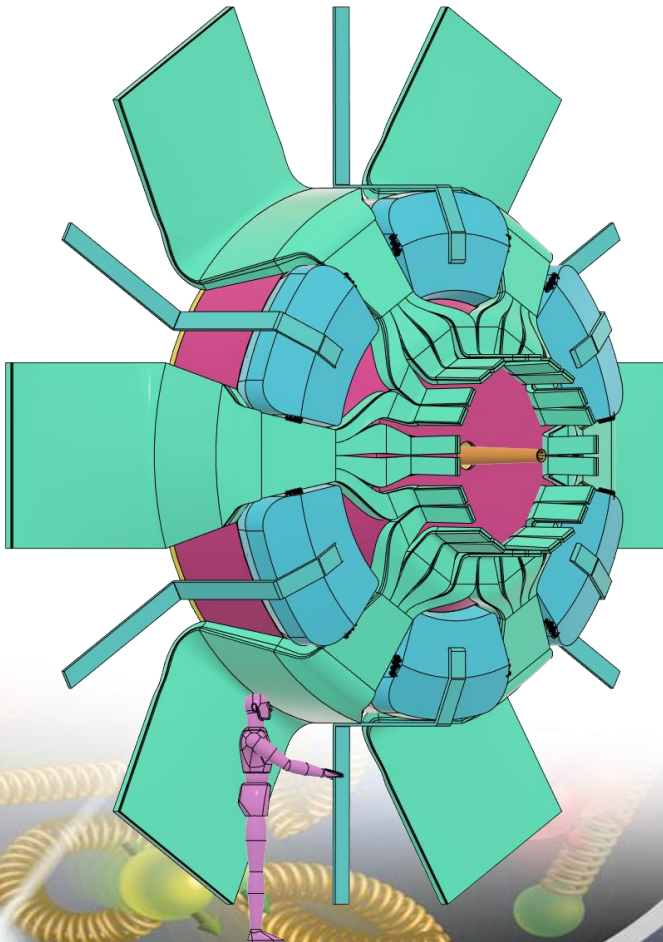
DIRC Support

- Using the barrel EMCAL for support
- Outer MPGDs sit close to the DIRC barboxes
- Inside the Outer MPGDs will be a carbon fiber cylinder that will support all the inner detectors
- There will be rails which will be used for the EEEMCAL and pF-RICH
- Gaps between the EEEMCAL and the carbon fiber cylinder will allow for inner services to be brought out

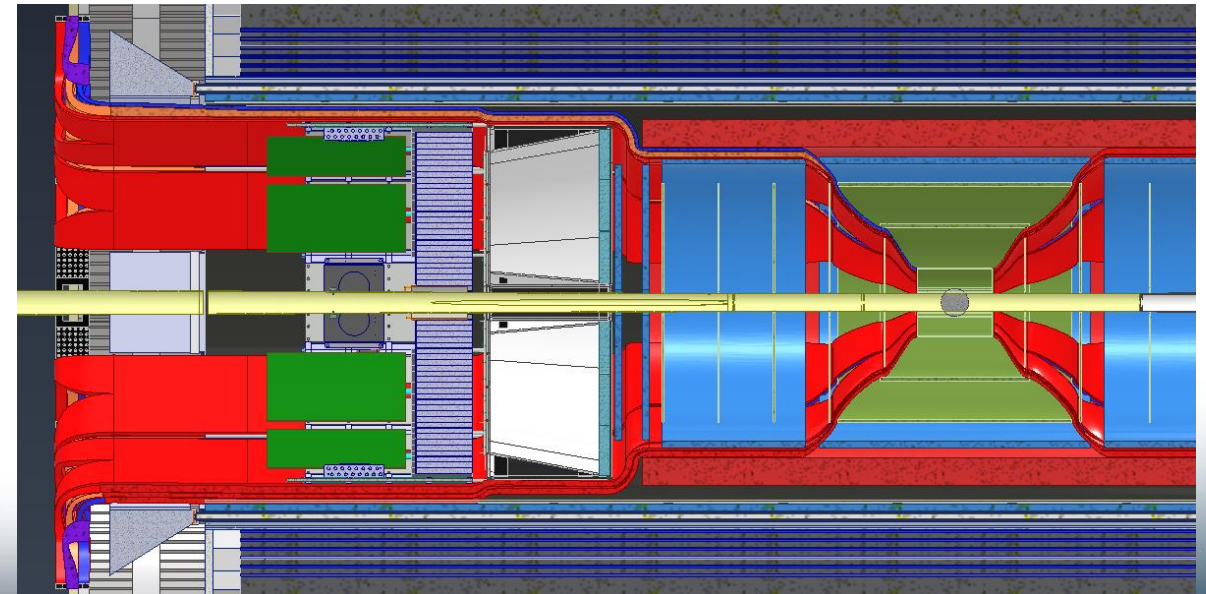


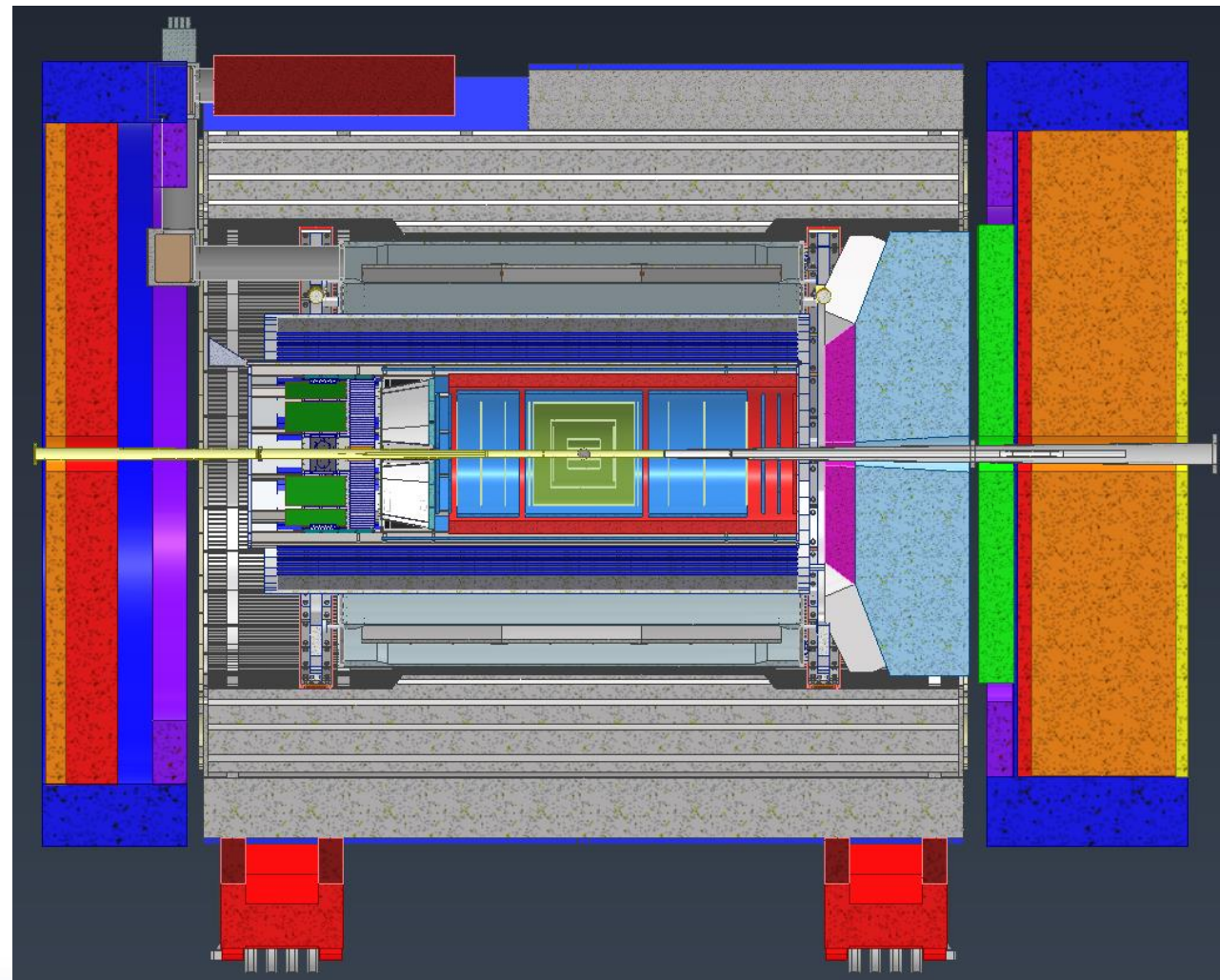
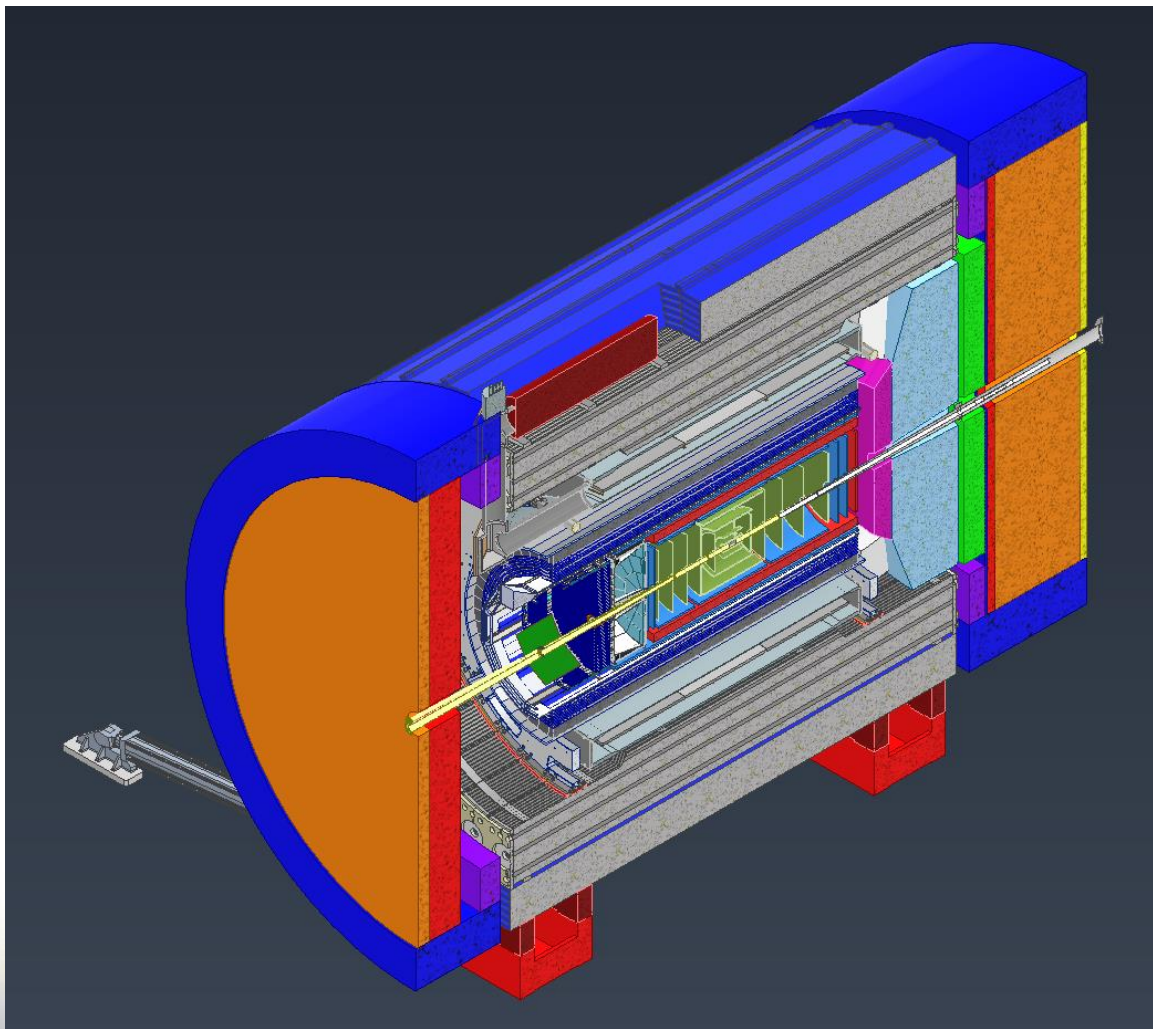
Services Layout

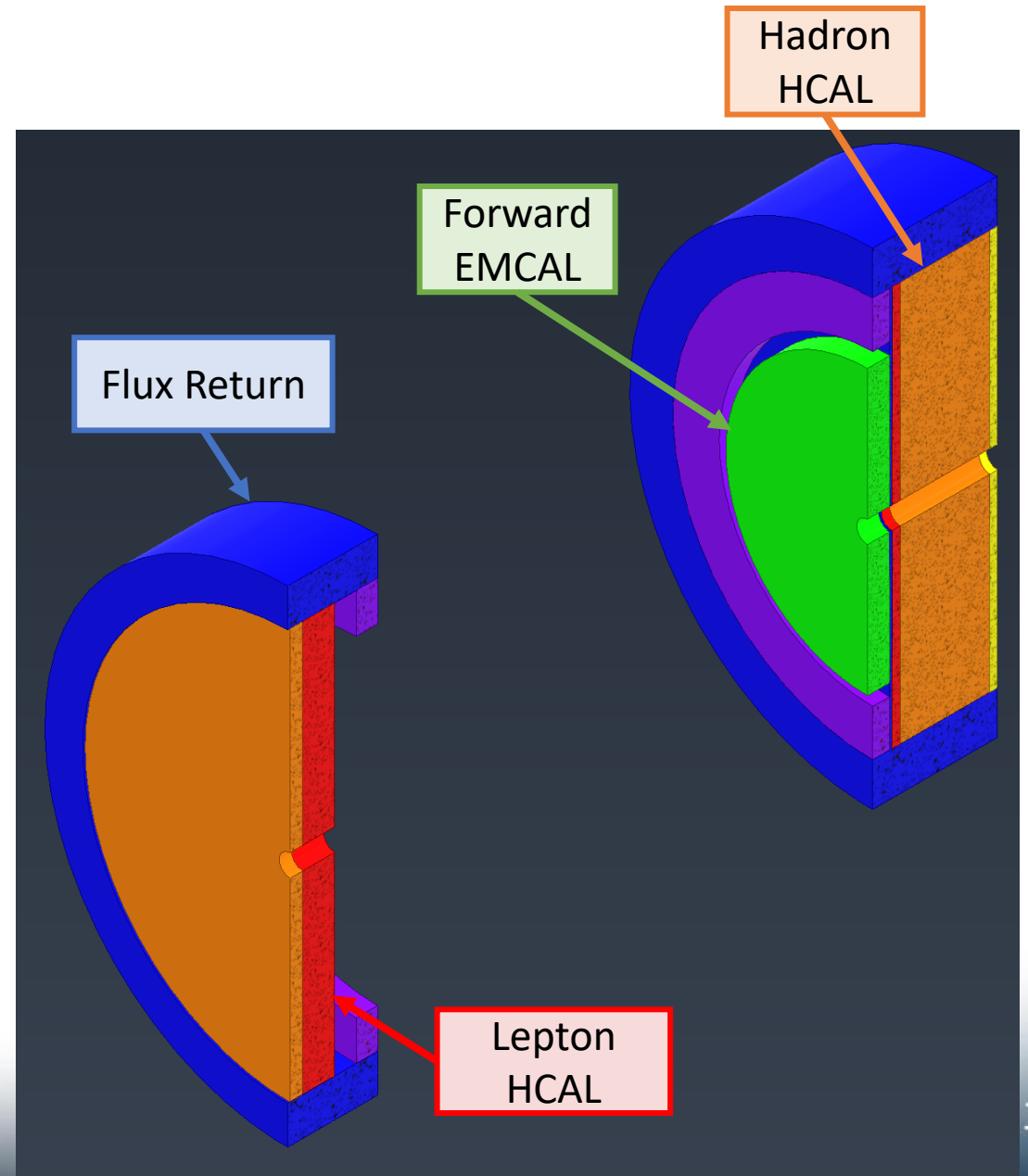
- Using service estimates from the detector groups calculated service bundle volumes at bottleneck locations along 2 common



Subsystem	Quantity	Cross Area (cm ²)	+50% Packing for Bundles	+50% for MISC spacing needs	Available Space
Red Path IP to pRICH Inner face					
Total	6003	853.72	1280.58		1800.00
Red Path From pRICH to EEEMCAL Inner face					
Total	7244	1290.06	1935.10	2418.87	2240.00
Red Path From EEEMCAL to Flux Return Bars					
Total	20158	2867.21	4300.81	5483.67	9650.97
Orange Path From IP to AC-LGAD Disk					
Total	5499	759.74	1139.61		1998.05
Orange Path From AC-LGAD disk to Aerogel					
Total	7735	1559.01	2338.51	1894.25	4084.07
Orange Path From dRICH Aerogel to Dogbones					
Total	8311	1597.23	2395.84	1980.25	3965.46
Orange Path From 4 to 5					
Total	12801	2274.49	3411.74	3504.09	12189.38







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