ESB & DAQ

Progress Report

Z. Papandreou

BIC General Meeting

March 14, 2025

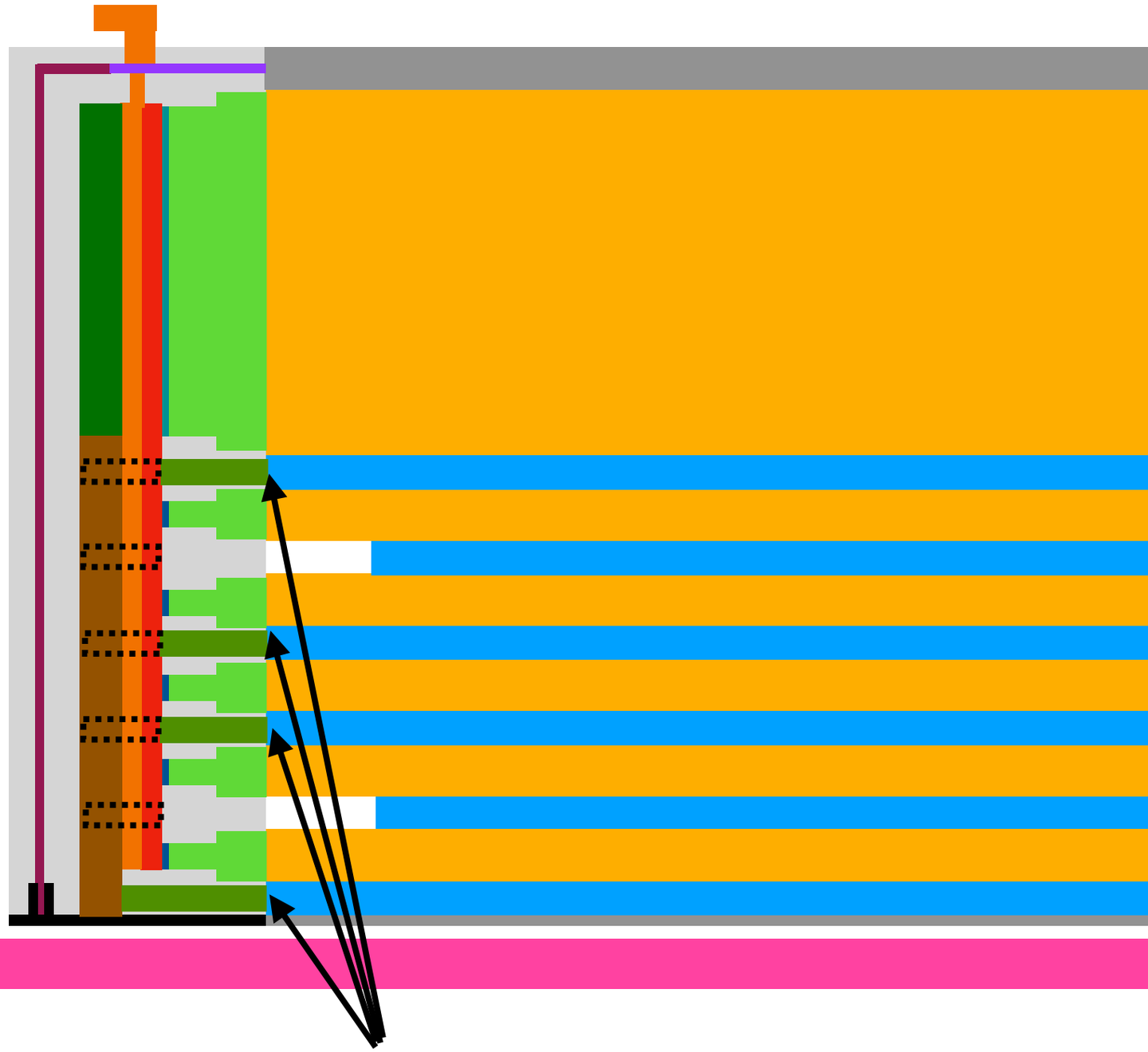
ESB Napkin Sketch - Electron End

Legend:

PbScFi
Astropix
Light Guides
Cookies
SiPMs
Cooling

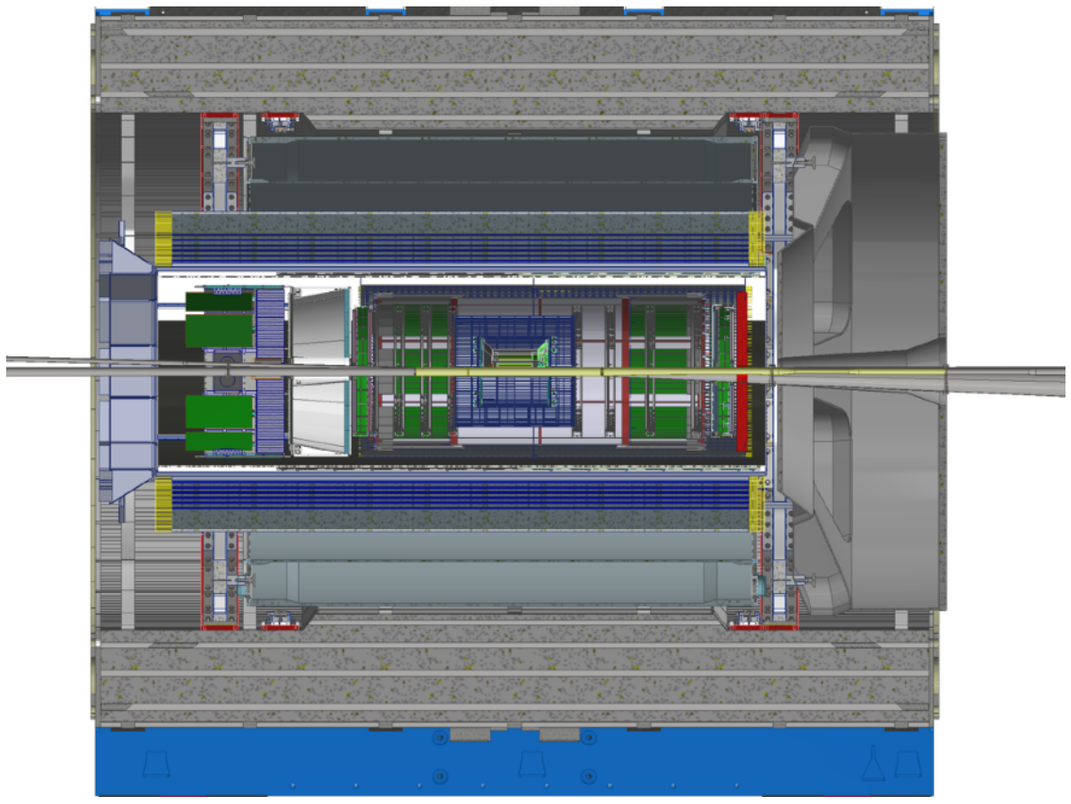
CALOROC
ETC
ETC cable
Top plate
Bottom plate
End plate

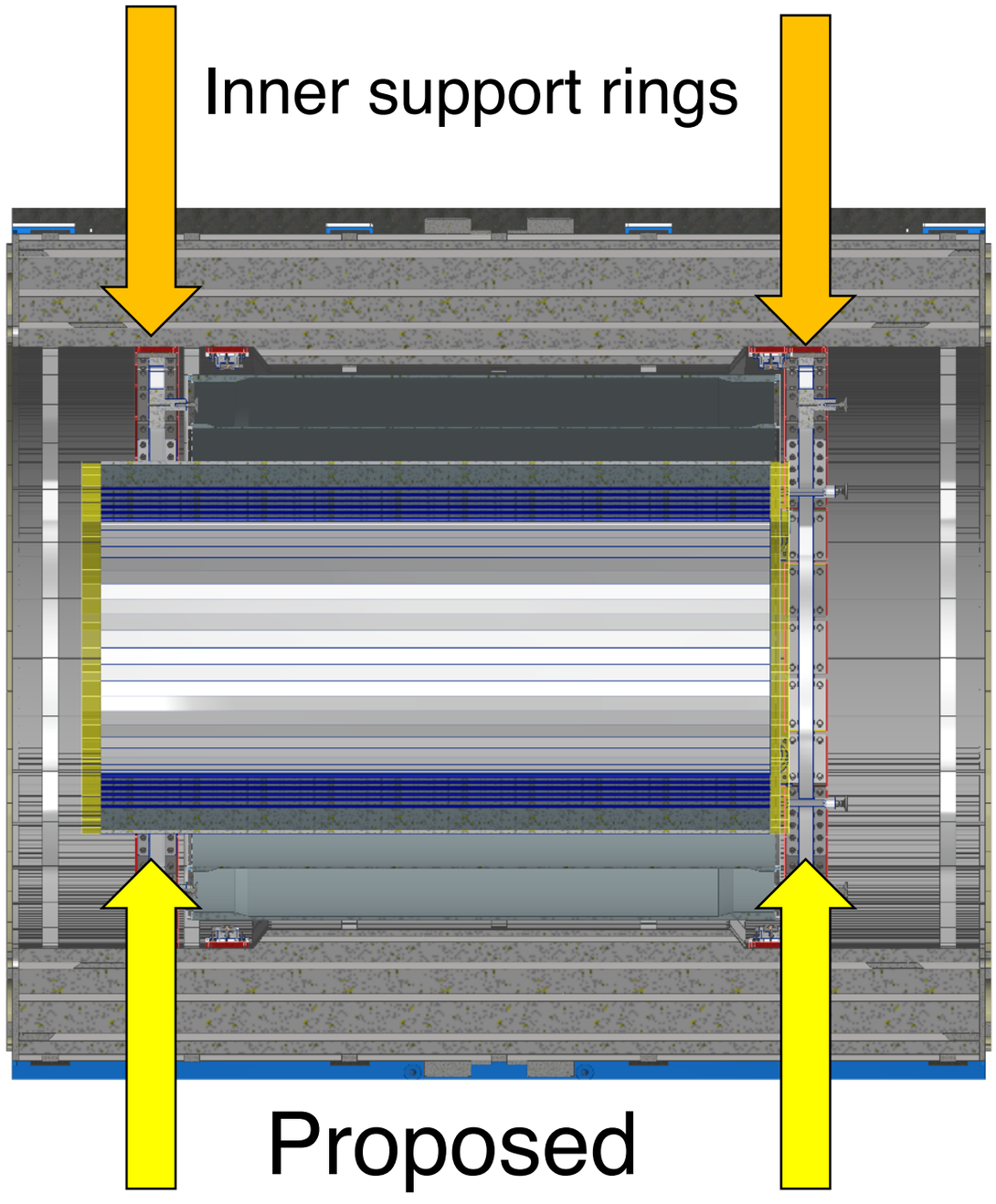
(Nasty)
DIRC



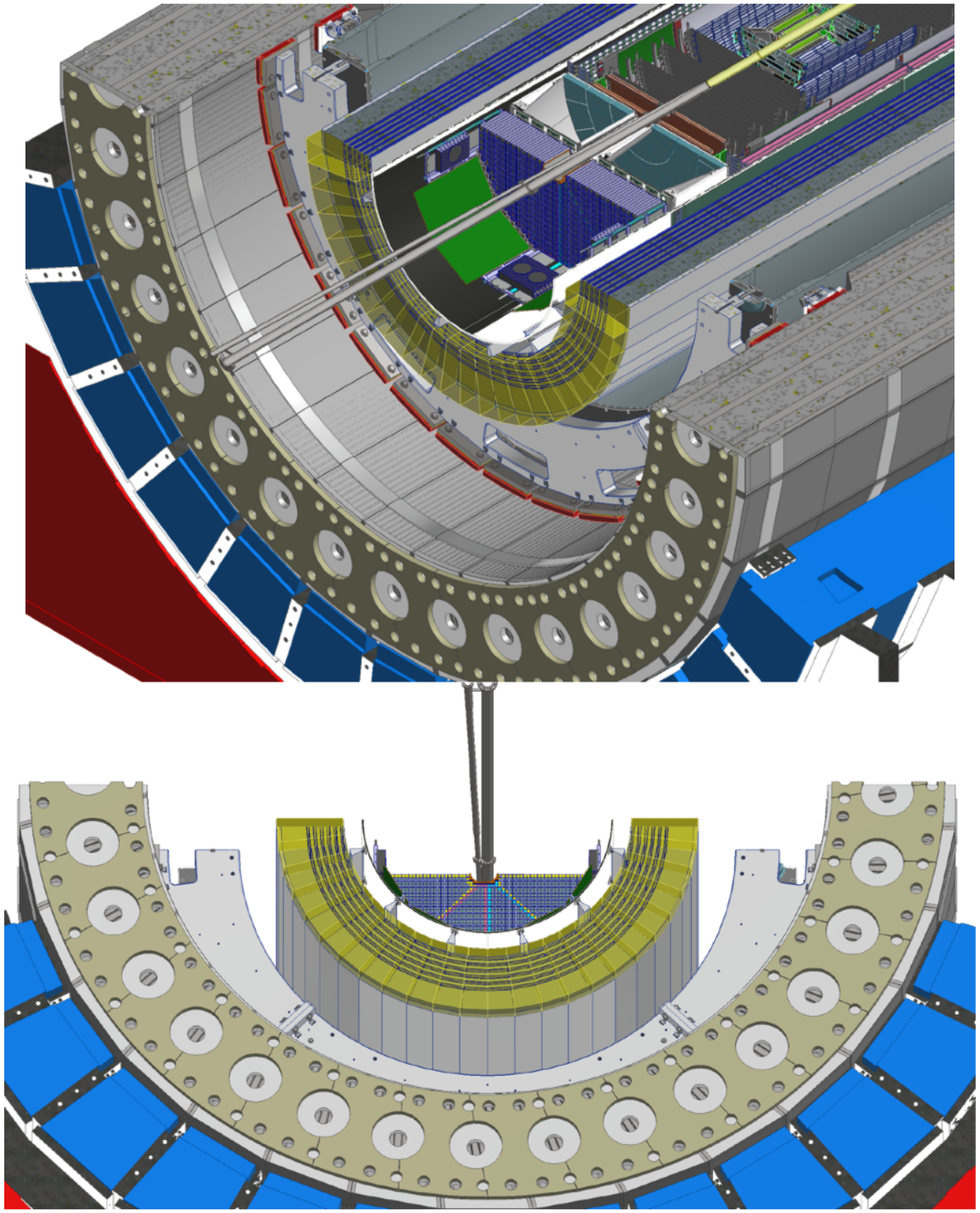
Sylvester & Zisis, March 4, 2025

BNL Project Drawings

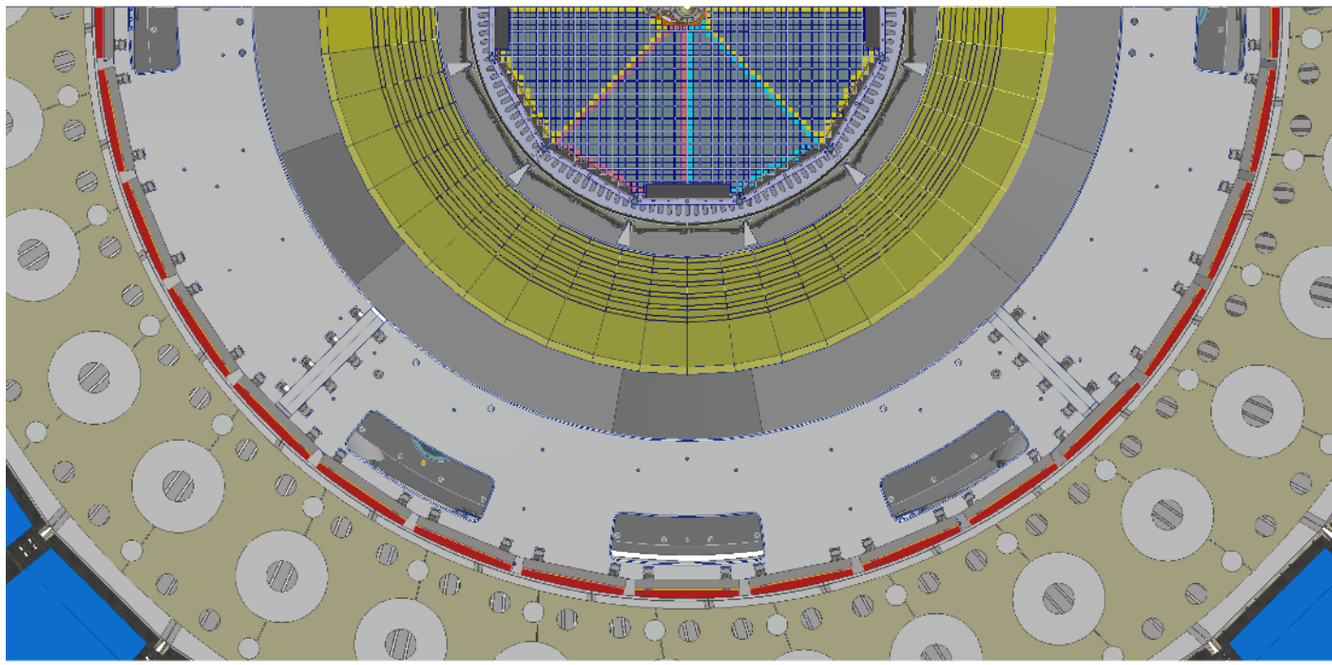




BNL Project Drawings

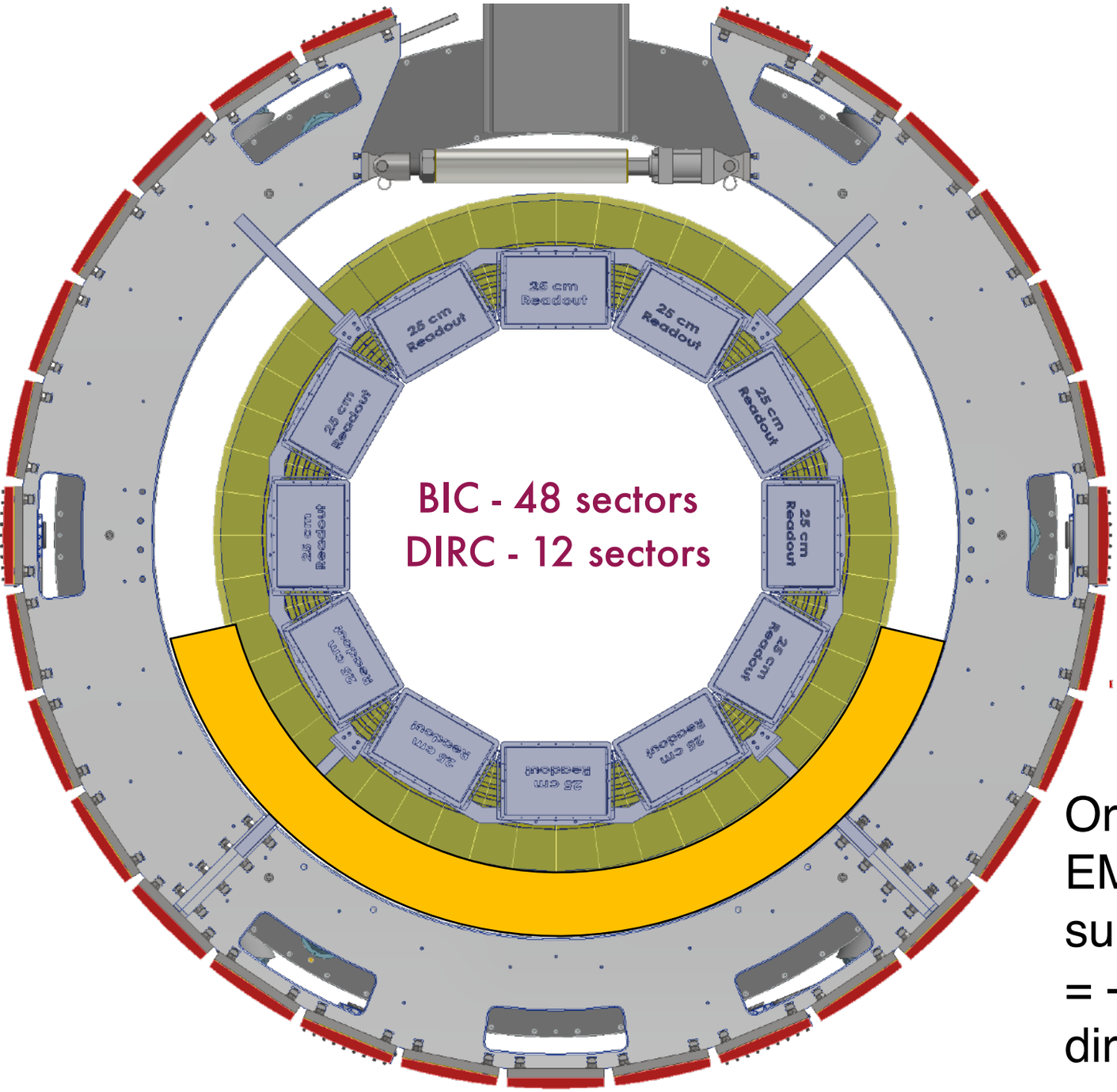


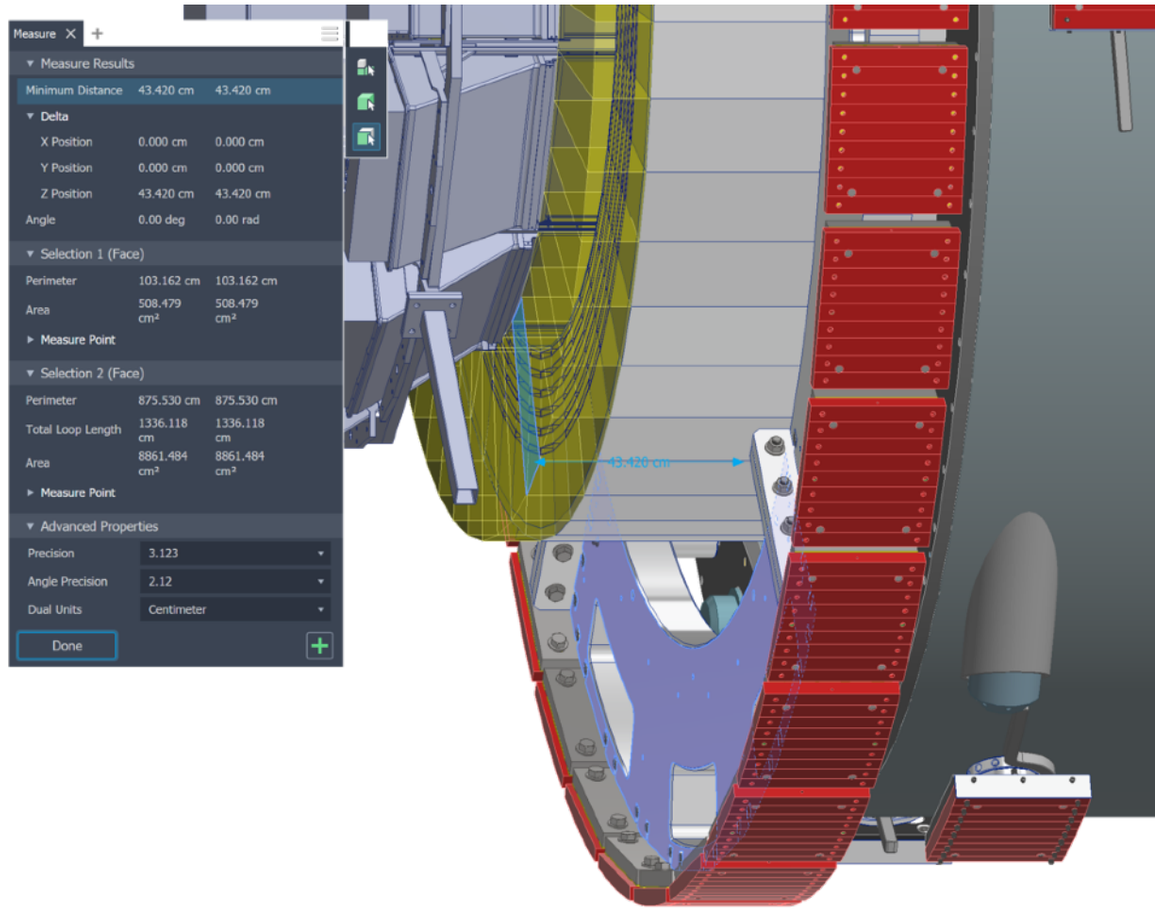
Backward end views



Roland Wimmer, BNL, February 28, 2025

BNL Project Drawings

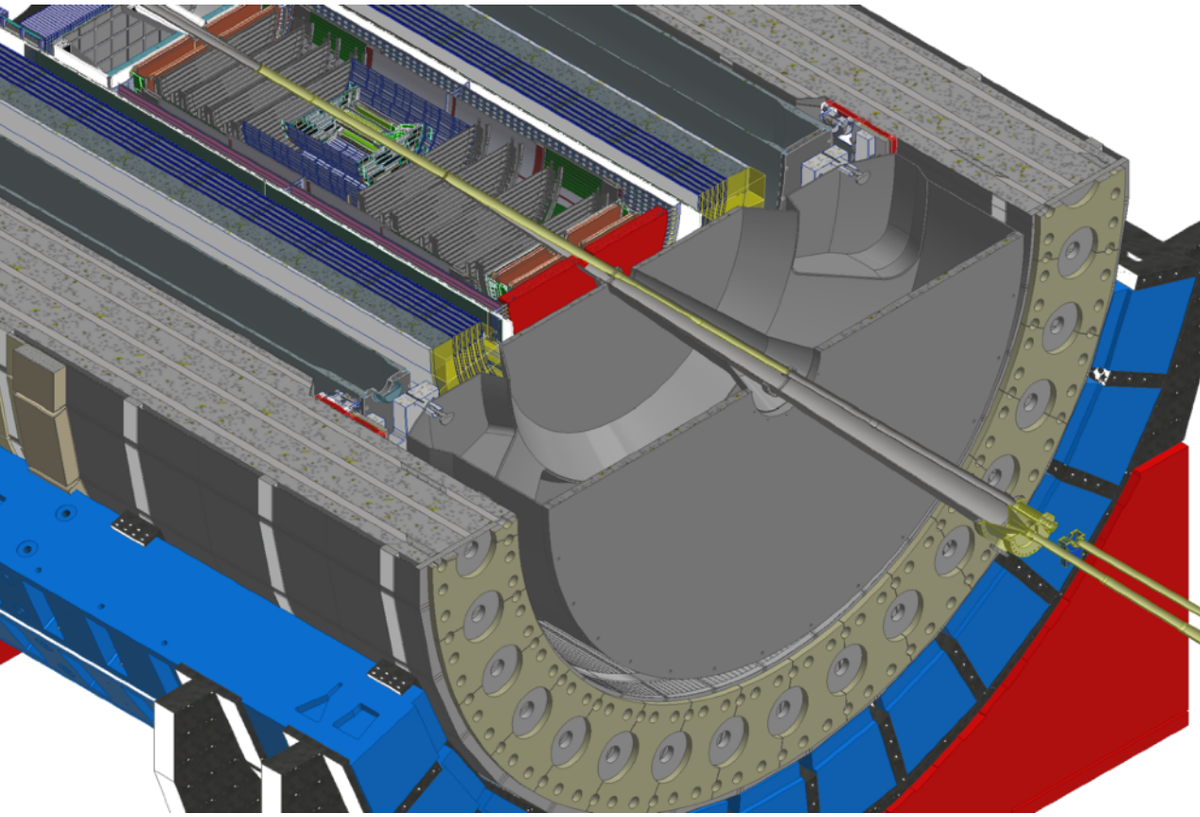




Orange is proposed support location. The EMCAL supports would sit on top of the inner support rings. The inner support rings sit at Z = -217.17 cm to -227.33 cm in the backward direction and Z = 194.310 cm to Z = 204.470 cm in the forward direction. **In the backward direction the support will be simple and will support the EMCAL directly from the inner support rings. DIRC is an issue.**

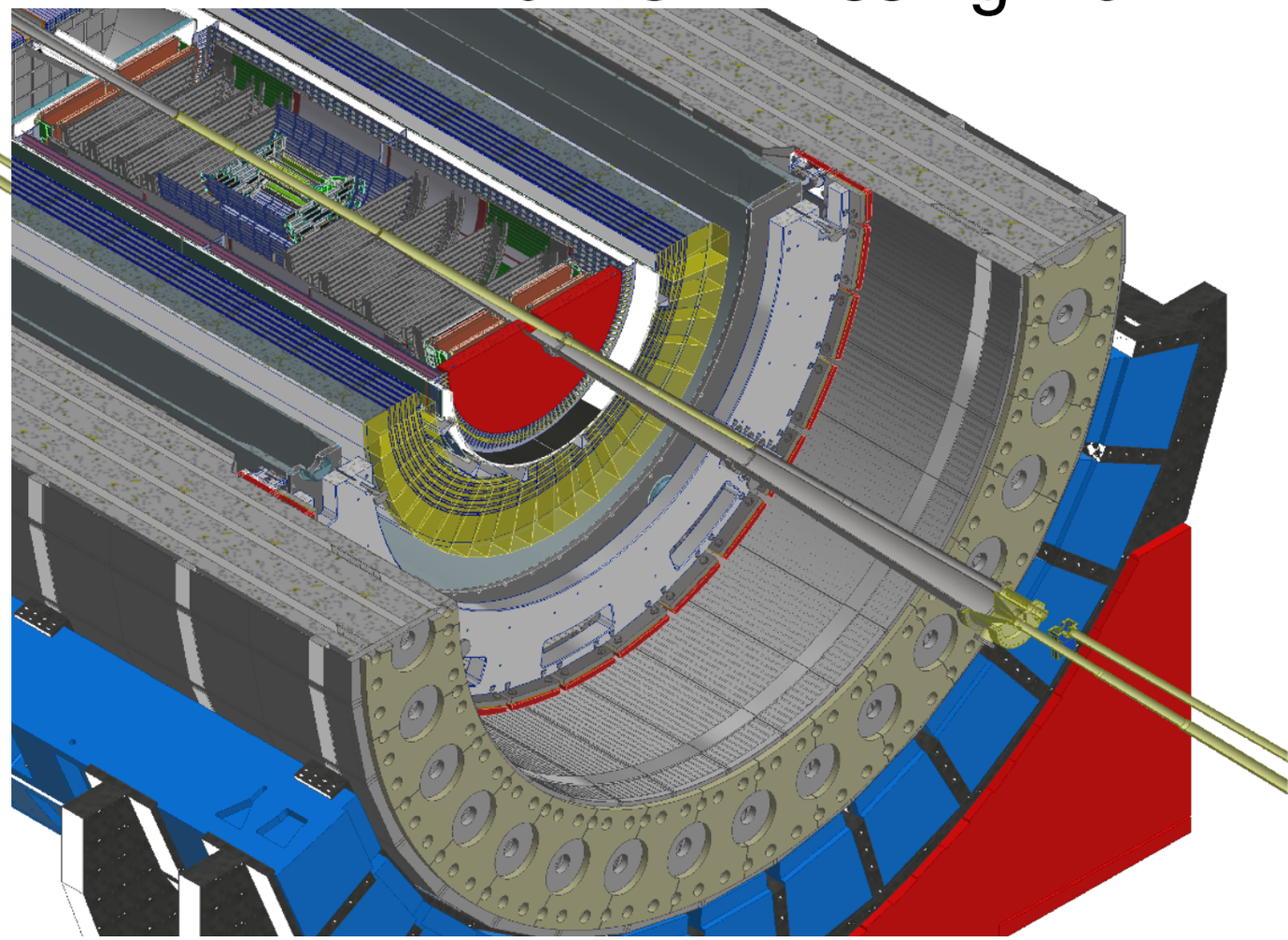
Roland Wimmer, BNL, February 28, 2025

BNL Project Drawings



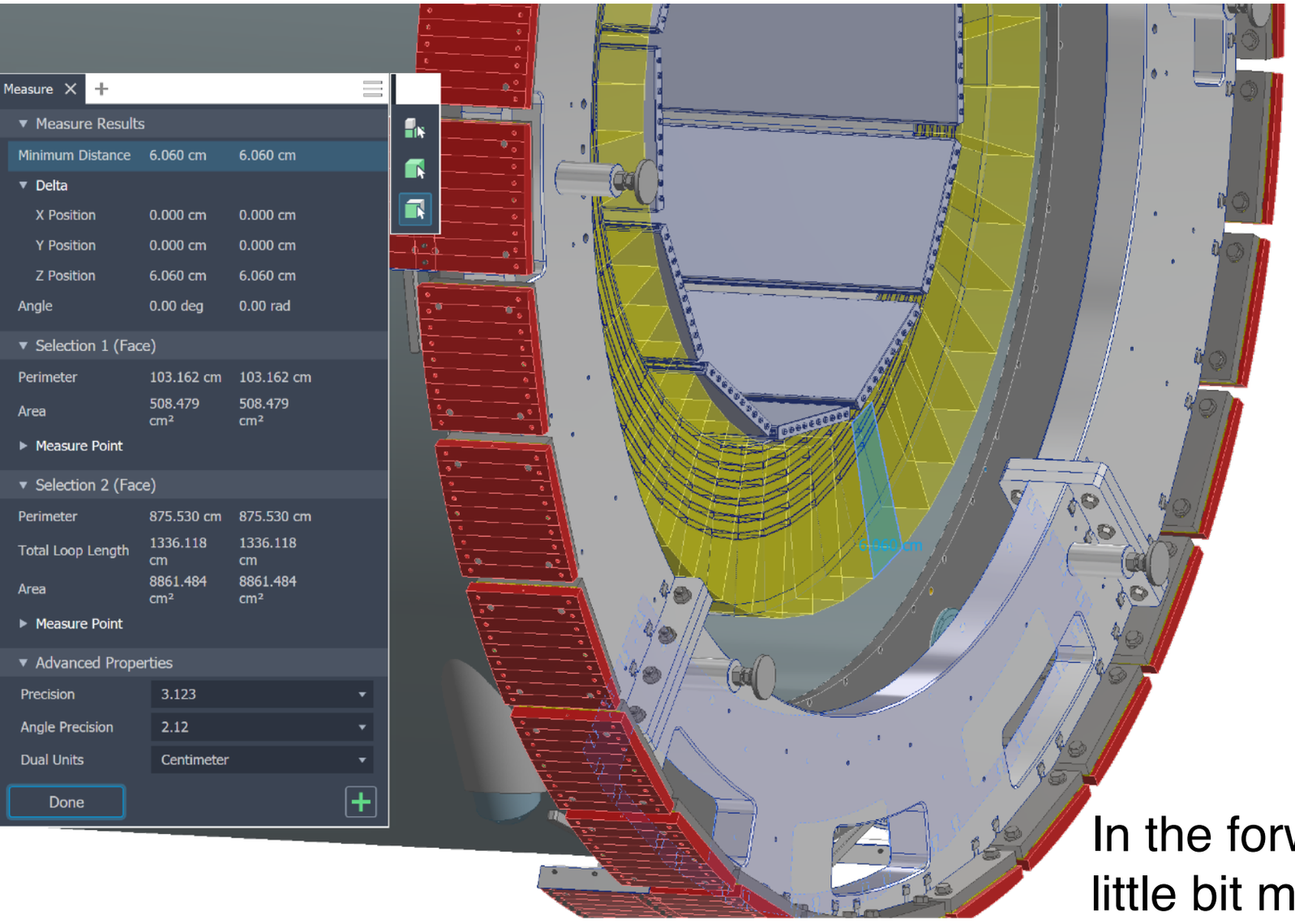
Forward end views

dRICH missing view



Roland Wimmer, BNL, February 28, 2025

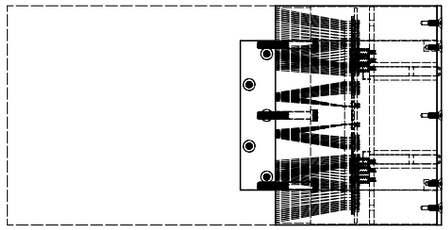
BNL Project Drawings

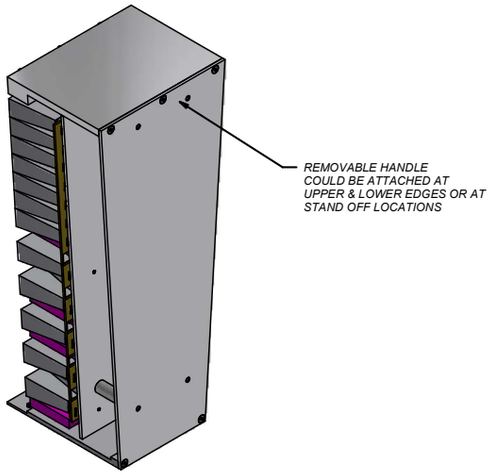


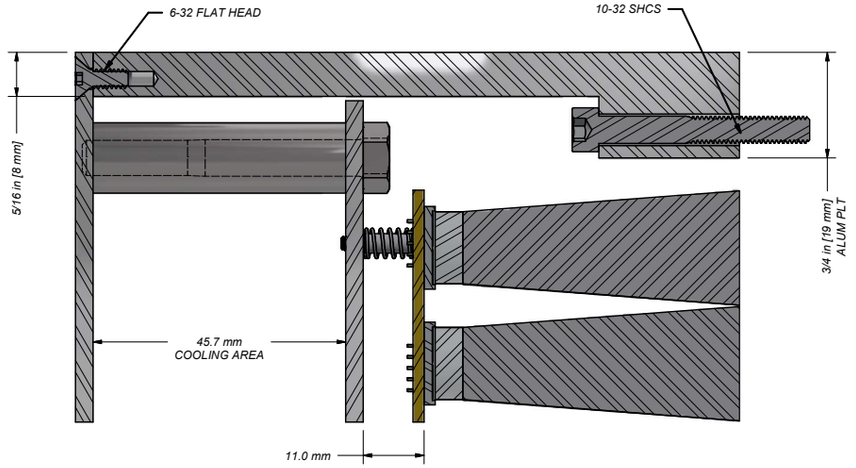
In the forward direction the support will be a little bit more complicated due to the support ring being past the EMCAL in Z. **Moving the electronics outward radially may not be possible.**

Roland Wimmer, BNL, February 28, 2025

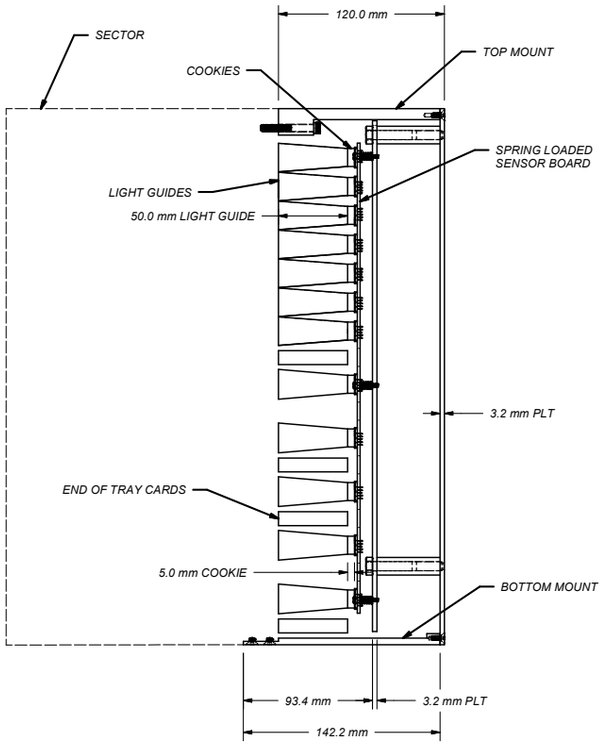
ESB Design - Concept 1 - Hadron End

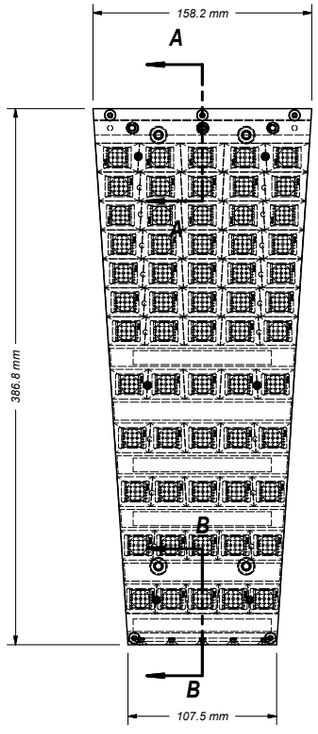


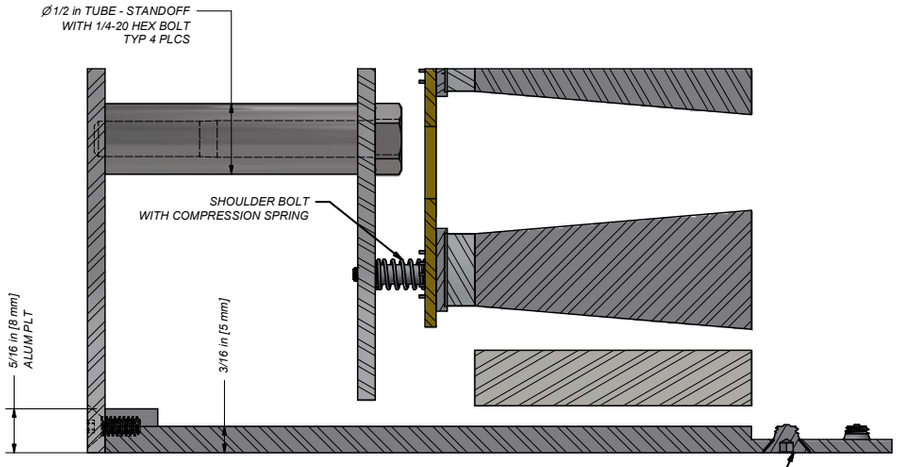




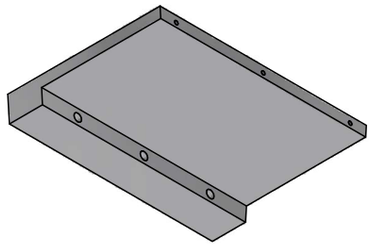
SECTION A-A



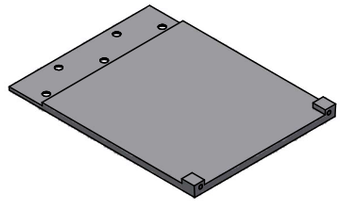




SECTION B-B



TOP MOUNT



BOTTOM MOUNT

END OF SECTOR BOX - COMPACTION CONCEPT 1

ESB removed along length

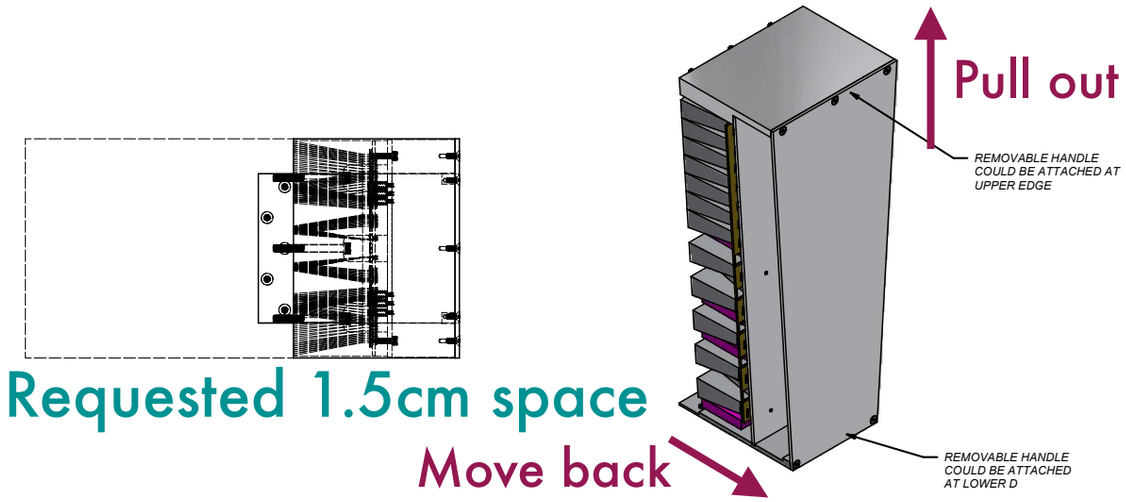
REV	DESCRIPTION	DATE	REV BY	APVD BY
A	RELEASE FOR APPROVAL	04/DEC/2024	SGM	Z.P.

MANUFACTURING TOLERANCES - U.N.O.
SAW - ± 1/16 | DRILL DIA. - ±1/64Ø
TORCH - ±1/8 | DRILL LOC. - ±1/32
FAB - ±1/16 | ANGLE - ±1°
MACHINING TOLERANCES - U.N.O.
CONCENTRICITY: 0.003 T.I.R. | MACHINING
BREAK EDGES: 0.015 x 45° | NOM. ±0.015
Min. RADIUS: 0.010 | .XXX - ±0.005
SURFACE FINISH 125 | .XXXX - ±0.0005
ANGLE: ±0.1°

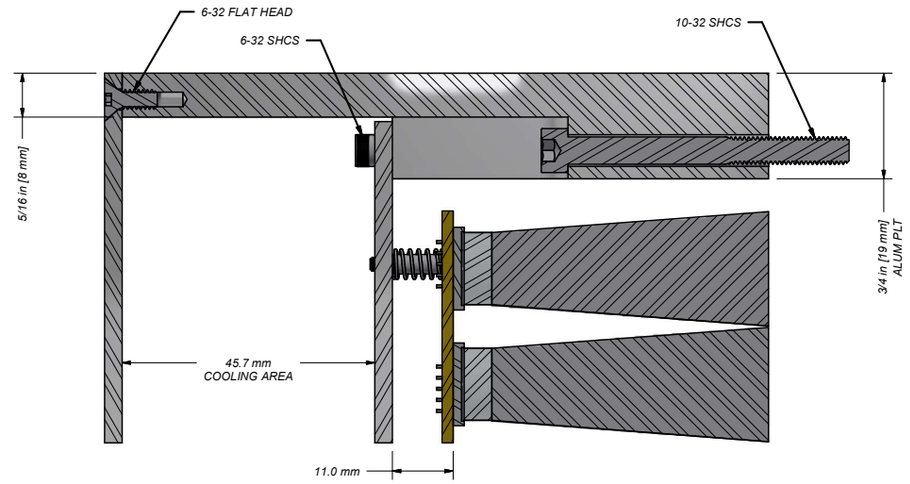
ROSS MACHINE SHOP
DRAWN BY: MB | DATE: 11/6/2024
SCALE: 1 / 4 | SIZE: A3 | DWG NO:

CUSTOMER: U of R
PROJECT: BIC DETECTOR SECTOR ESB COMPACTION CONCEPT 1
FILE #: 71485-101 | REV: A

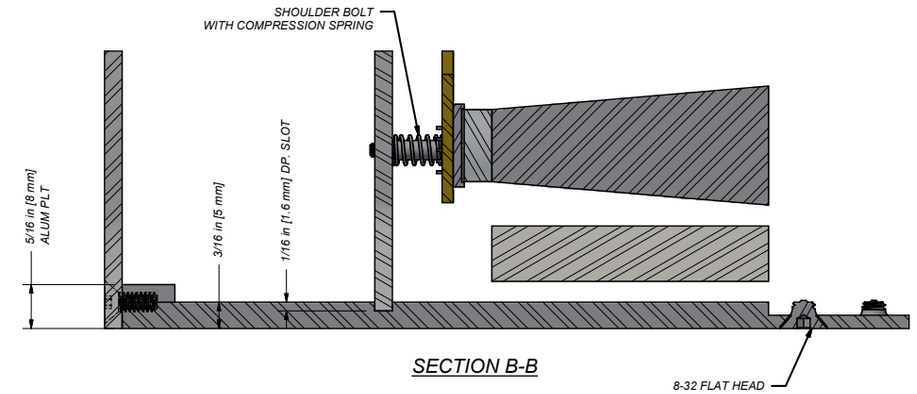
ESB Design - Concept 2: Electron End



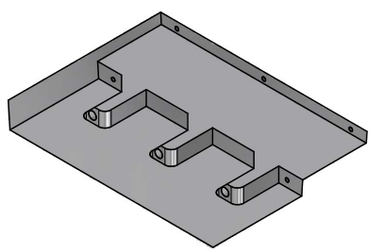
END OF SECTOR BOX - COMPACTION CONCEPT 2



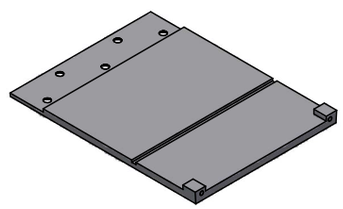
SECTION A-A



SECTION B-B



TOP MOUNT



BOTTOM MOUNT

ESB removed along radius

REV	DESCRIPTION	DATE	REV BY	APVD BY
A	RELEASE FOR APPROVAL	03/DEC/2024	SGM	Z.P.

MANUFACTURING TOLERANCES - U.N.O.
SAW - ± 1/16 | DRILL DIA. - ±1/64Ø
TORCH - ±1/8 | DRILL LOC. - ±1/32
FAB - ±1/16 | ANGLE - ±1°
MACHINING TOLERANCES - U.N.O.
CONCENTRICITY: 0.003 T.I.R. | MACHINING
BREAK EDGES: 0.015 x 45° | NOM. ±0.015
Min. RADIUS: 0.010 | .XXX - ±0.005
SURFACE FINISH | .XXXX - ±0.0005
ANGLE: ±0.1°

ROSS MACHINE SHOP

CUSTOMER	U of R
PROJECT	BIC DETECTOR SECTOR ESB COMPACTION CONCEPT 2
DRAWN BY	MB
DATE	11/6/2024
SCALE	1 / 4
FILE #	71485-102
REV	A

M&S

- New tooling received by RMS.
  - 10 new LGs will be made next, and compared to those for SFILs
- New order will be placed to Eljen for 3-mm and 2-mm thick cookie sheets.
- Waiting for Hamamatsu quote on 130 S14 SiPMs.

Different degrees of polish

New diamond-carbide cutter

ESB Design - Cooling

- Manitoba will look at: a) thermal conduction of Astropix through the lead SciFi and b) ESB cooling for SiPM stability and ETC and CALOROC heat removal.
- Use thermal pad or metal-core PCB for implementation of a single copper line.
- Forced air in the ESB?
- Ross Machine Shop can build the cooling lines. Assuming a cooling snake that runs by all the SiPMs, we could fit a 1-cm-diameter copper line between SiPM rows.
- NASA: roughly 1 W per ETC card (the FPGA basically), so 4 W per box; Connector at the end of each the Astropix tray, then we can use cables to go to the ETC cards which could sit in the volume under the CALOROC and receive heat removal from the pad or metal-core PCB.
- Aram says that assuming his SiPM summing and amplification, 8 W total per ESB box.
- HGCROC chip: 4W each and operate at 40 C without cooling (from interface document)

BIC in-person meeting: ESB session April 10, 2025

12:00 **Lunch**

D172, Building 241 12:00 - 13:30

13:00 **ESB Design and Interfaces** *Zisis Papandreou*

D172, Building 241 13:30 - 13:50

ESB Cooling

D172, Building 241 13:50 - 14:00

14:00 **HGCROC Readout** *Norbert Novitzky*

D172, Building 241 14:00 - 14:20

ETC Design Interfaces

D172, Building 241 14:20 - 14:40

ESB & DAQ PDR and future plans (deliverables)

D172, Building 241 14:40 - 15:00

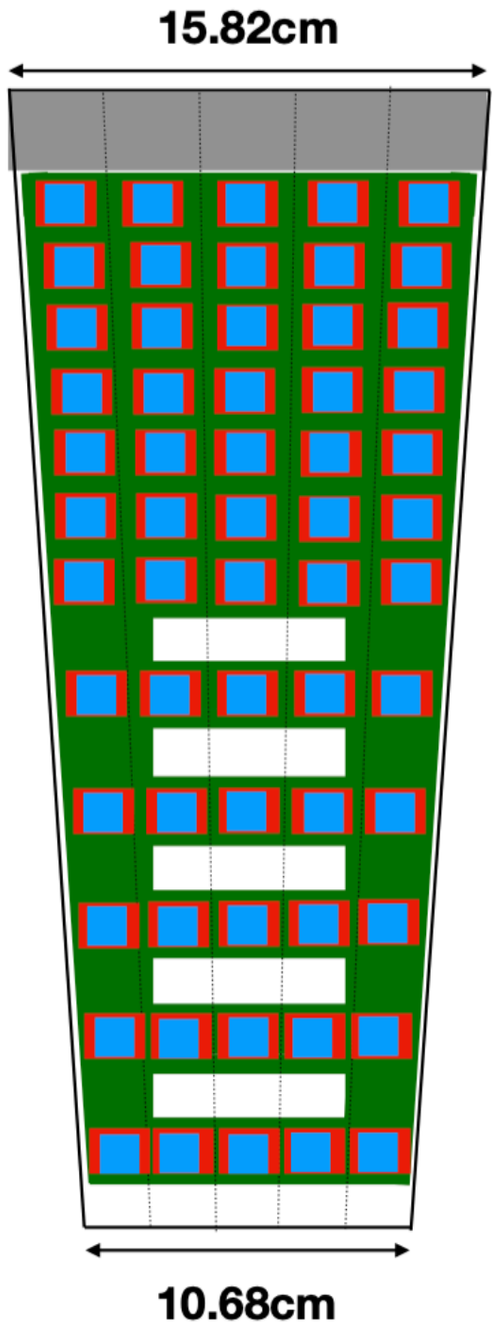
15:00 **Break**

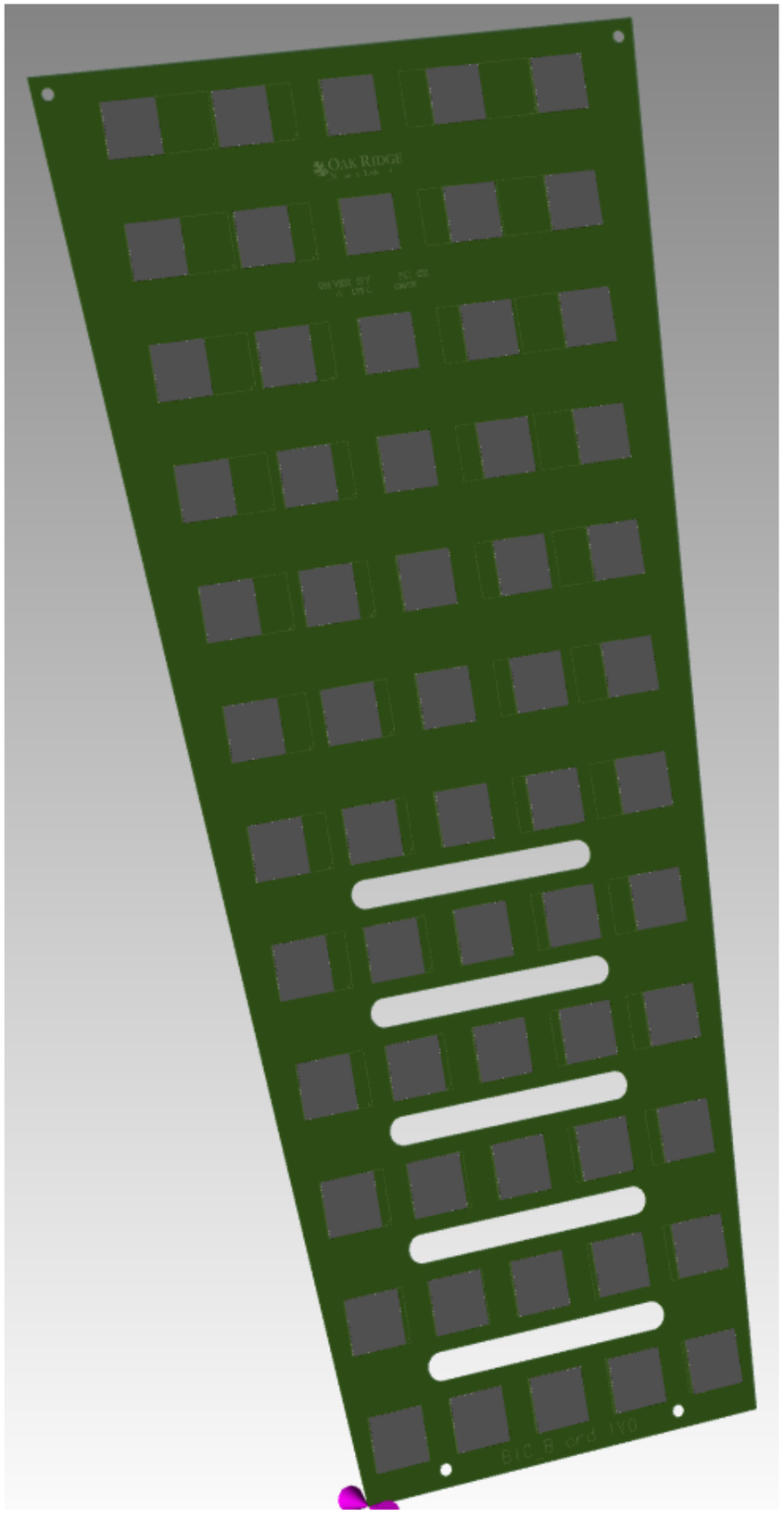
D172, Building 241 15:00 - 15:30

Summary

- **ESB Bi-weekly meetings, 8am CDT** (alternating weeks with System Testing at same time slot)
- **ESB design advancing but lots to do:**
  - ESB-BabyBCAL (Apr 2025), ESB-BIC (Nov 2025)
  - CALOROC: ORNL
  - ETCs: NASA / ANL / Regina
  - Cooling: Manitoba / Regina
- Merlin Project Schedule, Spreadsheets, Cooling
- R&D day April 16-17 / Project Review August

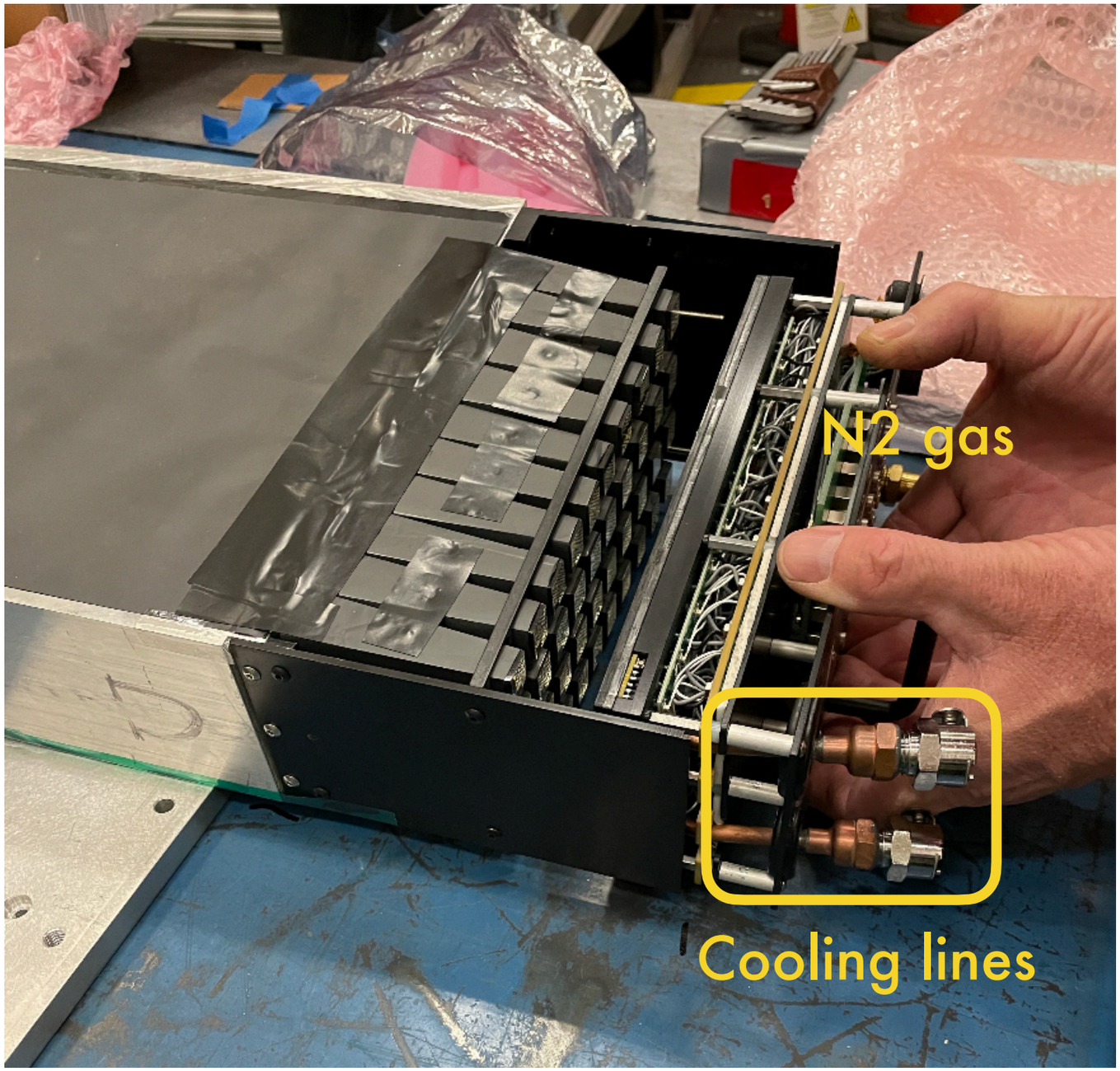
Backup slides





Testing at ORNL

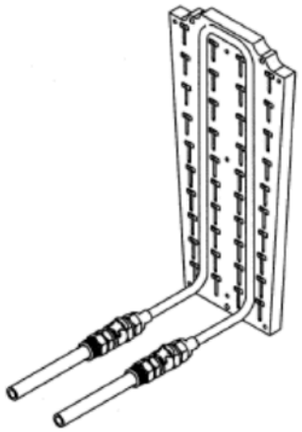
BCAL "Wedges"

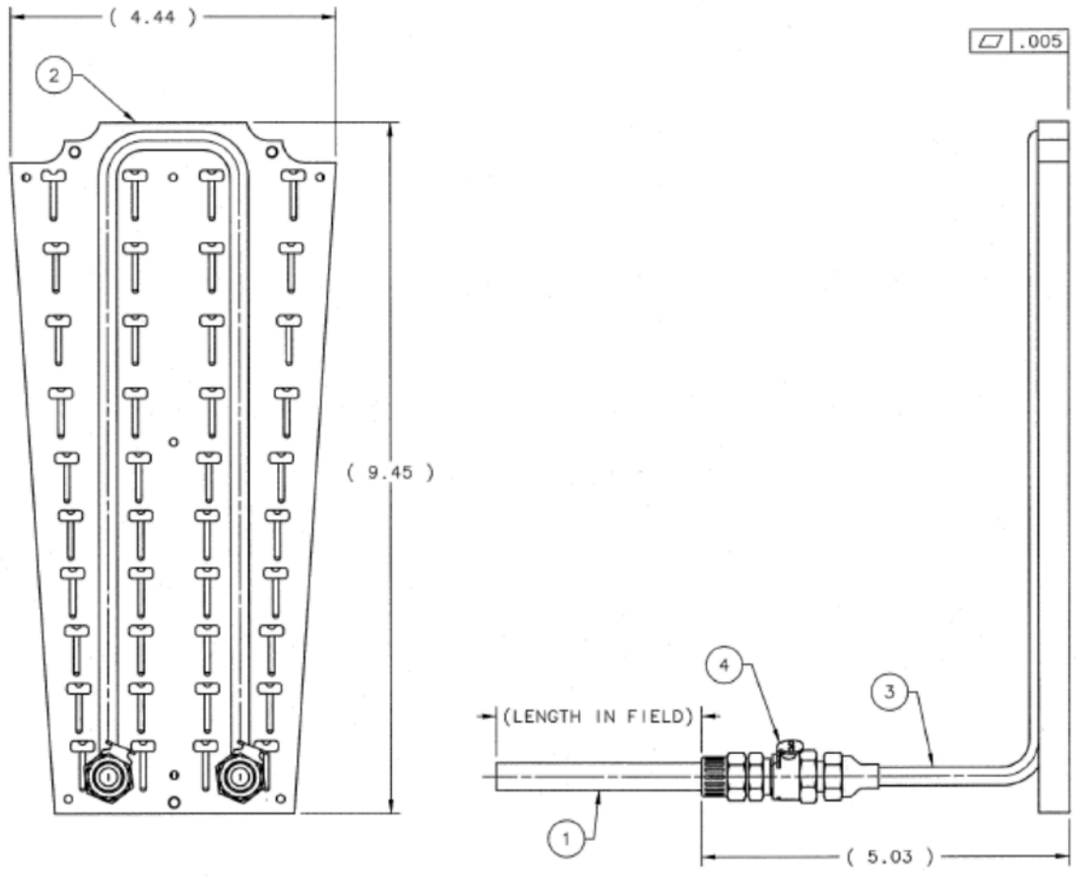


- Contiguous LG stacking
- LG-SiPM air gap
- BIC: Si cookie
- Spring loading
- Integrated ESB for installation ease

Cooling Assembly

REVISION HISTORY				
ZONE	REV	DESCRIPTION	DATE	APPROVED





NOTES:

1. SUGGESTED SOURCES OR JLAB APPROVED ALTERNATE:

   COLDER PRODUCTS COMPANY
   1-800-444-2474
   www.colder.com

2. SOLDER ITEM 2 TO ITEM 3 IN SUCH A WAY TO ENSURE GOOD THERMAL AND MECHANICAL CONTACT.

4. SOLDERING ITEMS 2 & 3 TOGETHER USING 50/50 TIN-LEAD SOLDER WITH GENERAL PURPOSE FLUX USING ANY STANDARD SOLDERING PROCESS.

5. PROCESS SHOULD ENSURE COMPONENT TEMPERATURES ARE MAINTAINED BELOW 800°F.

6. THOROUGHLY CLEAN ALL FLUXES WITH APPROPRIATE METHODS TO ENSURE REMAINING FLUX IS COMPLETELY REMOVED OR RENDERED NON-CORROSIVE

7. LENGHT OF ITEM 1 TO BE DECIDED IN FIELD TO ALLOW FOR APPROPRIATE LENGTH AND THEN INSTALLED AS SHOWN.

QTY REQD	ITEM NO.	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SPECIFICATION	NOTES
2	4	COLDER PRODUCTS MCD1002	1/8 NPT VALVED COUPLING BODY	BRASS	1
1	3	D00000-01-07-2041	COOLING TUBE W/FITTINGS		
1	2	D00000-01-07-2040	COOLING PLATE		
2	1	D00000-01-07-1022	HOSE ASSY		

PARTS LIST

DOCUMENT CONTROL STAMP

MATERIAL: SEE PARTS LIST

FINISH: MACHINED SURFACES 125 UNLESS OTHERWISE NOTED
DEBURR & BREAK ALL SHARP EDGES

DO NOT SCALE DRAWING

DIM & TOL PER ASME Y14.5 - UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ± N/A | DECIMAL .X ± .1, .XX ± .01, .XXX ± .005 | ANGLES ± .50°

THIRD ANGLE PROJECTION

TRACKING NO. N/A

APPROVALS	DATE
DRAWN: C L HUTTON	01MAR11
CHECKED	21 MAR 11
APPROVED	21 MAR 11
APPROVED	21 MAR 11

United States Department of Energy — Jefferson Lab, Thomas Jefferson National Accelerator Facility — Newport News Virginia

HALL D - GLUEX DETECTOR
BARREL CALORIMETER
COOLING PLATE ASSY

SIZE D | DWG. NO. D00000-01-07-1021 | REV. –

SCALE 1:1 | USED ON ASSY NO. D00000-01-07-1011 | SHEET 1 OF 1