ESB Mechanical

Progress Report

Z. Papandreou

BIC Workshop

June 16, 2026

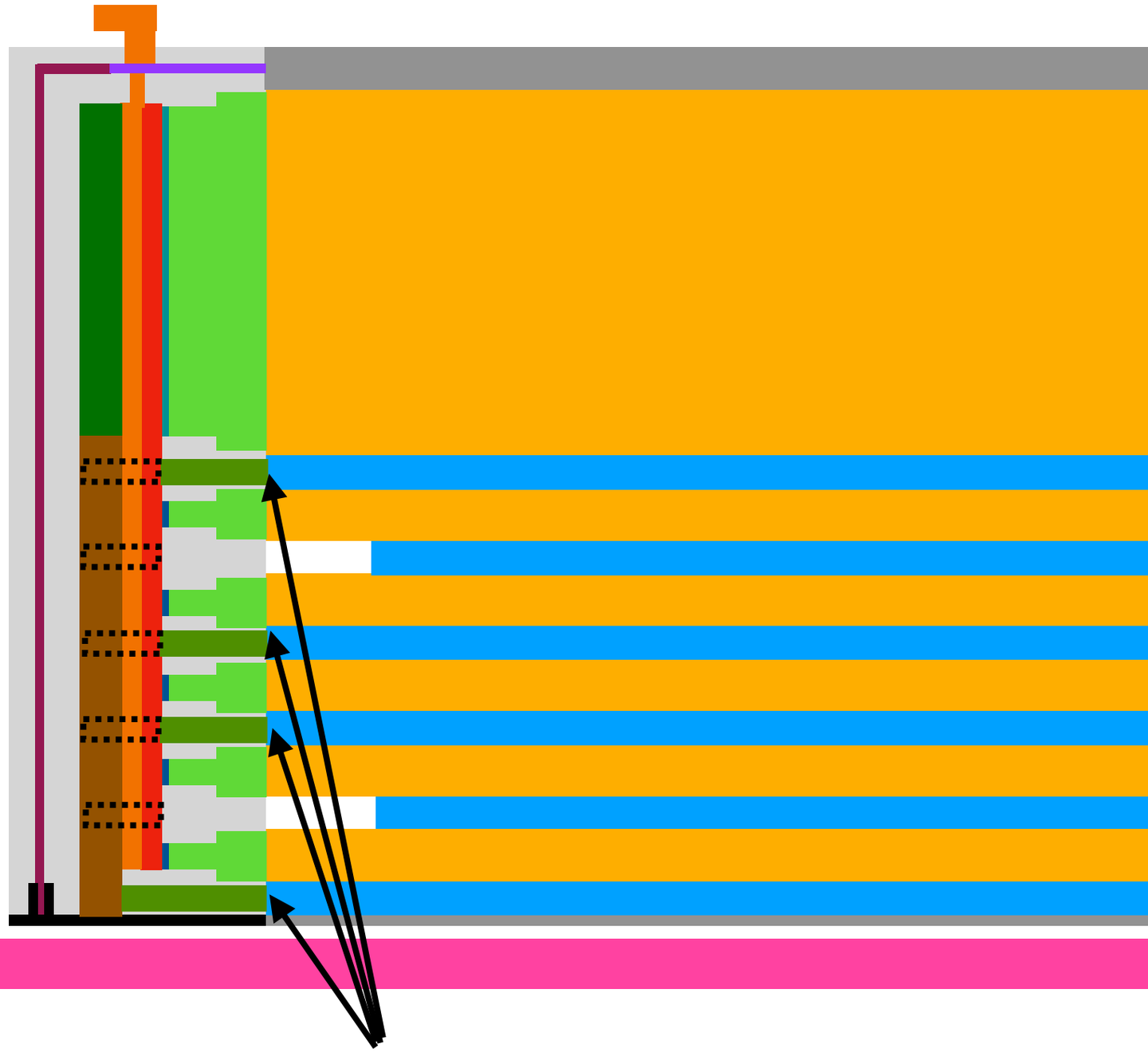
ESB Napkin Sketch - Electron End

Challenge in servicing

Legend:

PbScFi	CALOROC
Astropix	ETC
Light Guides	ETC cable
Cookies	Top plate
SiPMs	Bottom plate
Cooling	End plate

(Nasty) DIRC



ETC to Astropix connector

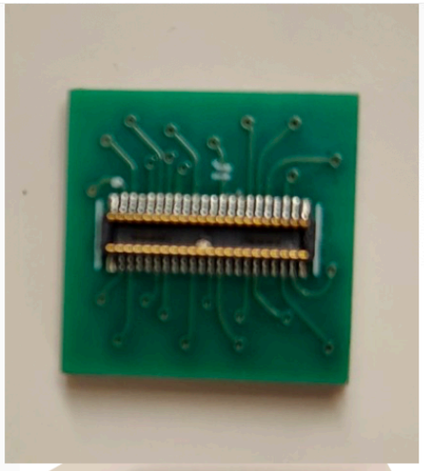
ETC window thru SiPM/Cooling layers

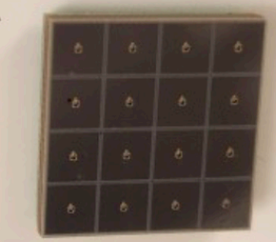
Sylvester & Zisis, March 4, 2025

Baby BCAL Box - Goals

- Mechanical interface to Baby BCAL
- Design v1 exists: no side panels
- August at Hall D/JLab:
  - Keep BCAL light guides
  - New Amp/Sum Uni-boards (easier to cool)
  - Connection/interface to HGCROC
  - Air cooling
  - Discuss needs for Rapid Access to Hall D

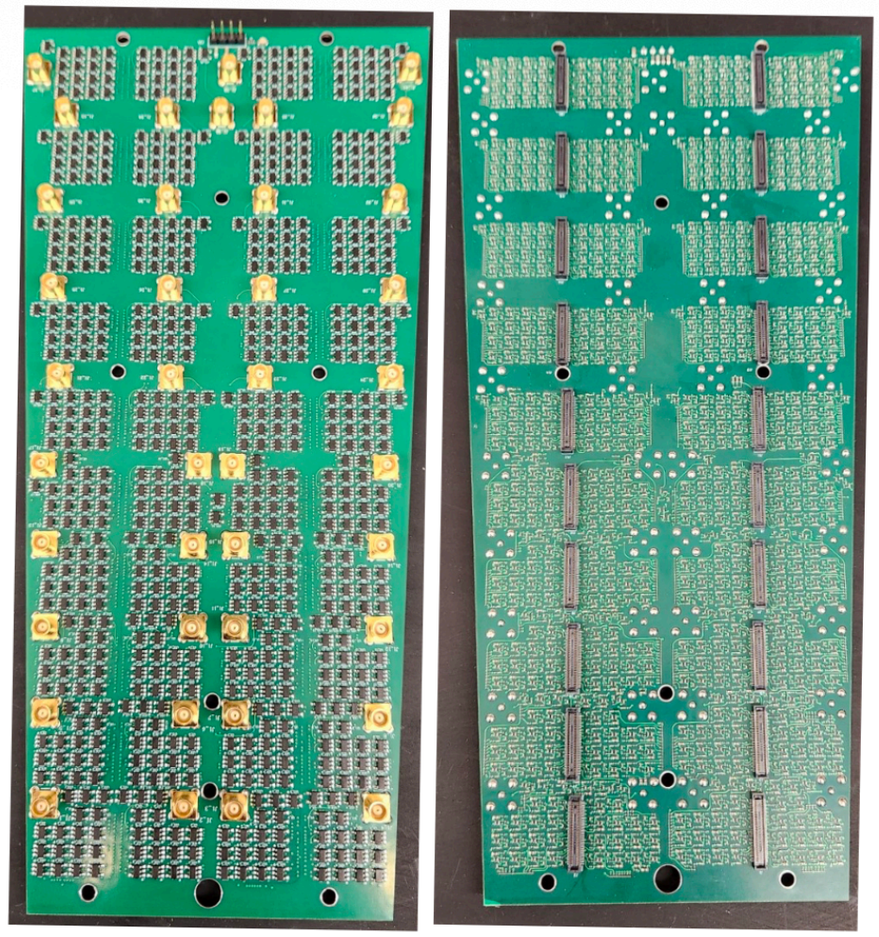
Baby BCAL Amp/Sum Apr-May 2025

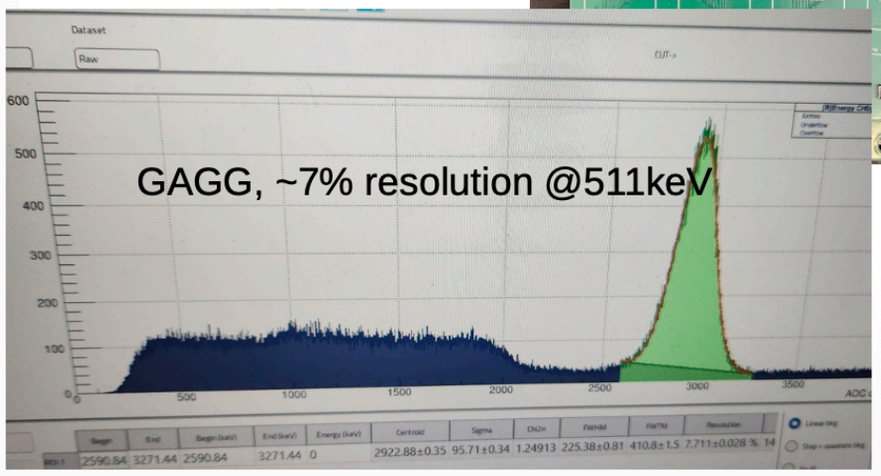




Mini-board

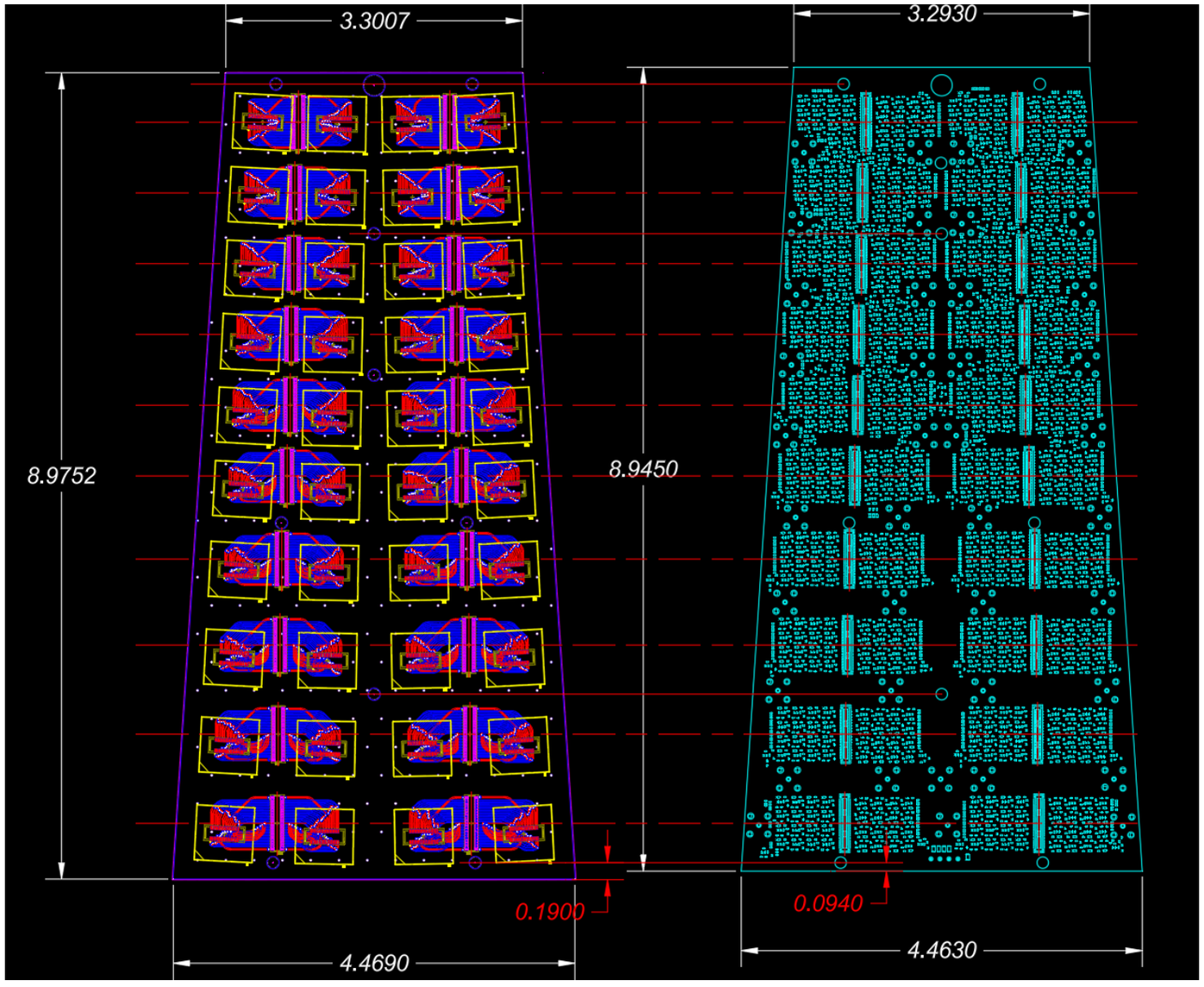
Baby BCAL readout based on 16 channel readout

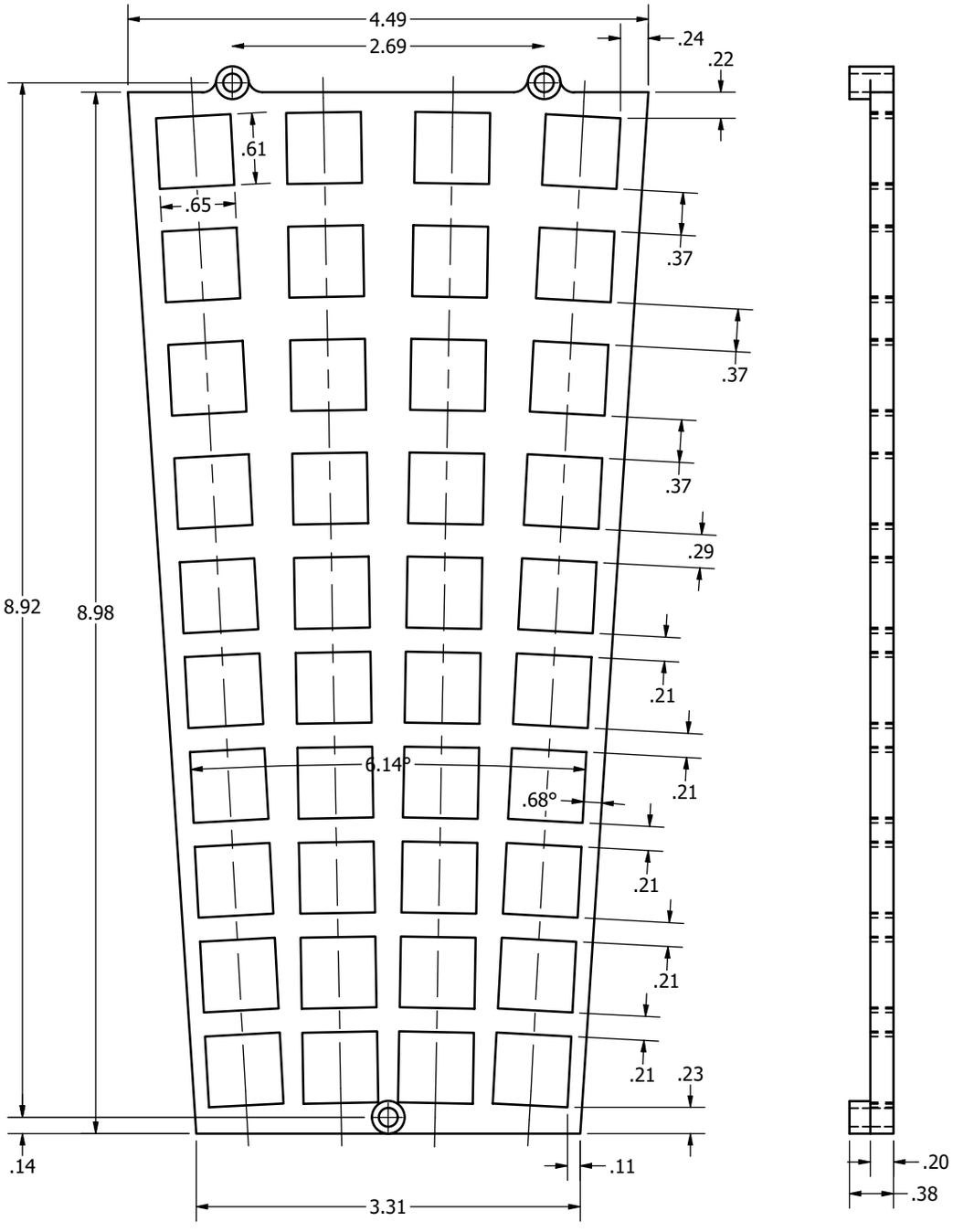




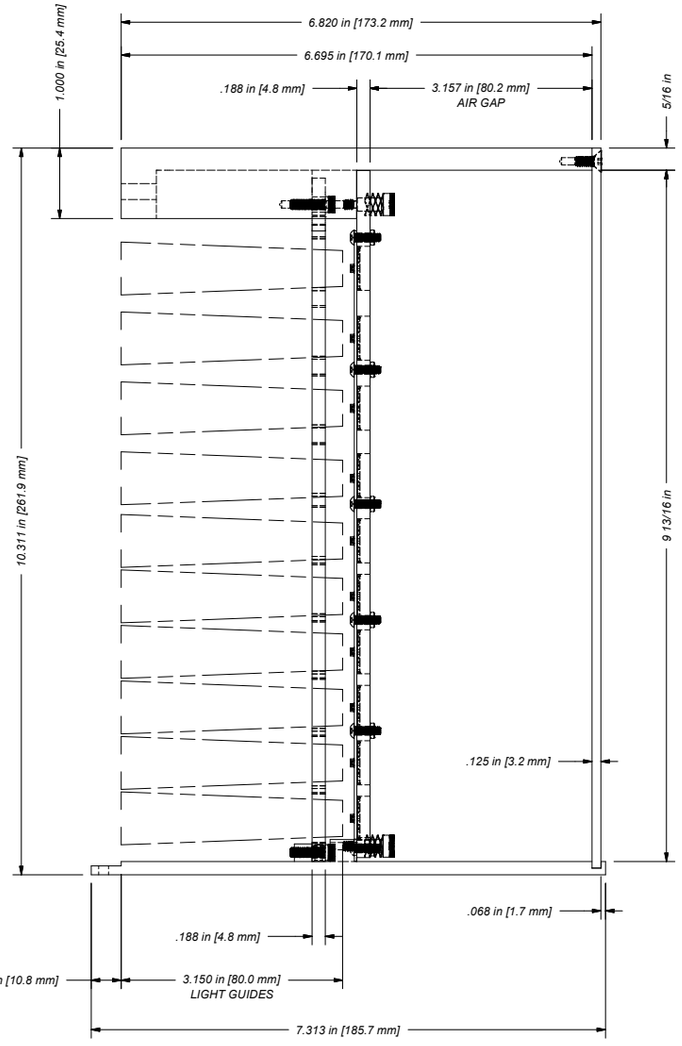
Amplifier board for 40 sipm arrays
16 channels each.
Only ~8W! For entire board

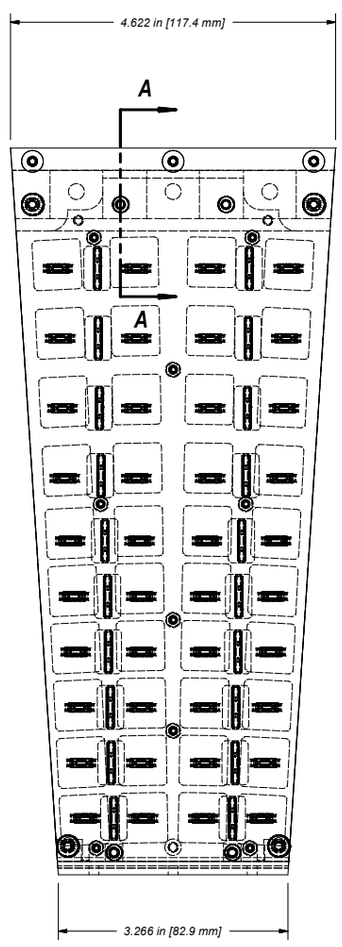
Baby BCAL Box - Design & 3D-print mockup



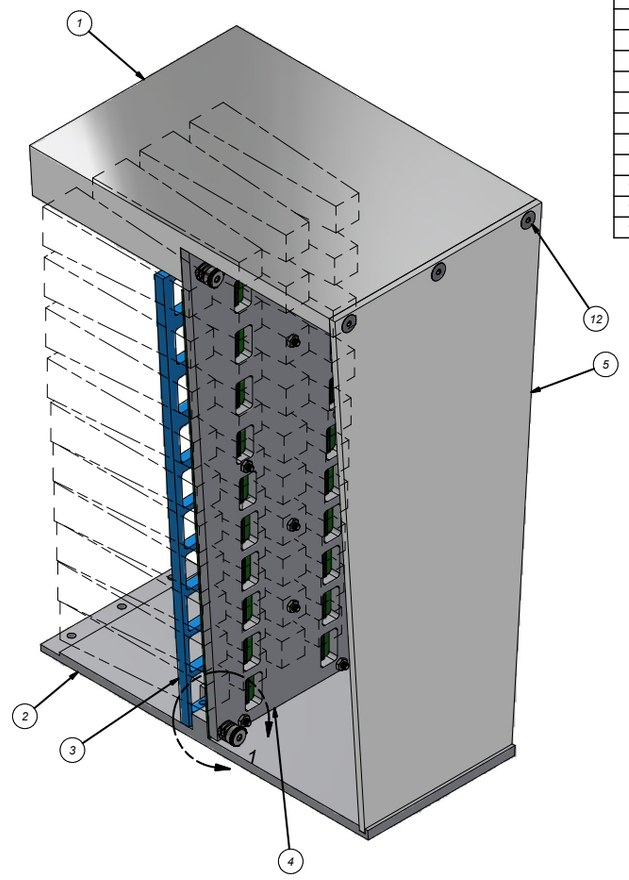


Baby BCAL Box - Design & 3D-print mockup

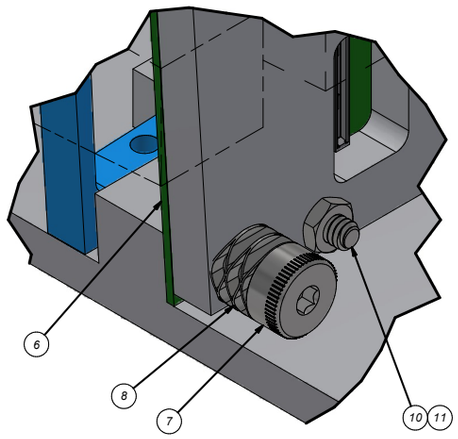




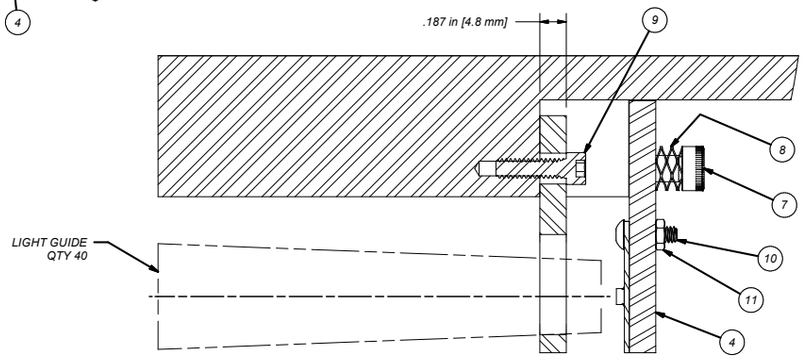
BABY BCAL EOSB ASSEMBLY



BILL OF MATERIALS			
ITEM	REF DWG	QTY	DESCRIPTION
1	RMS73047-2	1	UPPER MOUNT
2	RMS73047-3	1	LOWER MOUNT
3	RMS73047-4	1	CAGE PLATE
4	RMS73047-5	1	PCB MOUNT PLATE
5	RMS73047-6	1	COVER PLATE
6	-	1	PCB BOARD (BY OTHERS)
7		4	6-32 Ø3/16 SHOULDER SCREW 3/8" LG. McMASTER-CARR# 97345A331
8		4	3LB STACKED WAVE SPRING McMASTER-CARR #3741N138
9		4	6-32 SOCKET HEAD SCREW - 1/2" LG.
10		9	4-40 SOCKET HEAD SCREW - 3/8" LG.
11		9	4-40 NARROW PROFILE HEX NUT
12		3	6-32 HEX DRIVE FLAT HEAD - 3/8" LG.



DETAIL 1
SCALE 2:1



SECTION A-A
SCALE 1:1

REV	DESCRIPTION	DATE	REV BY	APVD BY
A	RELEASE FOR APPROVAL	25/AUG/2025	SGM	

MANUFACTURING TOLERANCES - U.N.O.
SAW - ± 1/16 | DRILL DIA. - ±1/64Ø
TORCH - ±1/8 | DRILL LOC. - ±1/32
FAB - ±1/16 | ANGLE - ±1°

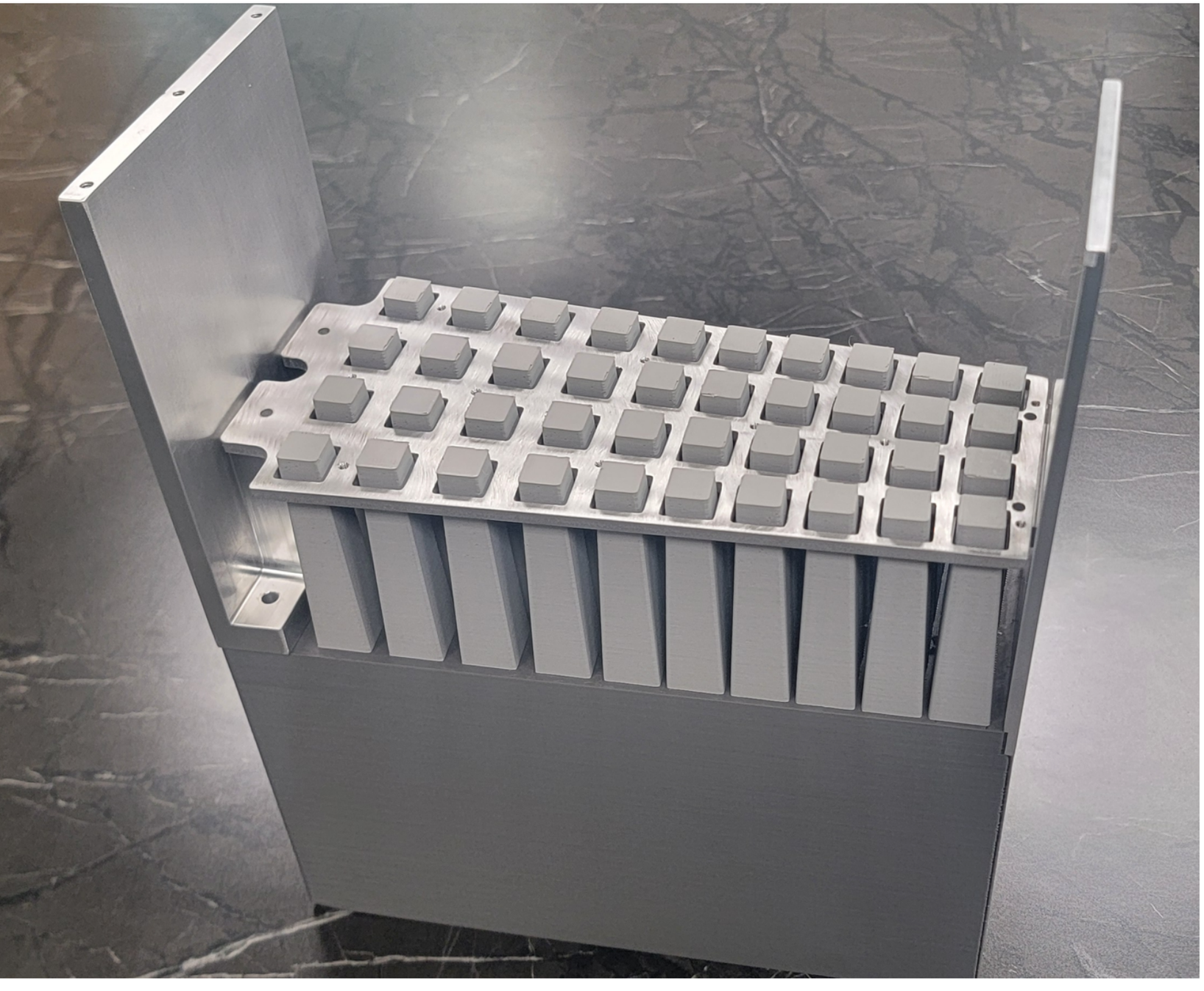
MACHINING TOLERANCES - U.N.O.
CONCENTRICITY: 0.003 T.I.R. | MACHINING
BREAK EDGES: 0.015 x 45° | NOM. ±0.015
Min. RADIUS: 0.010 | .XXX - ±0.005
SURFACE FINISH 125 | .XXXX - ±0.0005
ANGLE: ±0.1°

ROSS MACHINE SHOP

DRAWN: SGM | DATE: 8/25/2025
SCALE: 1 / 2 | PART NO: 73047

CUSTOMER: UNIVERSITY OF REGINA
PROJECT: BABY bCAL END OF SECTOR BOX (EOSB) ASSEMBLY
FILE #: RMS73047-1
REV: A

Baby BCAL Box - Design & 3D-print mockup



BIC Light Guides

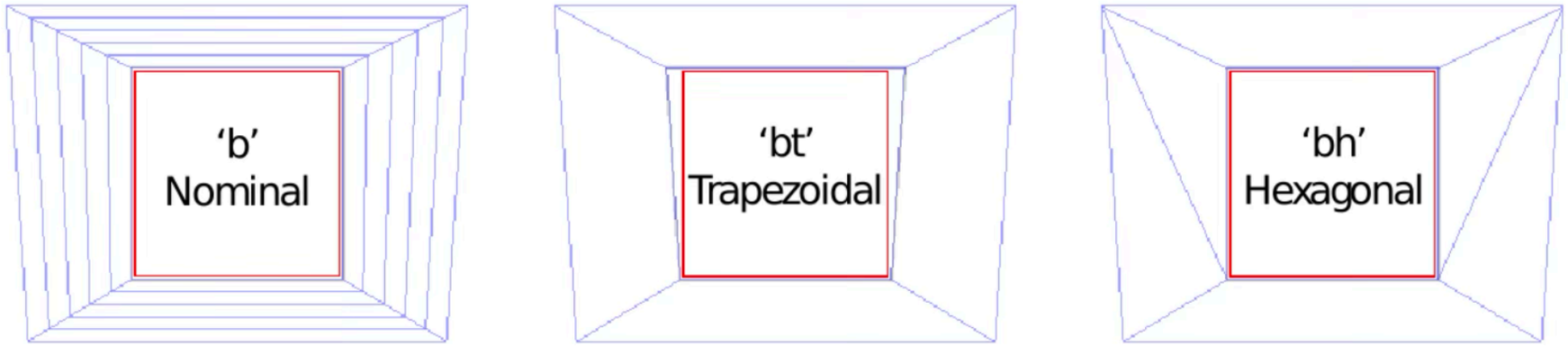


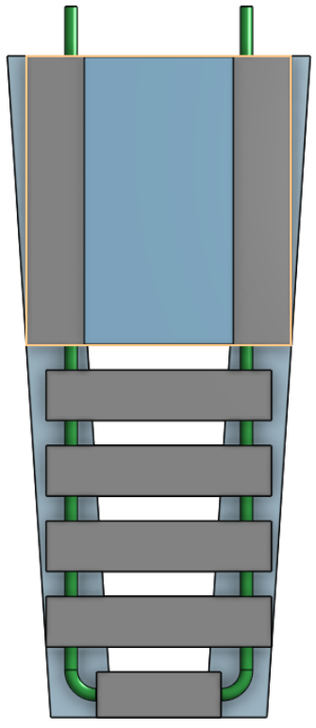
Figure 3: Geant4 renders of the Nominal ('b'), trapezoidal ('bt'), and hexagonal ('bh') BIC light guide shapes. The active SiPM area is shown in red.

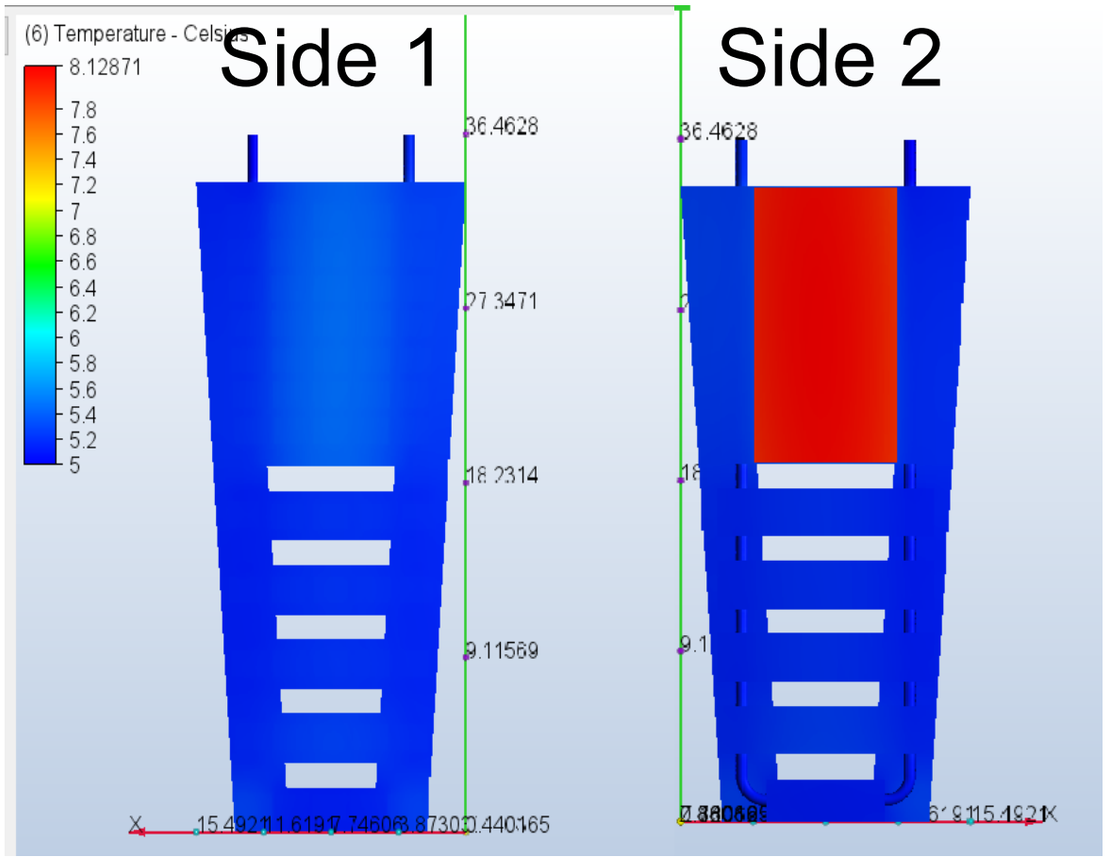
Some shipped to KNU; rest under test right now with 16-channel SiPM array

- A) 50-mm-long light guides: 2 OF EACH KIND
- 1) all three designs, b1_50, bh1_50, bt1_50 drawings (1st layer)
- 2) all three designs, b12_50, bh12_50, bt12_50 drawings (12th layer)
- B) 60-mm-long light guides: 2 OF EACH KIND
- 3) only the nominal design, b12_60 drawing (12th layer)

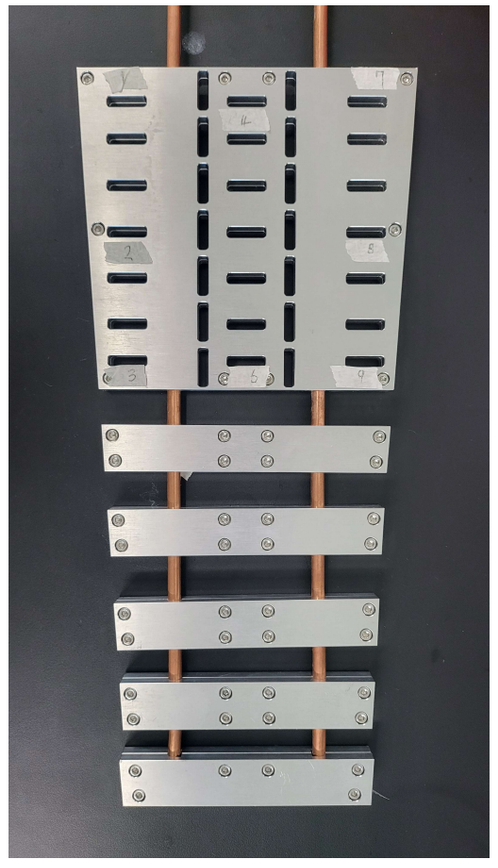
Cooling R&D

- Thermal simulation at Manitoba Univ.





- Prototype at KNU



Aluminum cold plate, PCBs on both sides:

- Side 1: ESB PCB with SiPMs
- Side 2: CALOROC and AstroPix ETC

Design dimensions:

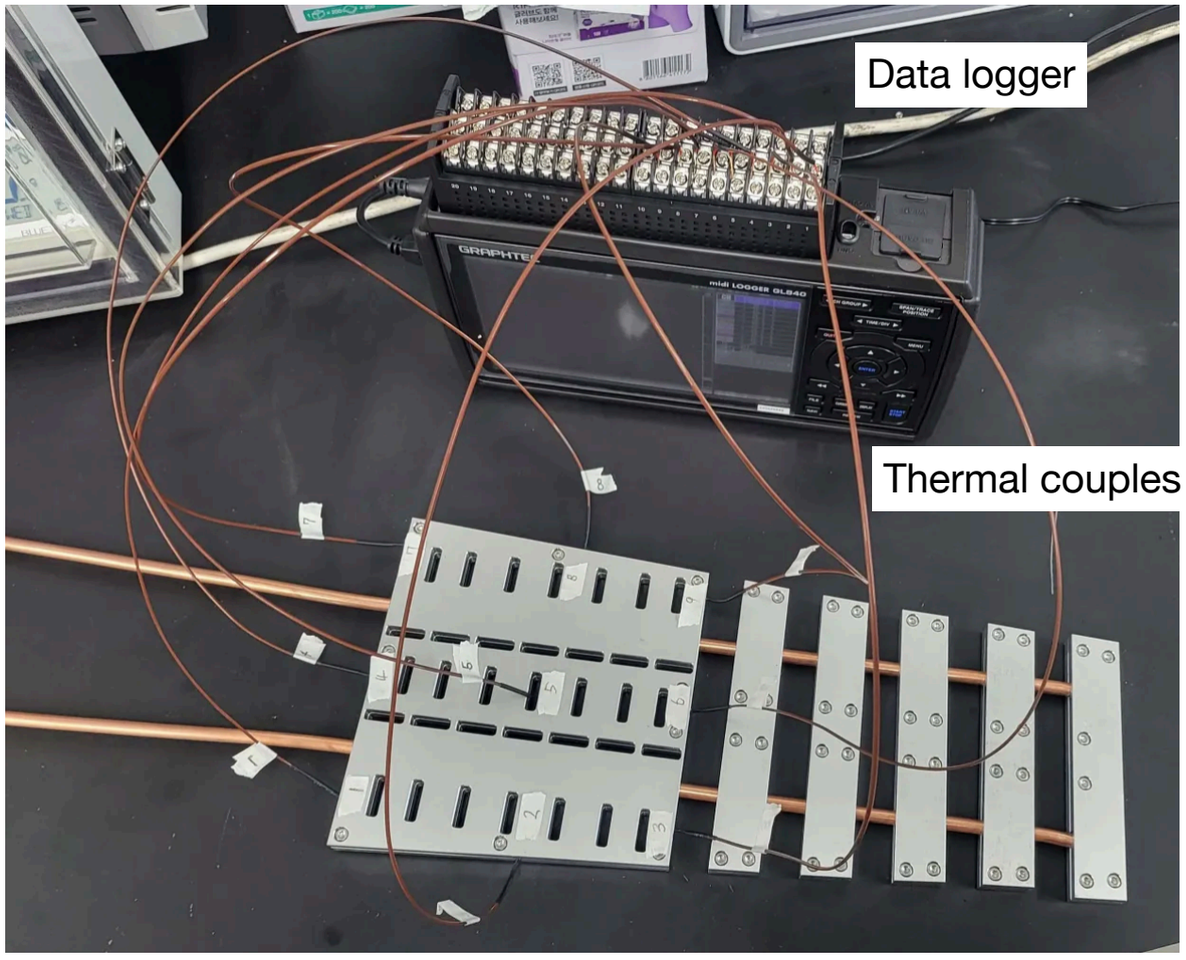
- Cu cooling lines ¼” OD
- Aluminum cold plate thickness ½”

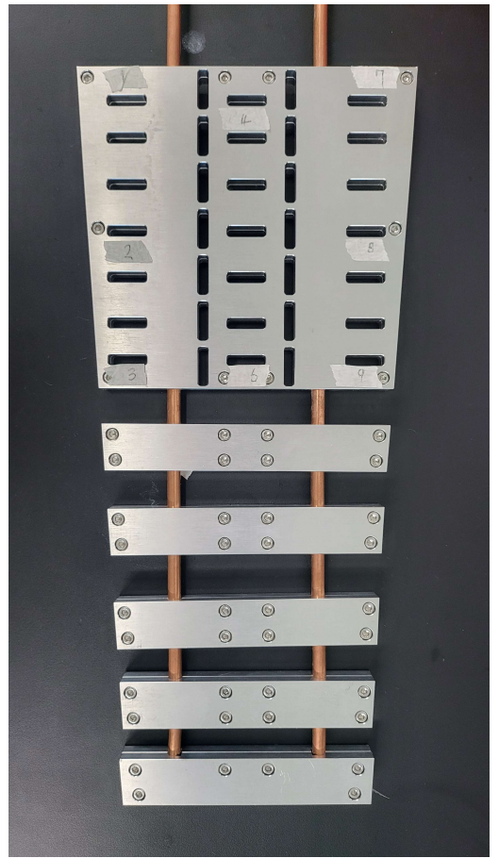
KNU

Cooling R&D

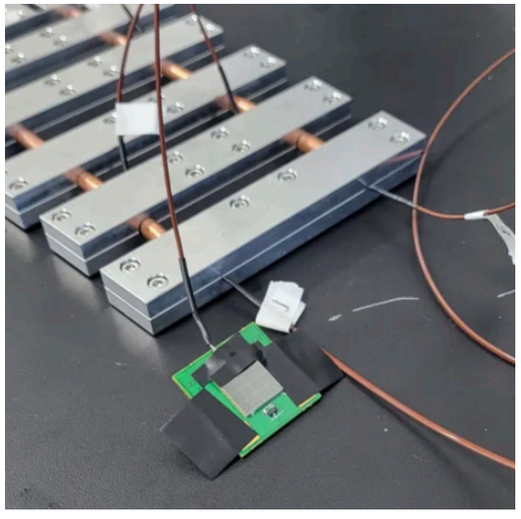
Goal: Temp/Gain Stabilize SiPMs;
Use passive circuit (copy BCAL)

- Water cooling
- Temperature monitoring
- Prototype at KNU





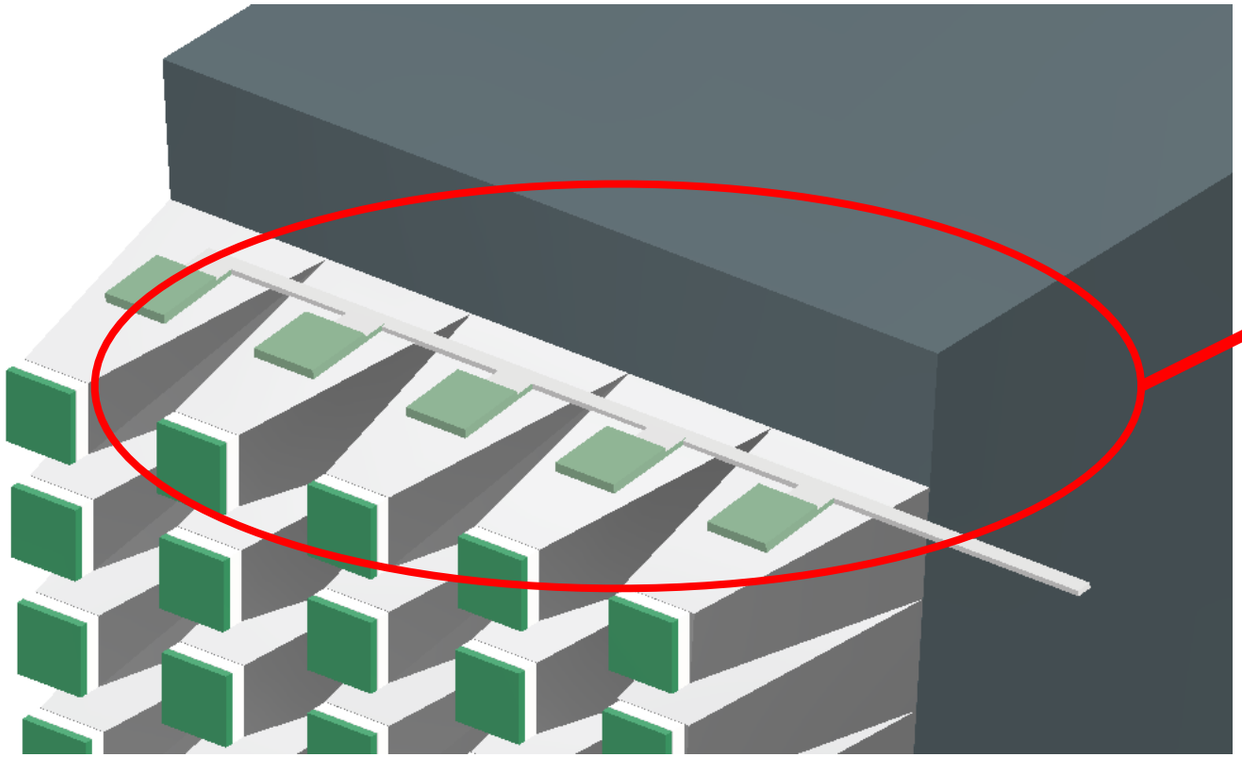
- Water temperature: -25 ~ 150 °C
- flow rate: 0.006 ~ 3400 mL/min

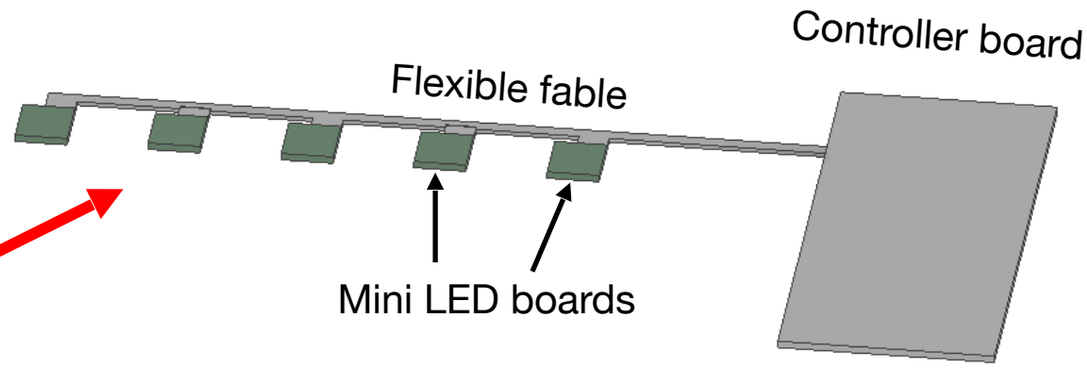


- Ongoing: development and construction of PCB (thermal) test articles for validation of CFD calculations
  - resistive element array distributed at locations of SiPMs

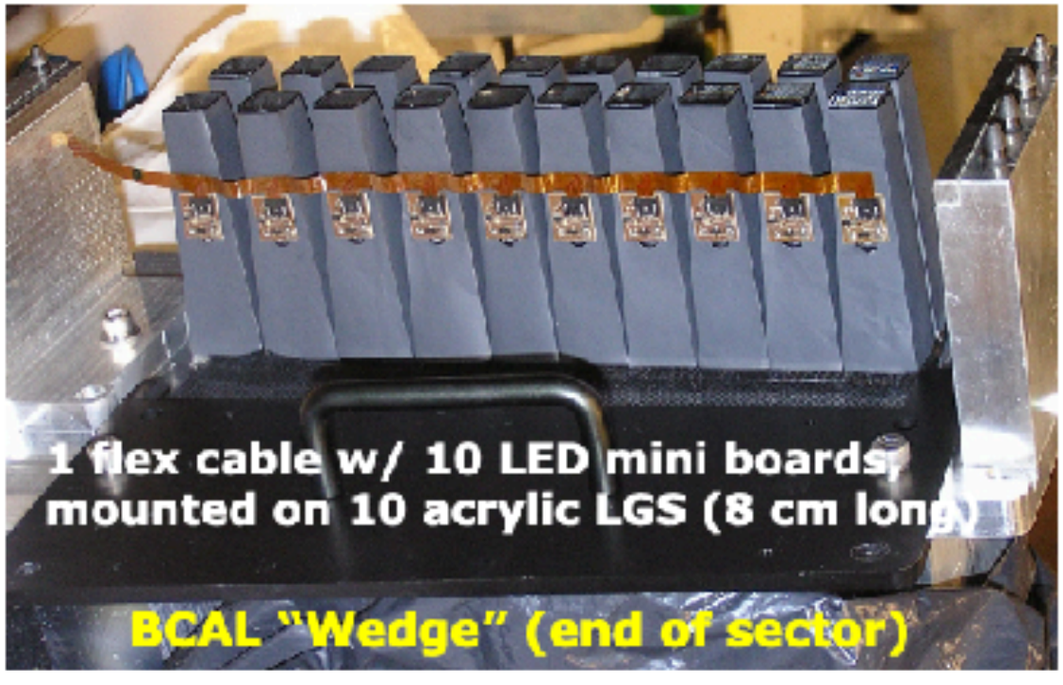
KNU

LMS system

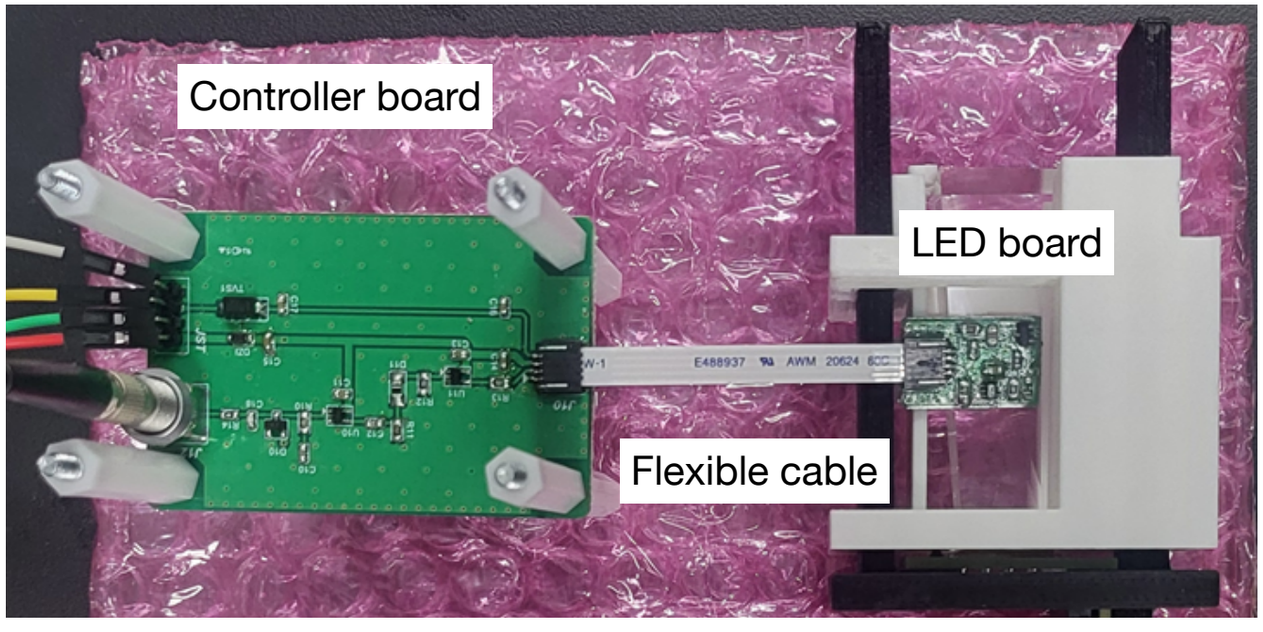




- glueX LMS system



- 1-ch prototype board at KNU

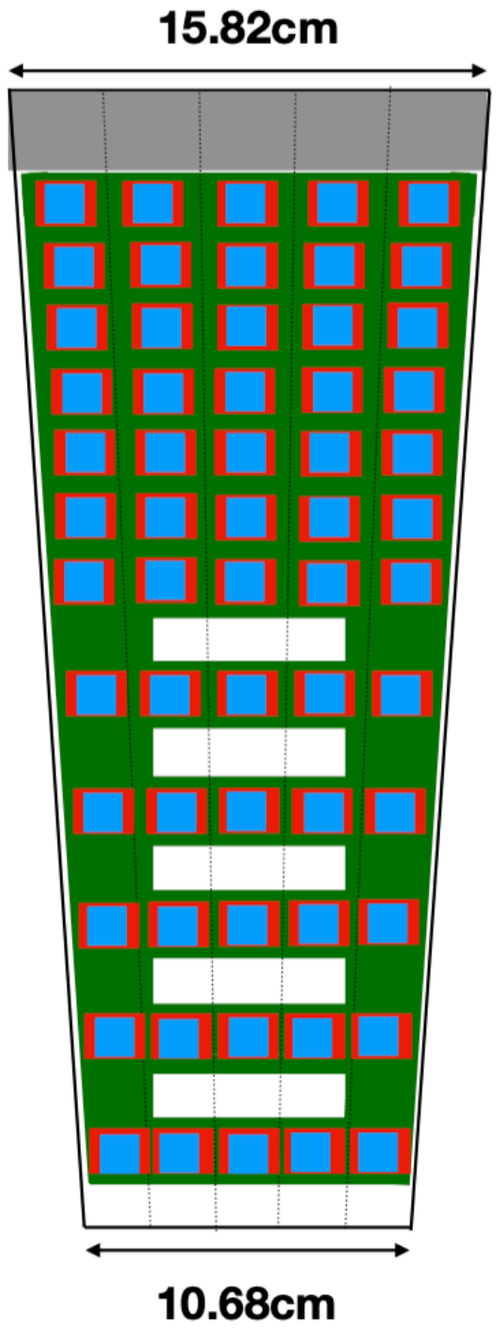


- Test on-going

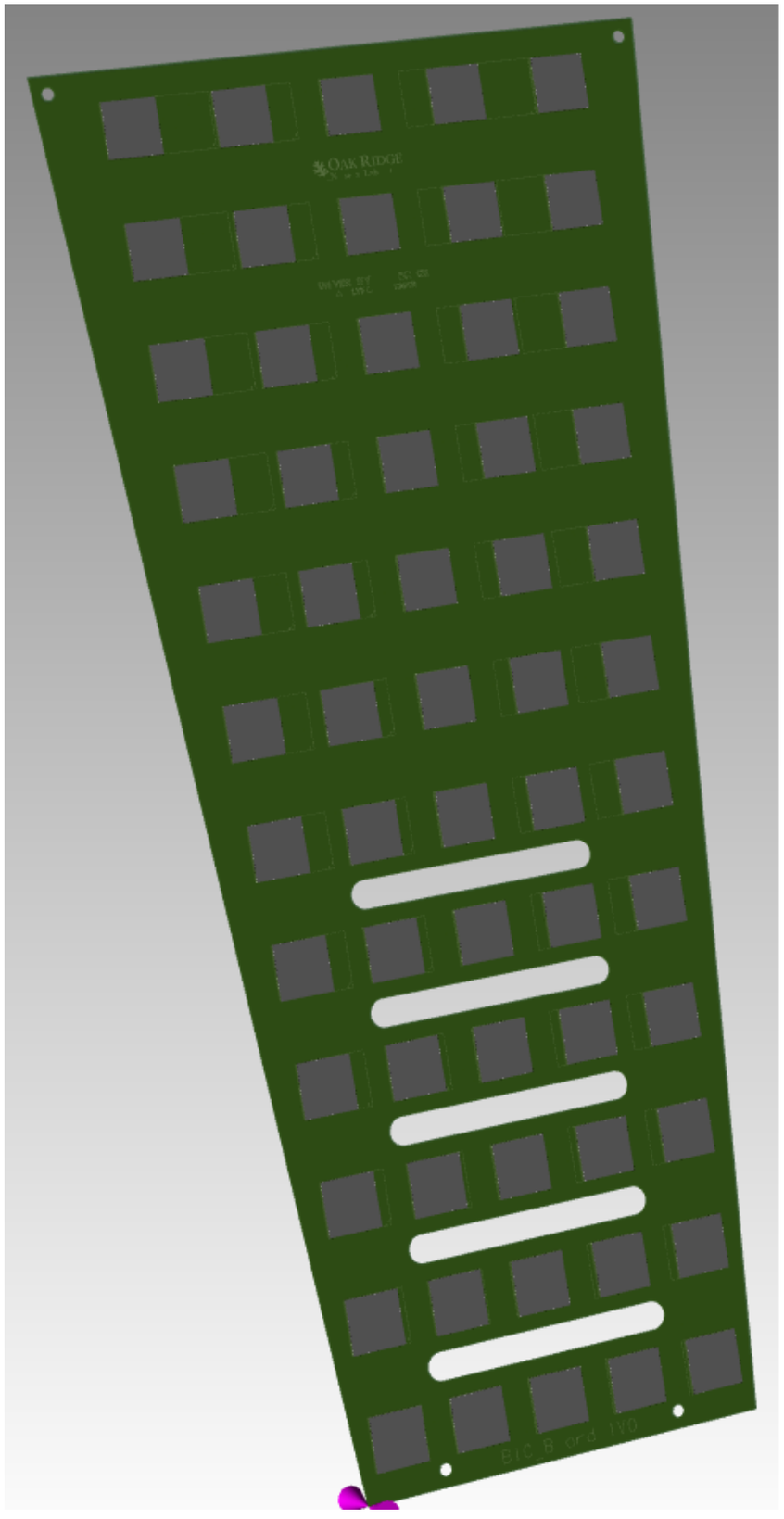
Summary & Looking Ahead

- Mechanical:
  - Baby BCAL box - design advanced for August 2026 at Hall D; air cooling, new amp/sum boards, signals suitable for HGCROC
  - BIC Box - design in September-October
  - LGs 50mm design being tested; *see Thursday Open Contributions*
  - Cooling design advanced; *see next talk*
  - LMS underway; *see Thursday Open Contributions*
- Electronics:
  - *See other sessions today and tomorrow.*

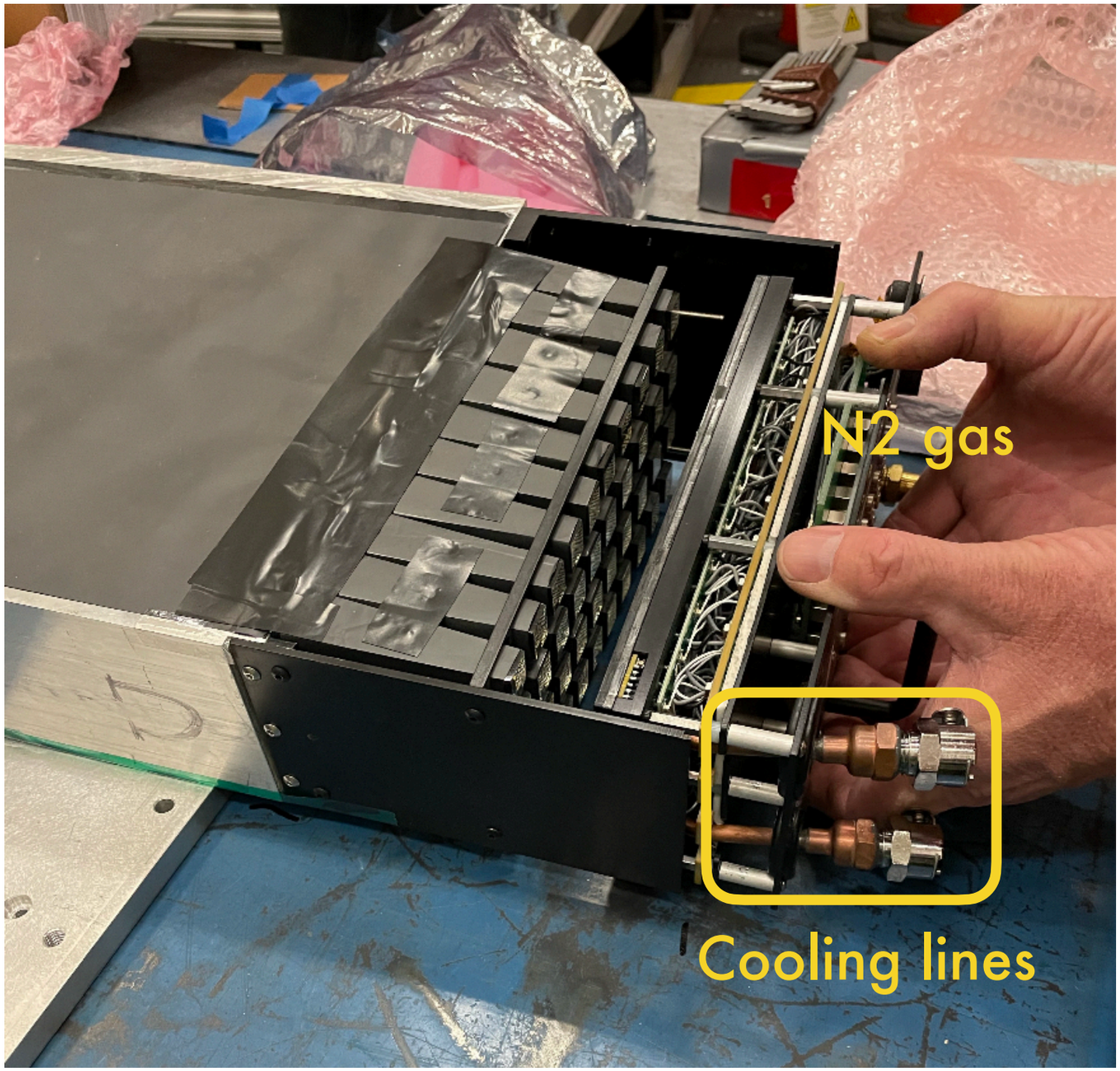
Backup slides



Testing at ORNL



BCAL "Wedges"



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