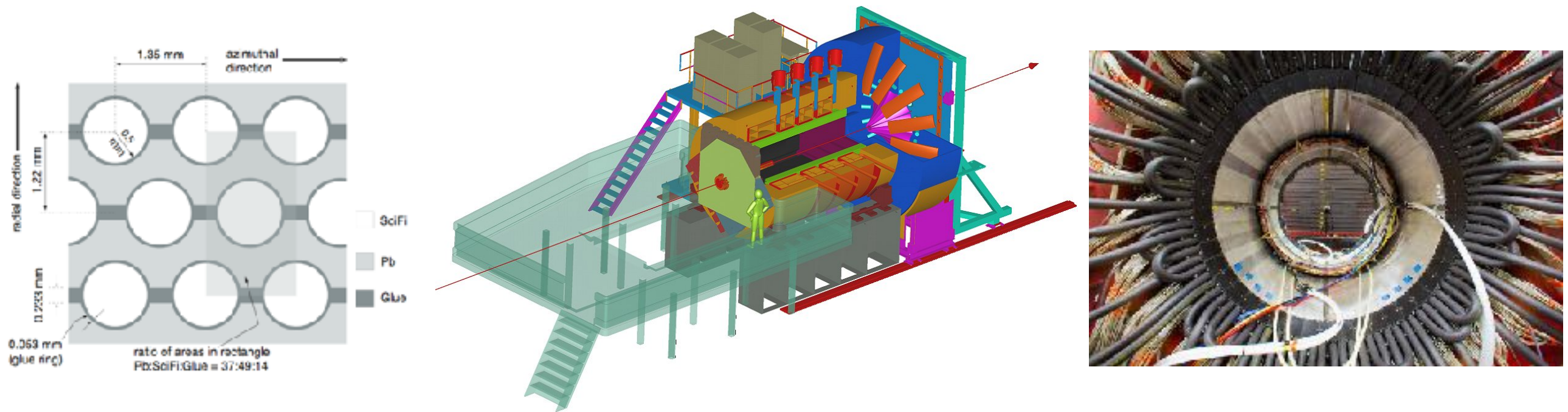




Overview of the Readout of the GlueX BCAL

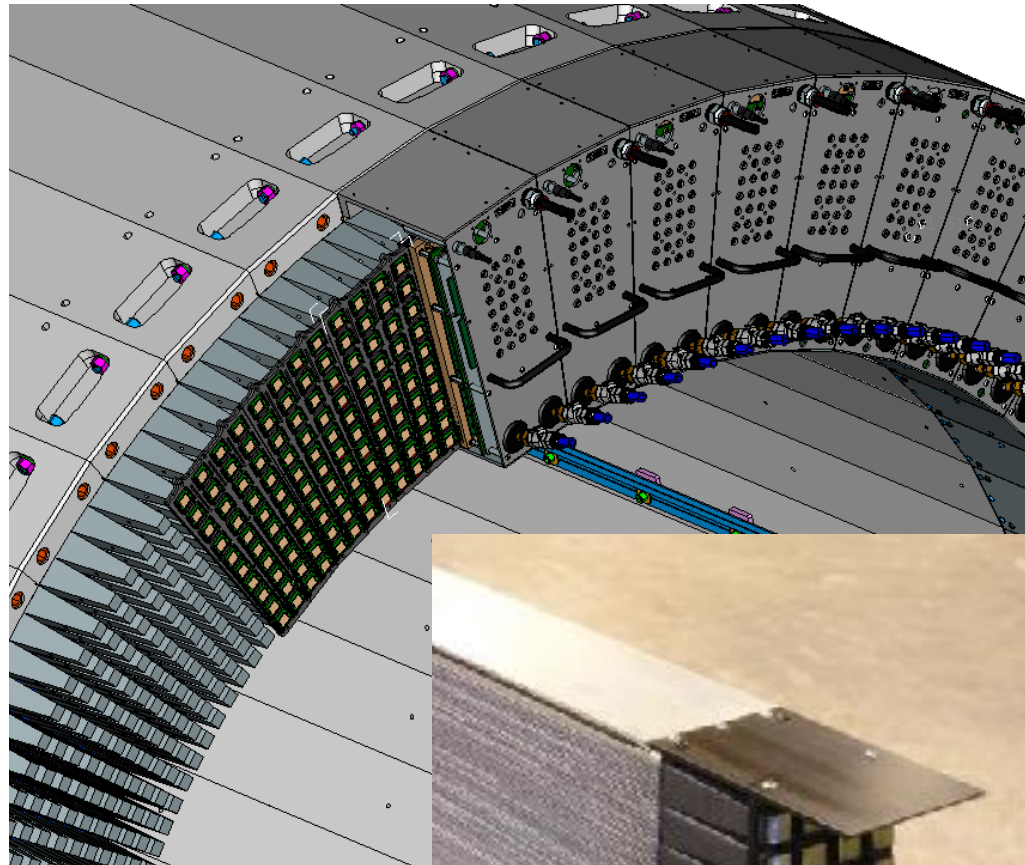
In-Person Barrel Imaging Calorimeter Meeting

Argonne National Lab

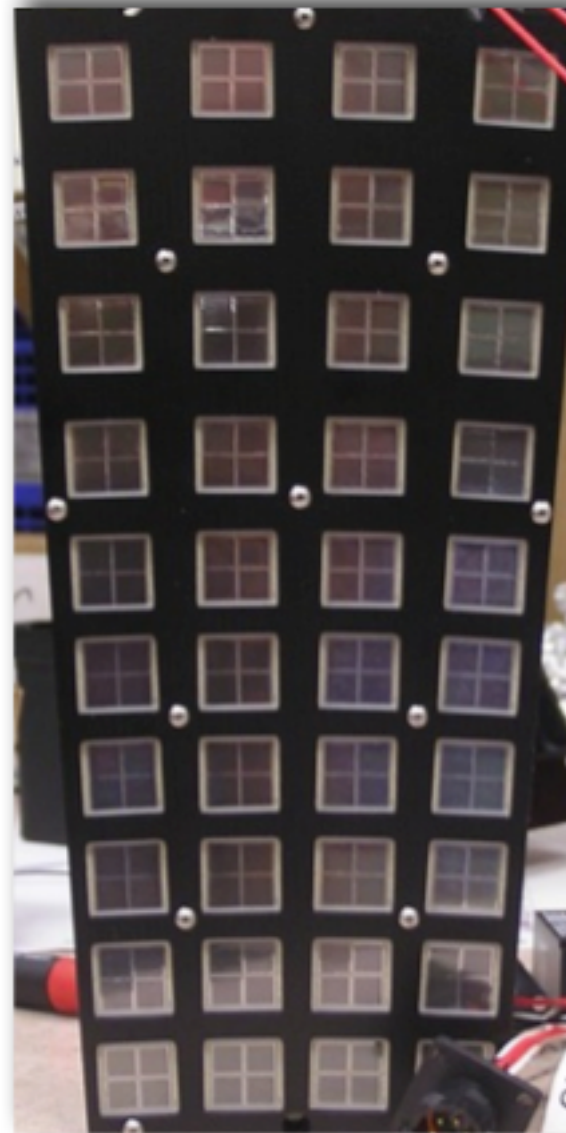
June 12-16, 2023

Z. Papandreou

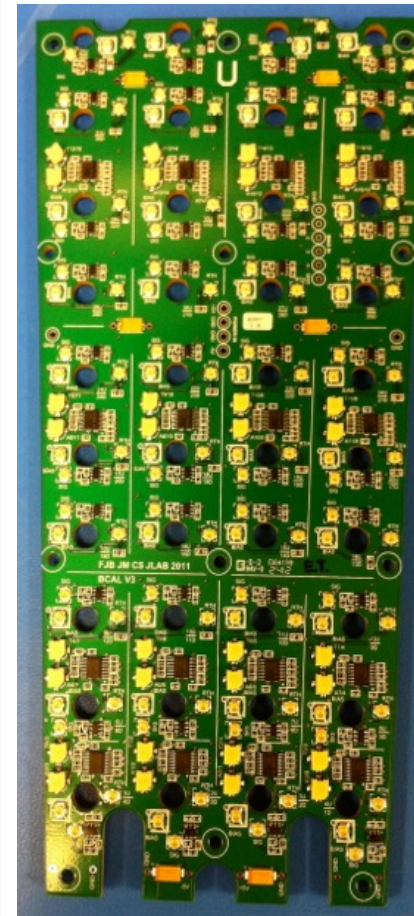
SiPM Readout Assemblies



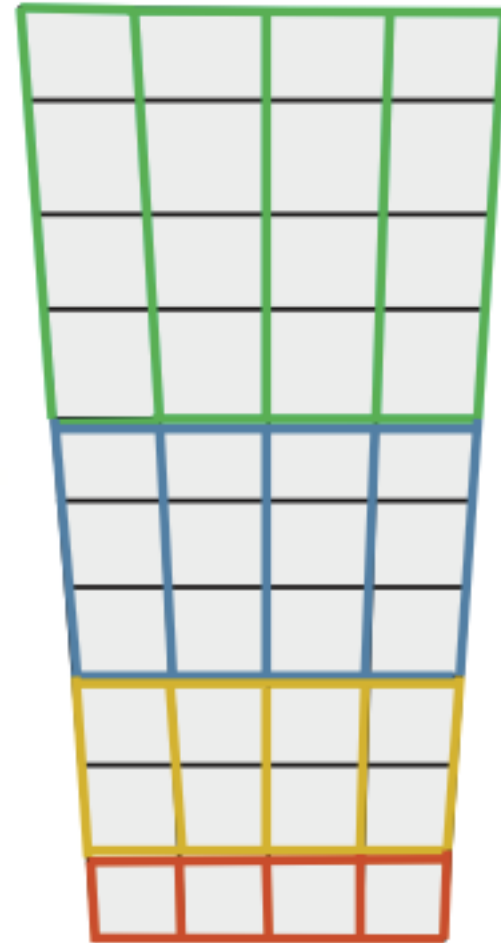
Light
guides



Assembly

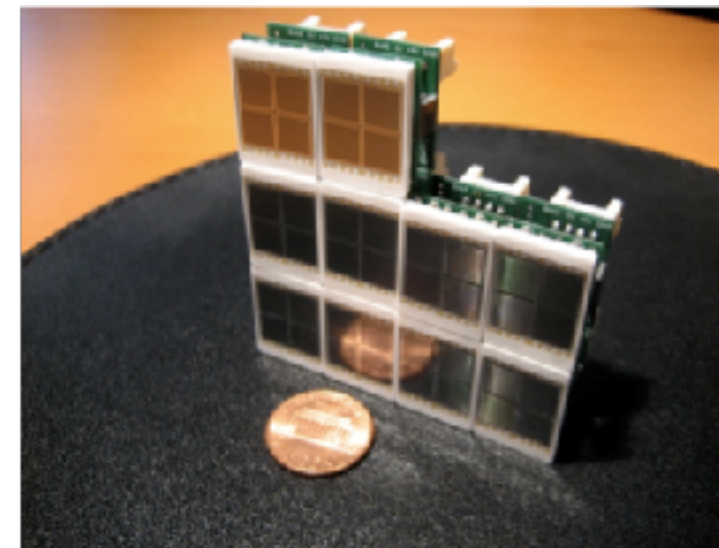
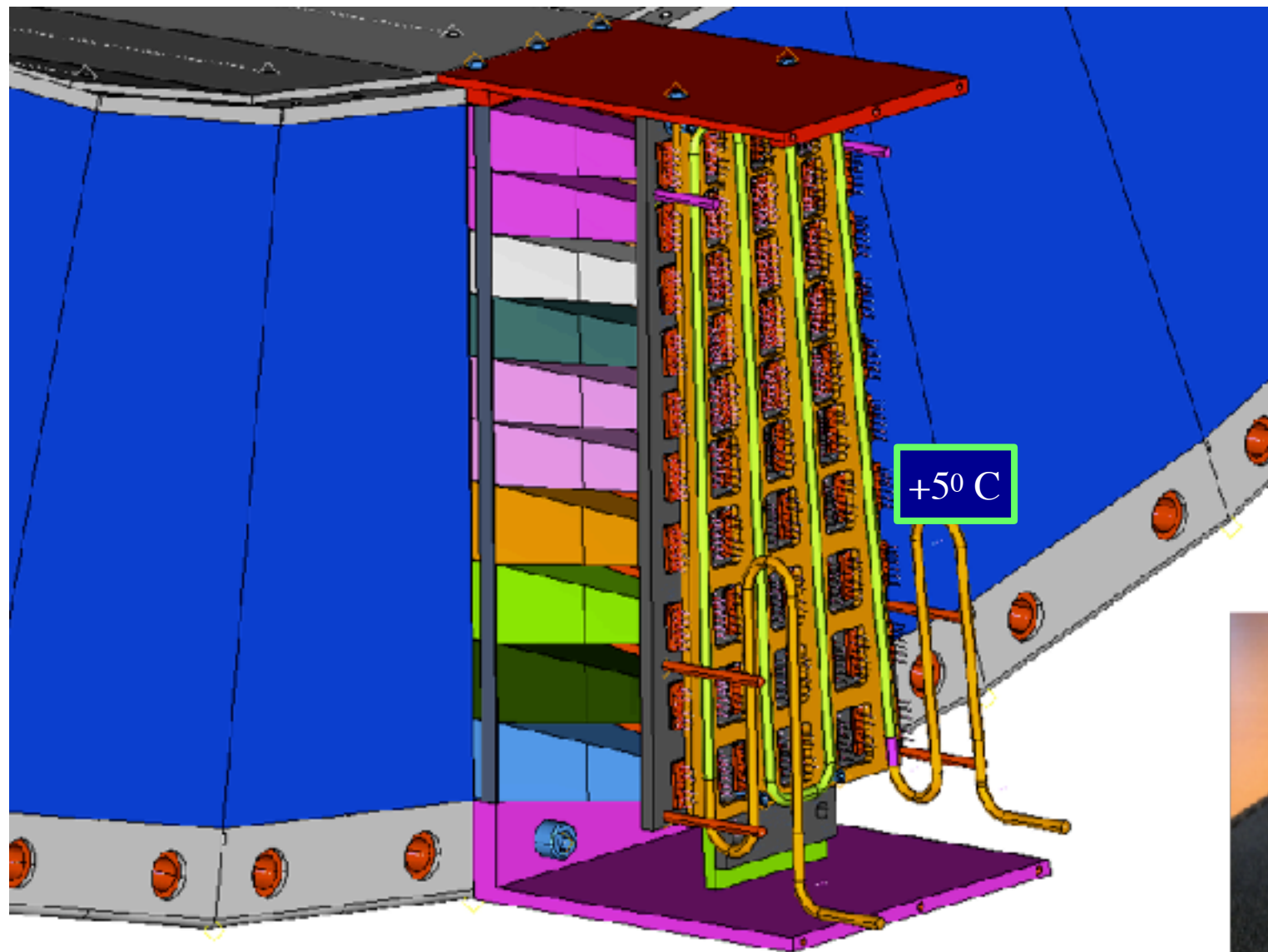


Electronics



Summing
Scheme

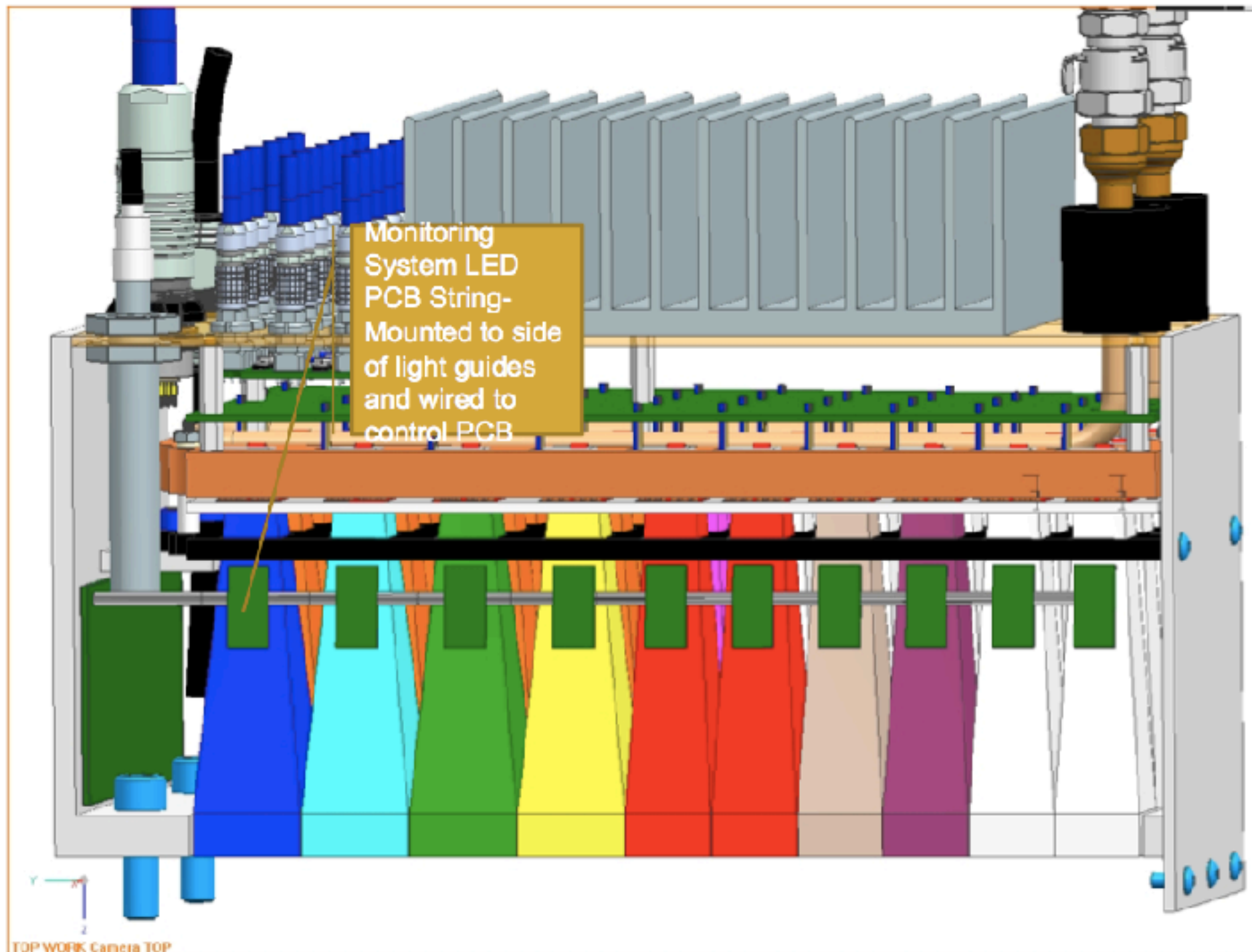
Light Guides & Cooling



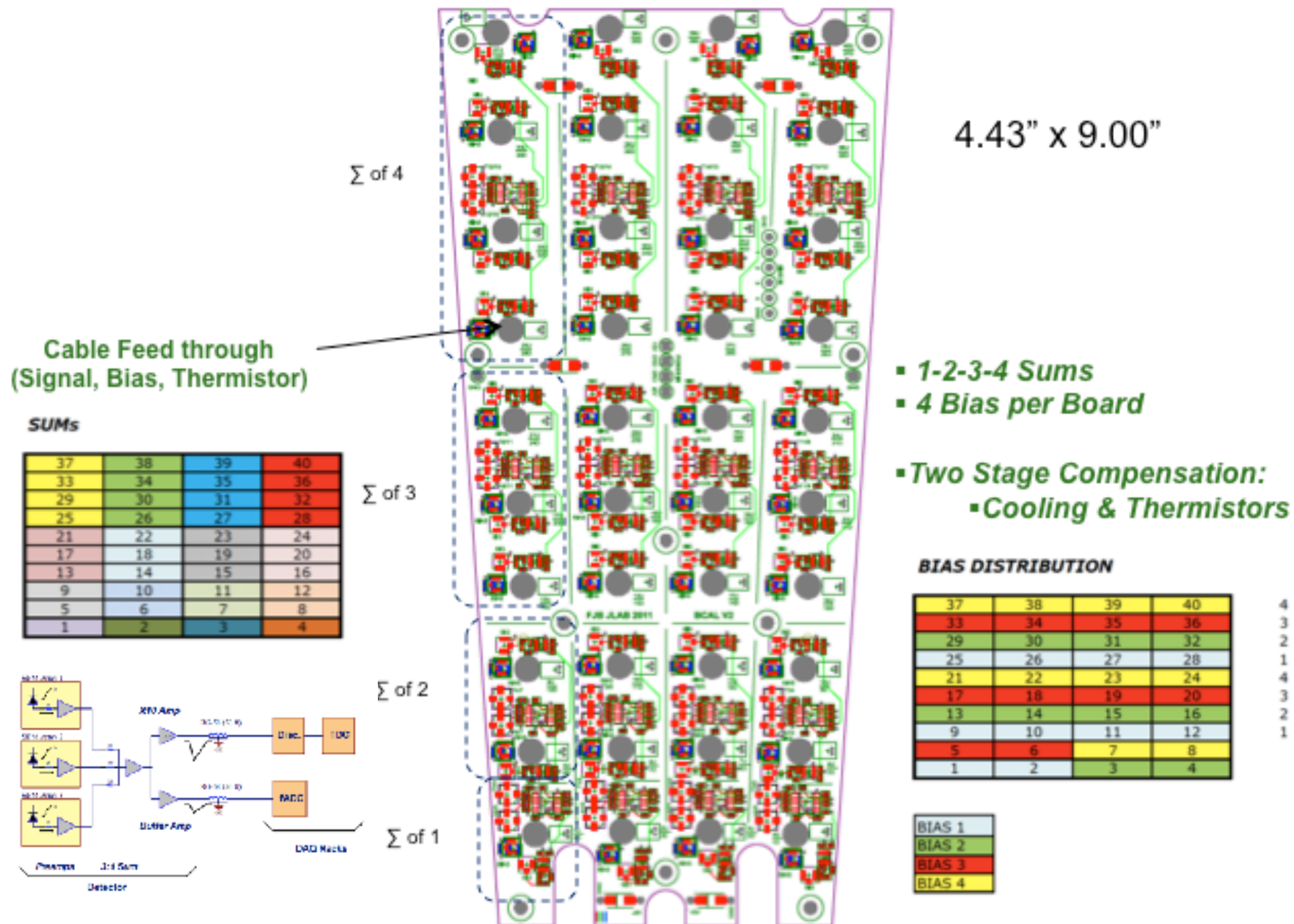
3840 Arrays of
16 3x3 mm²
MPPCs:
1.26 cm² area

Hamamatsu MPPC

+ LED system



Wedge Board



The BCAL SiPM Array Readout

Fernando J. Barbosa

GlueX-doc-1795

Jefferson Lab

8 August 2011



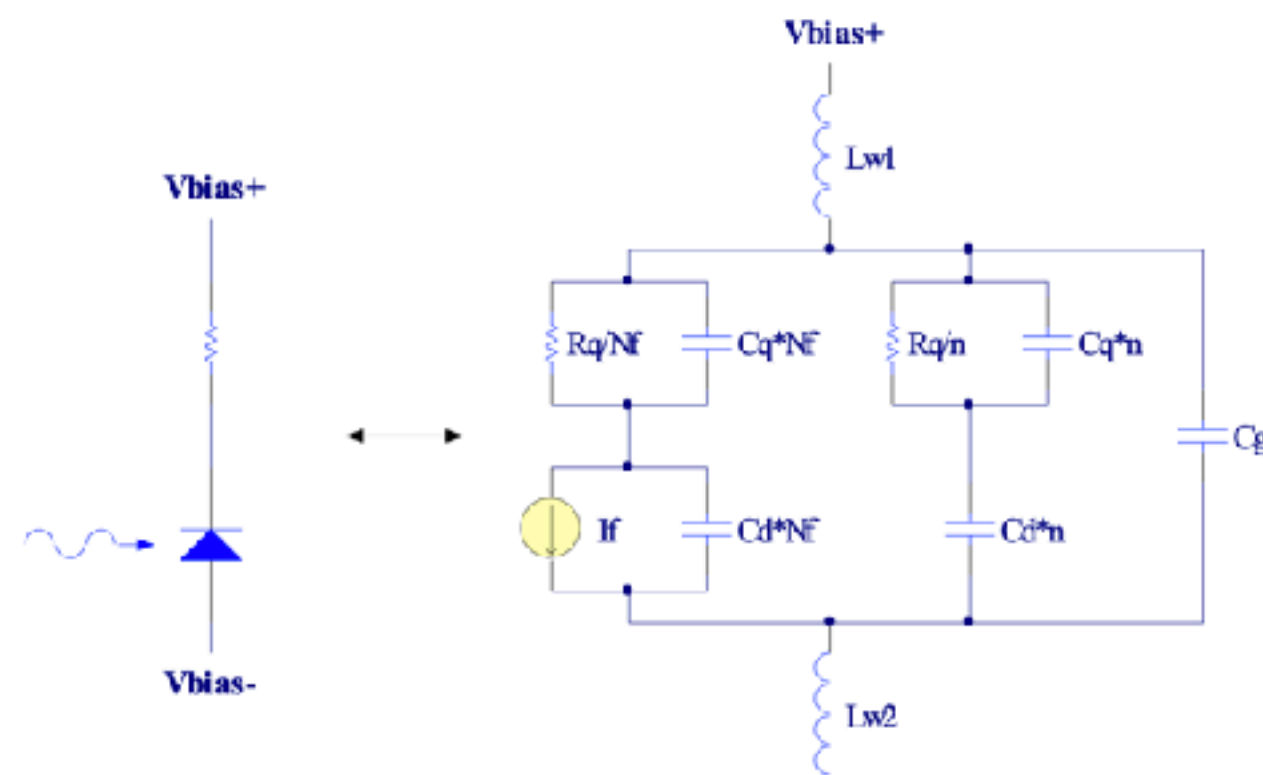
1. Introduction

The BCAL readout employs Hamamatsu 16-cell SiPM photo-detectors arranged in a 4 x 4 array. Each cell has 3600 pixels (50 μm x 50 μm) all connected in parallel (S12045). The 16 cells on an array are further connected in parallel for readout via a single preamp.

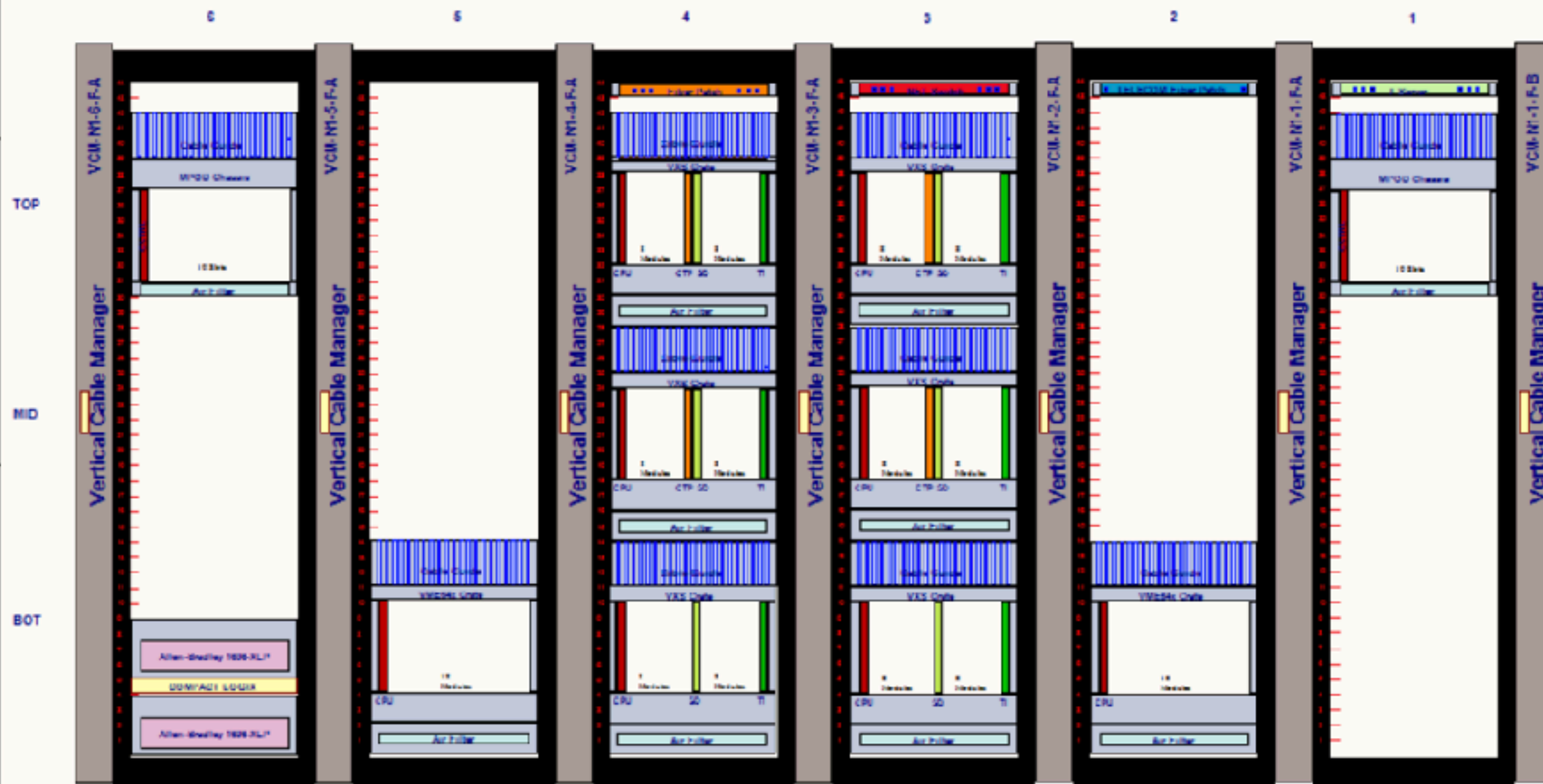
There are 3840 SiPM arrays with their preamp outputs summed in groups of 3 or 4. Each sum is then split and fed into a buffer (BCAL_A) and a gain of 10 amplifier (BCAL_T). BCAL_A will be readout via flash ADCs; BCAL_T will be readout via discriminators and TDCs (fig. 1).

2. The SiPM

Electrical models and characterization of SiPMs have been previously reported [1], [2]. Fig. 2 shows the model for the BCAL SiPM.



Location: N1
Sub-System: BCAL



Sub-System:BCAL

BCAL

BCAL

BCAL

BCAL

BCAL

Function: 6 BIAS/2 LV

12 fADC250
 12 tADC250
 9 FITDC

12 fADC250
 12 tADC250
 9 FITDC

6 BIAS/ 2 LV

Temp Monitor

18 DISC

18 DISC

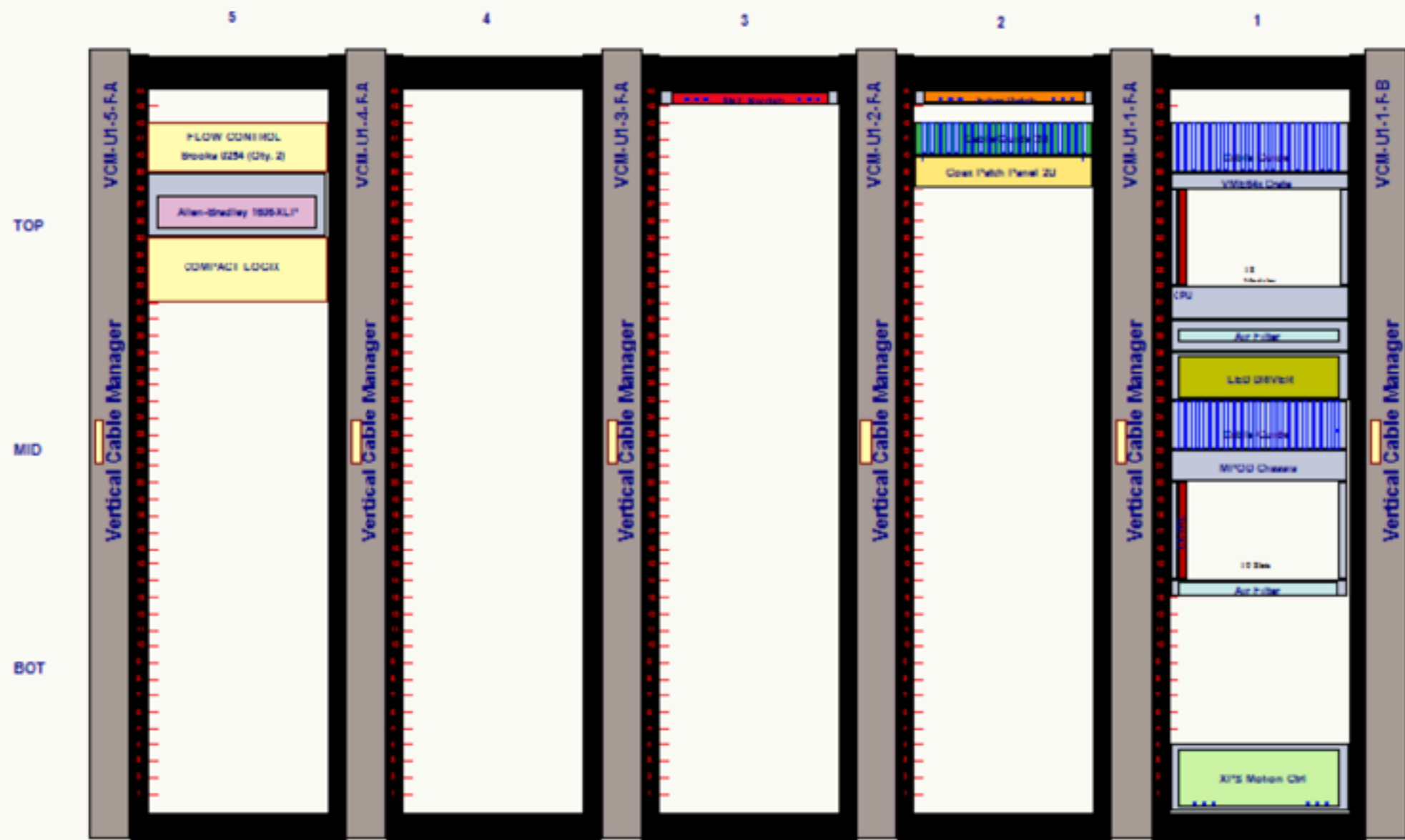
Note 1: Crate/Chassis Nomenclature: Platform/Location-Rack-Position (e.g., T1-1-TOP).

Note 2: An equal and corresponding number of Vertical Cable Managers are intalled on the rear of the racks.
 Nomenclature: Type-Platform/Location-Rack-Front/Rear-A/B
 (e.g., VCM-T1-1-F-A and VCM-T1-1-R-A, etc.)

Front View

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Location: U1 (A)
 Sub-System: TARG, GAS, COOL, BCAL LED Pulser, BP



Sub-System: GAS/COOL

TARG

BCAL/BP

Function: CDC/FDC/BCAL

LED Pulser/BP
 LED/BP LV/Bias
 Controls

Note 1: Crate/Chassis Nomenclature: Platform/Location-Rack-Position (e.g., T1-1-TOP).

Note 2: An equal and corresponding number of Vertical Cable Managers are intalled on the rear of the racks.
 Nomenclature: Type-Platform/Location-Rack-Front/Rear-A/B
 (e.g., VCM-T1-1-F-A and VCM-T1-1-R-A, etc.)

Front View

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Approved: J. J. S.	Date: 01/11/2001	Checked: J. J. S.	Date: 01/11/2001
Signature: J. J. S.	Date: 01/11/2001	Checked: J. J. S.	Date: 01/11/2001

SiPM Schematic

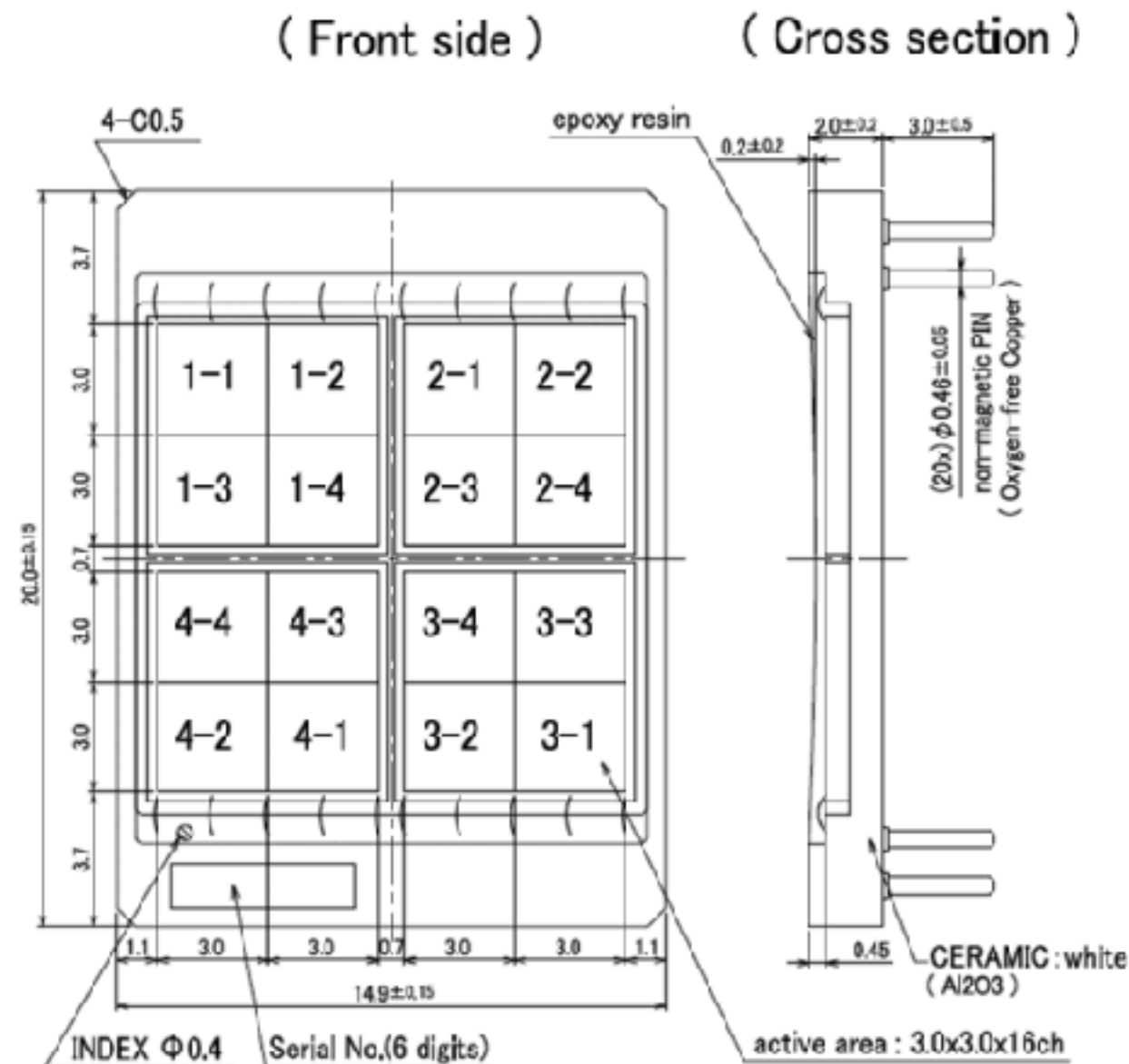


Fig. 1. A schematic drawing of the front and side views for the Hamamatsu MPPCs for the GlueX experiment is shown, detailing the tiling of the $3 \times 3 \text{ mm}^2$ cells into a 4×4 configuration. The numbered cells are active; all other areas and spacings are inactive. (Courtesy of Hamamatsu).

R&D-Phase Board

SiPM/MPPC and Pre-amp

Hamamatsu S10943-0258(X) SiPM arrays

- 4x4 array of 3x3 mm SiPM
 - 50 μm pixel: 57,600 pixels/array
 - First article:
 - 16 outputs, 4 power inputs
 - Production:
 - 1 output, 1 power input
- Preamplifier for the test
 - 16 individual outputs
 - High gain mode ($\times 67$)
- Production:
 - Summed output
 - Smaller boards

