University of Kentucky ECAL Efforts

Renee Fatemi

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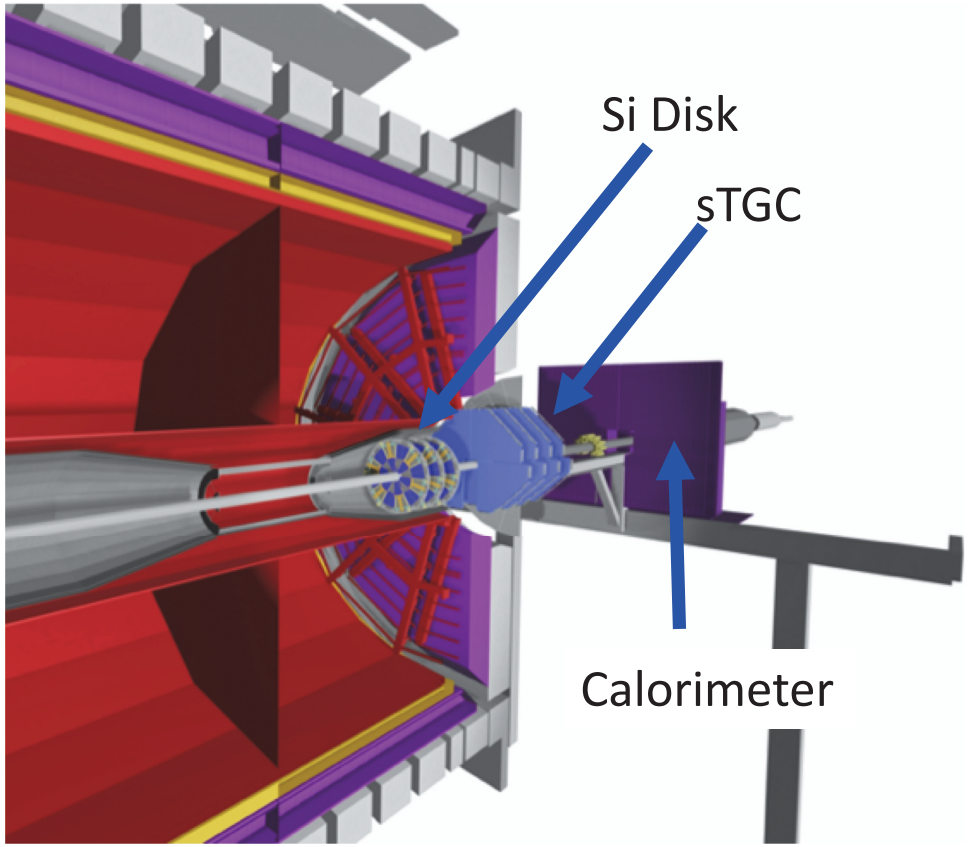
STAR Forward Upgrade



Coverage: $2.5 < \eta < 4.0$

- Mid-rapidity Emcal/Tracking coverage $|\eta| < 1.2$

Forward Tracking System (FTS)

- Silicon microstrip sensors
- Small-Strip Thin Gap Chambers (sTGC)
- Momentum Resolution **< 30%**
- Tracking **Efficiency > 80%** @ 100 tracks / evt

Forward Calorimetry System (FCS)

- Hadronic Calorimeter
  - Resolution **~50%/$\sqrt{E}$+10%**
- Electromagnetic Calorimeter
  - Resolution **~10%/$\sqrt{E}$ p+p vs ~20%/$\sqrt{E}$ A+A**

Location: 7 m from the IP on the "FMS platform"
Readout: SiPMs

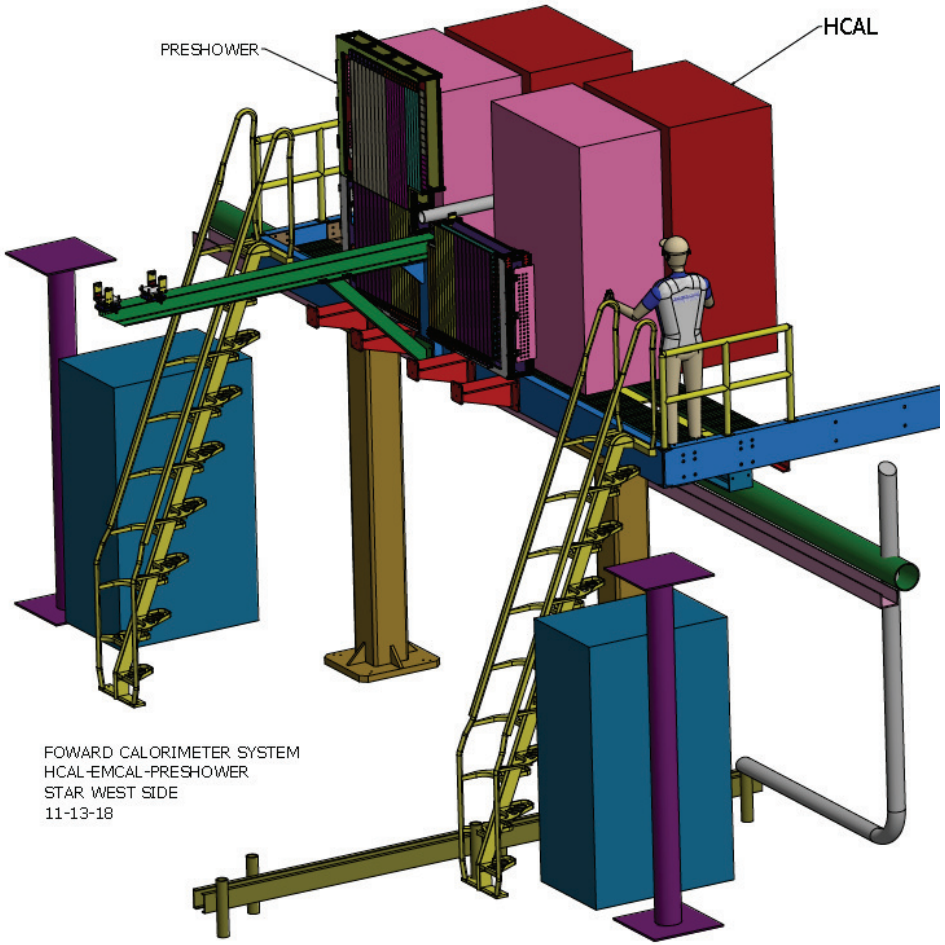
- ❑ Used in Trigger
- ❑ Split in 2 movable halves inside and outside of ring
- ❑ Slightly projective

ECal:

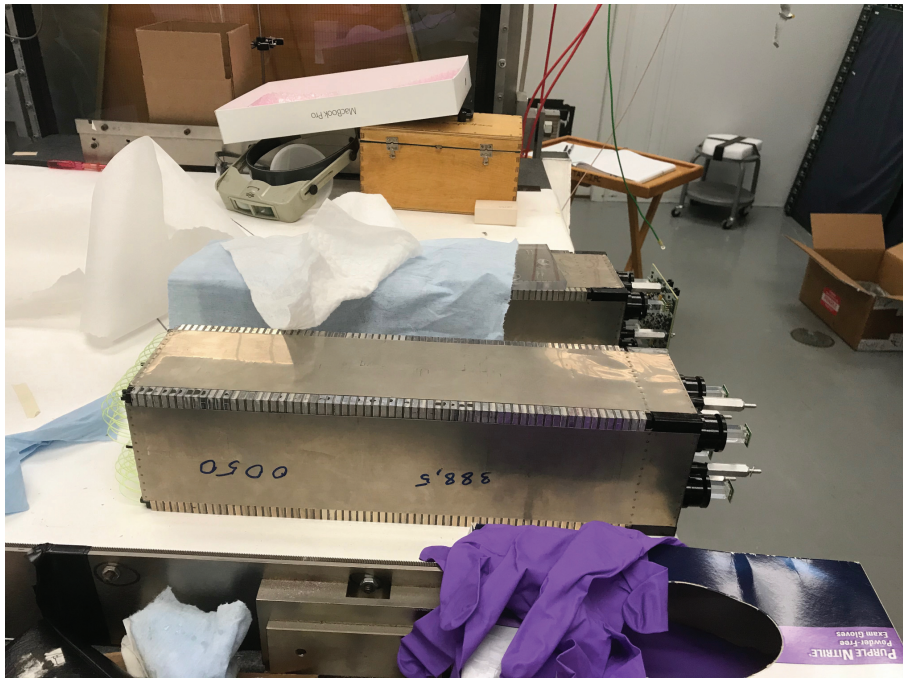
- ❑ reuse PHENIX PbSC calorimeter with new readout on front phase → 1496 channels
  - ➢ Secured one Sector (2592 towers) PbSc towers: 5.52 x 5.52 x 33 cm^3 (18 X_0)
    66 sampling cells with 1.5 mm Pb,
    4 mm SC & Wavelength shifting fibers

HCal:

- ❑ Fe/Sc (20mm/3 mm) sandwich.
- ❑ 520 readout channels
- ❑ Lateral tower size 10 x 10 cm^2, ~ 4.5 λ



Refurbished ECAL

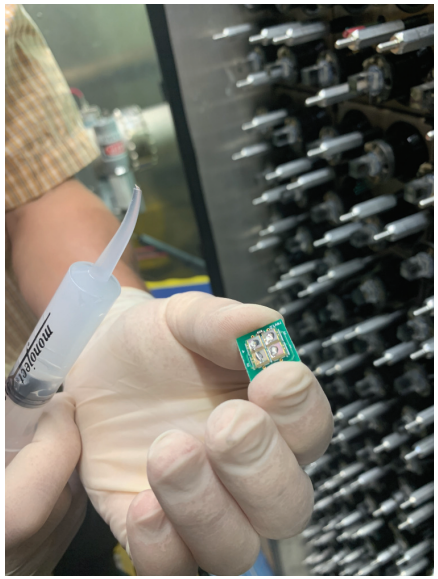


The towers have embedded wavelength-shifting fibers for light collection.

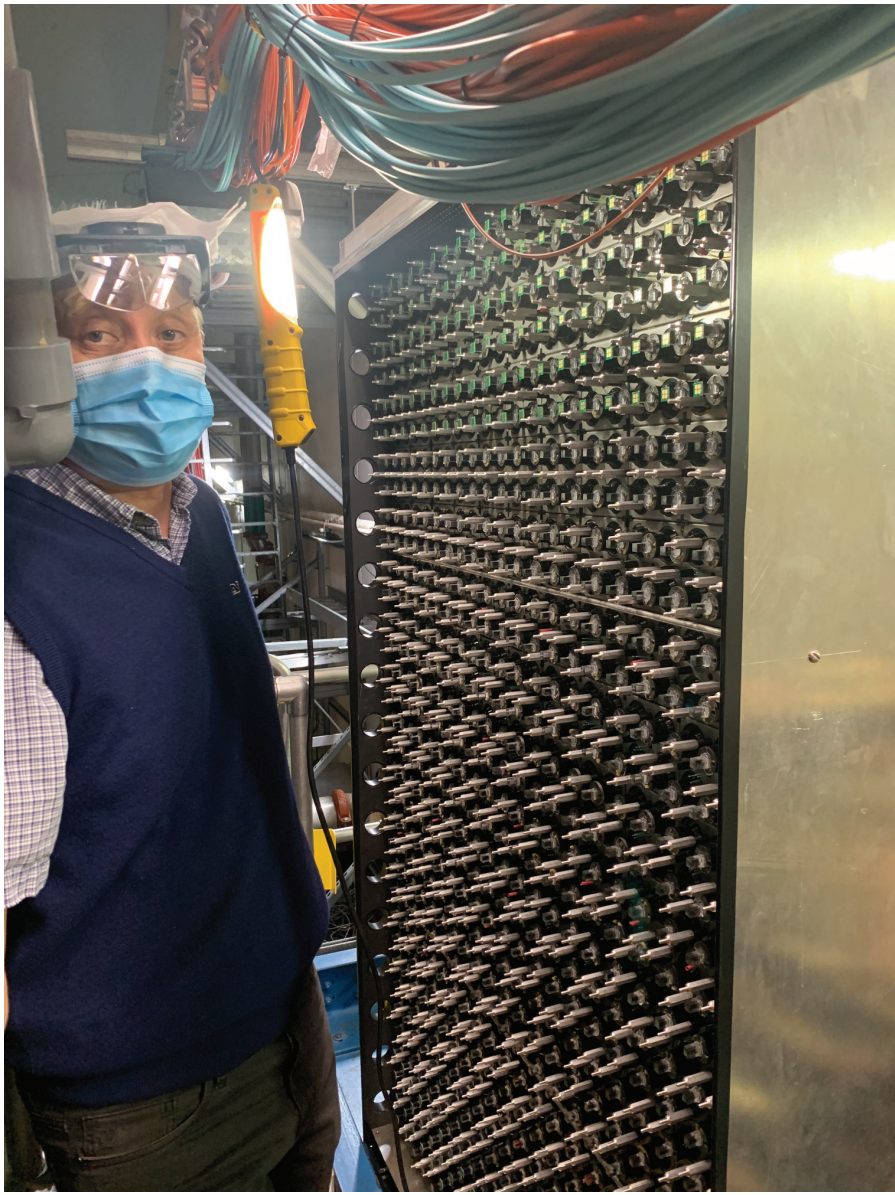
The original PMT's were removed and replaced with new light guides.

The refurbished towers are bundled into modules of four, and stacked in place at the west end of STAR.

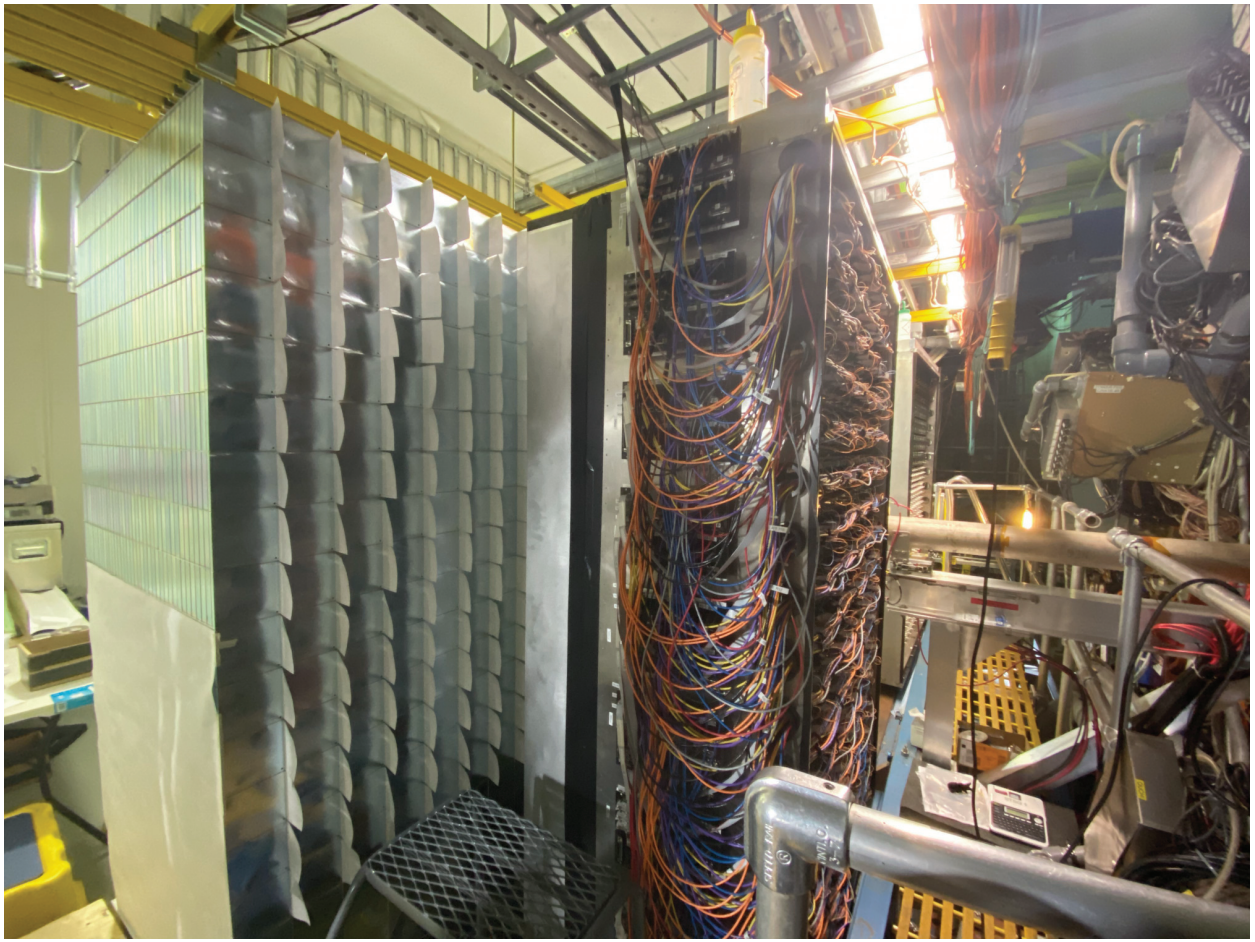
A SiPM carrying board was glued to the lightguide, optically connecting four SiPMs to each tower.



The FEE boards are connected utilizing Pogo pins in the existing holes of the modules.



HCAL + ECAL



38 layers of Fe/Sc corresponding to ~4.5 interaction lengths.

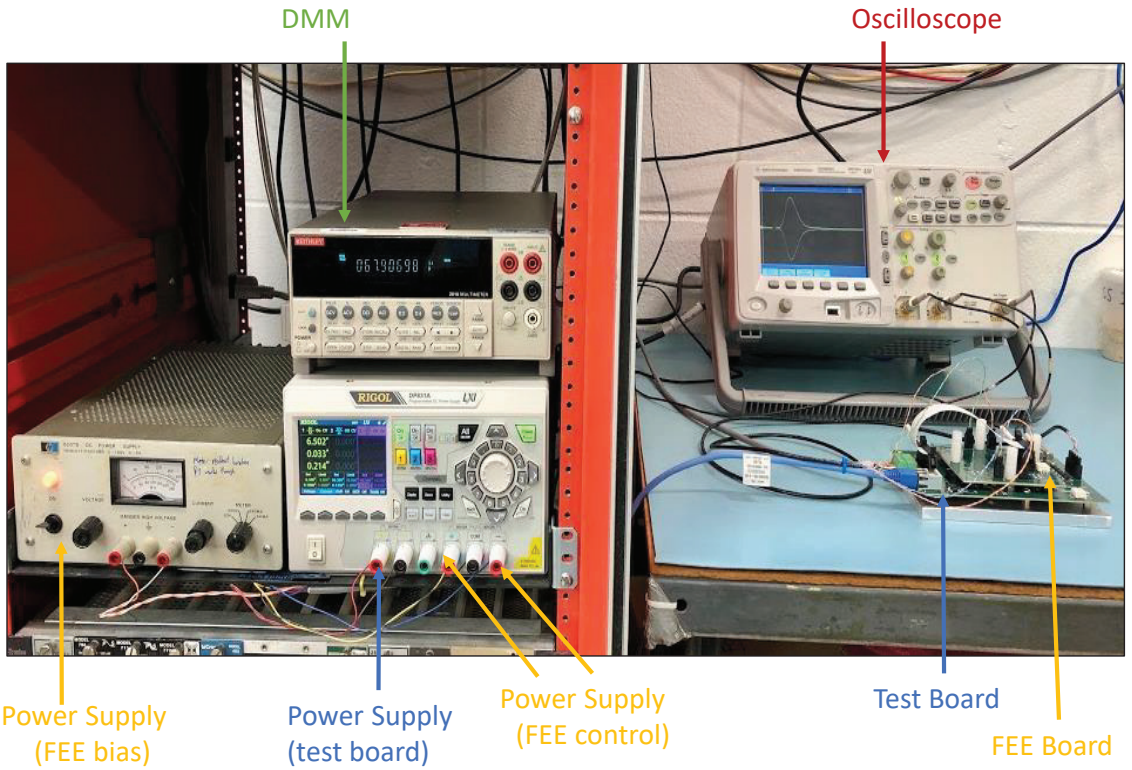
Scintillation light from each tower is collected with a 3-mm thick wavelength-shifting plate (EJ-280) placed in the gap between two adjacent towers.

ECAL+HCAL FEE BOARD Testing

FEE Boards designed by G. Visser at Indiana.

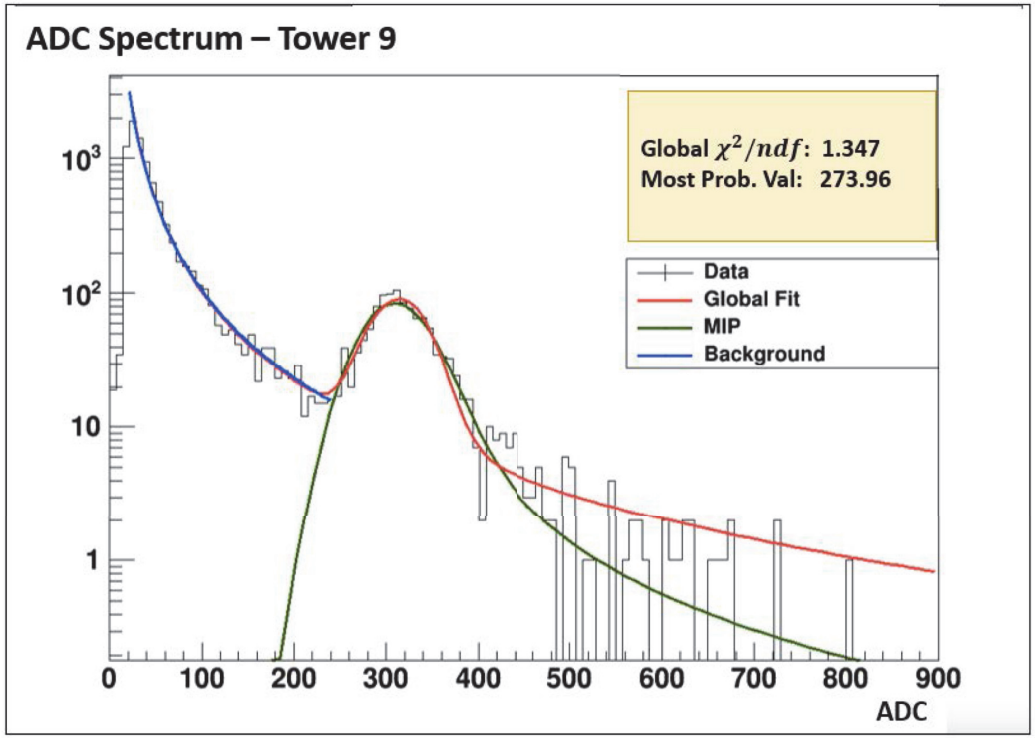
UKY developed code to control and readout the scope, DMM, PS and FEE boards

Hannah Harrison tested 500 ECAL boards. Code was used for HCAL board tests as well.



MIP Calibration for ECAL

1. ECAL+HCAL prototypes were installed in STAR for 2019 Au+Au run.
2. Moderate thresholds ~6GeV in the HCAL combined with spatially isolated towers in the ECAL were used to enhance ECAL MIP signal.
3. Exponential at low ADC is from EM shower.
4. Peak is a convolution of Landau (MIP) + Gaussian (SiPM)
5. Plan to implement in fast offline this year.



DOE EPSCoR Proposal : Kentucky Acquisition & Computational Data Center

We propose to establish the Kentucky Acquisition and Computational Data Center, which will support collaborative infrastructure for DOE-related research and science within the Kentucky EPSCoR jurisdiction. A focal point will be the development of electronics and algorithms to process streaming data in real time as they are acquired or generated. This technology will be augmented to support the analysis of large complex stored data sets. The center will also develop compression and encoding algorithms for storage of data streams, including quantum information. This grant will support infrastructure for the development of customized hardware, firmware, and software, and the evaluation of novel commercial platforms for processing fast or complex data.

Includes a Digital Electronics Laboratory, with two electrical engineers and a postdoc to develop custom DAQ and processing hardware and firmware.