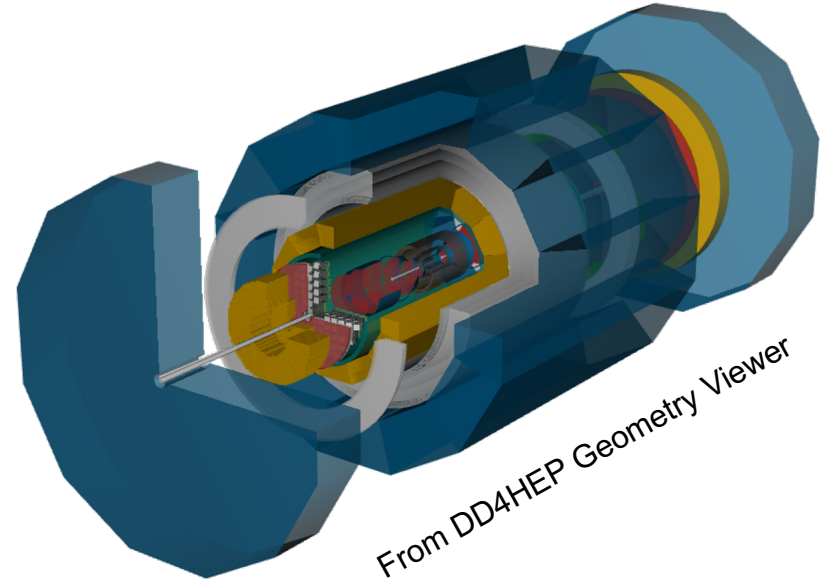
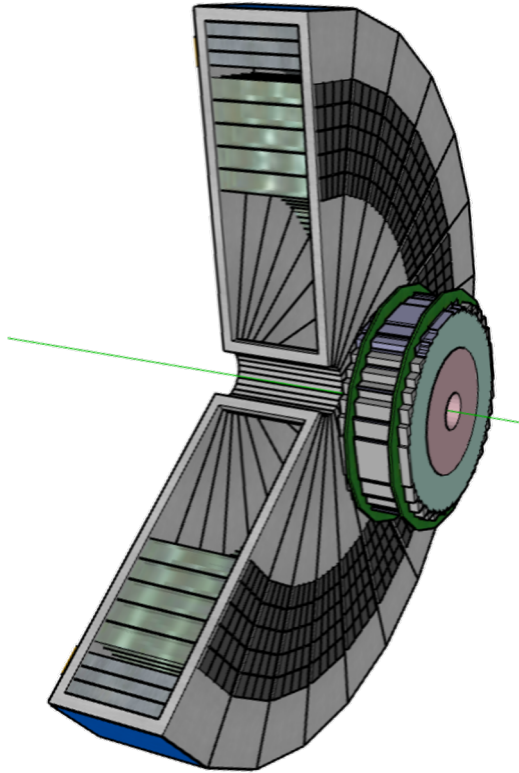


CALORIMETER WG SUMMARY TO THE BiWEEKLY MEETING

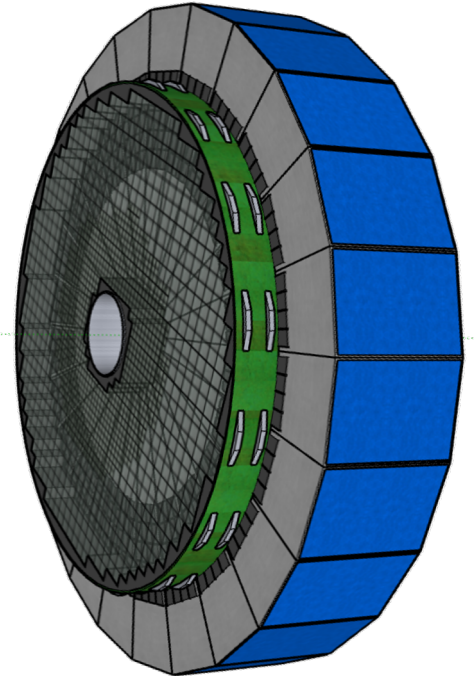
PAUL E REIMER
14 October 2021



CALORIMETER WG: ENDCAPS & BHCAL



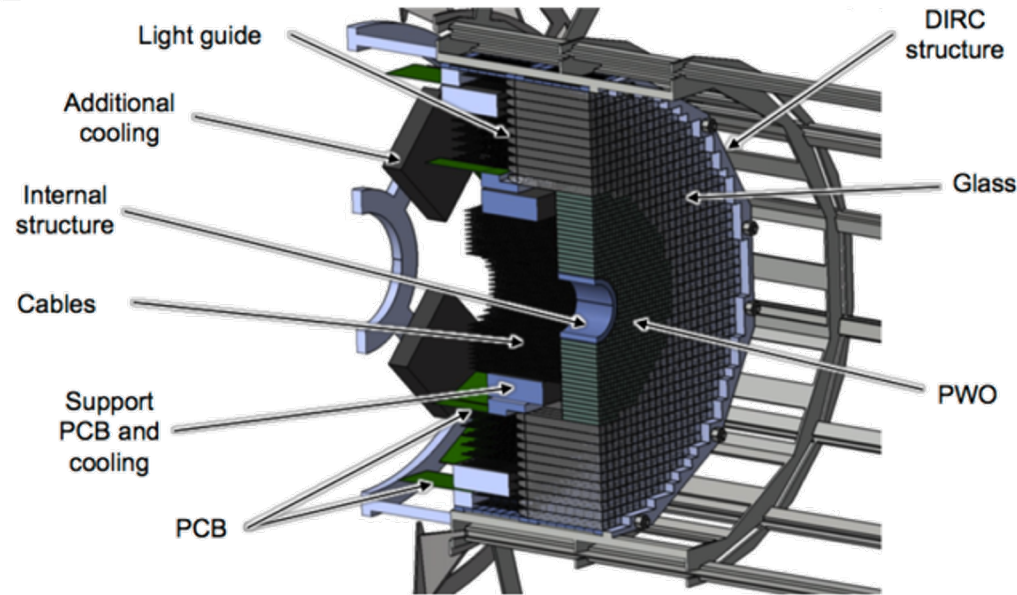
- P/N Hcal
 - Design has not changed
 - NHCAL is still an orphan detector
- PECaI
 - Design has not changed



nECAL

The nECal is a high-resolution electromagnetic calorimeter designed for precision measurements of the energy of scattered electrons and final-state photons in the region $-3.5 < \eta < -1.0$. The requirement on high energy resolution is driven by inclusive DIS where precise measurement of scattered electrons is critical to determine the event kinematics.

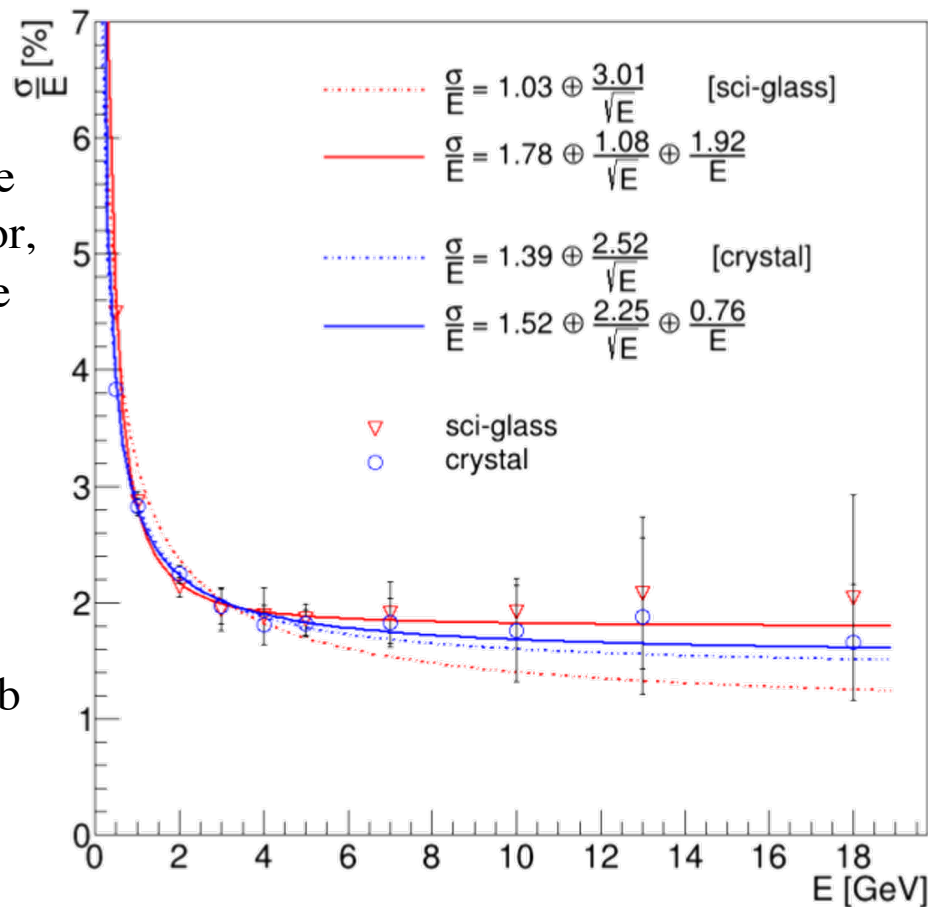
- The inner part of nECal: 1976 $20 \times 20 \times 200 \text{ mm}^3$ **PbWO₄ (PWO)** crystals ($\approx 22X_0$)
- Outer part of nECal: 1104 $40 \times 40 \times 550 \text{ mm}^3$ **Scintillating Glass (SciGlass)** blocks ($\approx 20X_0$)



nECAL

- A detailed design of nECal is in progress. The EEEMCAL team has begun to organize activities into mechanical design, scintillator, readout, and software/simulation among the collaborating institutions. Pre-design activities, in particular for the support structure have started in 2021.
- EOI for the Electron Endcap Electromagnetic Calorimeter (EEEmCal). 2021.
[url:https://indico.bnl.gov/event/8552/contributions/43186/](https://indico.bnl.gov/event/8552/contributions/43186/)

E resolution of inner[crystal] and outer[sci-glass]

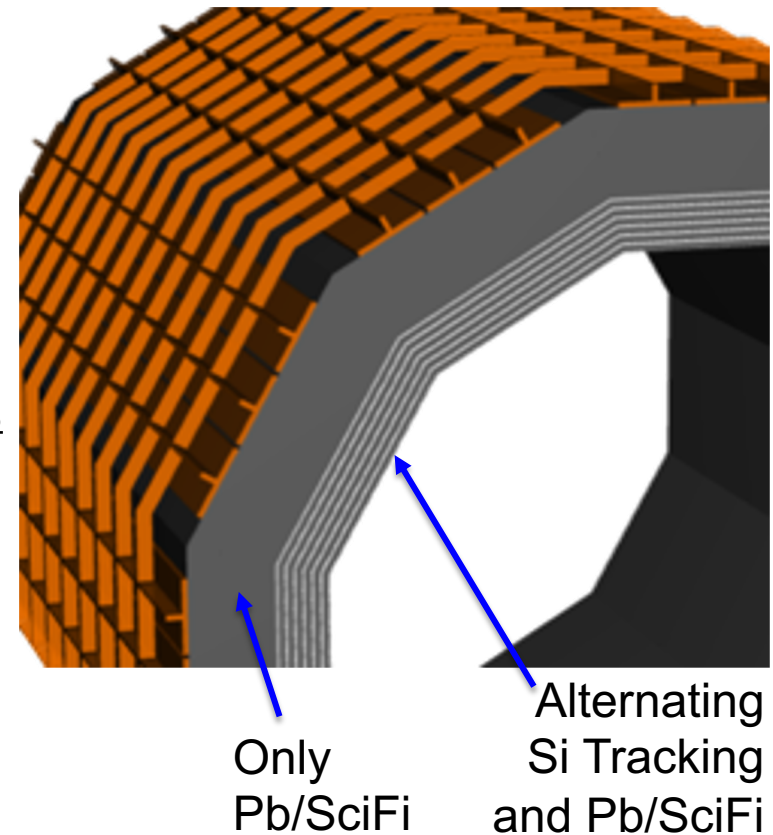


BHCAL

- Still an orphan detector
- ATHENA magnet (about 2 interaction lengths) precludes good
- 2 interaction length (tail-catcher) to contain about 95% of hadronic showers.
- 5 layers steel and scintillation sandwich (4 cm/ 5 mm layer structure).
- Re-use existing scintillation mega- tiles from STAR bECal
- We can make up for some of this deficiency with optimized BECal,
– but **BECal must still perform its Ecal functions**

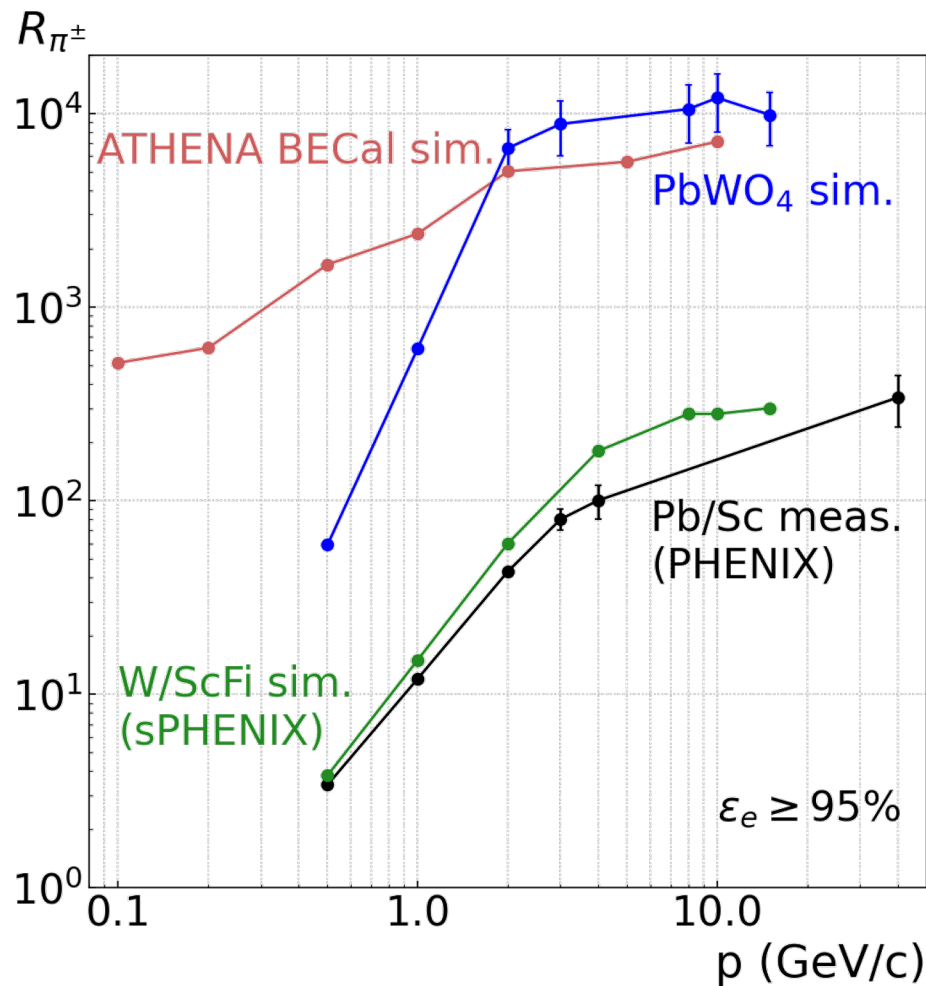
BECAL CONFIGURATION

- Alternating sections of Pb/SciFi and Si Tracking Calorimeter
- Nine layers of Si Tracking in the inner half (roughly) of the BECal
 - Why 9? See C. Peng and M. Zurek at https://indico.bnl.gov/event/13531/contributions/55893/attachments/37653/62025/BECAL_pion_rejection_1011.pdf
- Si layers are
 - 0.155 cm of Si + 1 cm of air = 1.155 cm
- Pb/SciFi layers are
 - 13 layers of fibers
 - $13 \times 1.22 \text{ mm} = 1.586 \text{ cm}$ layers of Pb/SciFi



BARREL ECAL PERFORMANCE

- π/e separation
 - comparable to PbWO_4
 - Caveat: Hadronic showers at this energy are poorly modeled by GEANT4
- γ, e energy resolution
 - Design from GlueX, $\frac{5\%}{\sqrt{E}} + 1\%$
 - Important for DVCS measurements
- Additional help for barrel hadron energy measurement
 - Needs group to study this
 - Will affect γ -resolution

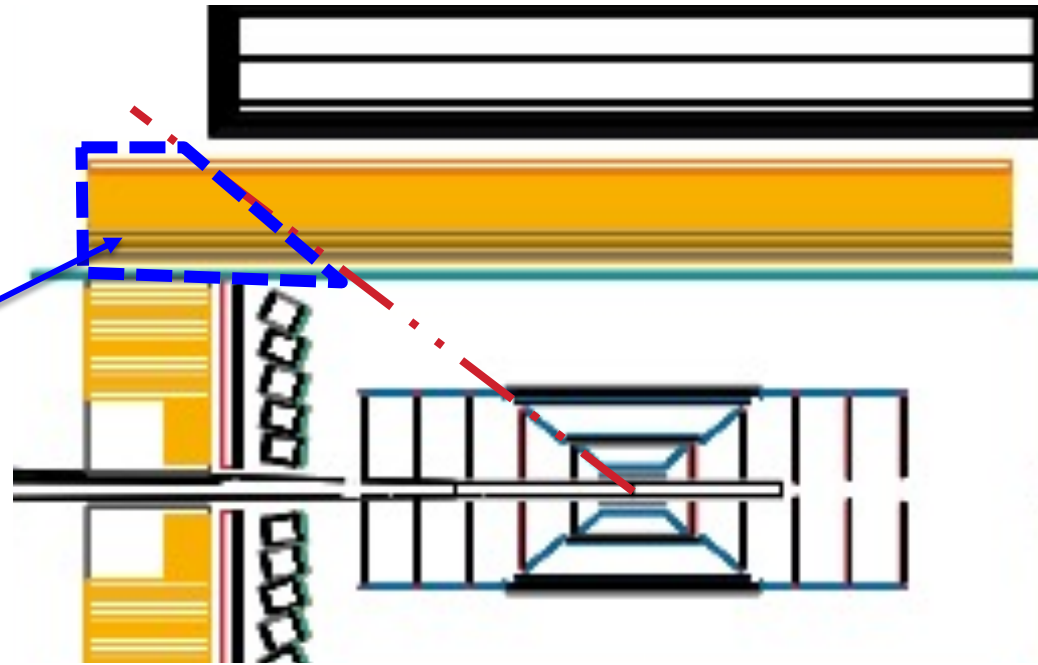


COST

- Remember **Barrel** ECal is covering much of the *electron endcap*

This volume is not SciGlass

- Rough cost
 - fixed costs + \$1.1M/layer
 - Cost directly scales with area
 - Radius is important to cost
 - \$1M/10 cm radial.



SUMMARY

- All calorimeters are well defined
 - Optimization continues
- BHCaI and NHCaI
 - being shepherded through,
 - but have no strong advocate

