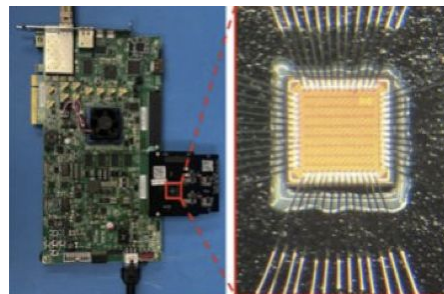
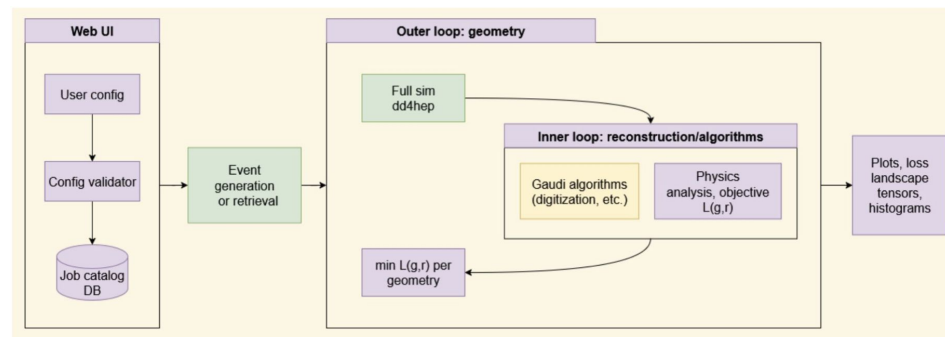
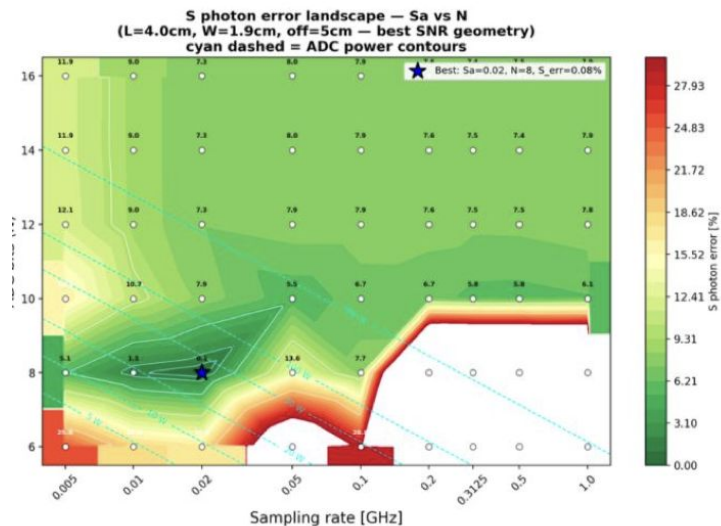


Summary and Plans for Detector

Christoph Paus (MIT) and Charlie Young (SLAC)

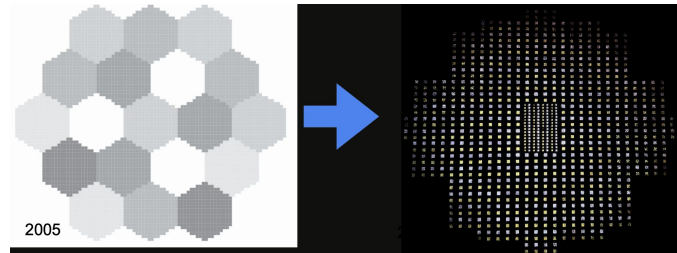
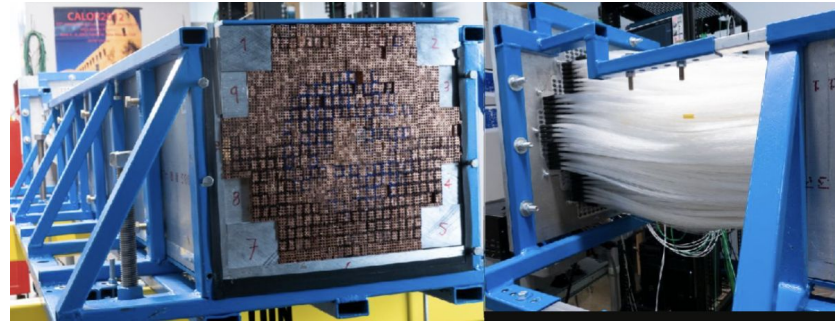
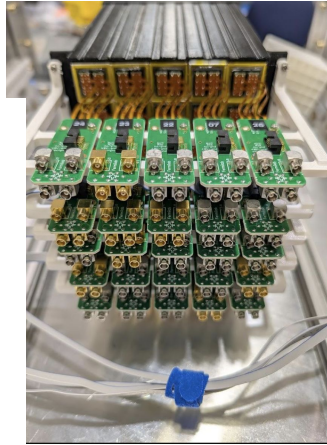
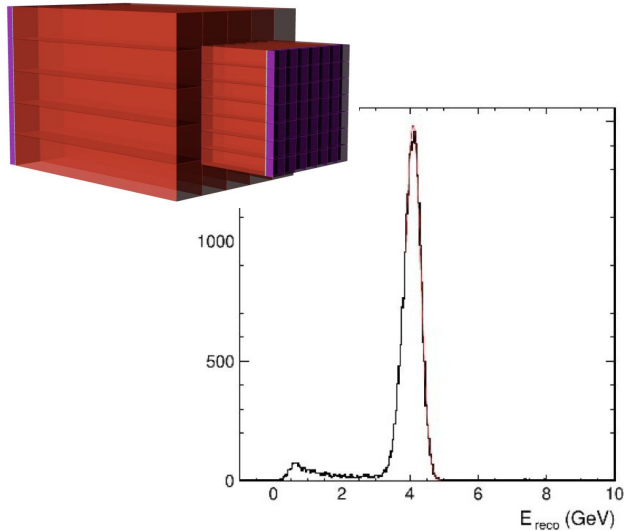
Progress - AIM

- Bi-Level Detector Optimization Framework (VIBRATO)
- Agentic workflow
- Embedded FPGA



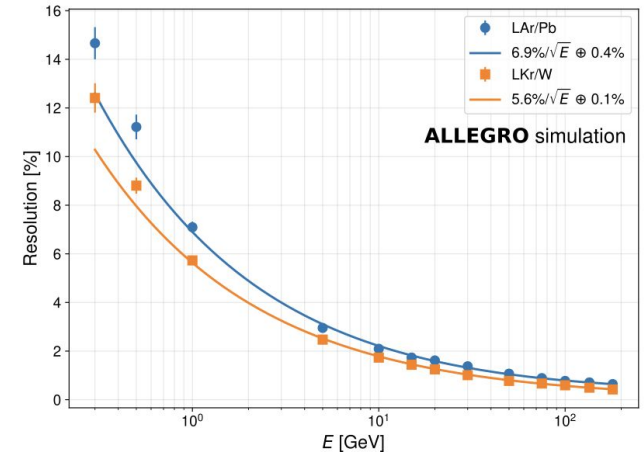
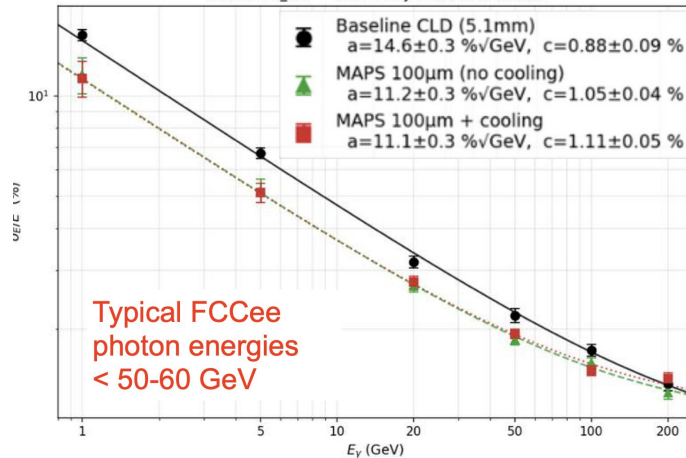
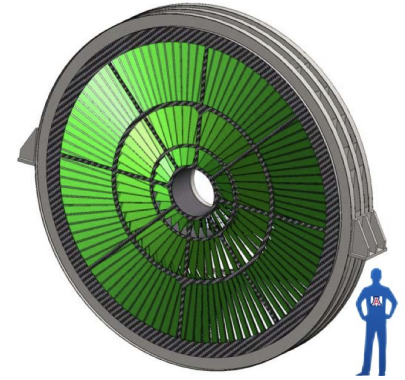
Progress - Dual-Readout Calorimeters

- Dual-readout crystal ECAL with 2 depth segments - recent DESY beam tests
- Dual-readout fiber HCAL - going from 38 PMT channels to 896 SiPM channels; timing information provides virtual depth segmentation.



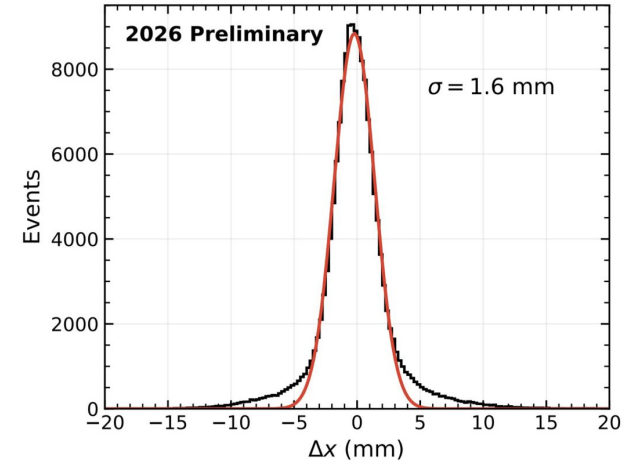
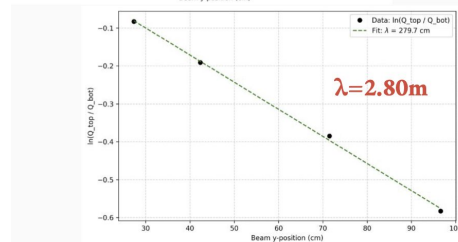
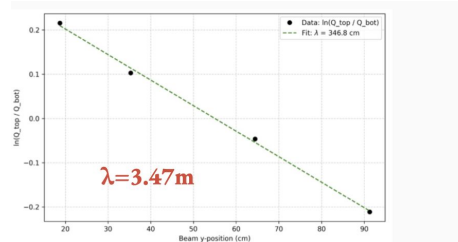
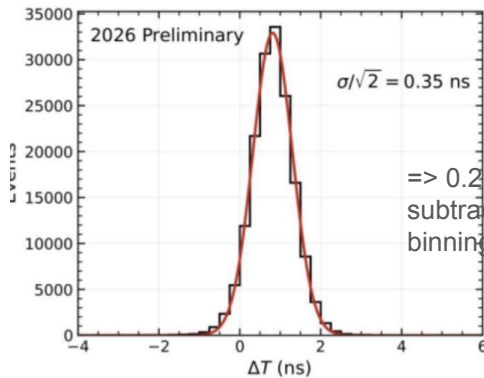
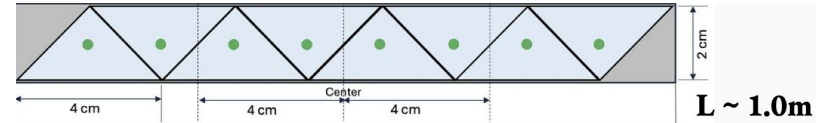
Progress - Noble Liquid and Silicon-tungsten Calorimeters

- Endcap noble liquid calorimeter
 - Turbine design
 - Projected resolution $\sim 7\%/\sqrt{E}$
- Si-W
 - Smaller readout pads improve E resolution
 - Studying impact of additional material due to cooling

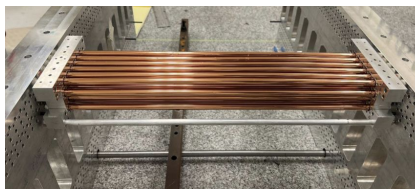


Progress - Scintillator Bars for Muon System

- Scintillators with triangular cross section
 - Extruded at Fermilab
 - Read out using wavelength shifting (WLS) fiber
- Test beam at CERN
 - Attenuation length ~ 3 m in WLS
 - Transverse position resolution ~ 1.6 mm
 - Timing resolution ~ 0.2 nsec

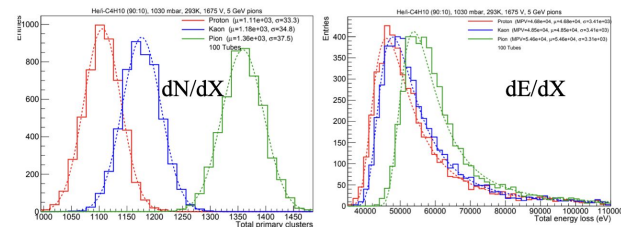


Progress - Tracker

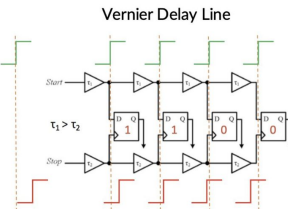
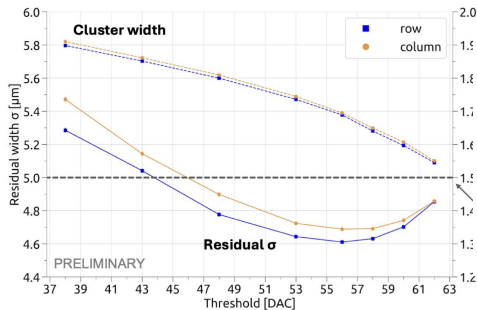
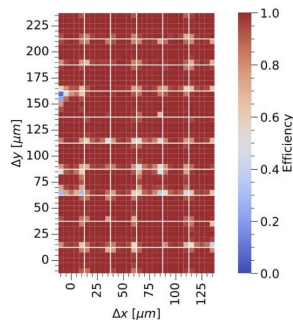
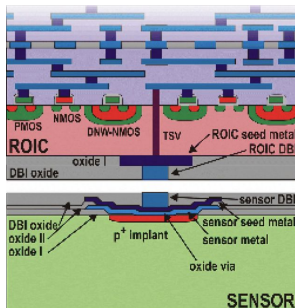
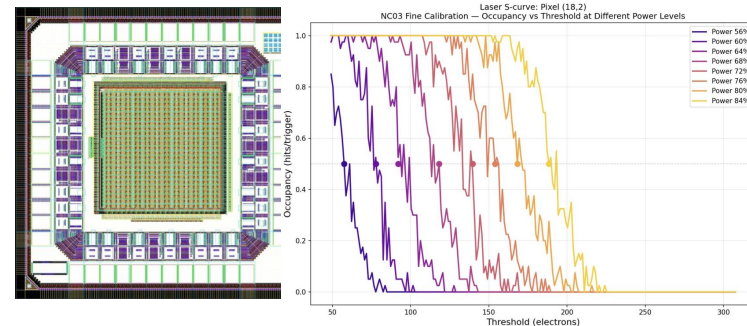


100 tubes

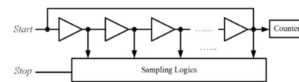
- Straw tubes - mechanics and dN/dx studies
 - Gain studies using Fe55
 - Test beam at CERN
- MAPS -
 - sensor design/fab
 - TDC implementation and 3D integration
- AC-LGAD - close cooperation with EIC team
 - Good spatial and temporal resolution
 - Test beam at DESY and KEK, Irradiation test on-going



Optical S-curves



Ring Oscillator (RO)



FY27 Activities / Funding Requests (unordered)

AIM

- AI-assisted detector design optimization - work towards more realistic and complex scenarios
- “Hackathons” to expand the use of agentic tools.

DAQ

- Development of radiation-tolerant (at FCC-ee levels) silicon photonics data link - reduce material budget that would otherwise be unavoidable from cables; no commercial options because of lack of a market

Muon detector

- Further development of scintillator bar and drift tubes for muon system

FY27 Activities / Funding Requests (unordered)

Calorimeter

- Test beam campaign - dual-readout crystal ECAL and fiber HCAL to further improve performance and to move towards buildable design
- Endcap Liquid Argon turbine calorimeter - mechanical and electronic design towards a demonstrator
- Simulation for thermal management of cold electronics needed for liquid argon calorimeter
- Simulation studies for SI-W luminometer - precision luminosity is one of the systematic challenges given the exquisite statistical precision available.
- Digital Si-W ECAL using MAPS - optimize design for cooling and thermal management

FY27 Activities / Funding Requests (unordered)

Tracking

- MAPS development - strong candidate for vertex detector, and candidate for other applications.
- Straw tube development - option in ALLEGRO main tracker
- Beam background studies and production of samples - intimate connection to MDI, and crucial consideration for vertex detector design
- Carbon fiber wire for chamber - low mass tracker
- Precision timing wrapper for particle ID via TOF (LGAD development)
- Low-mass support such as carbon fiber - reduction of material budget
- Front-end electronics for cluster counting - enabler of dN/dx