

Overview: detector technologies

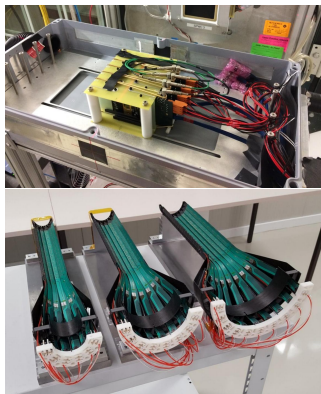
Sho Uemura

How can we use our hardware capabilities?

- What have we done, what are we working on?
- What have we learned how to do?
- What are other people doing? What could we do?
 - ▶ Who can we collaborate with? What could we contribute?

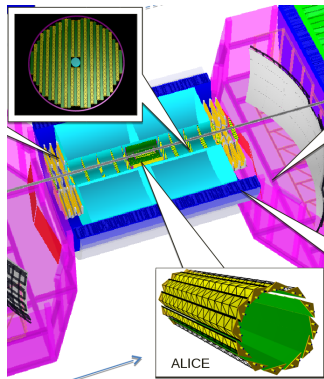
Current effort, silicon pixels: MVTX

- System integration: readout electronics, mechanical integration
- Simulation and performance optimization of MVTX+INTT
- Sensor characterization for sPHENIX-specific requirements
- We won't have done the hard work of designing MVTX from scratch, but integration and commissioning is not trivial
 - ▶ We will be intimately familiar with all parts of this state-of-the-art design



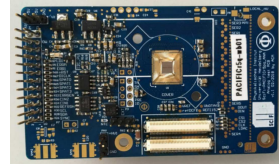
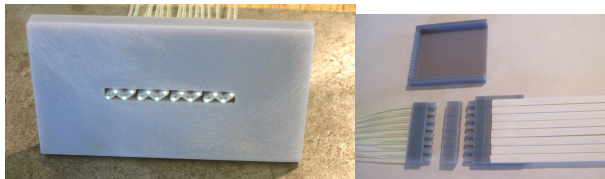
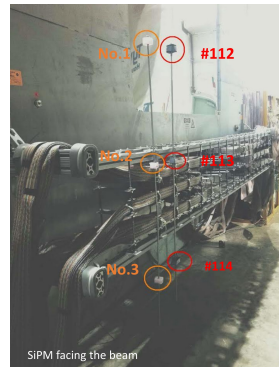
Future effort, silicon pixels

- EIC vertex detector is the obvious big target
 - ▶ Smaller short-term applications are good (X-ray?)
- MAPS development: long cycles, specialized equipment
 - ▶ We are probably “users” and not “developers” for now
 - ▶ Collaborators: Heidelberg, CERN, Geneva?
- Mechanical design and assembly: MechE support essential, assembly requires specialized facilities
 - ▶ Collaborators: LBL, Fermilab?



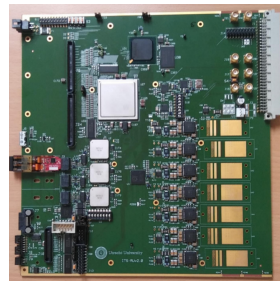
SiPM-based detectors

- We built the dark photon hodoscopes, we are building the LHCb magnet station
 - ▶ SiPM characterization
 - ▶ Discrete and ASIC frontends
 - ▶ Fiber connectors and assembly techniques for efficient construction
- Other examples: LHCb SciFi, STAR EPD, sPHENIX EMCal and HCal
 - ▶ This is becoming a dominant technology for many types of detectors
 - ▶ Collaborators: Fermilab, Heidelberg?

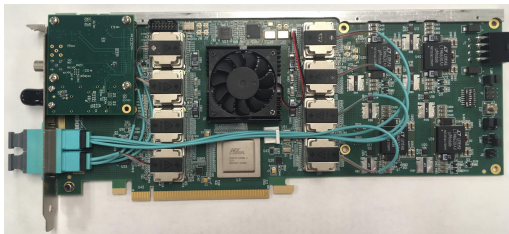
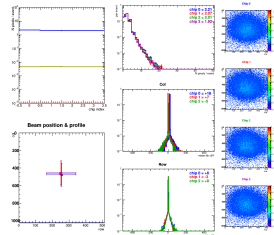


Readout electronics

- MVTX: RU frontend and FELIX backend
 - ▶ Rad-hard GBT link (the new CERN standard)
 - ▶ Rad-tolerant FPGA design
 - ▶ High-speed data acquisition (100 Gbps per FELIX, 48 fiber inputs and outputs)
 - ▶ RCDAQ: lightweight, flexible DAQ software
- SeaQuest DAQ and trigger upgrades
 - ▶ Efficient general-purpose designs



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Readout electronics

- RCDAQ and FELIX (for high-performance optical readout) or off-the-shelf kits (otherwise) could be the heart of a general-purpose “DAQ in a box”
 - ▶ This could be what we offer collaborators
 - ▶ EE support essential
- We have put a lot of effort into digging into, understanding, and documenting the systems we have been working with
 - ▶ Building blocks for future efforts