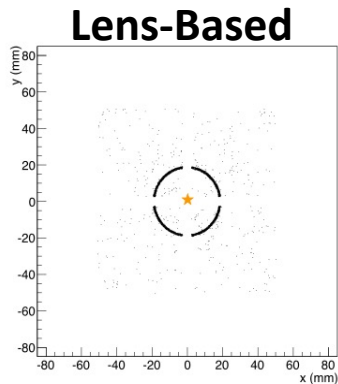
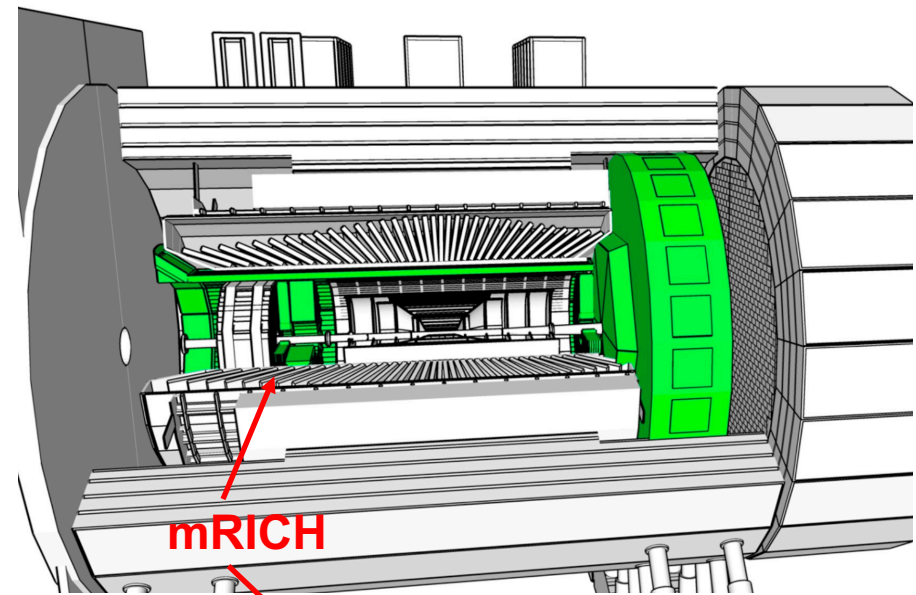


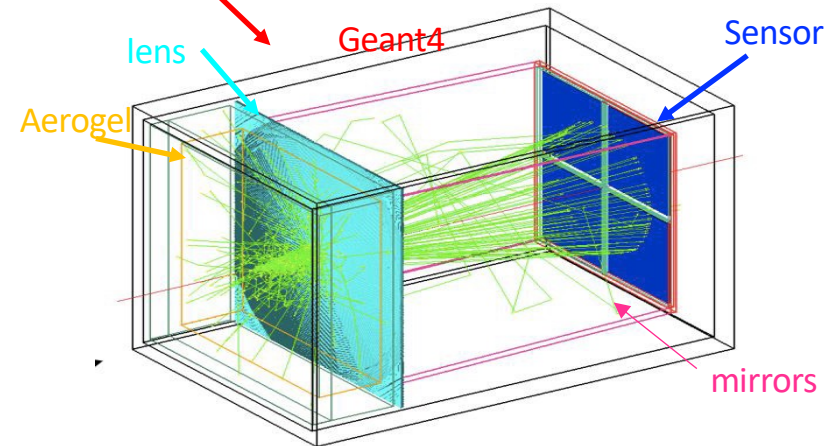
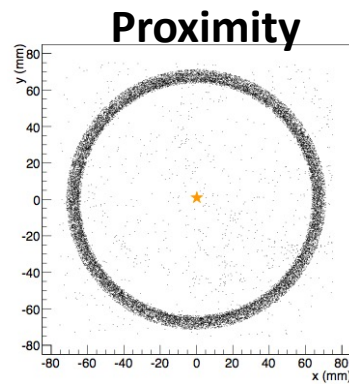
EIC/ePIC mRICH

M. Sarsour
Georgia State University

- A compact aerogel RICH which can be projective.
Compact, modular and projective
- Radiator: Aerogel, L~3 - 4 cm and n= 1.03
- Focusing: 6" Fresnel lens



at 23 cm



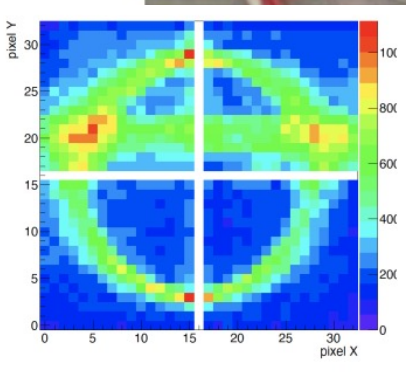
- ❖ Compact PID device with momentum coverage up to 10 GeV/c for π/K and e/π up to 2 GeV/c or more.
- ❖ The emission point error is minimized at the lens focal plane, and chromatic dispersion error is reduced by UV filtering (acrylic).
- ❖ R&D is at very advanced stage – 3 beam tests already!

3rd mRICH Beam Test at JLab

late September to early October of 2021

1-6 GeV/c Secondary Electron Beam

electrons



(a)

1/9/23

GEM Tracker 1

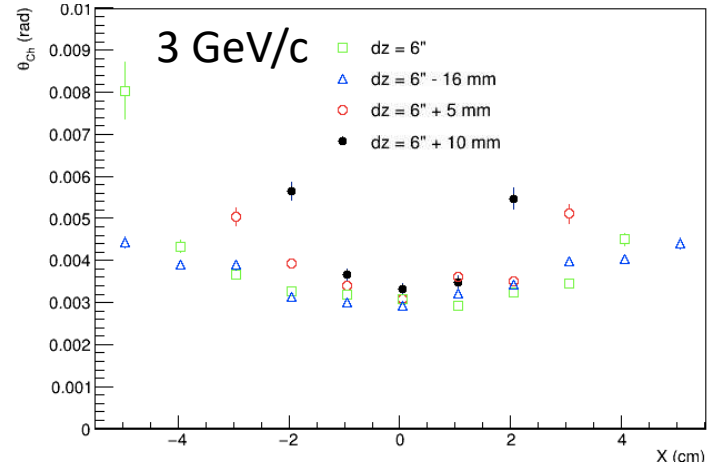
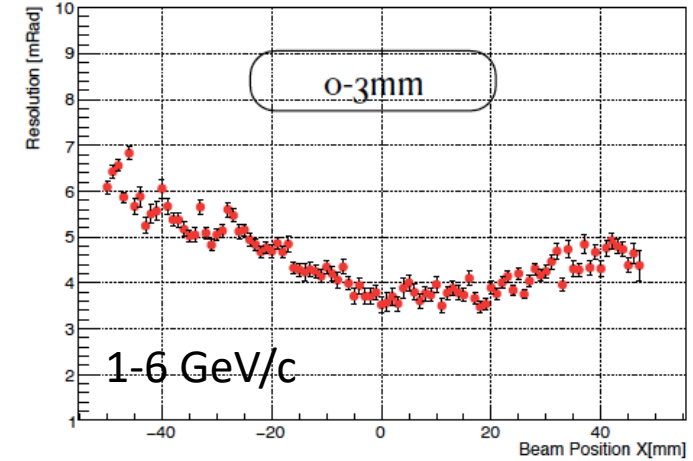
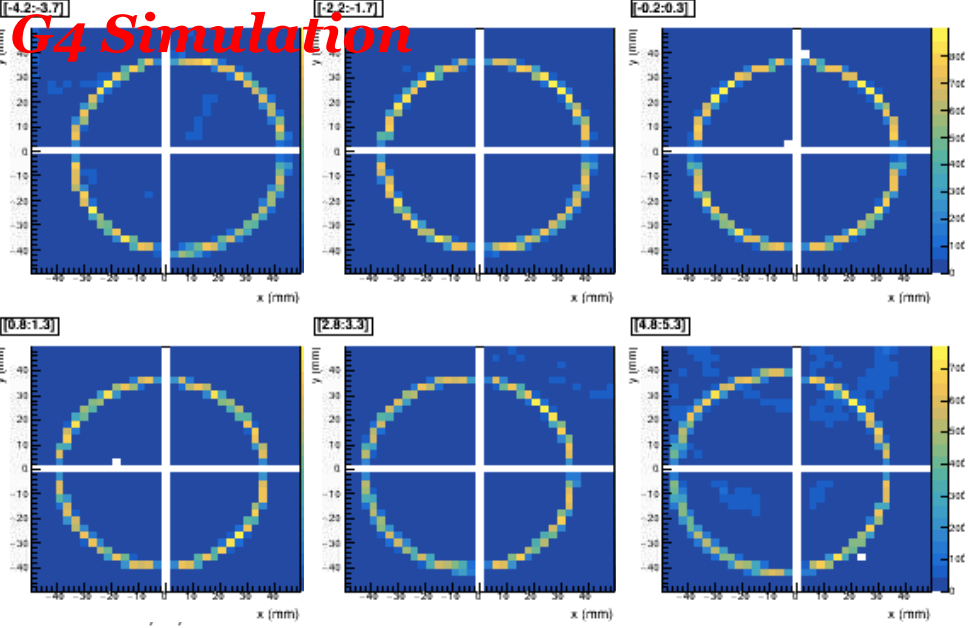
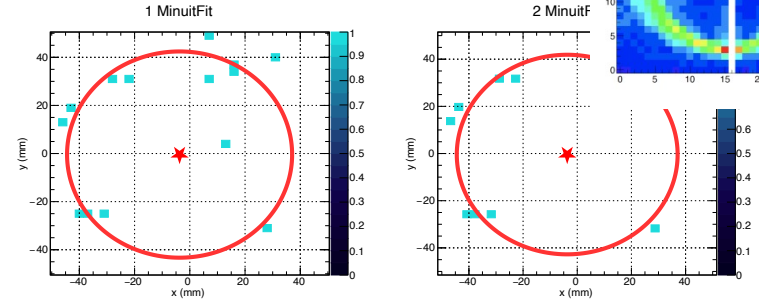
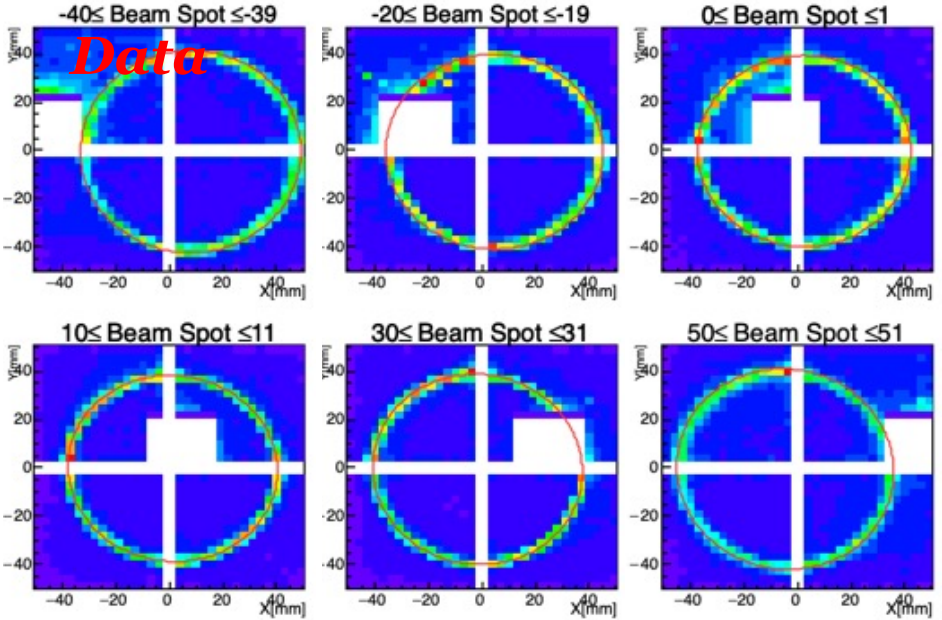
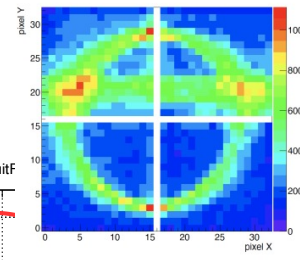
GEM Tracker 2

mRICH

(b) Top view

2

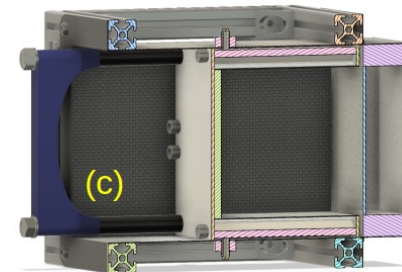
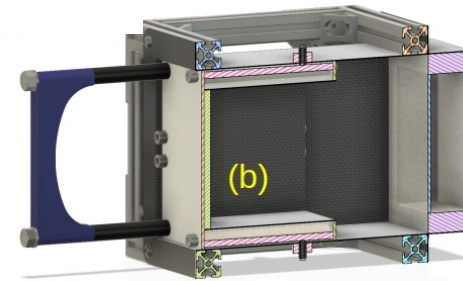
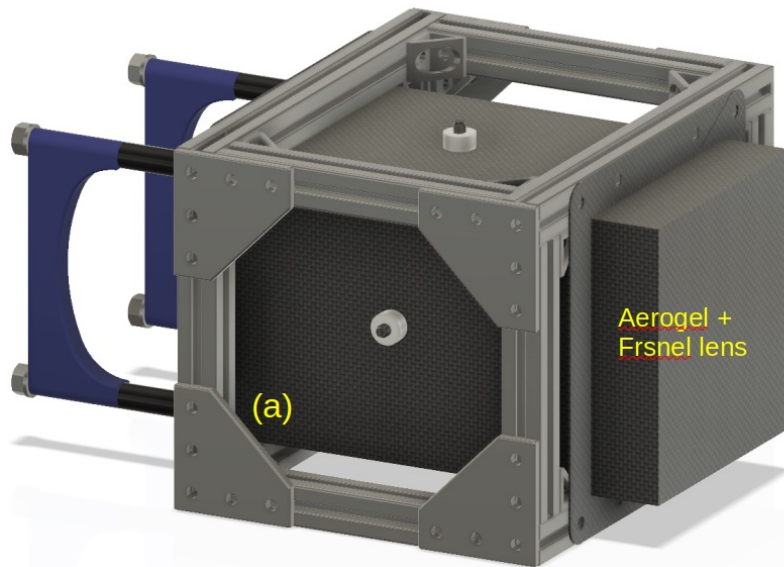
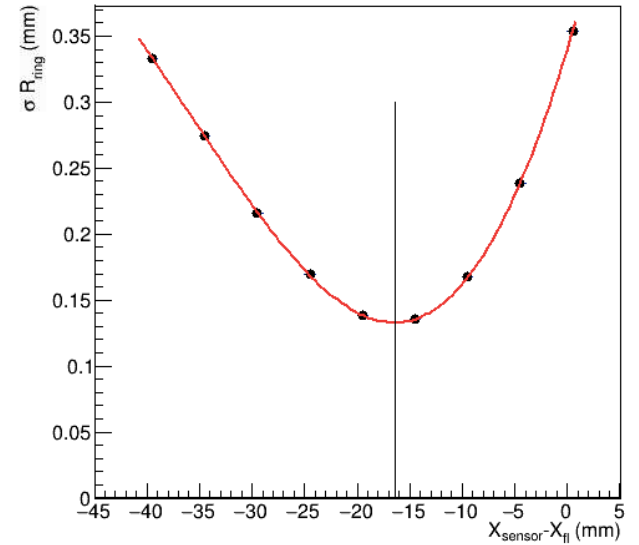
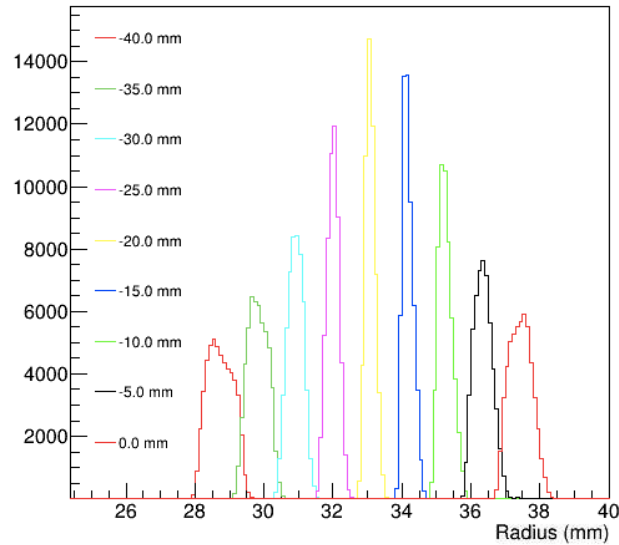
Results from JLab Beam Test



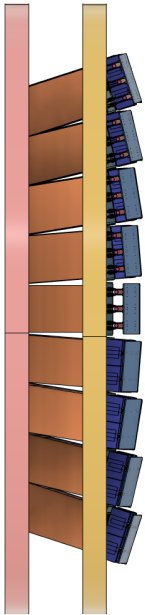
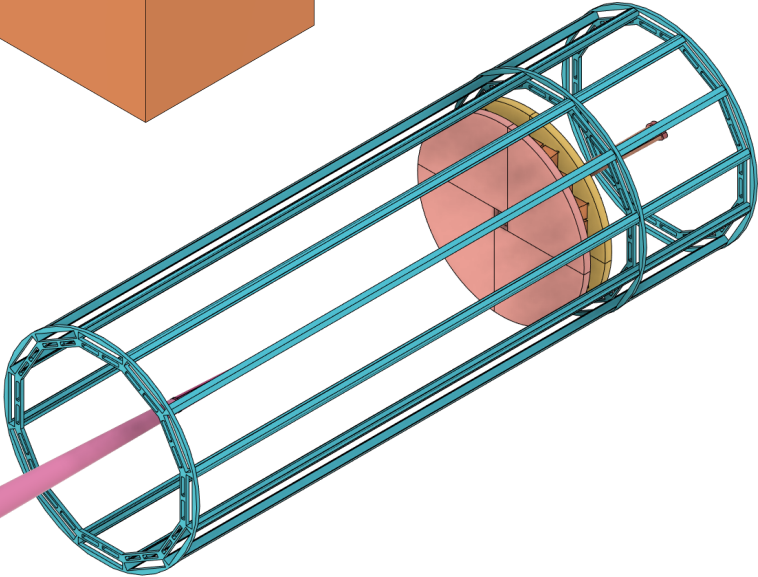
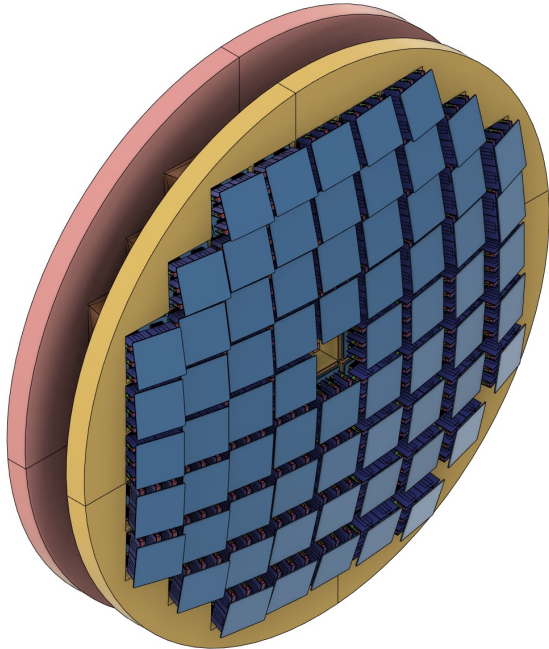
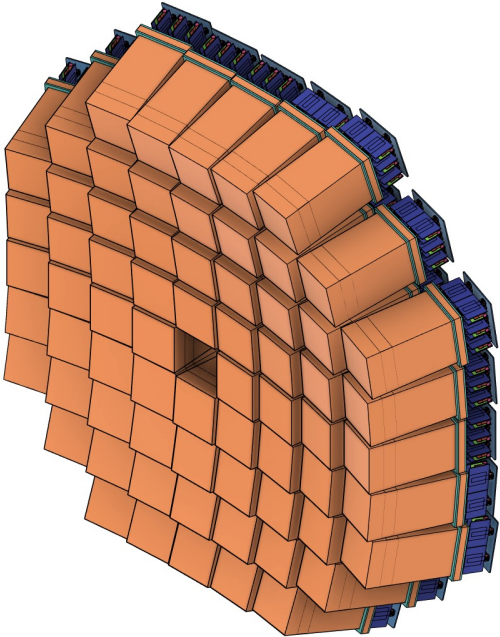
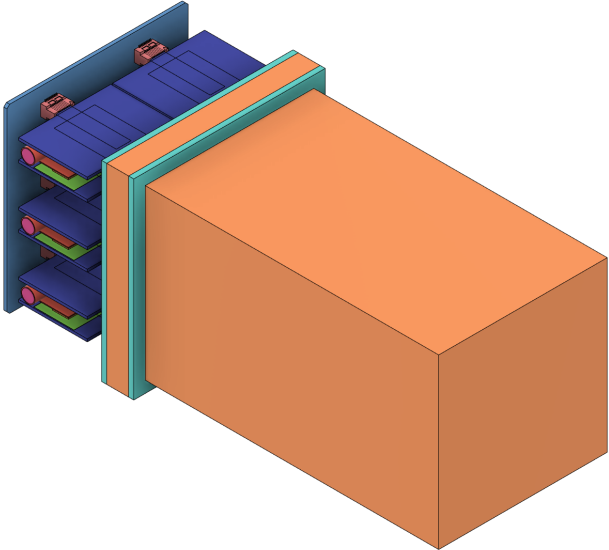
New mRICH Prototype Design

Optimizing

- the sensor location
- Aerogel thickness



mRICH Support Frame



eRD101 - mRICH Project R&D in FY2023

- “Most of request funds are awarded to eRD101 for FY23”

Category
Design support from JLab engineer
Postdoc at GSU
Postdoc at University of Glasgow
Machining support (GSU shop)
Aerogel purchase
Readout
Mirrors and Fresnel lens
GEM tracker and readout
Material supplies

- *Urge the Glasgow group to participate in eRD110 that is focusing on LAPPD R&D*
- *The aerogel purchase will be handled through the project*

Summary

- JLab beam test data analysis is near completion -> extracting s.p Cerenkov angle resolution
- Support structure - reduce material budget and test support integrity (JLab & GSU)
- Beam test: Optimizing the photosensor plane location & Aerogel block size
 - Optimizing the sensor plane location and testing Aerogel blocks with three different thicknesses: 3 cm, 4 cm and 5 cm
 - Testing mRICH PID performance (K/ π and e/ π separation)
 - Potential sites for beam test (Fermi & CERN and may be JLab)
- March review!

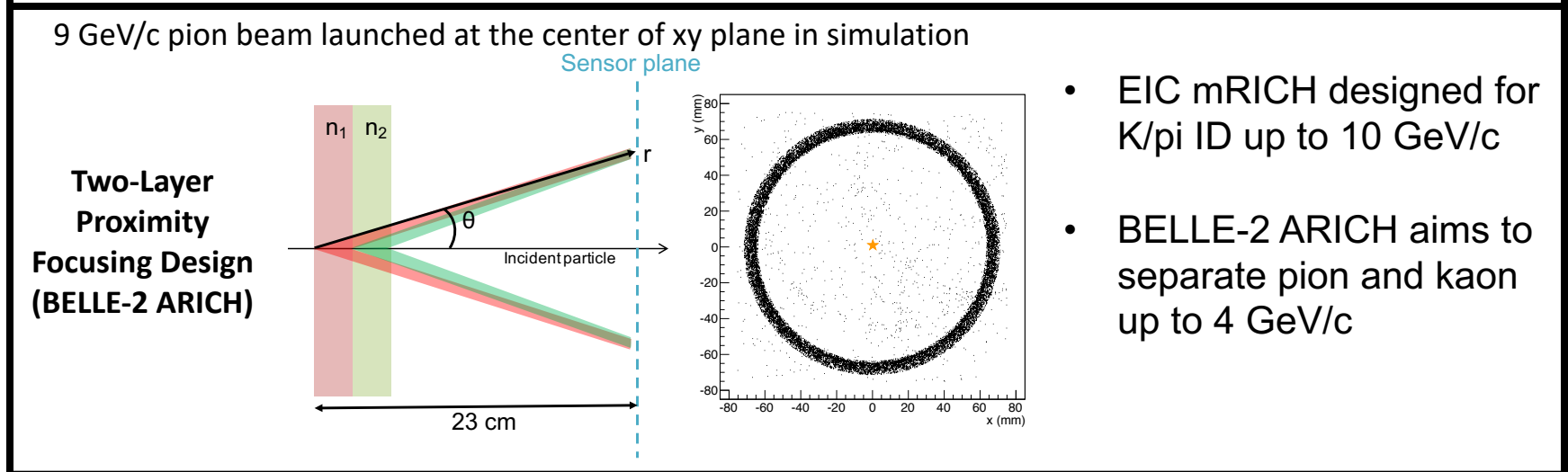
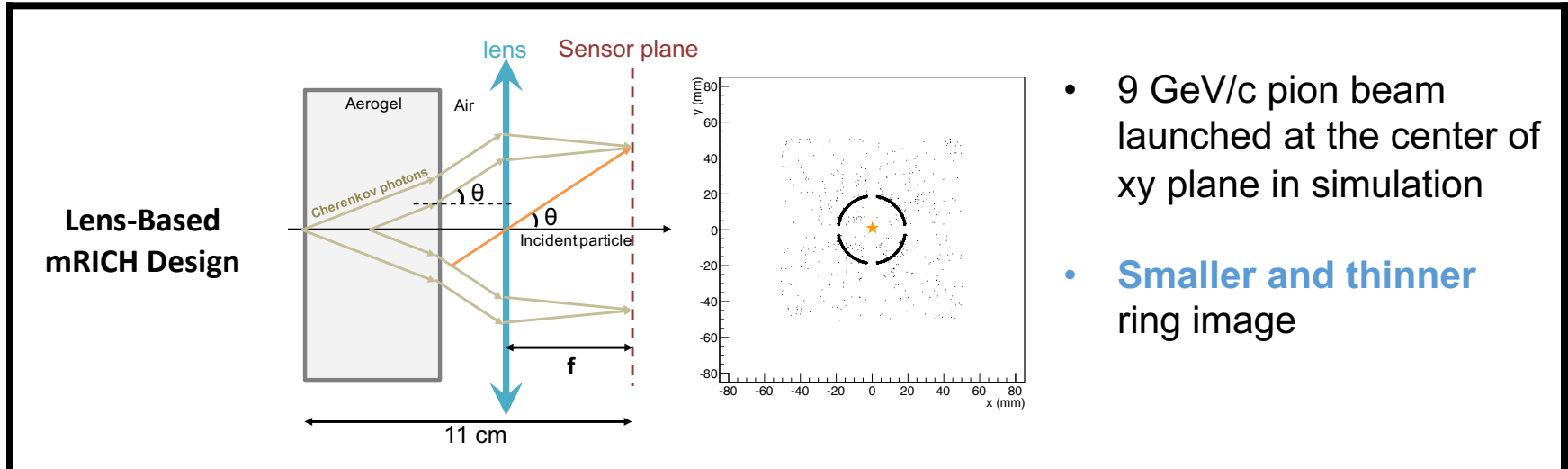
mRICH Team

ANL (Junqi Xie), BINP (Alexander Barnyakov), BNL (Edward Kistenev and Alexander Kieslev), Duke University (Zhiwen Zhao), Glasgow University (Rachel Montgomery and Bjoern Seitz), Georgia State University (Xiaochun He, Murad Sarsour and Deepali Sharma), INFN/Ferarra (Marco Contalbrigo), JLab (Alex Eslinger and Benedikt Zihlmann), Tsinghua University (Zhihong Ye) and University of South Carolina (Yordanka Ilieva).

THANK YOU

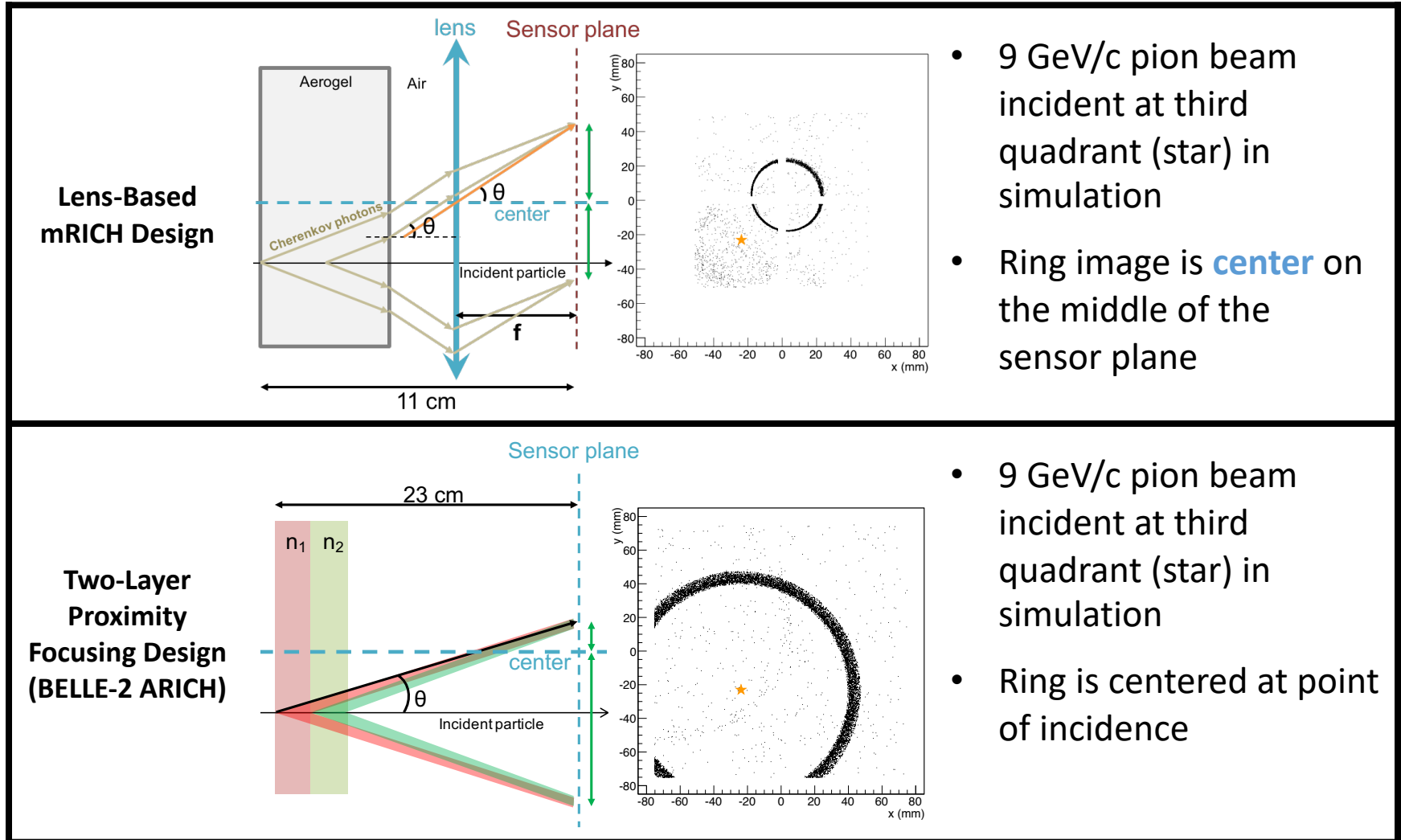
mRICH – lens-based focusing aerogel detector design

Smaller, but thinner ring improves PID performance and reduces length



mRICH – lens-based focusing aerogel detector design

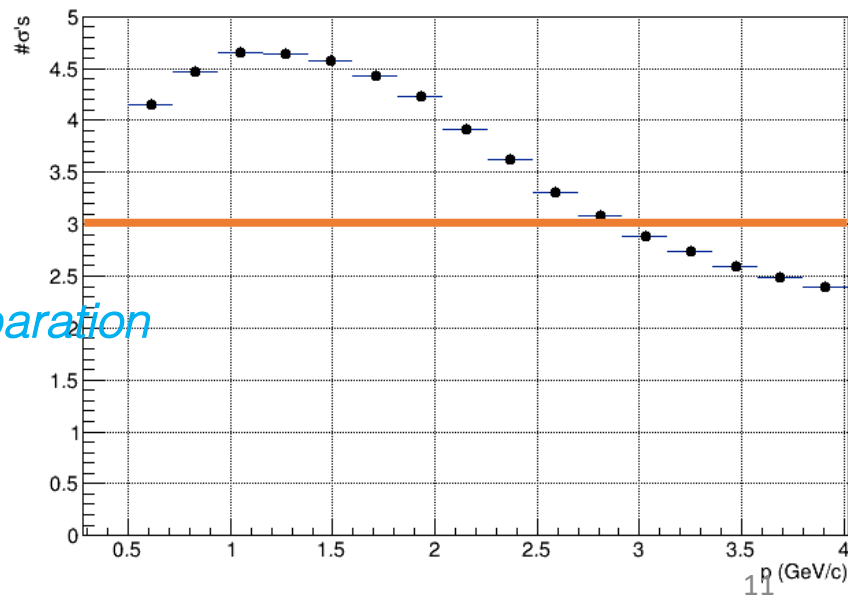
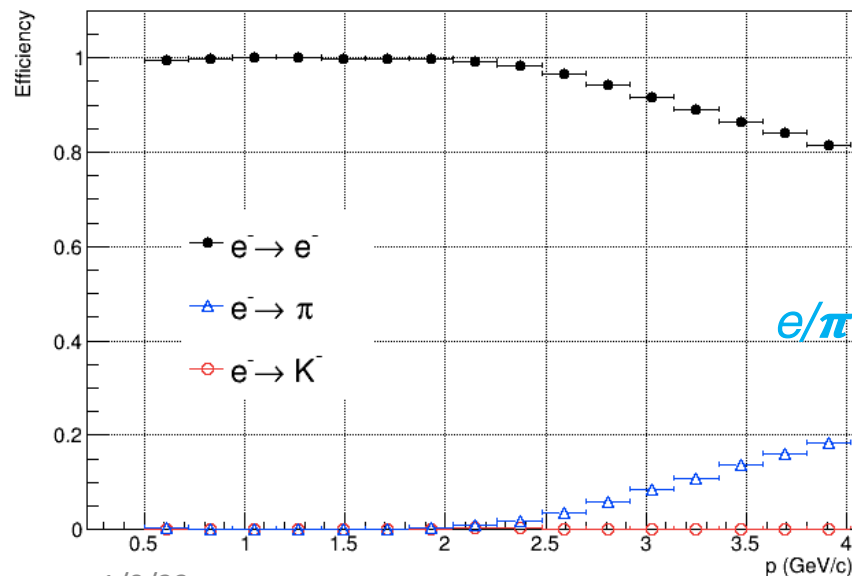
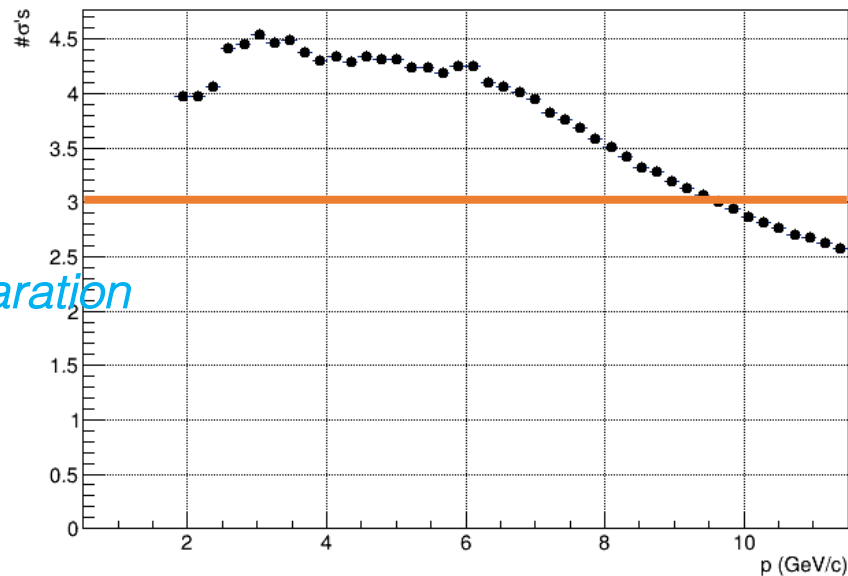
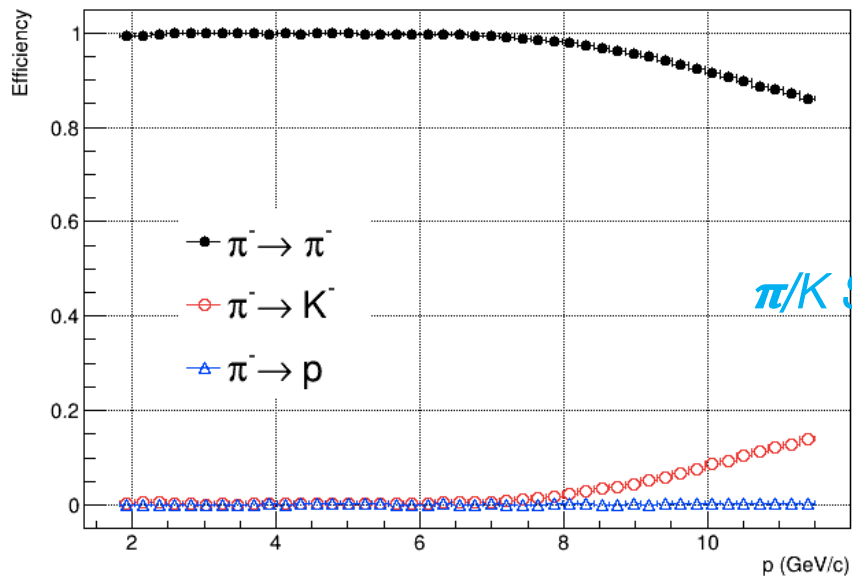
Ring centering of lens-based optics reduces sensor area (main cost driver)



mRICH PID Performance

- 3 cm Aerogel @ $n = 1.02$
- SiPM Q.E.

$\Delta\theta = 1.75$ mrad



mRICH PID Performance

