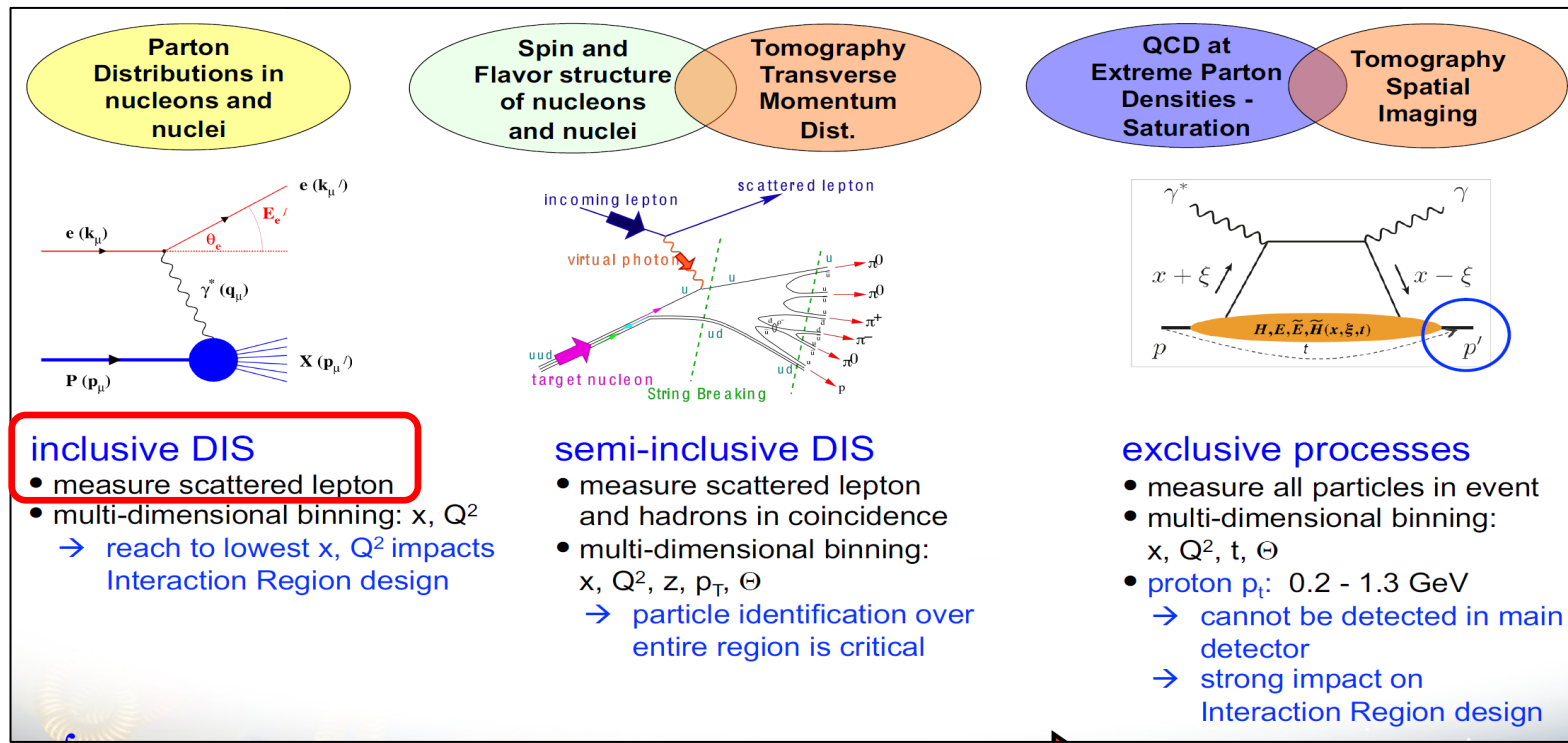


Context: **Electron-Ion Collider (EIC)** – hadron physics measurements with electromagnetic reactions

Scattered electron and final-state photon detection are crucial at the EIC

- ❑ Nearly all physics processes require the *detection of the scattered electron*
 - The requirement of *high-precision detection is driven mainly by inclusive DIS* where the scattered electron is critical to determine the event kinematics.
- ❑ DVCS, where a real photon is additionally detected in the final-state, is one of the fundamental processes to image and understand proton and nuclear structure at EIC.
- ❑ Precision detection of EM showering is essential to optimal particle ID and to determination of radiative corrections.

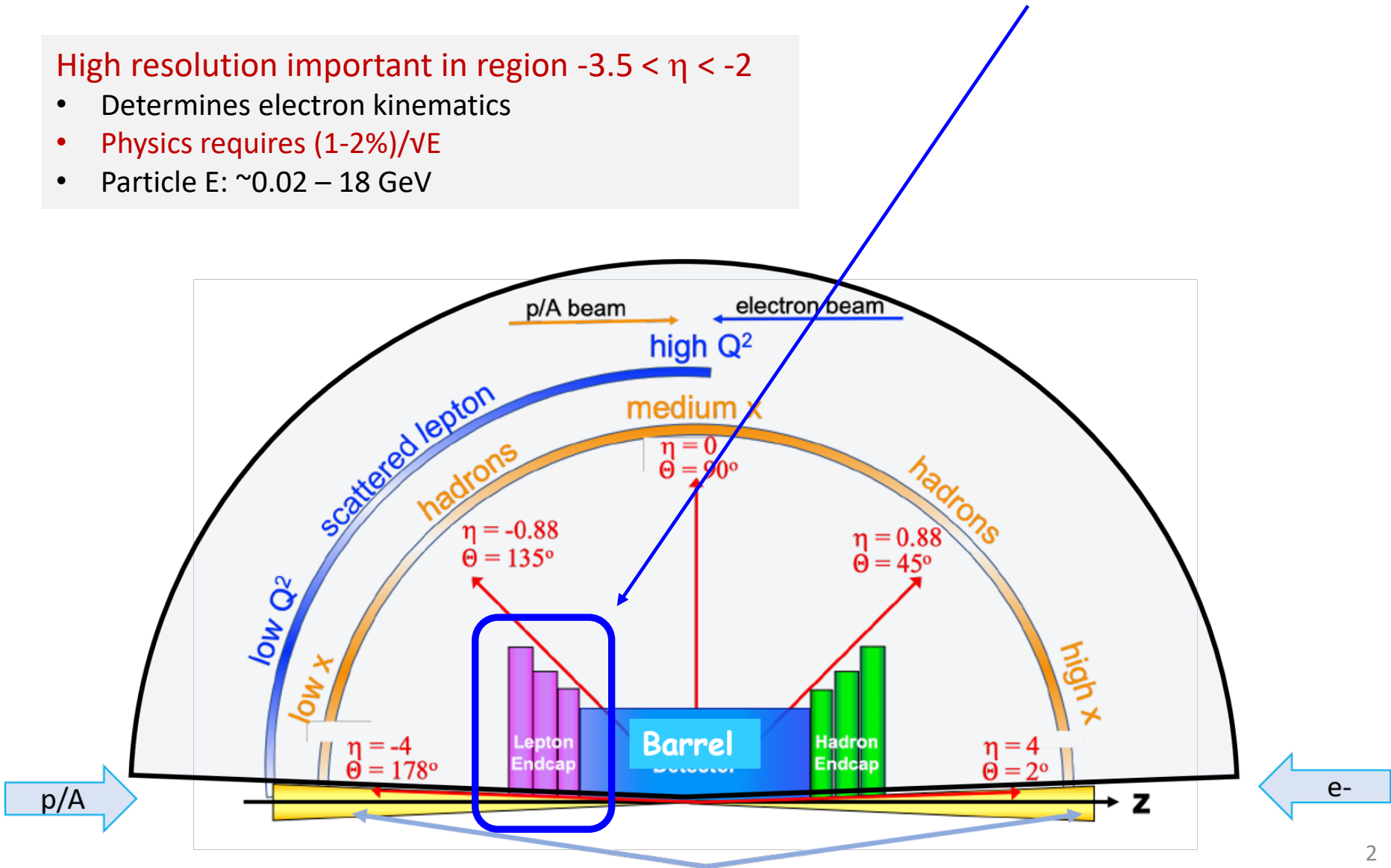


Scattered Electrons – special detection requirements

Scattered electrons have to be detected in the Lepton Endcap ($-3.5 < \eta < -1.0$)

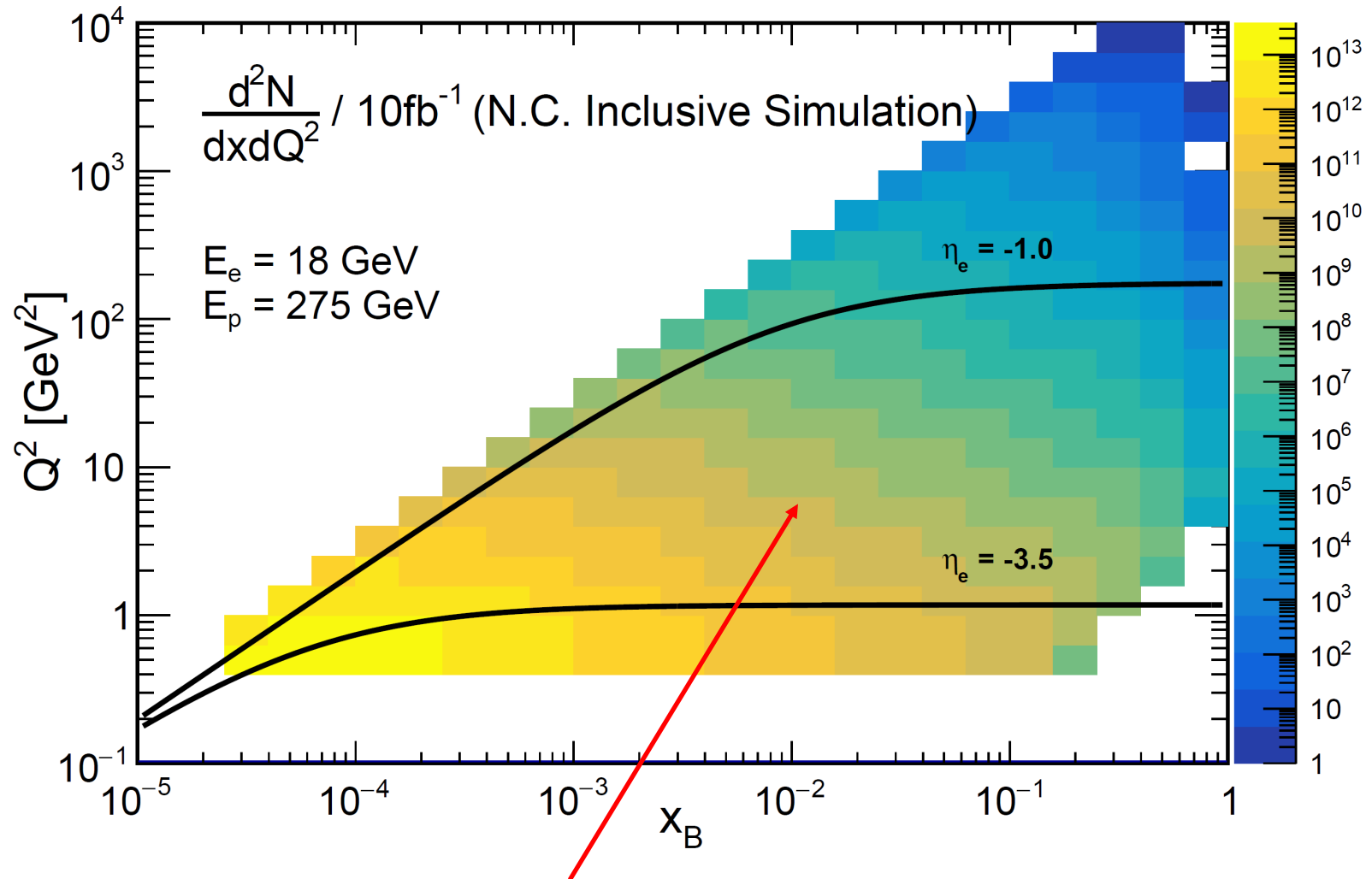
High resolution important in region $-3.5 < \eta < -2$

- Determines electron kinematics
- Physics requires $(1-2\%)/\sqrt{E}$
- Particle E: $\sim 0.02 - 18$ GeV



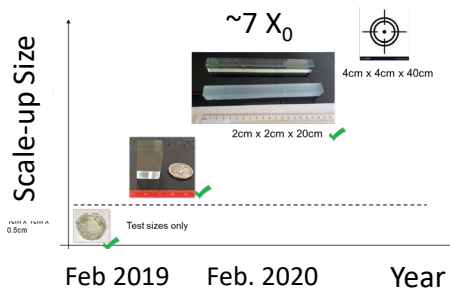
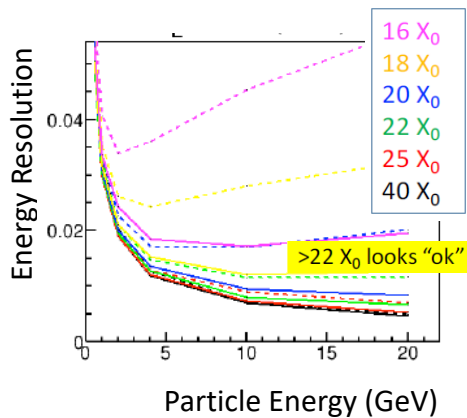
Scattered Electrons – special detection requirements

Scattered electrons have to be detected in the Lepton Endcap ($-3.5 < \eta < -1.0$)



Electron Endcap EM Calorimeter for Electron Detection - **Proposal**

We propose to design and construct the scattered electron detection in the Lepton Endcap covering pseudorapidity -3.5 to -1 with an electromagnetic calorimeter (**EEEMCal**).



REFERENCE

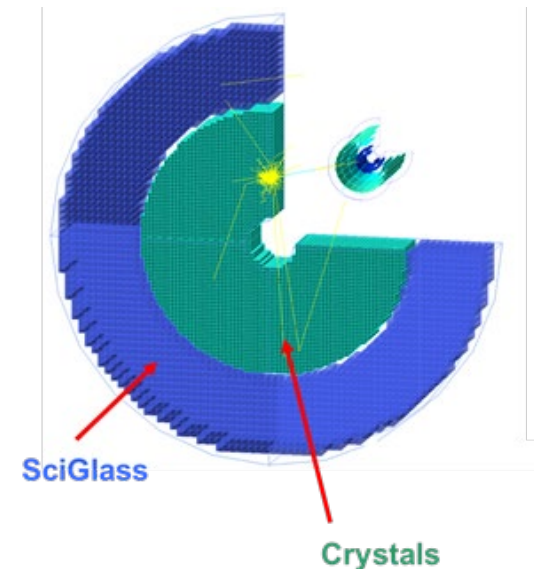
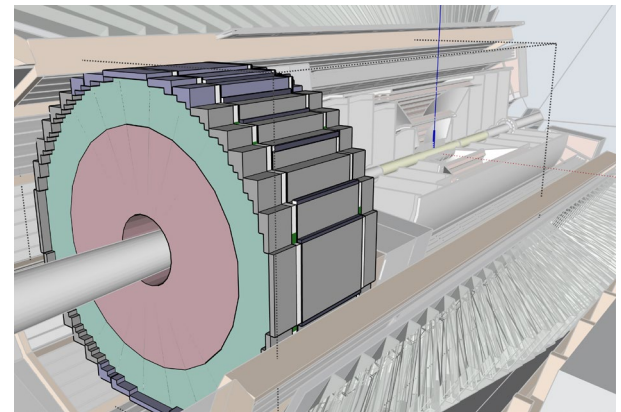
PbWO₄ crystals (inner)

- compact, radiation hard, luminescence yield to achieve high energy resolution, including the lowest photon energies

- Sensor: SiPMs (TBC)

SciGlass (outer)

- EIC eRD1
- radiation hard, luminescence yield similar or better than crystals depending on longitudinal length
- Sensor: SiPMs (TBC)



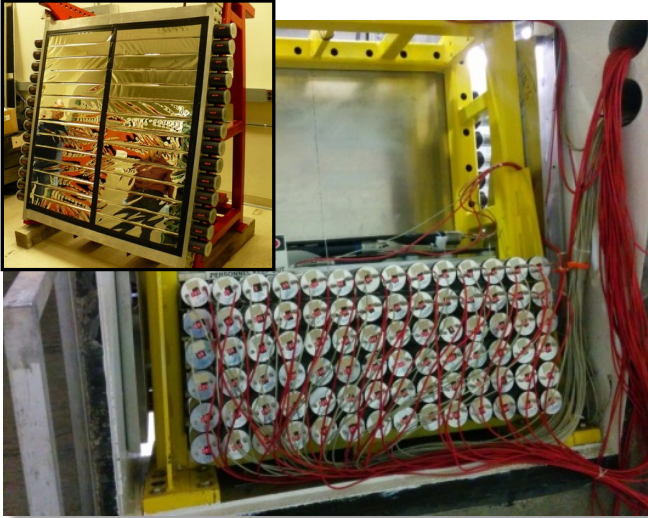
- Much progress with EEEMCal over the last 9 months
- Yellow Report shows requirements for high precision
- All three proto-collaborations need the EEEMCal

EEEMCal – Electron Endcap EM Calorimeter for Electron Detection - Team

- ❑ The Catholic University of America (contact: Tanja Horn, hornt@cua.edu)
- ❑ Lehigh University (contact: Rosi Reed, rosijreed@lehigh.edu)
- ❑ University of Kentucky (contact: Renee Fatemi, renee.fatemi@uky.edu)
- ❑ MIT and MIT-Bates Research and Engineering Center (contact: Richard Milner, milner@mit.edu)
- ❑ Florida International University (contact: Lei Guo, leguo@fiu.edu)
- ❑ James Madison U. (contact: Gabriel Niculescu, gabriel@jlab.org)
- ❑ AANL, Armenia (contact: Ani Aprahamian, aapraham@nd.edu)
- ❑ Charles University Prague, Czech Republic (contact: Miroslav Finger, Miroslav.finger@cern.ch)
- ❑ IJCLab-Orsay, France (contact: Carlos Munoz-Camacho, munoz@jlab.org)

EEEMCal Team – Examples of Infrastructure and Expertise

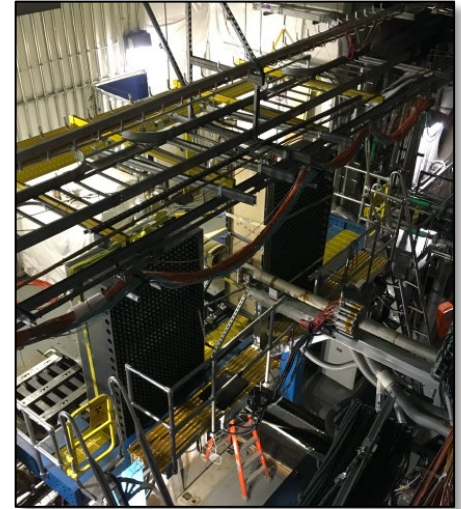
Selected calorimeters



SHMS EMCAL: 252 TF-1 blocks

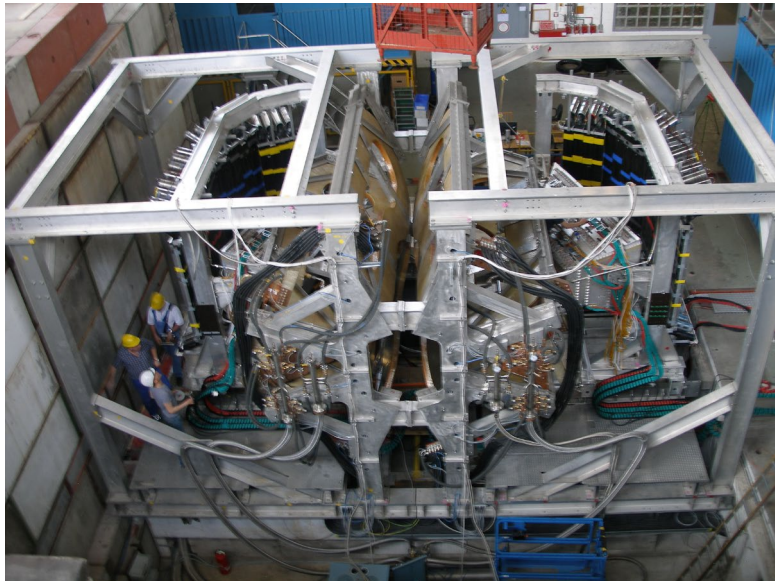


NPS: 1080 PbWO_4
(CRYTUR, SICCAS)



STAR: ECAL of the
forward upgrade

One infrastructure example



- Collective experience includes detector design and construction, technical support and infrastructure, readout electronics, crystal/glass fabrication and characterization
- Collective background includes hadron and heavy ion physics at BNL and JLab

OLYMPUS/DESY (BLAST) spectrometer: designed, fabricated, commissioned and operated at Bates