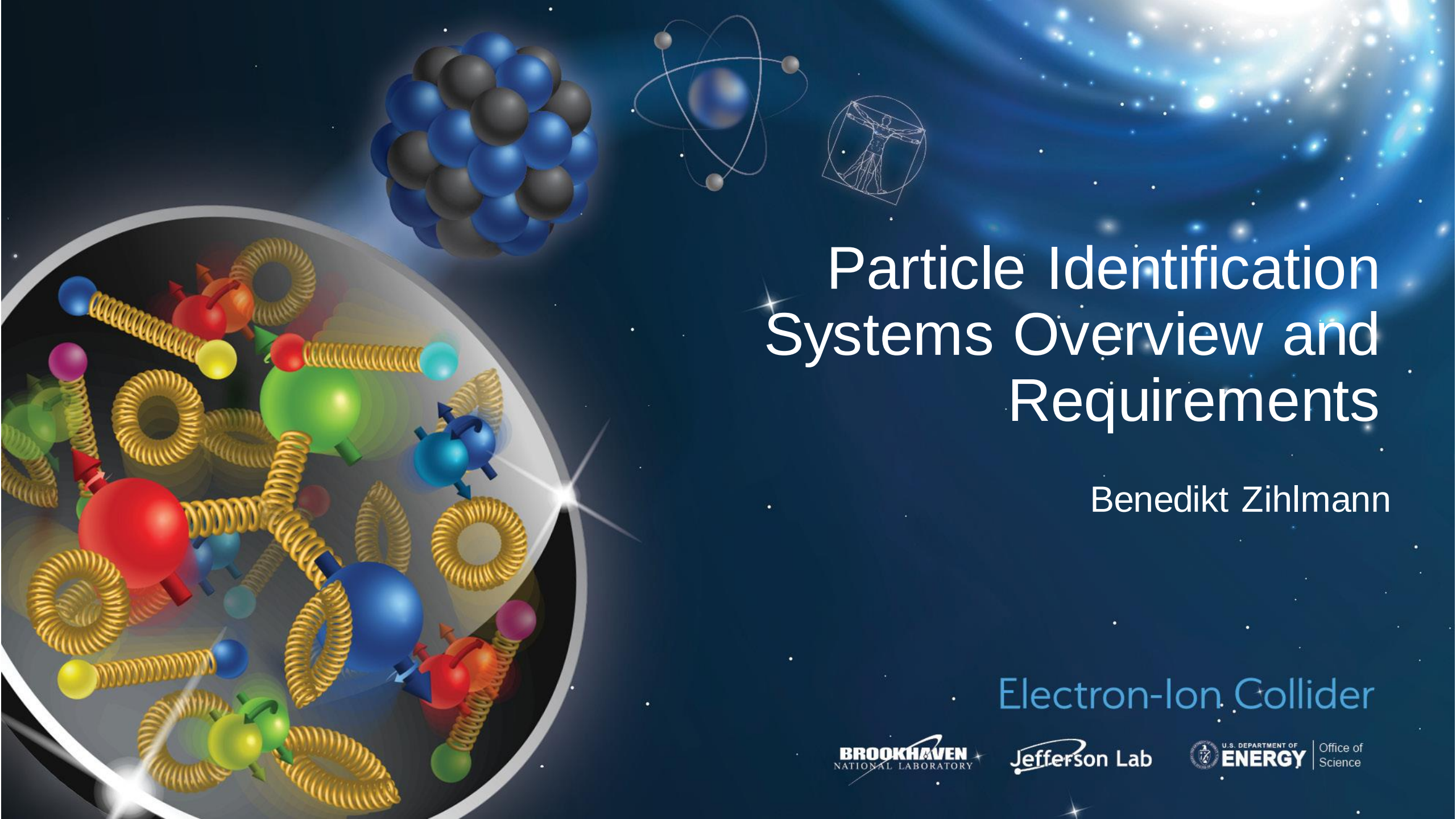

Particle Identification Systems Overview and Requirements

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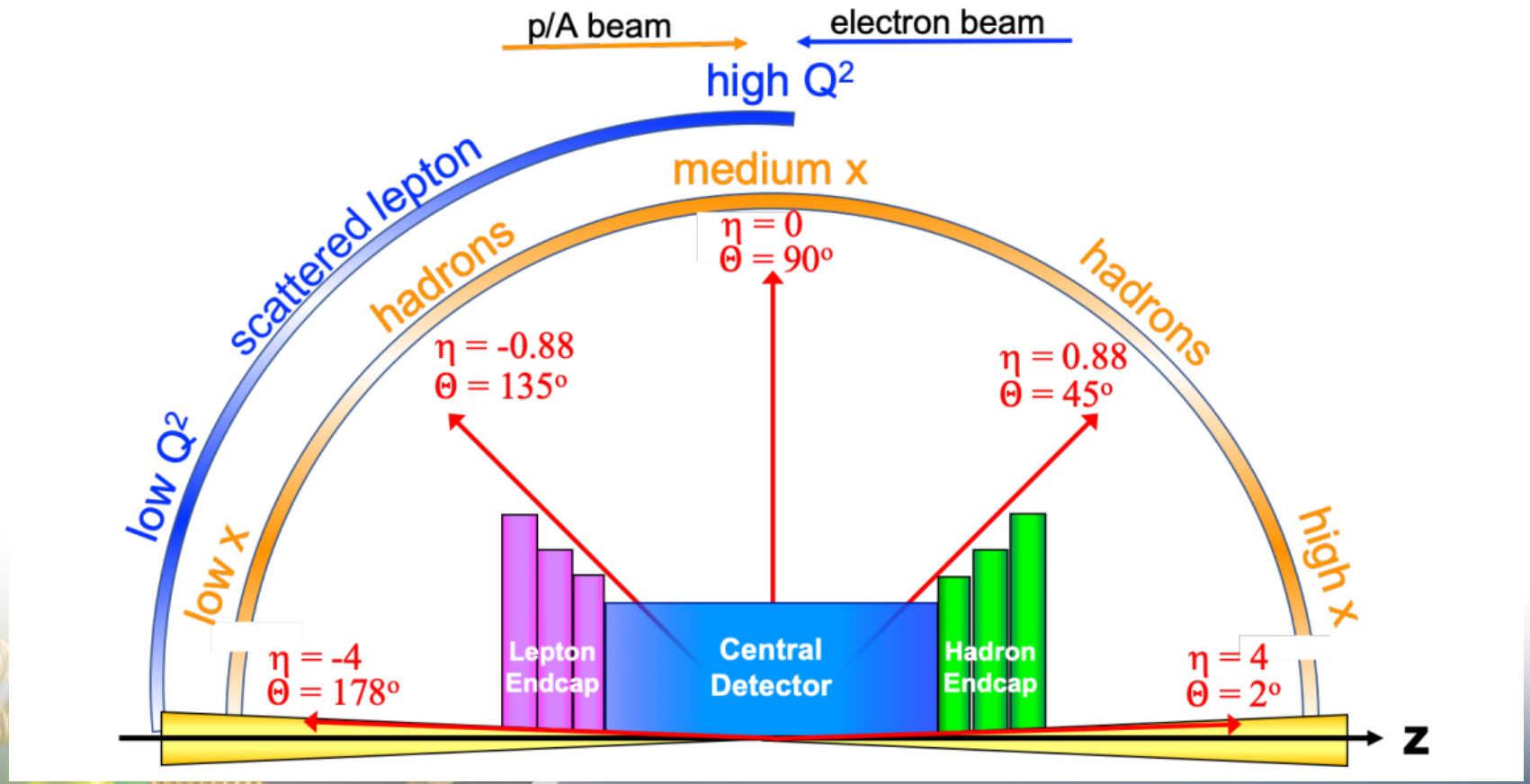
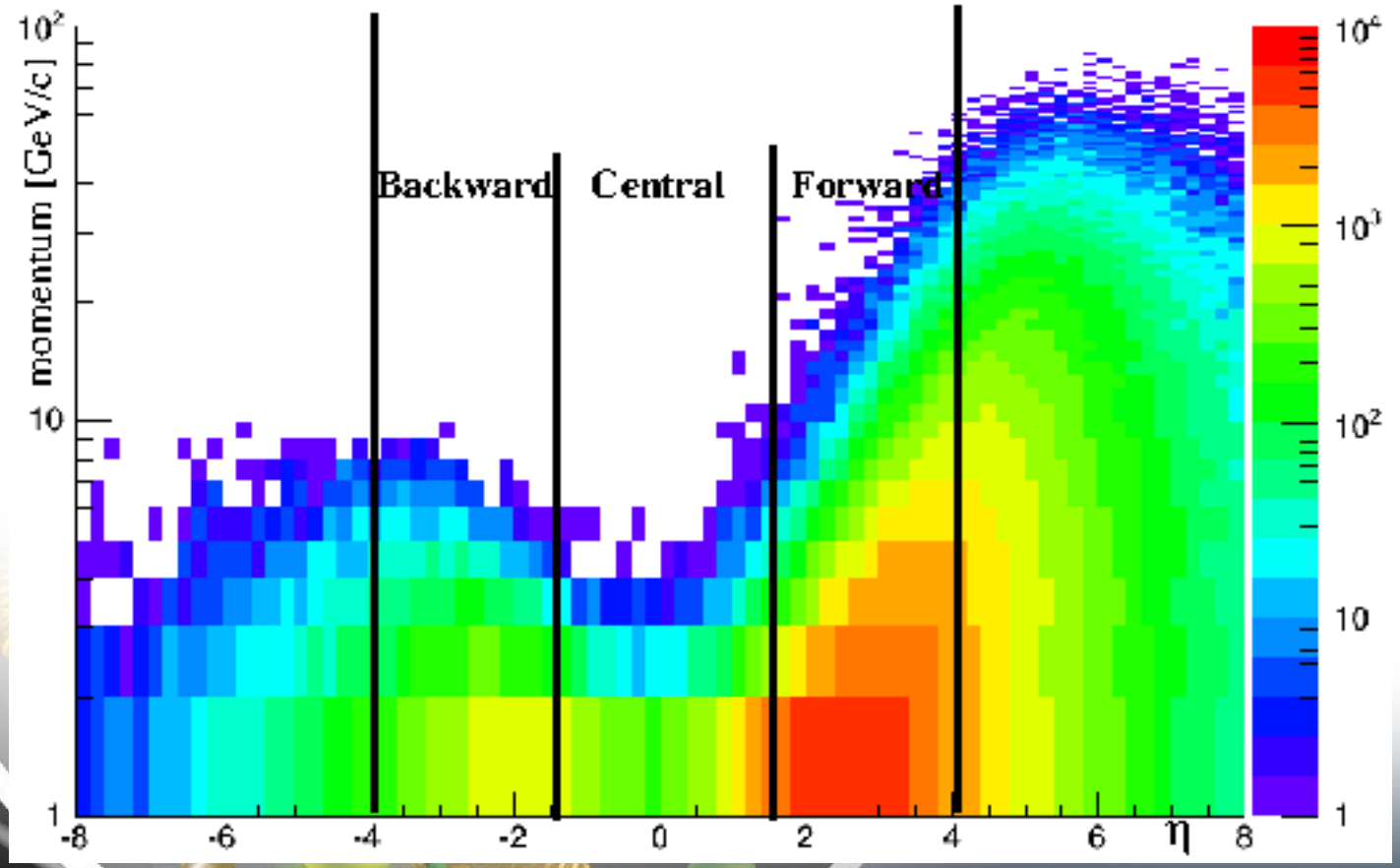
Kinematic Coverage

Relation between angles, rapidity, Q2, forward, backward



PID Detector Performance (p>1GeV/c)

Requirements: 3 σ separation capabilities for hadrons, π/K/p



p-e collisions up to 275><18 GeV

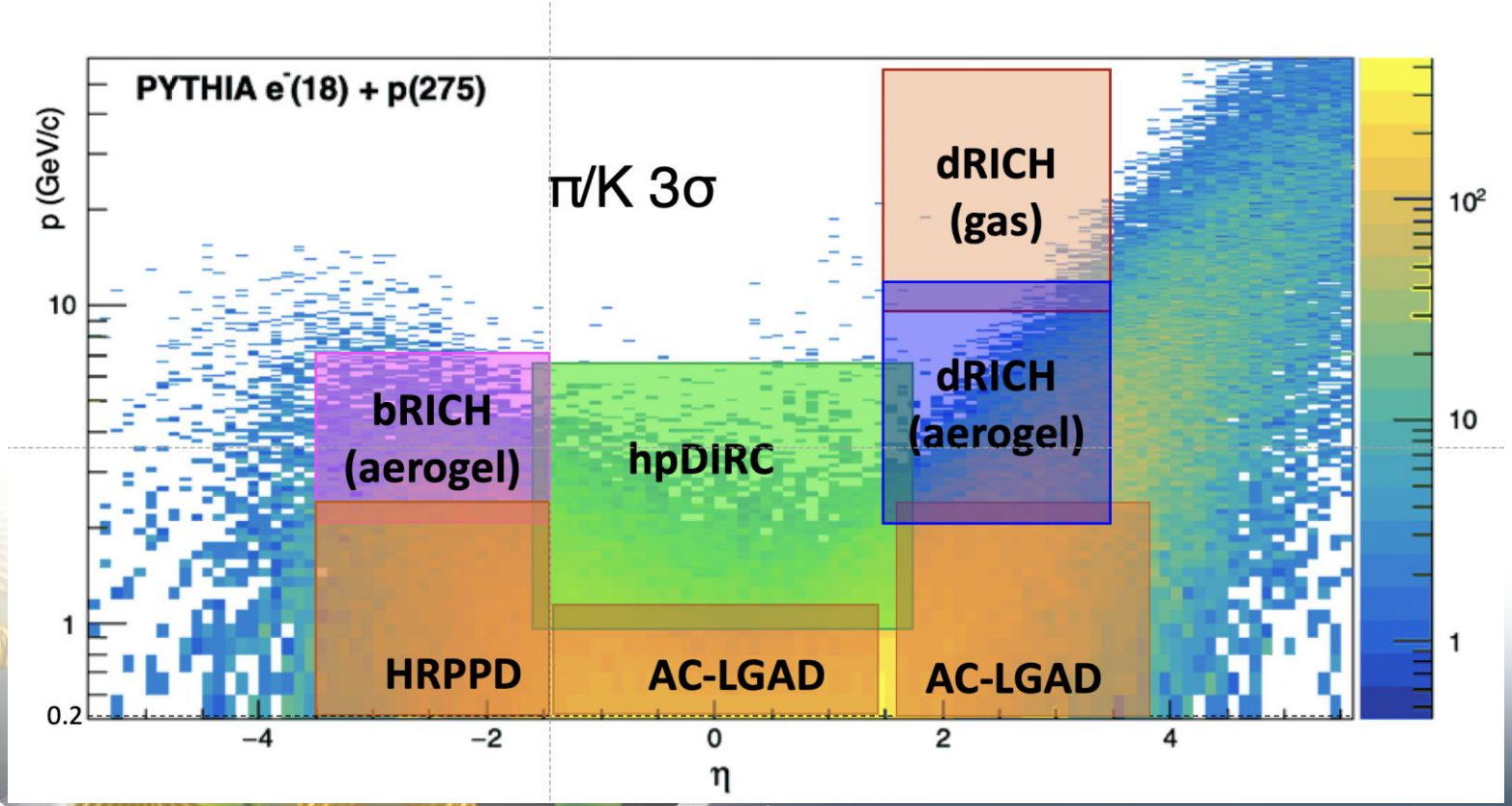
Backward: up to 7 GeV/c
Central: up to 6 GeV/c
Forward: up to 50 GeV/c

Solutions: RICH, DIRC, … (Cerenkov)

Complementary PID (p<1GeV/c)

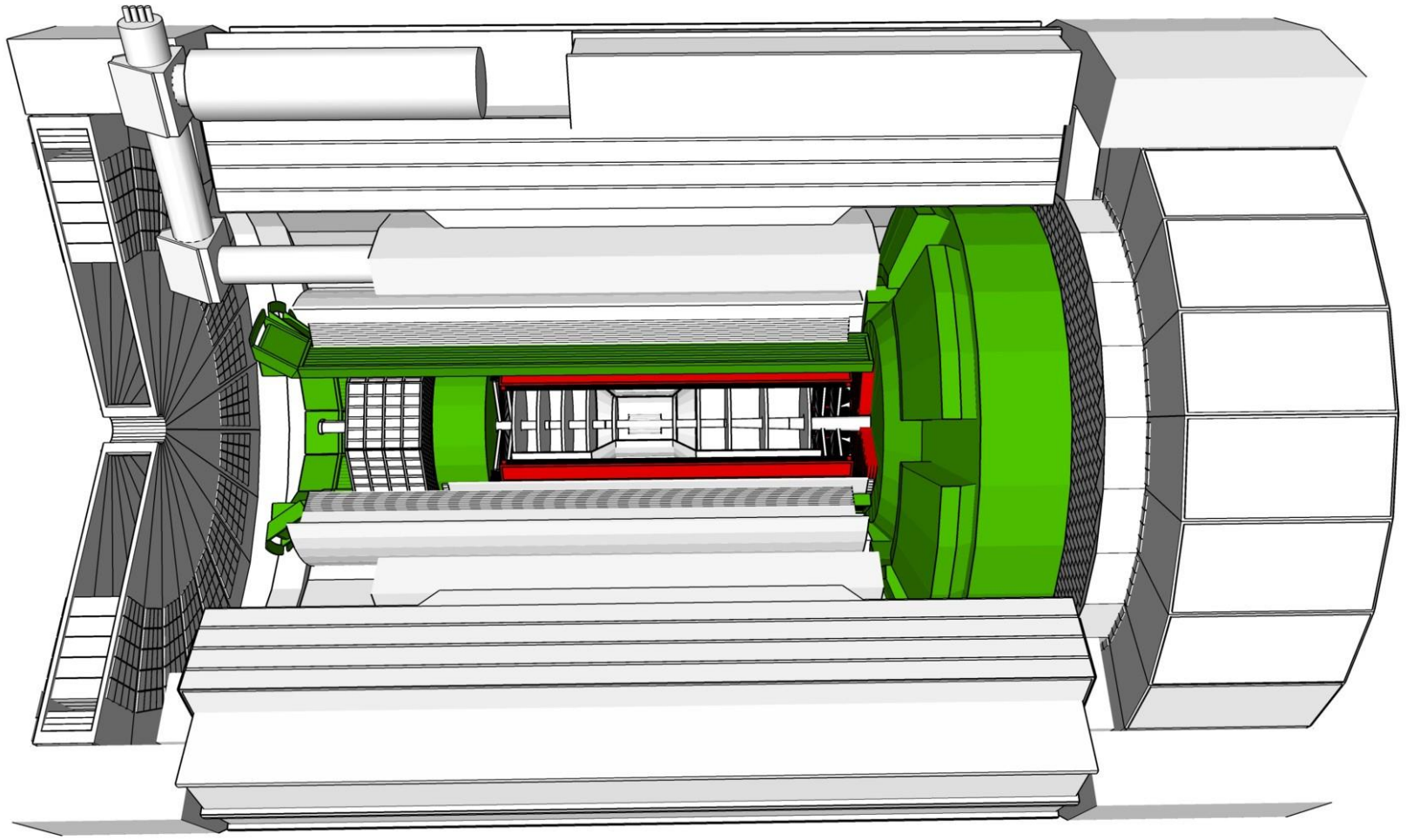
Similar requirements in terms of separation power (3 σ)

Solutions: TOF (timing), dEdx (energy deposition)



DIRC: direct internally reflected Cerenkov
RICH: ring imaging Cerenkov
LGAD: low gain avalanche diode
HRPPD: high-rate picosecond photodetector
d: dual (gas, aerogel)
hp: high performance (focusing lenses)

PID Detector Implementations (ePIC)



Cherekov based:

- hpDIRC
- pfRICH
- DRICH

TOF based:

- Barrel AC-LGAD
- Forward AC-LGAD

PID Detector Requirements on Tracking

In simple words: What is the required knowledge on impact location and angle of a particle trajectory at the location of the PID detector's radiator?

hpDIRC, TOF: $d\theta$, $d\varphi$, dz (direct tracking variables)

bwRICH, dRICH: angle between true and reconstructed trajectory

These quantities have multidimensional dependencies

- Θ, φ, η and momenta

PID Detector Specific Status (1-4)

Detector specific assessments presented by the groups:

- Technical performance requirements
- Development and documentation of detector performance
- Detector designs with electronics readout to meet expectations
- Fabrication and assembly also in context with the whole project

PID Detector Integration and Interfaces(5)

Integration:

- Detector support structures and infrastructure requirements
- Cable and service line routing
  - See talk by Alex Eslinger

Interfaces:

- HV, LV, signals, cooling
  - See talk by Walt Akers

DAQ:

- Streaming readout
  - See talk by David Abbott

ES&H at BNL (6)

BNL provides support on all ES&H related issues:

- General: https://www.bnl.gov/esh/index_e.php
- Technical: https://www.bnl.gov/esh/shsd/index_e.php
  - Subject matter expertise
  - Engineering and construction safety
  - Consulting and analysis support services
- Electrical: https://www.bnl.gov/esh/shsd/index_e.php
- Environment: https://www.bnl.gov/esh/shsd/index_e.php
  - Safety and health services
  - Technical information, hazard assessments

Quality Assurance (QA) (6)

Quality assurance and its implementation is important with many detector parts being procured from around the word.

- Photo sensors
- Radiators
- Mirrors
- Lenses
- LGAD
- ……

Assembly of the parts into a full detector also will require QA to assess and guarantee the expected performance.