Angular resolution studies
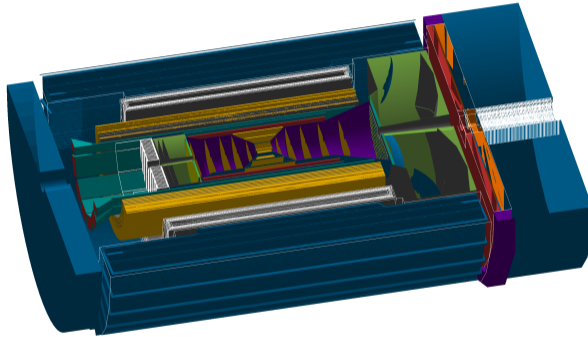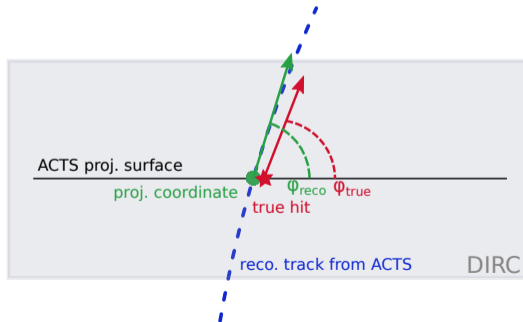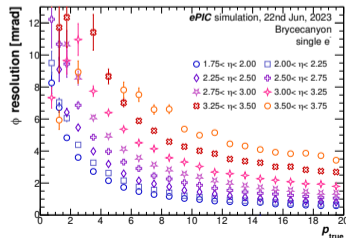## - cherenkov PID input -

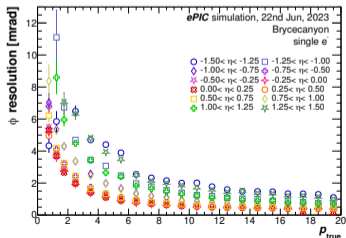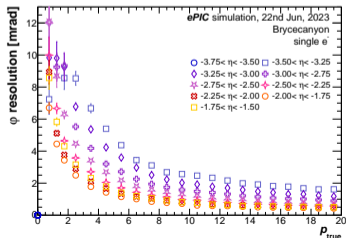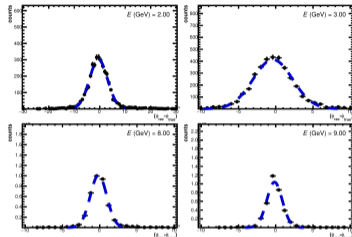**Nicolas Schmidt (ORNL)**

- Reconstructed angle:
  → create ACTS projection surface at entrance of Cherenkov detectors (cylinder surface for barrel, disk surface for endcaps)
  → $z_{\mathrm{pfRICH}} = -120.6$cm, $R_{\mathrm{DIRC}} = 70.9$cm, $z_{\mathrm{dRICH}} = 197$cm
  → momentum vector of track at projection surface provides position and angles
- True angle:
  → deactivate cherenkov light propagation in npsim → truth hits in aerogel (pfRICH and dRICH) or bars (DIRC)
  → use hit closest to projection surface as reference for angle and position (angle obtained from hit momentum vector)
- Same approach used for z position resolution for DIRC
- Tracking studies processor used ([link])
- Simulations based on Brycecanyon geometry
  → $p = 0.4 - 20$ GeV electrons generated
  → uniform in ϕ and $-4 < \eta < 4$
- Reconstruction with truth seeding

ACTS proj. surface
proj. coordinate φ_{reco} φ_{true}
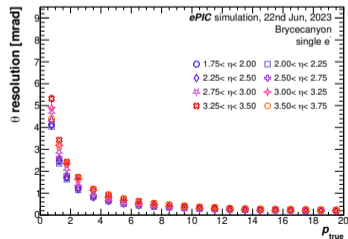true hit
reco. track from ACTS
DIRC

Angular resolutions vs momentum

- Fine binning of $\Delta\eta = 0.25$ over the range of $-3.75 < \eta < 3.75$
- Distributions fitted with Gaussian
- Good resolutions in central and backward region
- Forward region worse in comparison to rest
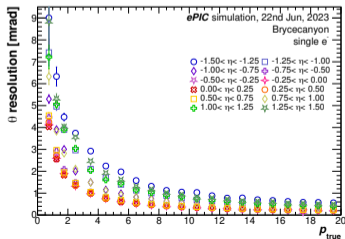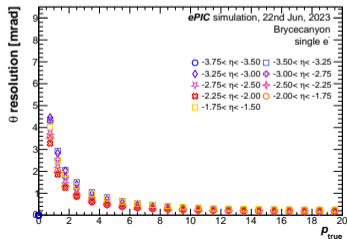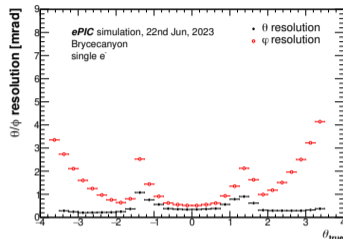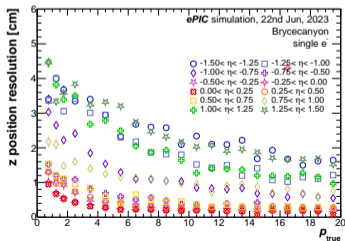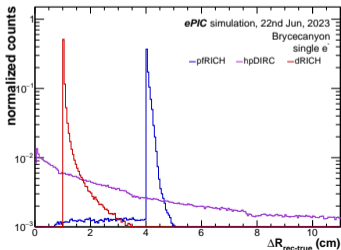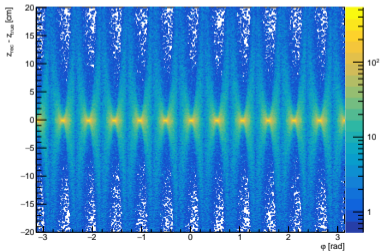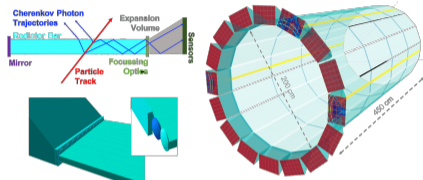 $\rightarrow$ maybe due to TOF disk material

Angular resolutions vs momentum

- Fine binning of $\Delta\eta = 0.25$ over the range of $-3.75 < \eta < 3.75$
- Distributions fitted with Gaussian
- Good resolutions in central and backward region
- Forward region φ resolution worse in comparison to rest
  → maybe due to TOF disk material
- θ resolution comparable among all regions

z position resolutions vs momentum

- *z* positon resolution determined for hpDIRC
  → necessary input for internal scattering estimation
- Technical problem: cylindrical ACTS propagation surface compared to DIRC bar structure
  → φ dependence of resolution due to difference in radial position between rec. and true
- Region around $\eta \approx 0$ well constrained
  → 1–2mm position resolution

Summary

- Detailed φ, θ and z resolutions for Cherenkov detectors determined in Brycecanyon setup
  $\rightarrow$ finely binned in η and momentum
- Technical limitations in current studies in assocication of truth and reconstructed information
  $\rightarrow$ propagation to fixed surfaces versus hits in cherenkov detector volume
- Overall good resolutions found
  $\rightarrow$ forward generally found to be worst region
- Studies can easily be repeated with latest detector setup (after tracker update)