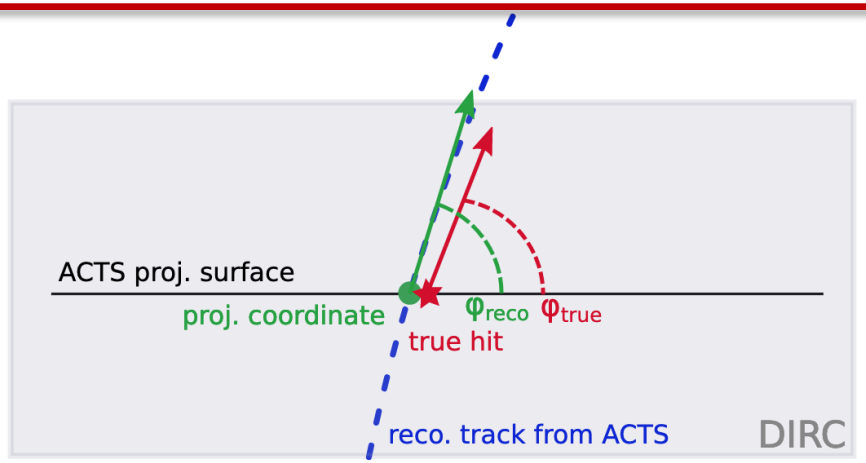
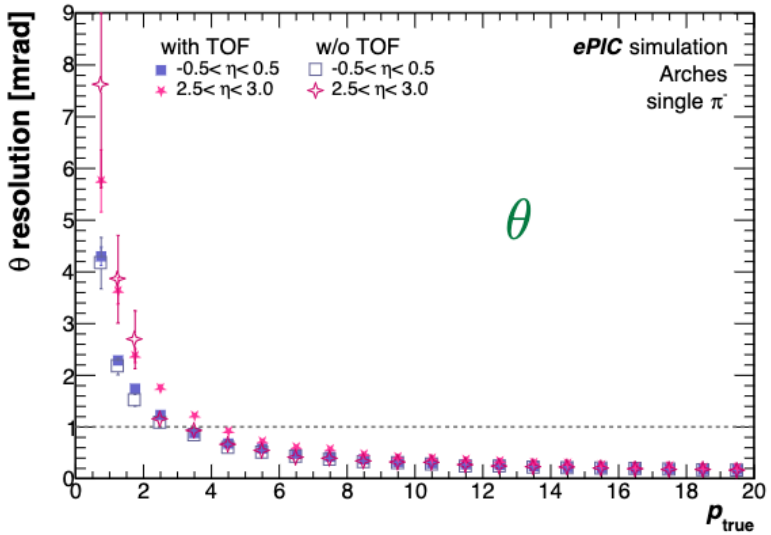
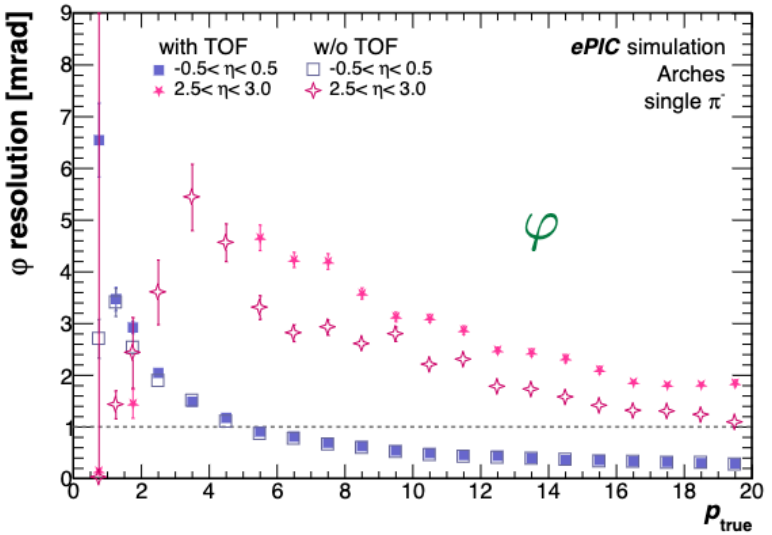
Angular Resolution at PID Surface

- Current Angular Resolutions
  - Propagate reconstructed track to surface for reco vector information (e.g. hpDIRC)
  - Use hit closest to propagated surface for truth vector information (e.g. Barrel ToF)
  - Phi angle grows at large $|\eta|$



$$\Delta\phi = \phi_{reco} - \phi_{true}$$





Tracking WG, Nicolas Schmidt

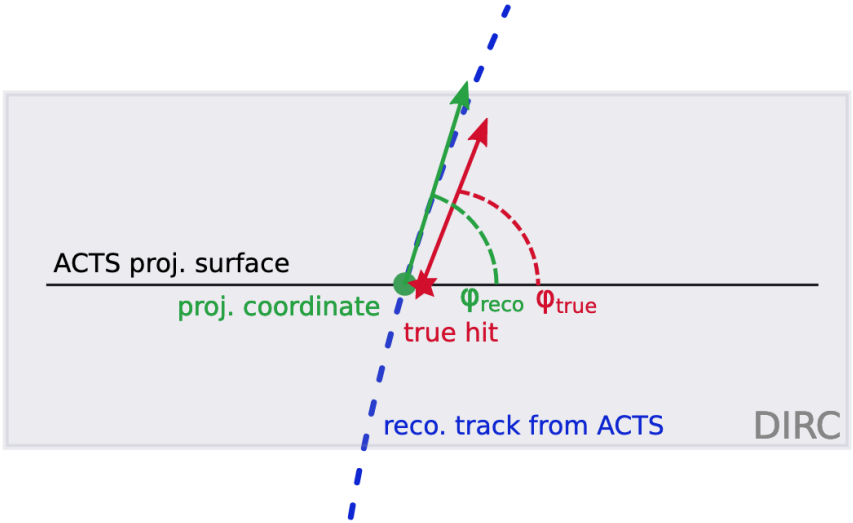
Angular Resolution Definitions

- Three angular resolution definitions

$$\Psi_\phi = arctan\left(\frac{(\vec{p}_{RECO} - \vec{p}_{TRUTH}) \cdot (\vec{p}_{TRUTH} \times \hat{z})}{|\vec{p}_{TRUTH}||\vec{p}_{TRUTH} \times \hat{z}|}\right) \sim \delta\phi \ sin(\theta)$$

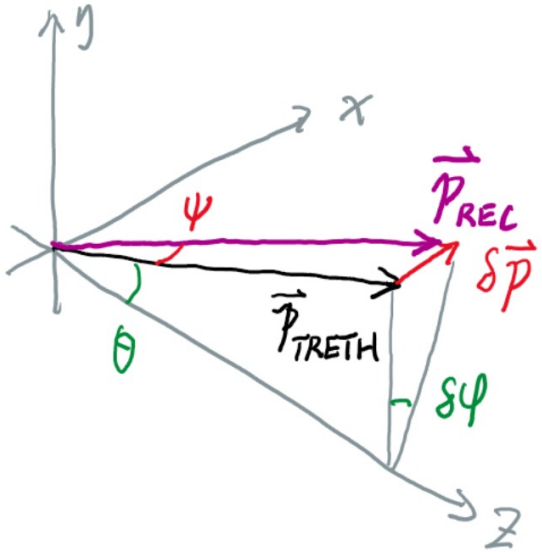
$$\Psi_\theta = arctan\left(\frac{(\vec{p}_{RECO} - \vec{p}_{TRUTH}) \cdot ((\vec{p}_{TRUTH} \times \hat{z}) \times \vec{p}_{TRUTH})}{|\vec{p}_{TRUTH}||(\vec{p}_{TRUTH} \times \hat{z}) \times \vec{p}_{TRUTH}|}\right) \sim \delta\theta$$

Tracking WG, Nicolas Schmidt

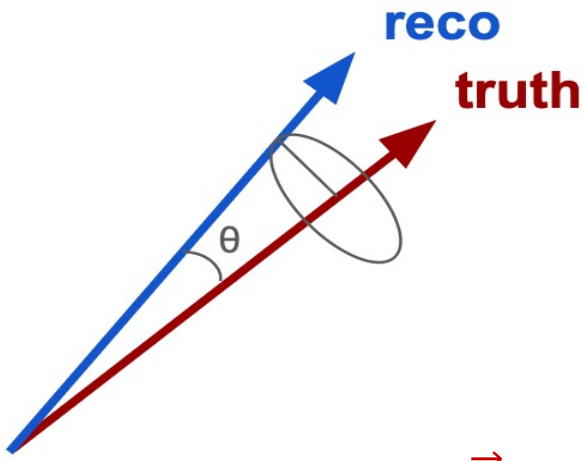


$$\Delta\phi = \phi_{reco} - \phi_{true}$$

PID WG, Roberto Preghenella



Tracking WG email list, Jin Huang



$$cos\theta = \frac{\vec{a} \cdot \vec{b}}{|\vec{a}||\vec{b}|}$$

How to Extract Angular Resolutions

- All angular definitions depend on direction information from truth and reconstructed track projected to PID surfaces
- Reconstructed Track
  - Use ACTS track propagator to propagate track to PID surface
- Truth Track
  - Couple options for obtaining truth information at projected surface
    - Use tracking hit closest to the projected reconstructed hit
    - Implement a dummy surface (low mass and poor resolution) at projection location to record truth hit → *could run into overlap issues as detectors and integration become more complex.*
    - Other options?