

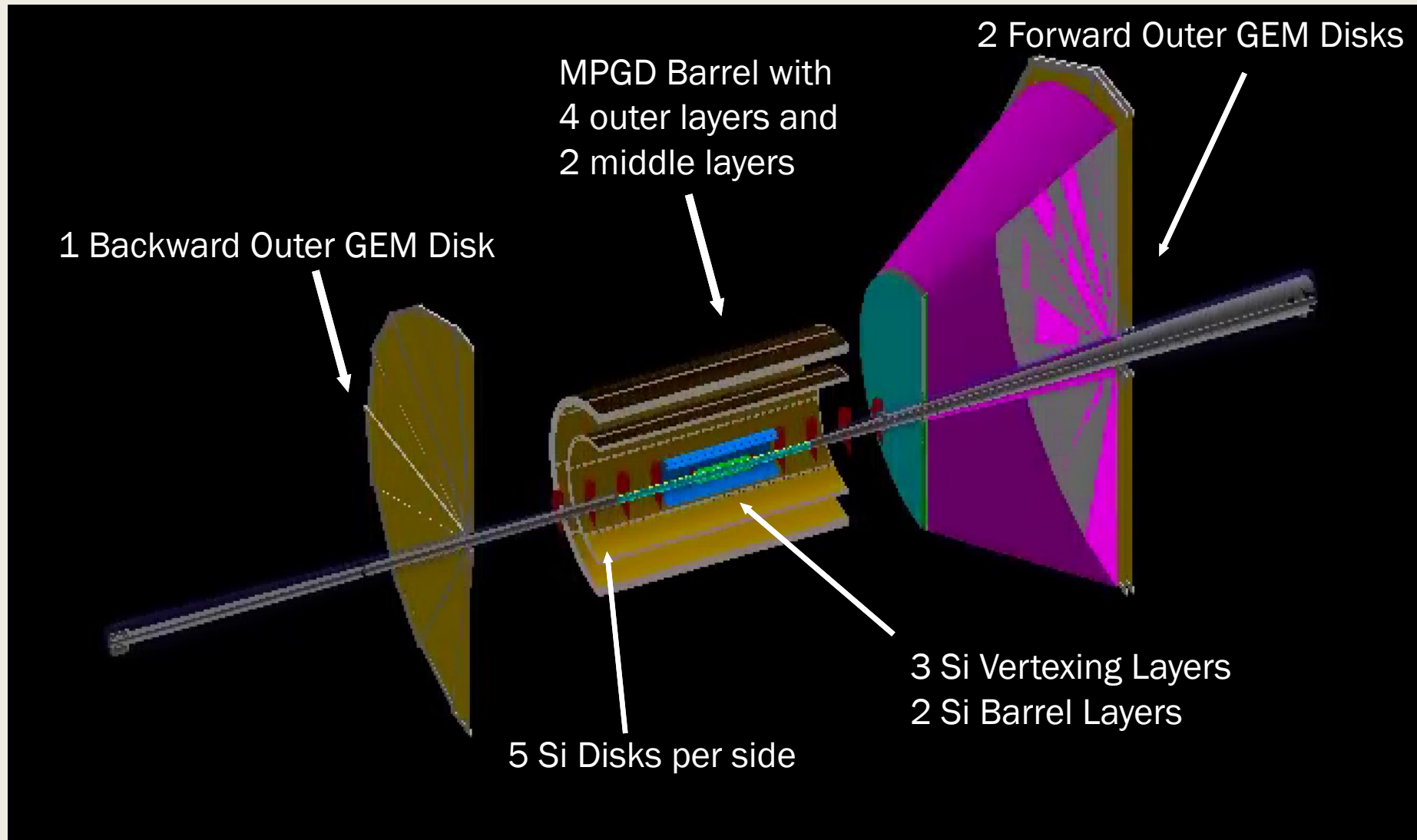
UPDATE ON B-1.0, P-1.0, N-1.0 (HYBRID BASELINE)

Nick Lukow + Athira Kunnath Vijayakumar

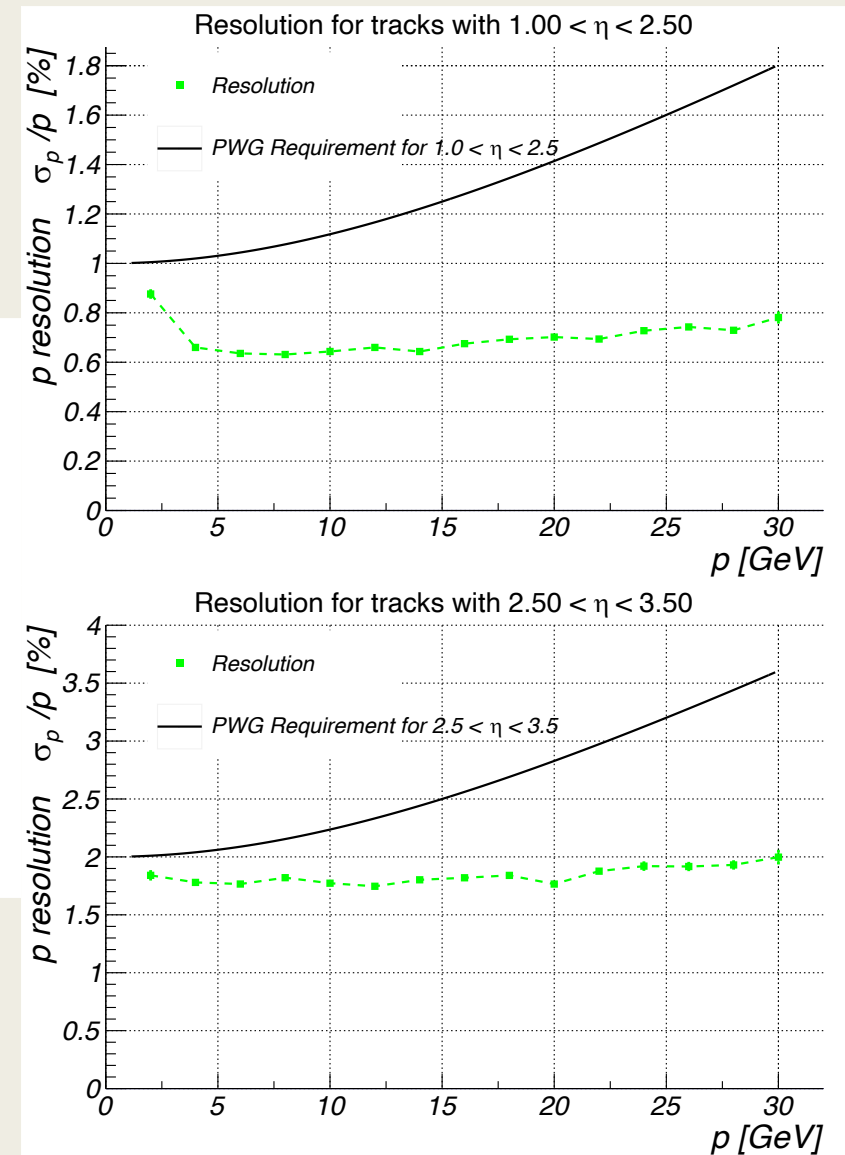
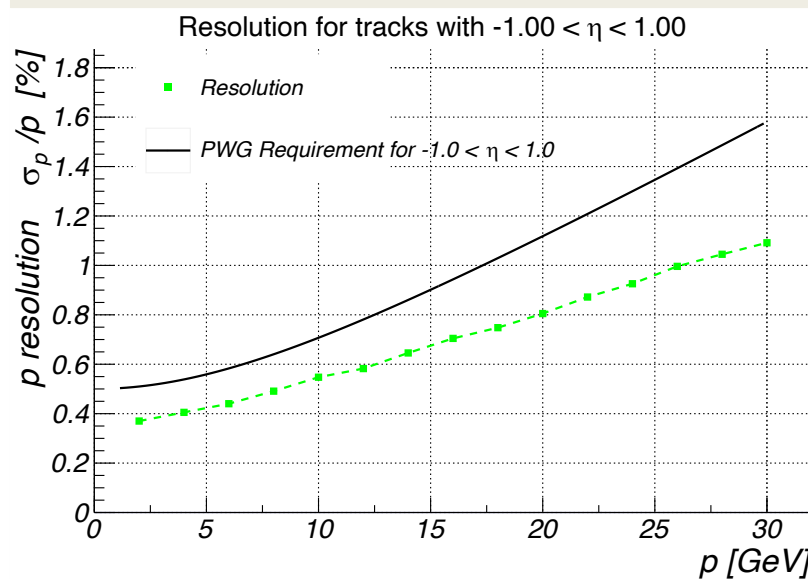
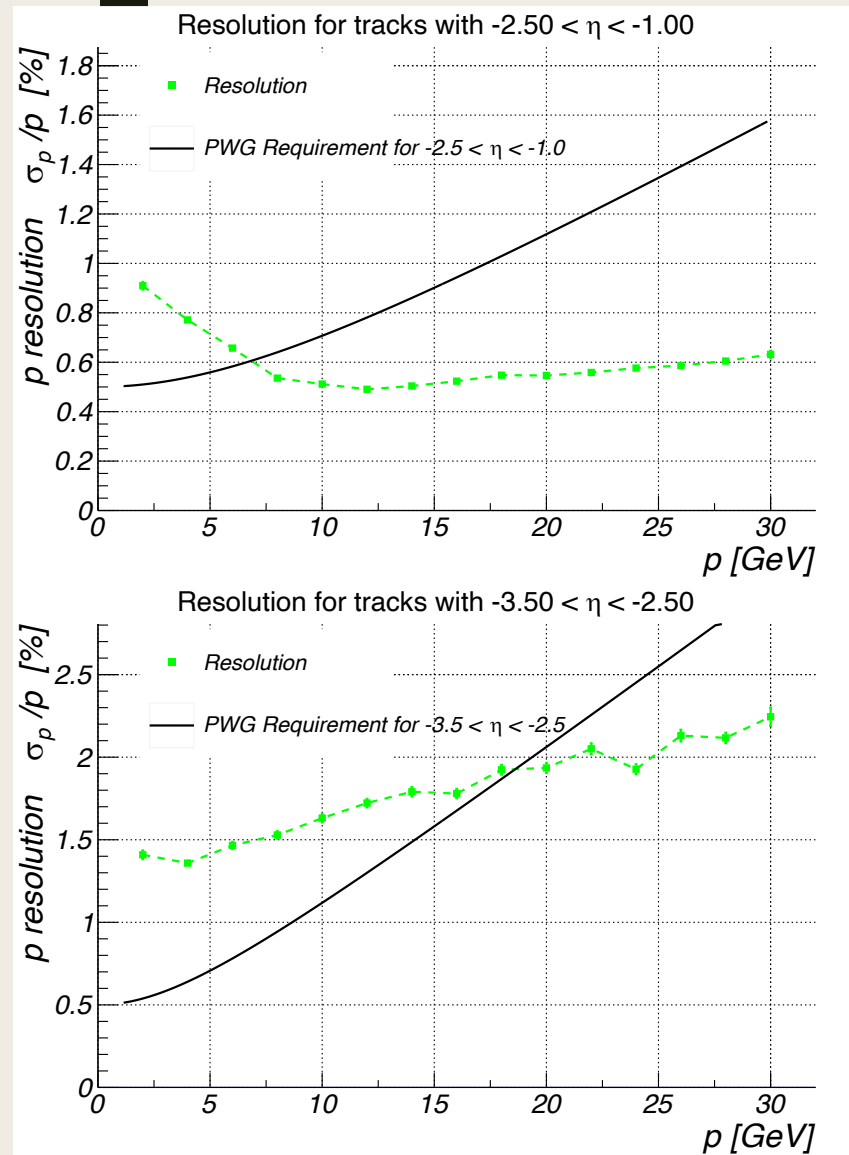
July 13, 2021

ATHENA Tracking WG Meeting

Hybrid Baseline Detector Configuration

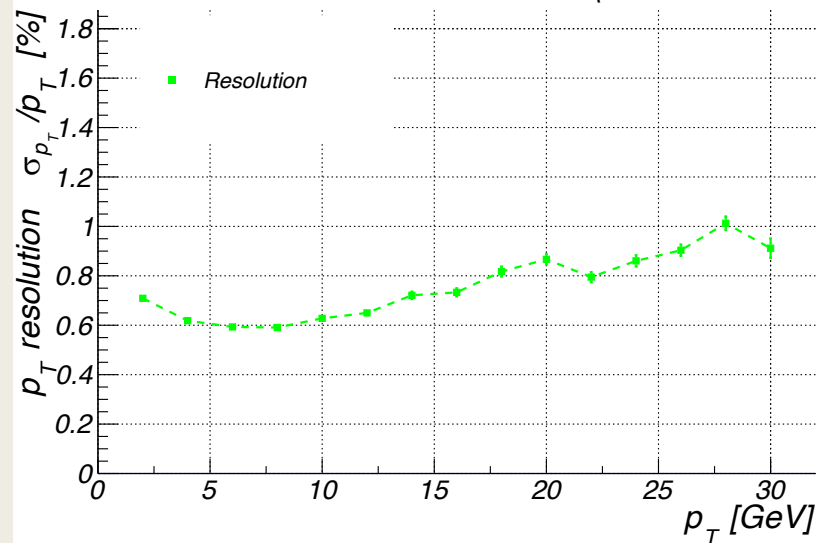


P Resolution vs P

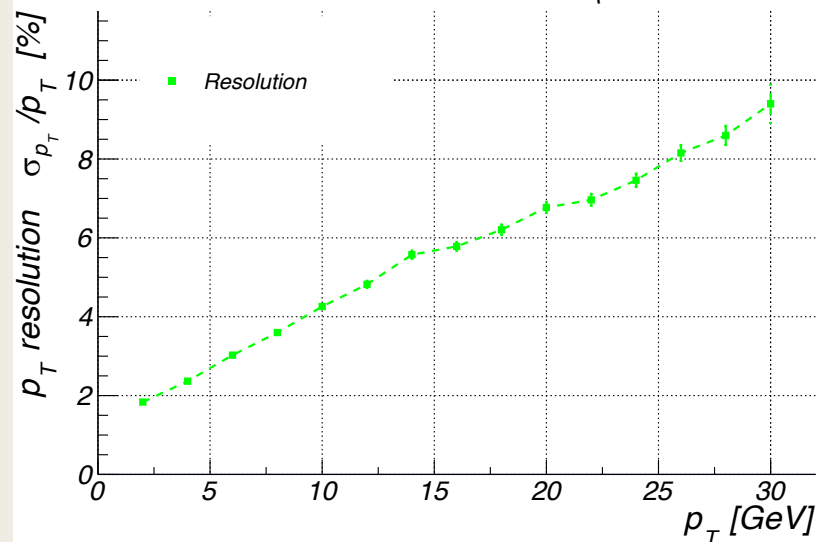


Pt Resolution vs Pt

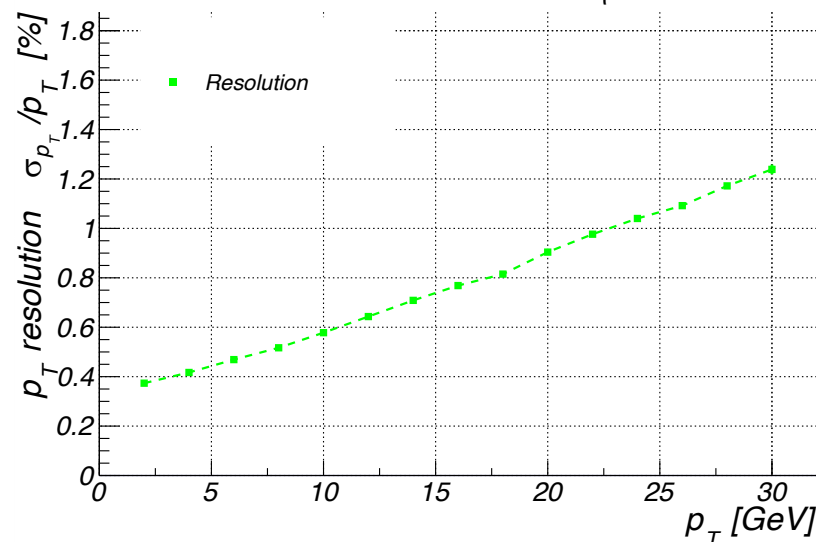
Resolution for tracks with $-2.50 < \eta < -1.00$



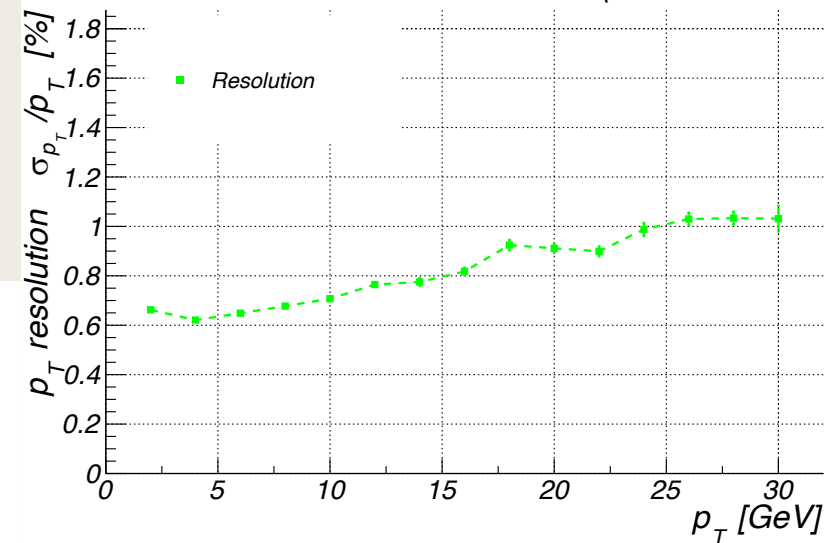
Resolution for tracks with $-3.50 < \eta < -2.50$



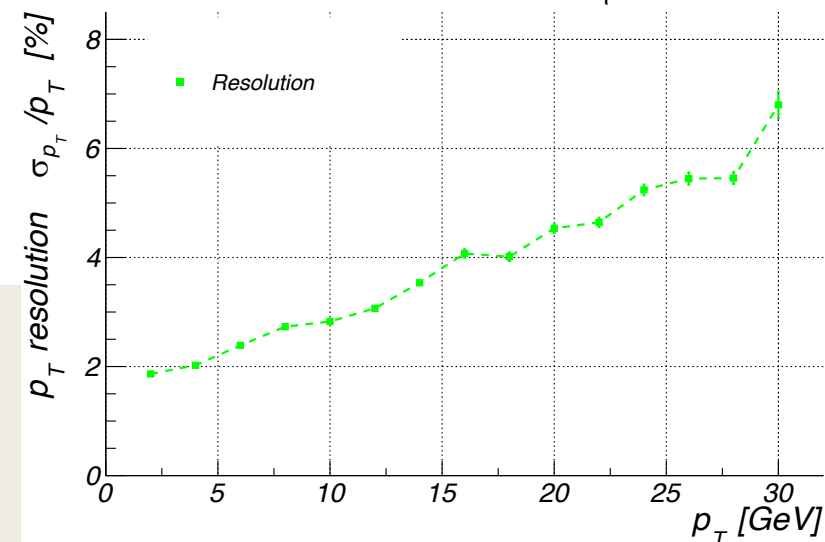
Resolution for tracks with $-1.00 < \eta < 1.00$



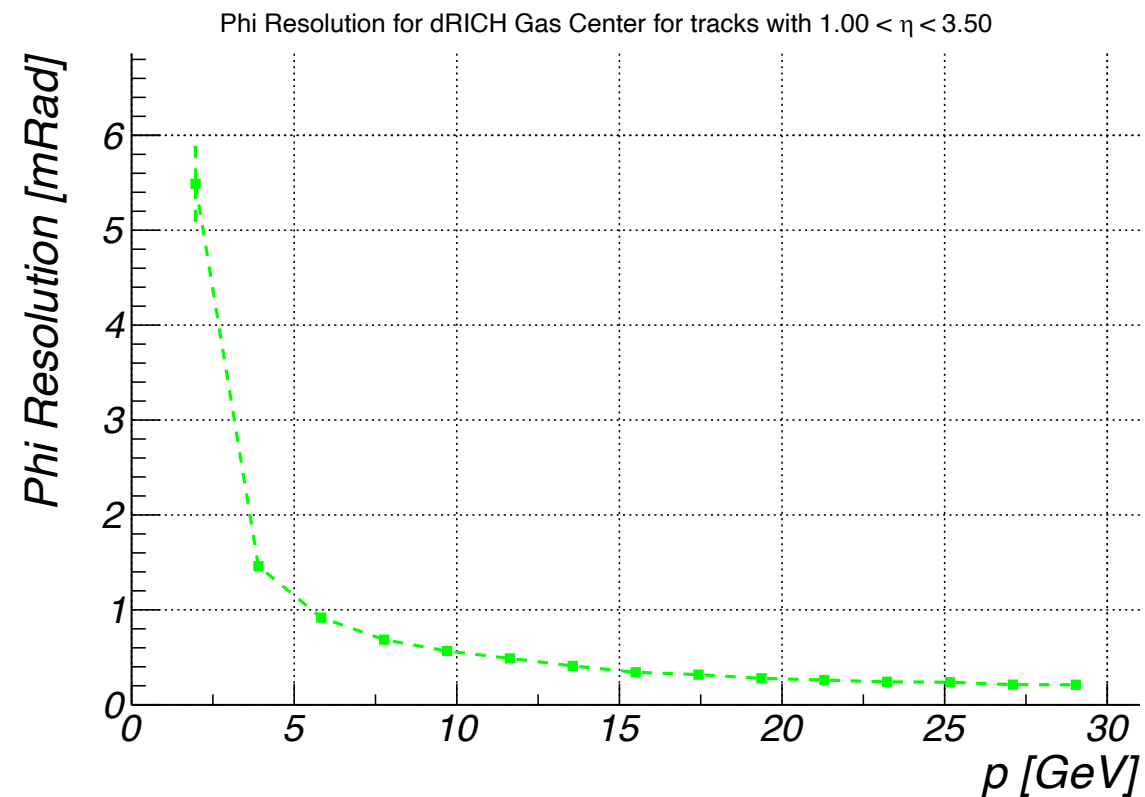
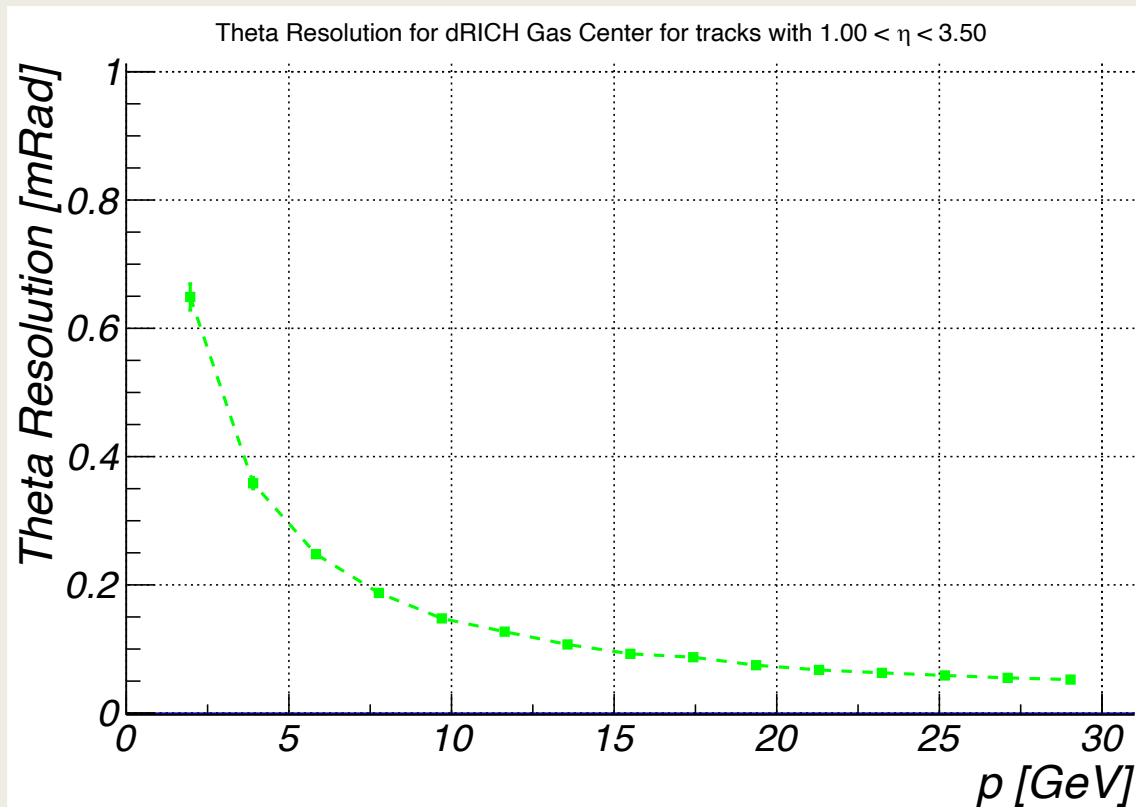
Resolution for tracks with $1.00 < \eta < 2.50$



Resolution for tracks with $2.50 < \eta < 3.50$

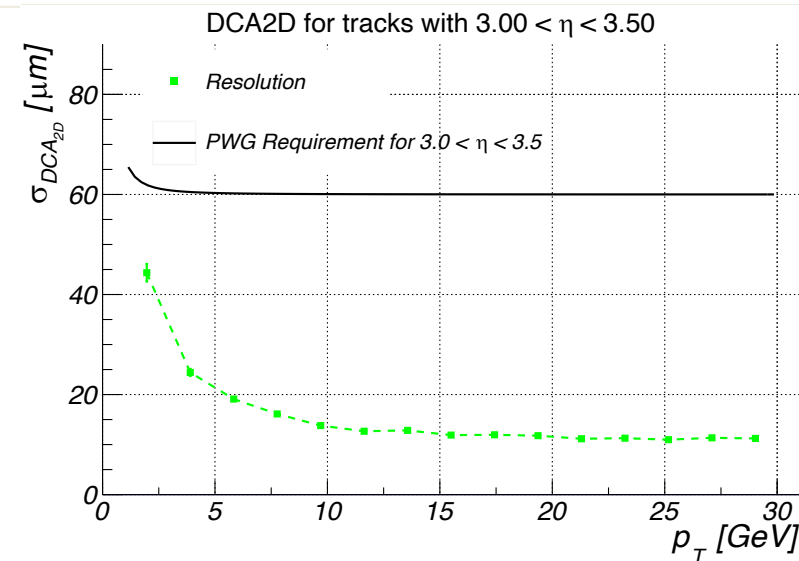
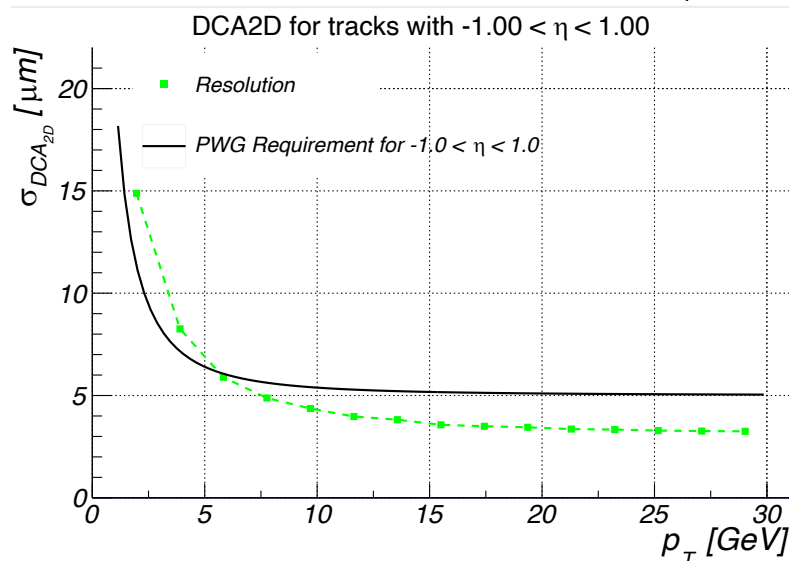
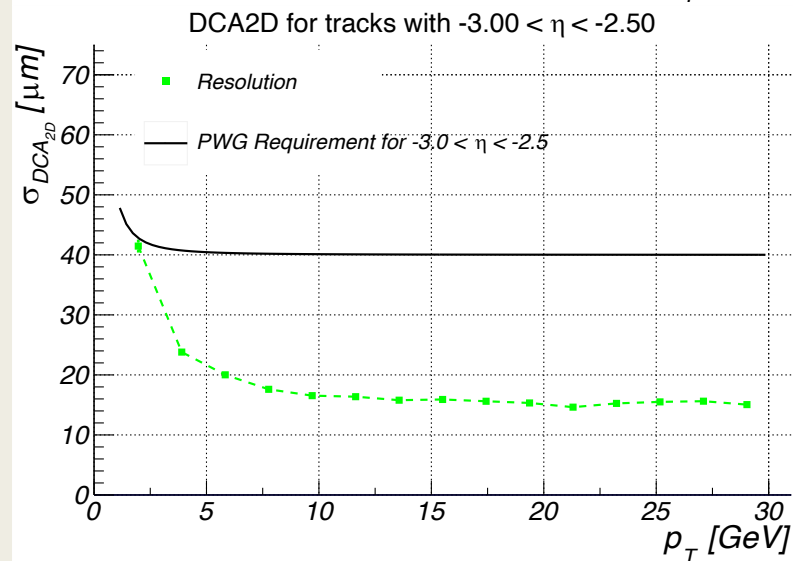
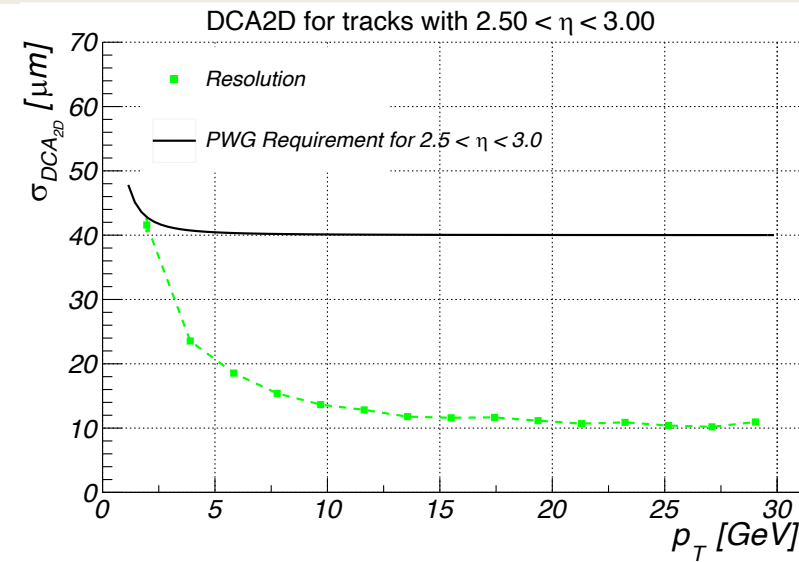
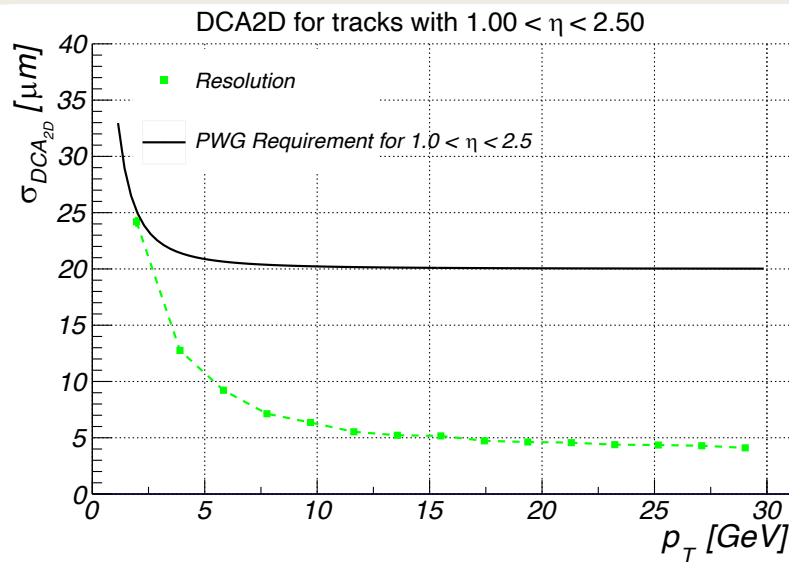
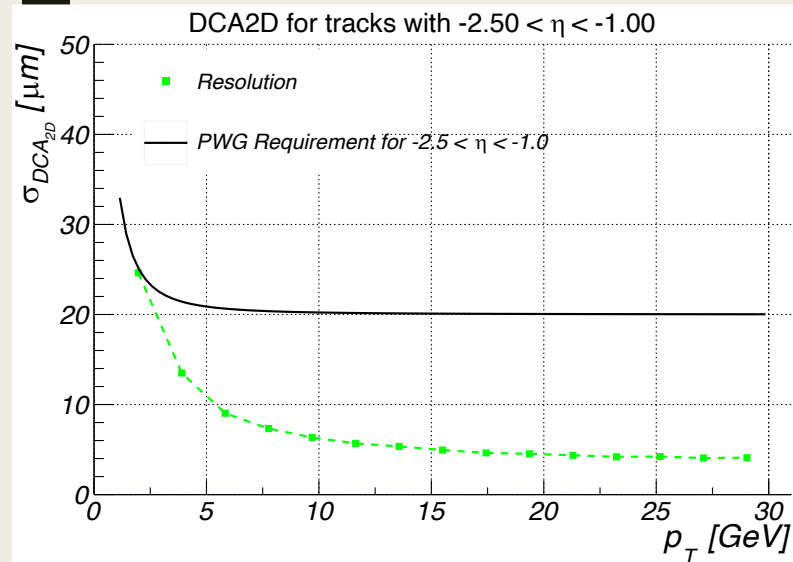


Angular Resolution at mid-gas dRICH

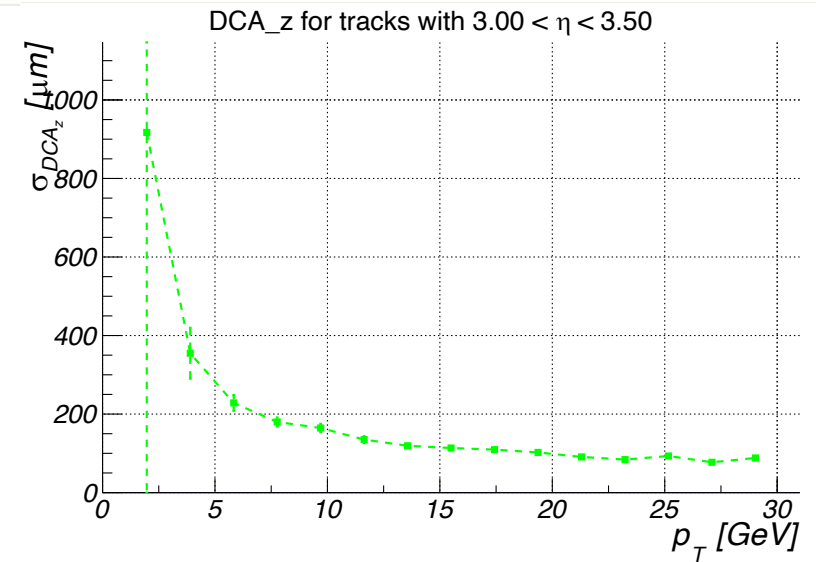
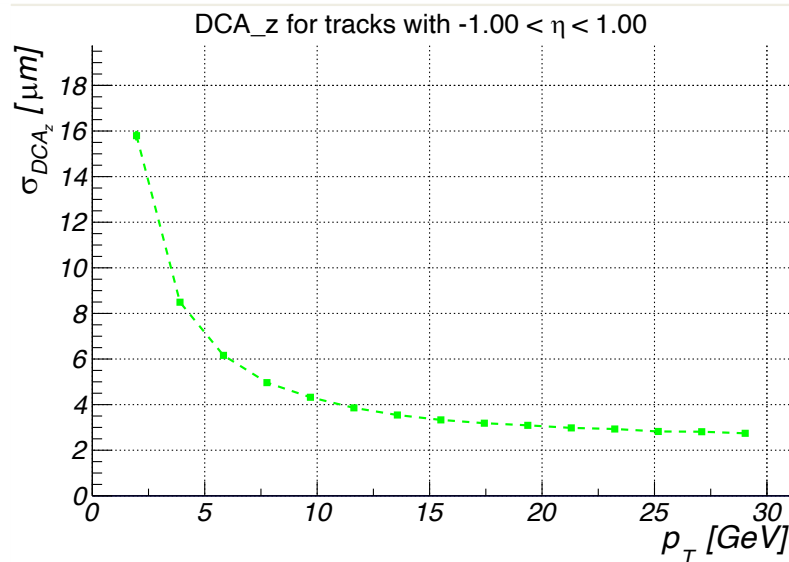
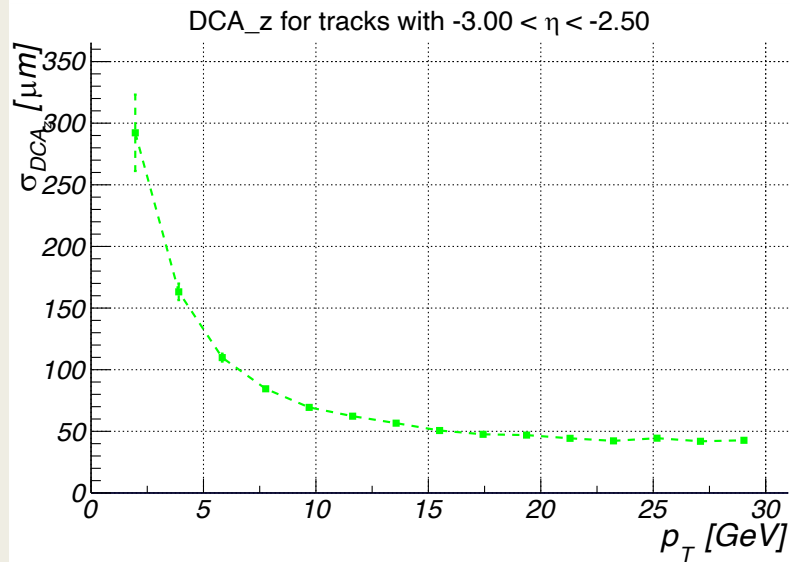
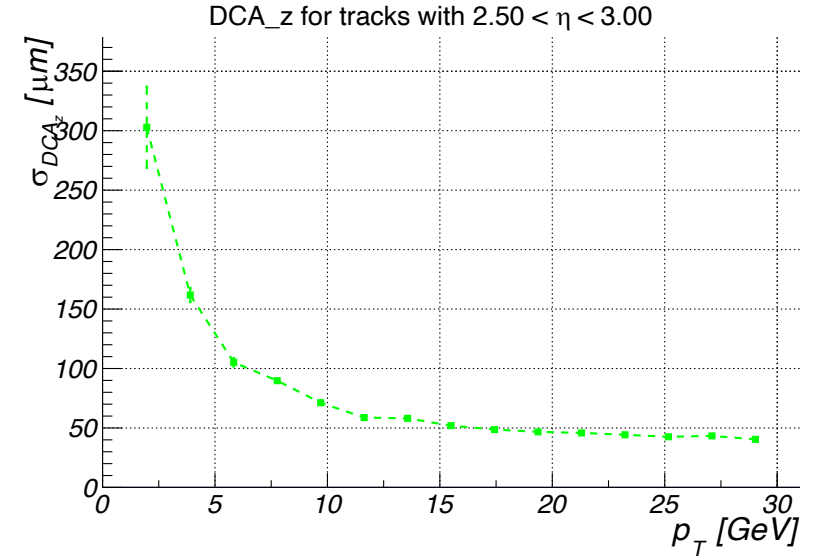
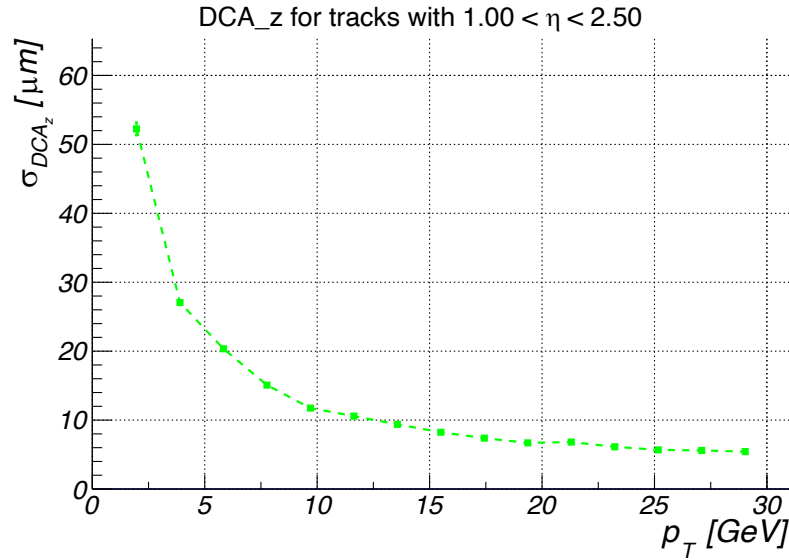
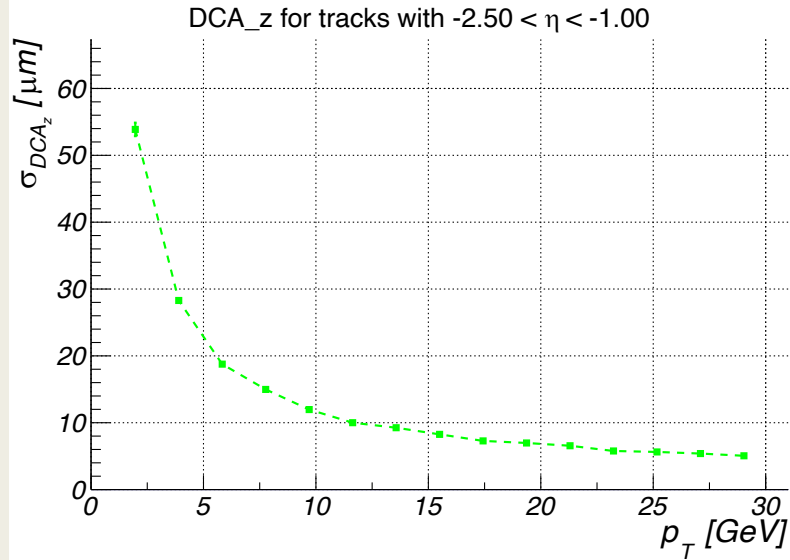


Measured at $z = +220\text{cm}$

Transverse Pointing Resolution



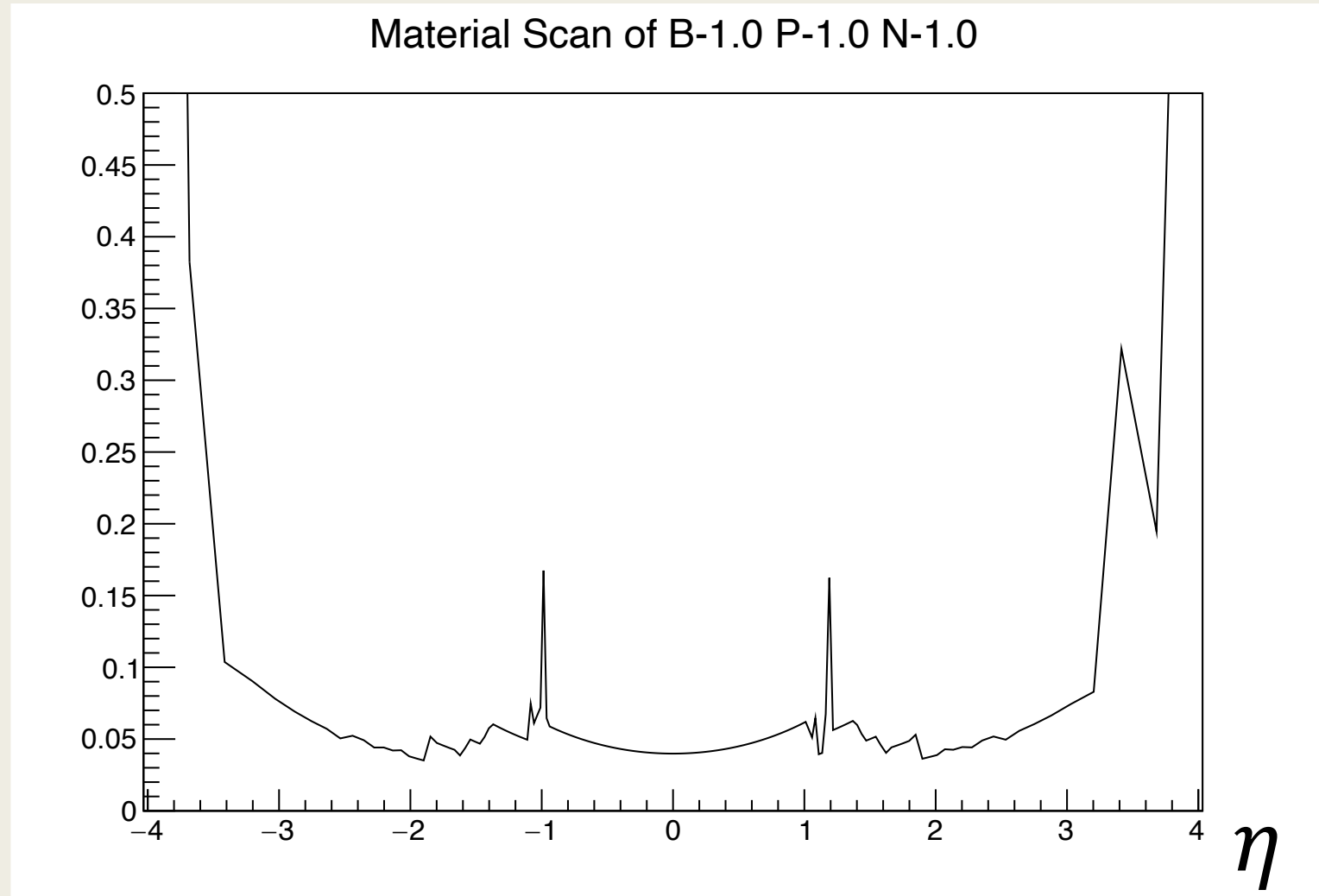
Longitudinal Pointing Resolution



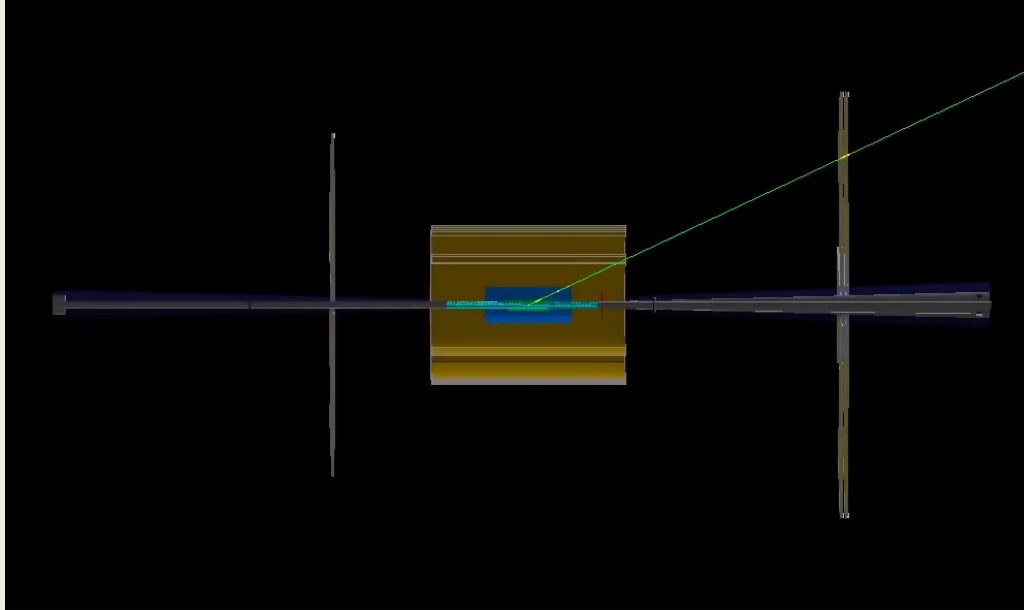
Material Scan – In η

- Baseline configuration without the RICH used for scans
- For scan in η the results were integrated over ϕ

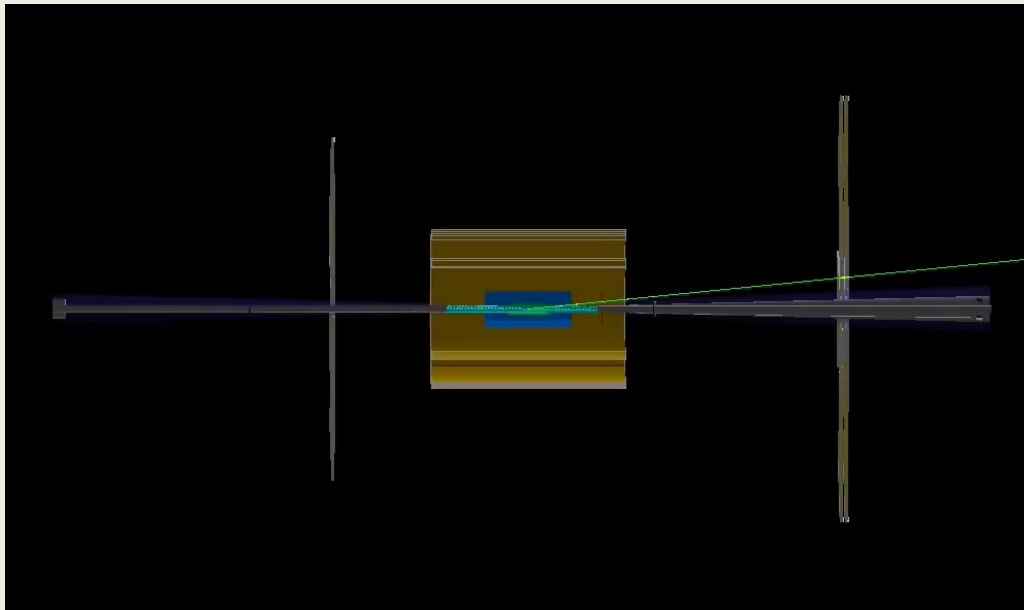
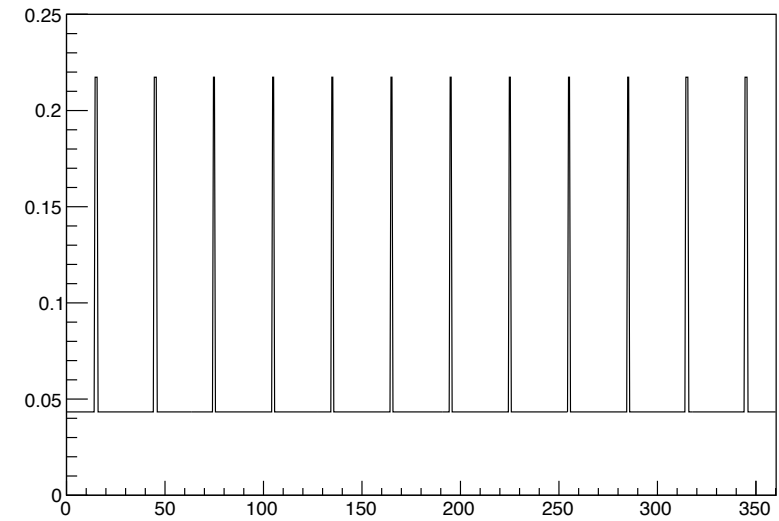
**CORRECTION: updated plots use vacuum environment. Slides presented used air*



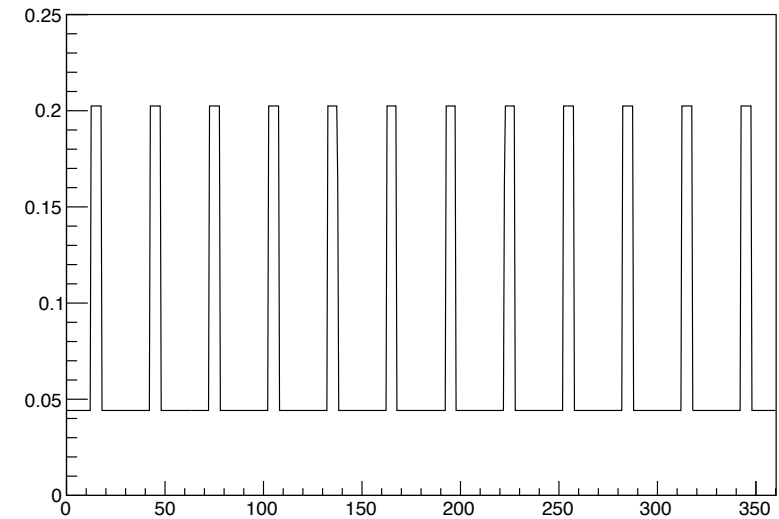
Material Scans – In ϕ



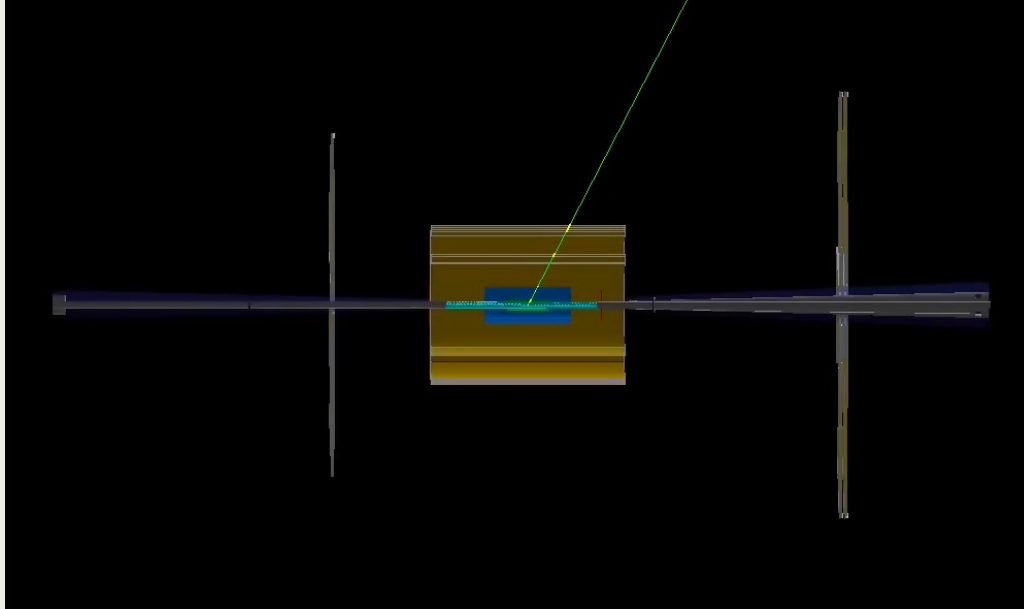
Material Scan in Phi at Fixed Eta = 1.5



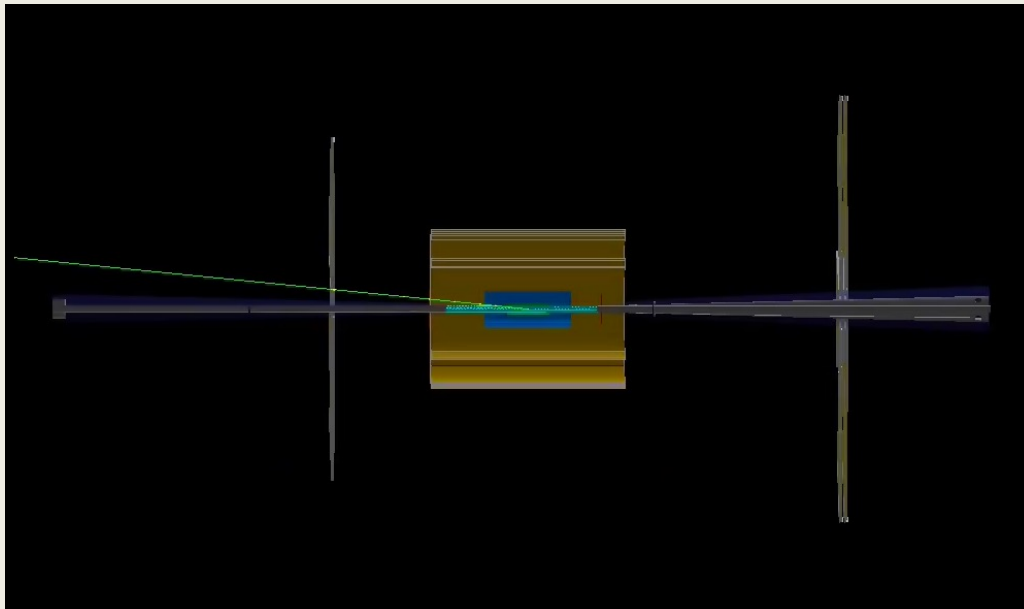
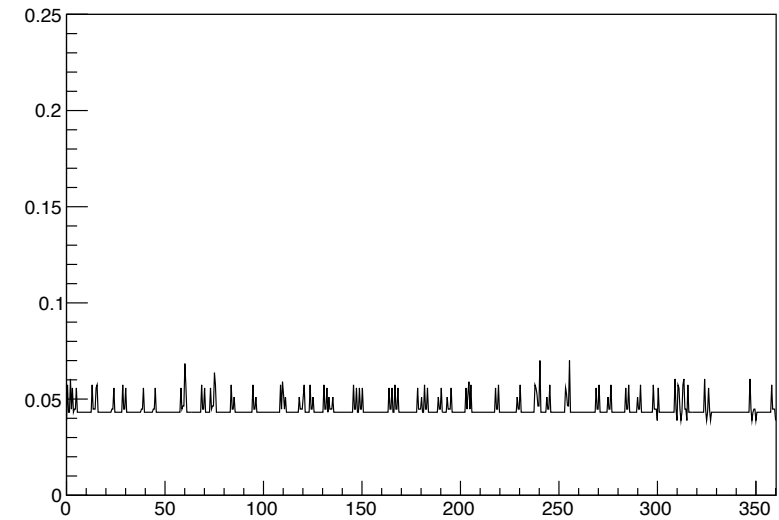
Material Scan in Phi at Fixed Eta = 3.0



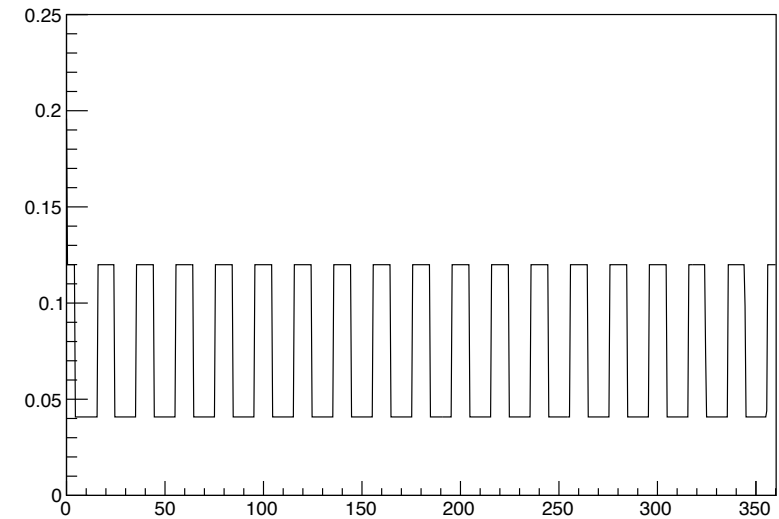
Material Scans – In ϕ



Material Scan in Phi at Fixed Eta = 0.5

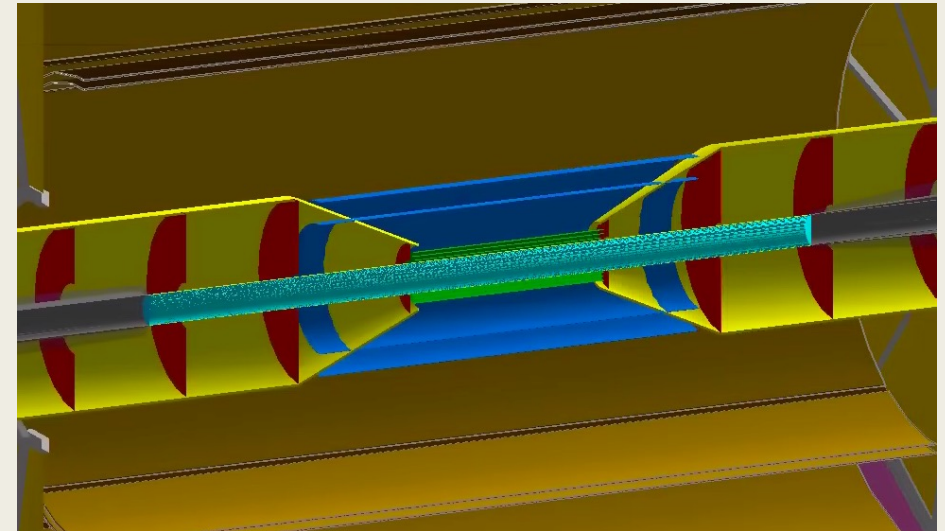


Material Scan in Phi at Fixed Eta = -3.0



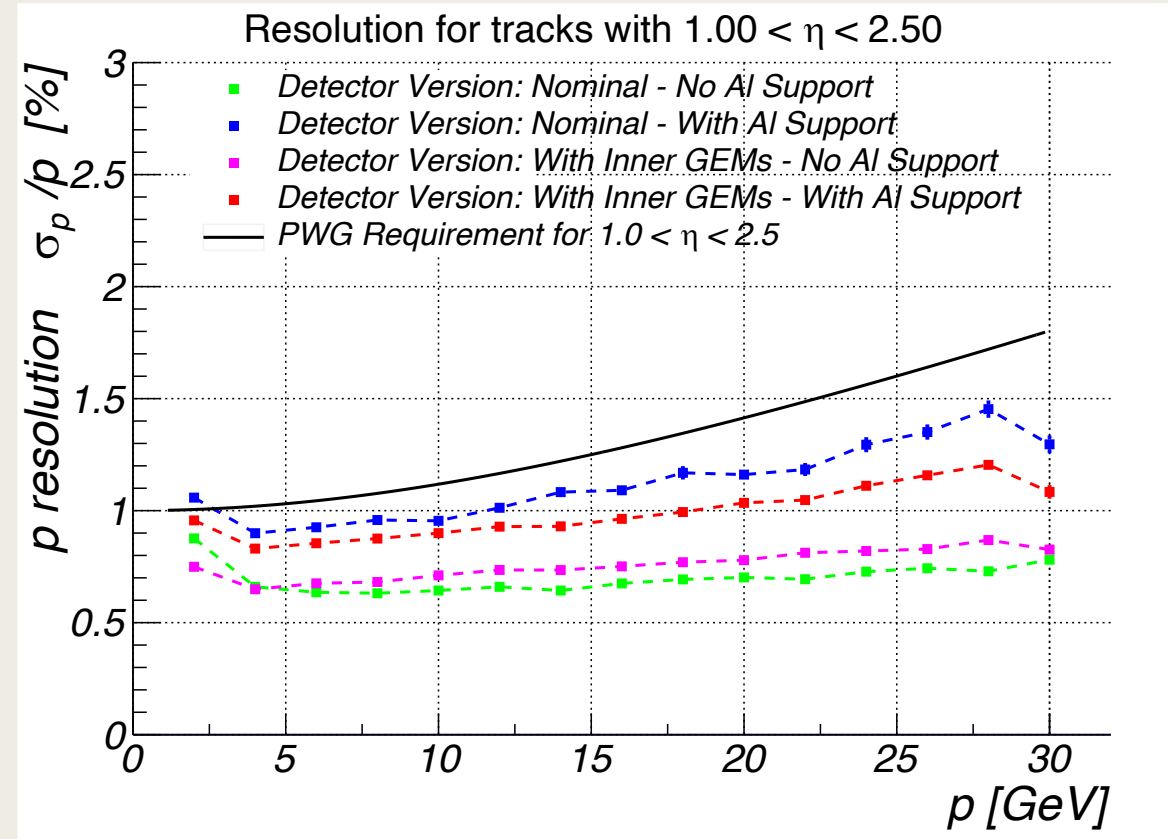
Al Support Structure for Si Disks

- To better assess the impact of adding GEM disks in the hybrid tracking configuration, accurate material needs to be simulated
- As a start, I implemented a modified version of the Al support structure designed for the All-Si Tracker.
- This is a very naïve implementation of Al support
 - *Simply changed the radii and z positions to match the Si disk geometry*
 - *Definitely incorrect:*
 - Not projective; Cone spans $1.64 < \text{Eta} < 1.86$
 - Intersects with inner Si barrel
- An accurate implementation is necessary for accurate optimization studies
 - *For example, adding inner GEM disks near $z \sim 105$ (see next slide)*



AI Support Structure for Si Disks

- Performance is impacted significantly by the support material
- Without the AI support structure, the **baseline configuration** outperforms the **version with additional inner GEM disks** (except at very low momenta)
- With the AI support, the **version with the inner GEM disks** outperforms the **baseline configuration**
- Having accurate support material simulated will help determine what is necessary to optimize tracking



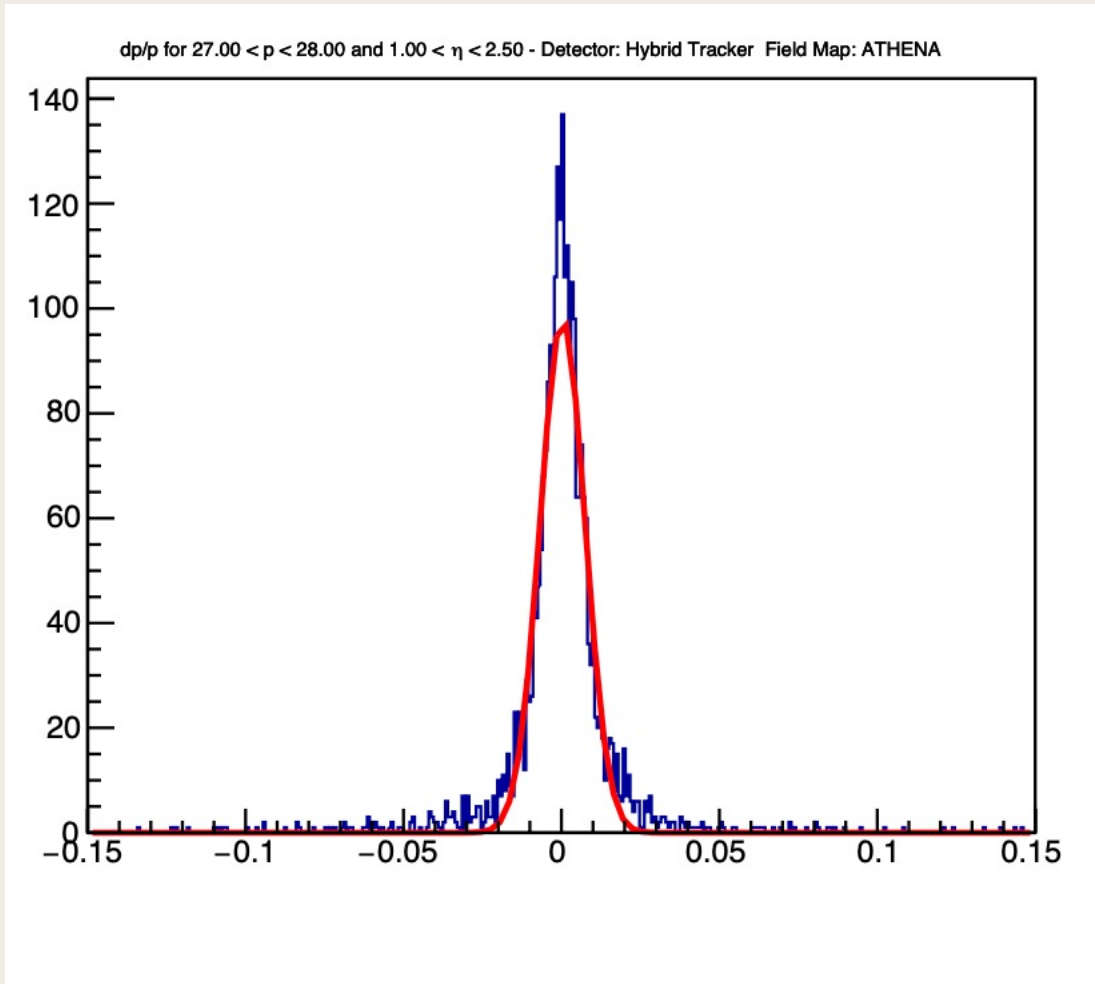
Summary

- Going forward it will be important to properly simulate material
 - *Need to understand what support structure for current design might look like*
- To Do:
 - *Implement proper support material*
 - *Angular resolutions at other PID detector locations*

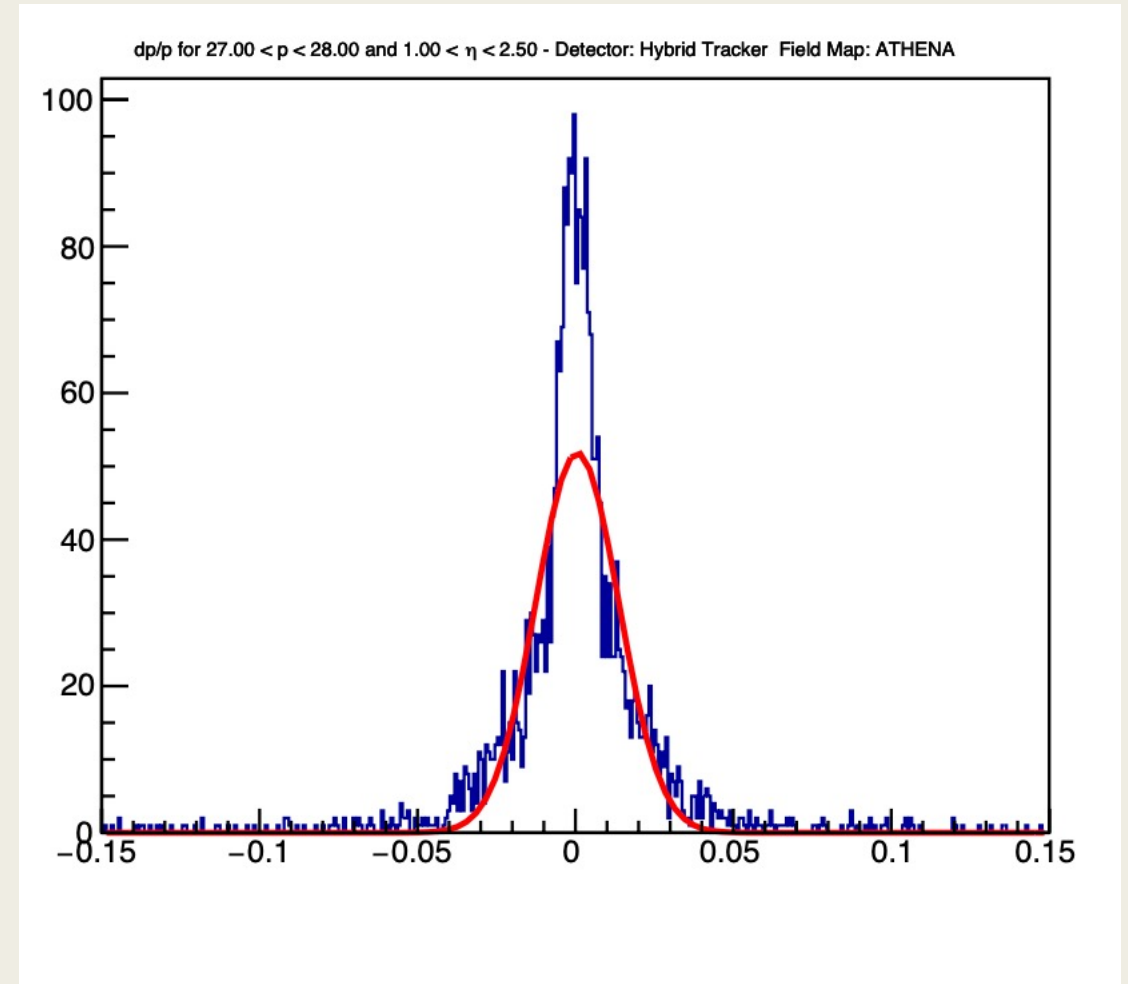
BACKUP SLIDES

Benchmark Plots With Aluminum Support

Effect of AI Support Structure

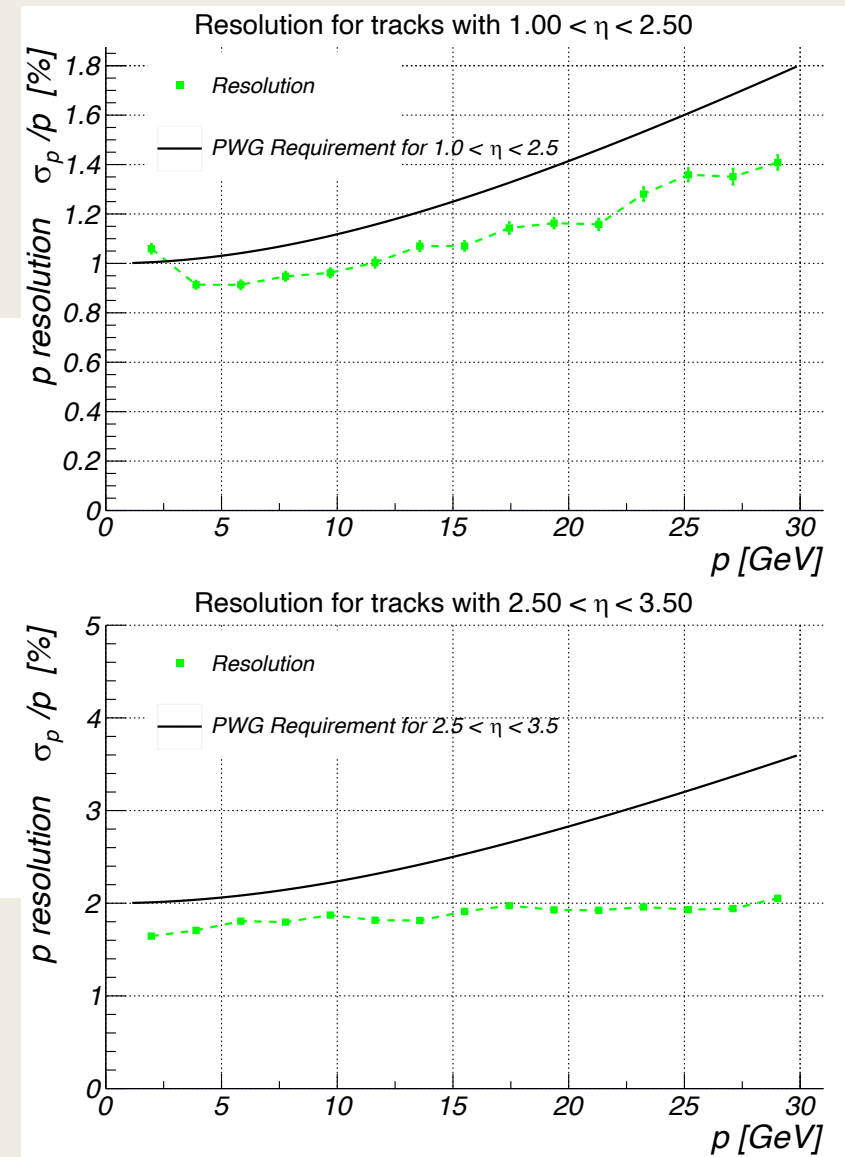
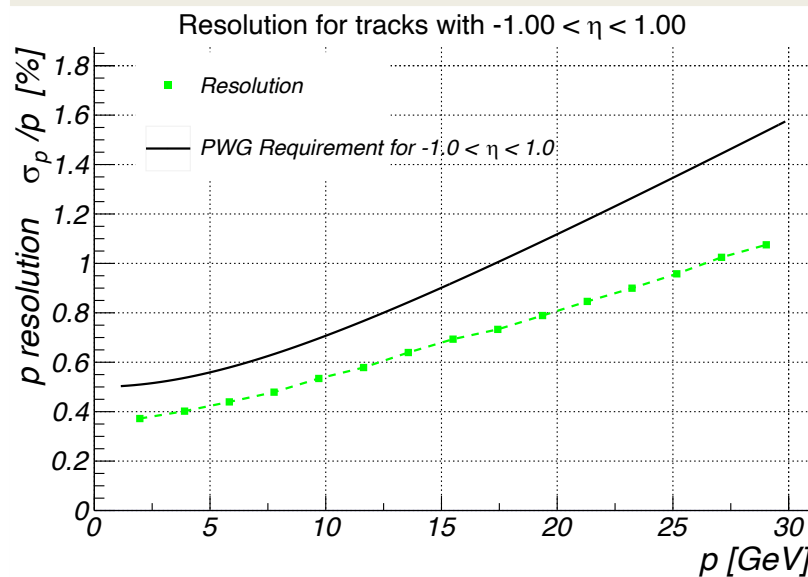
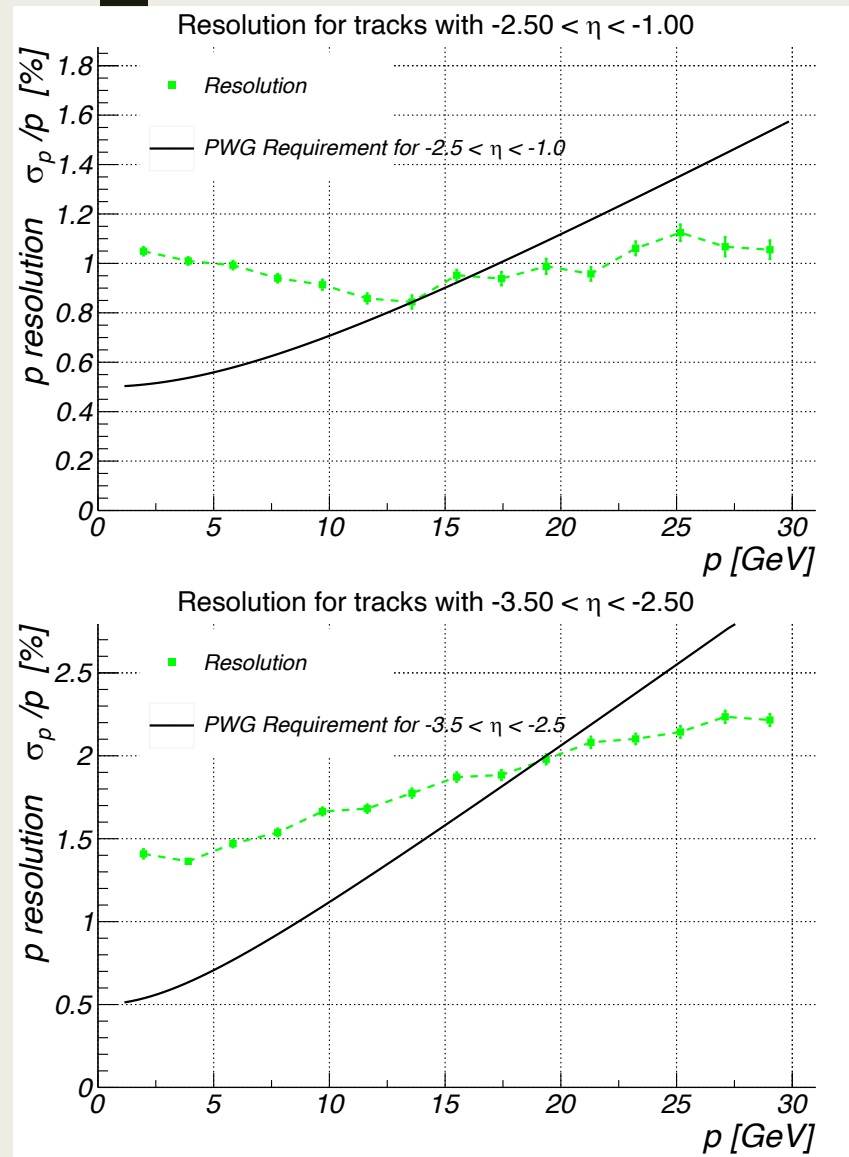


No AI Support Structure



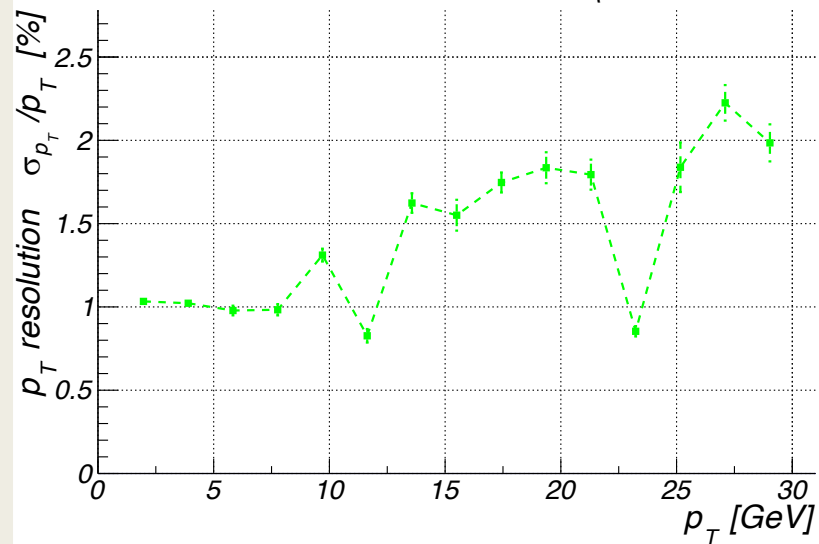
With AI Support Structure

P Resolution vs P

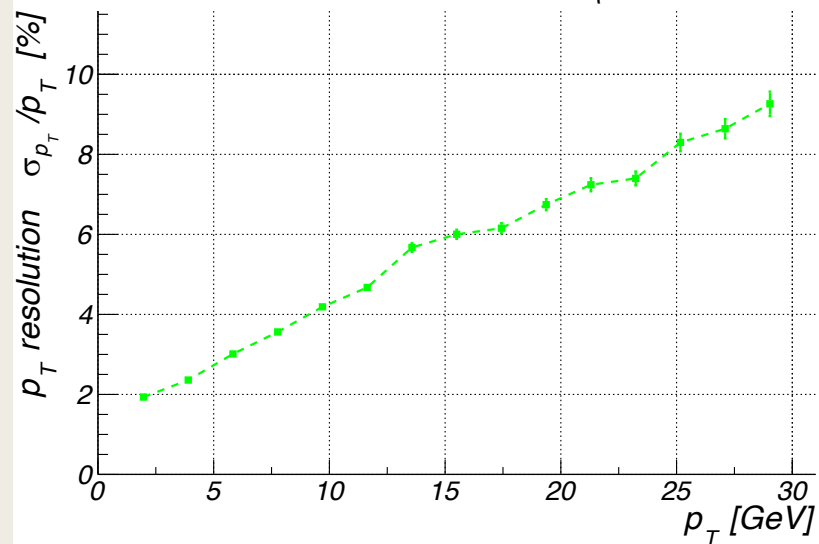


Pt Resolution vs Pt

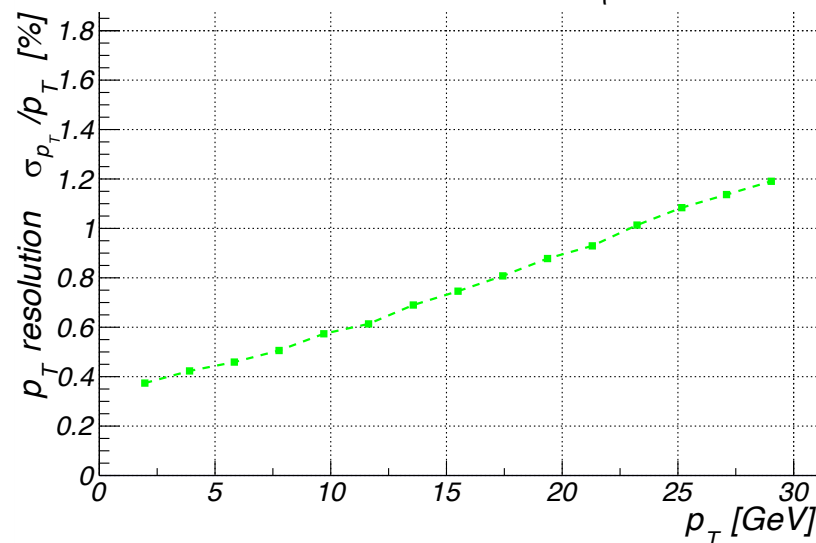
Resolution for tracks with $-2.50 < \eta < -1.00$



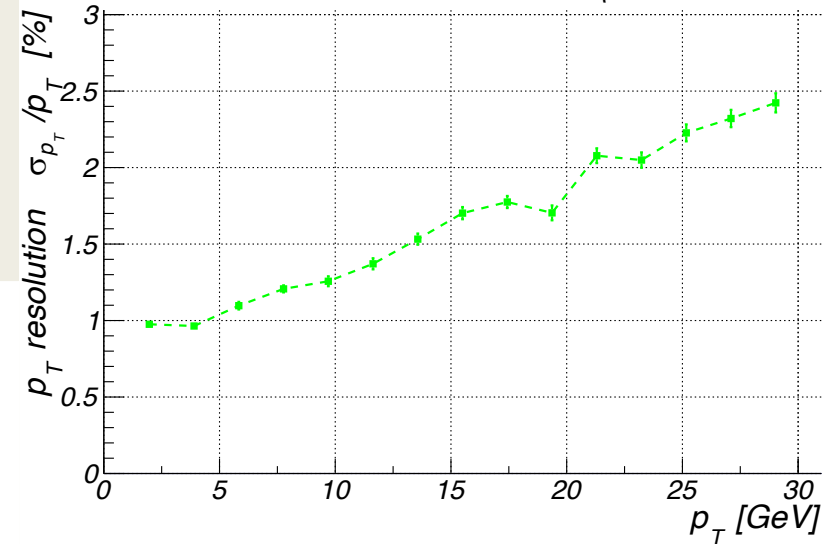
Resolution for tracks with $-3.50 < \eta < -2.50$



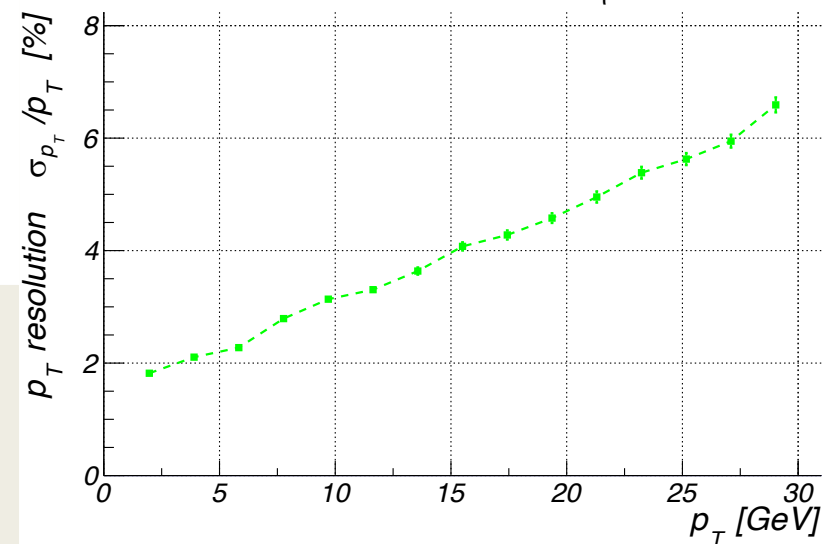
Resolution for tracks with $-1.00 < \eta < 1.00$



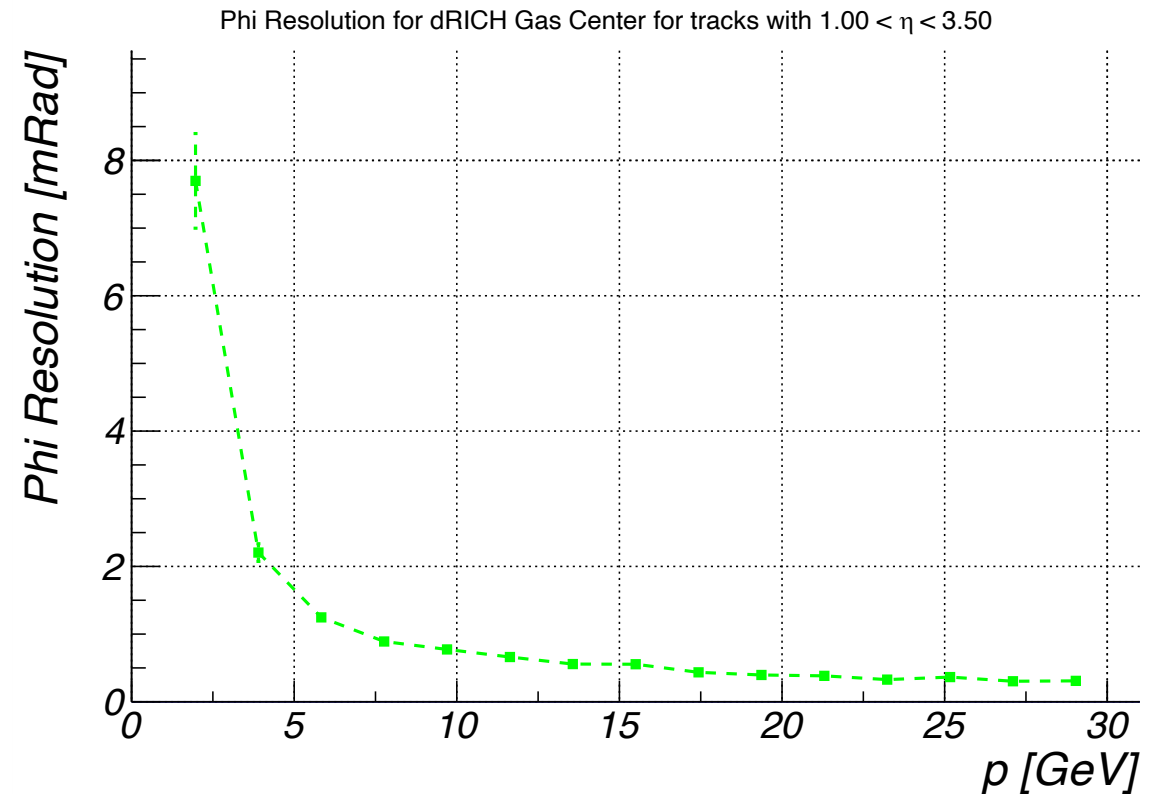
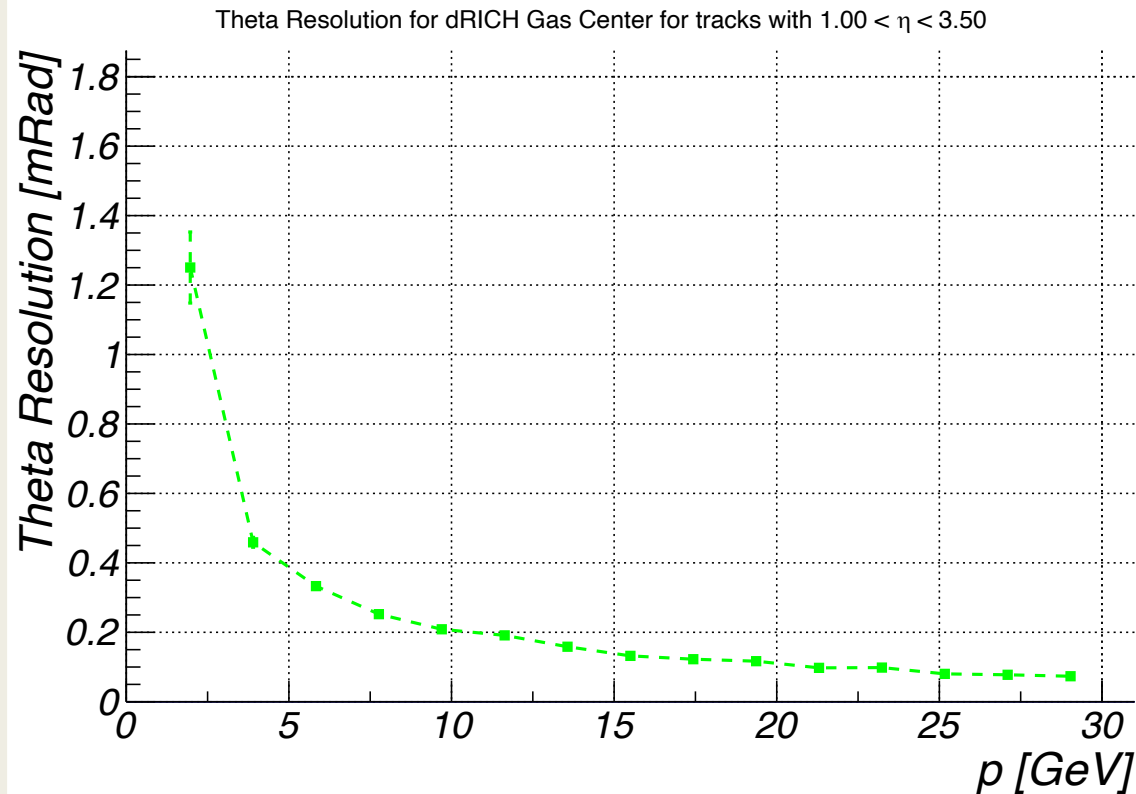
Resolution for tracks with $1.00 < \eta < 2.50$



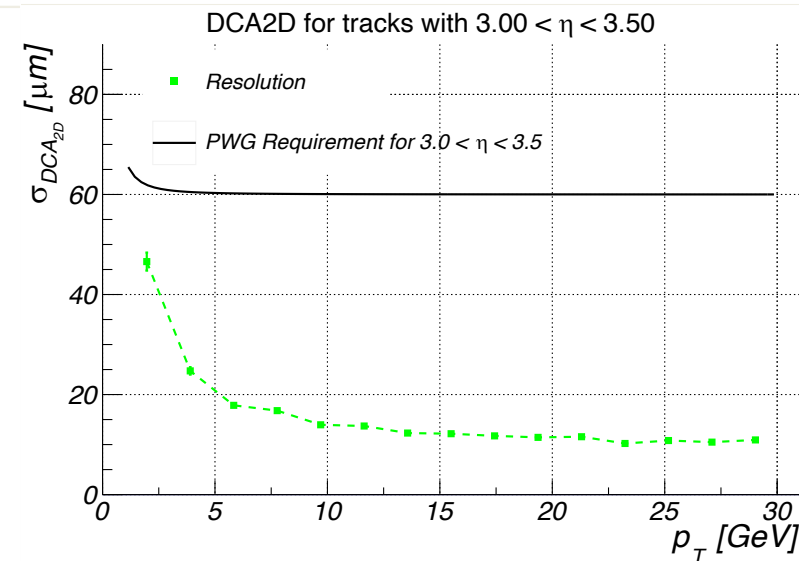
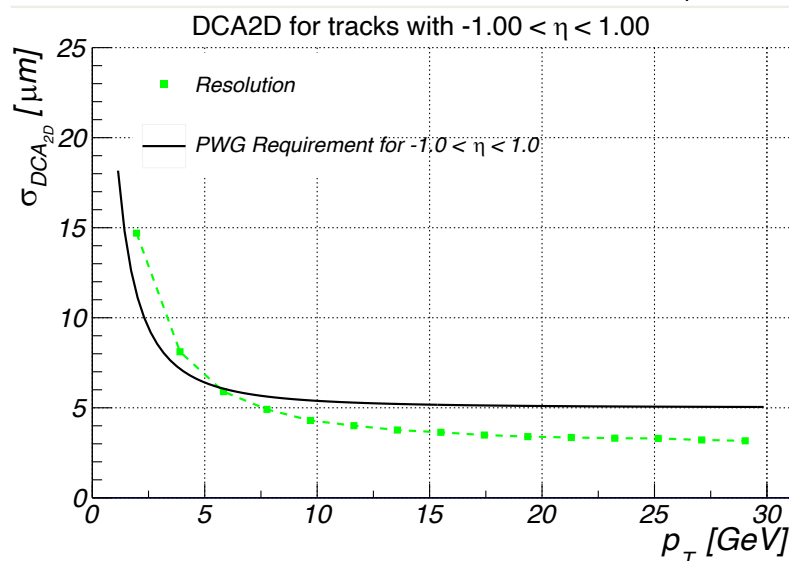
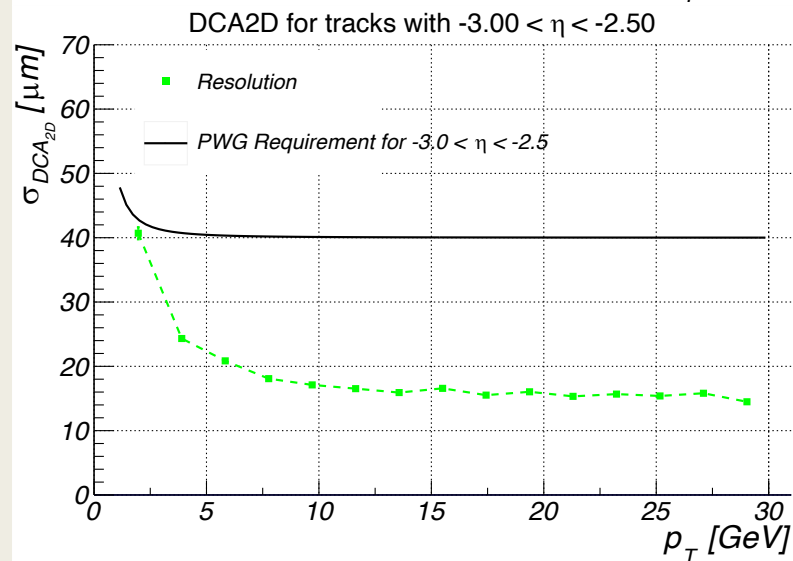
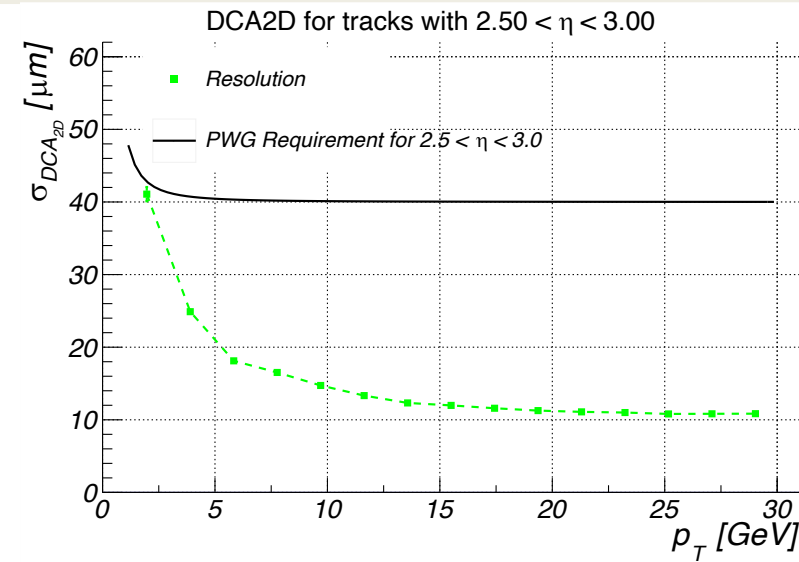
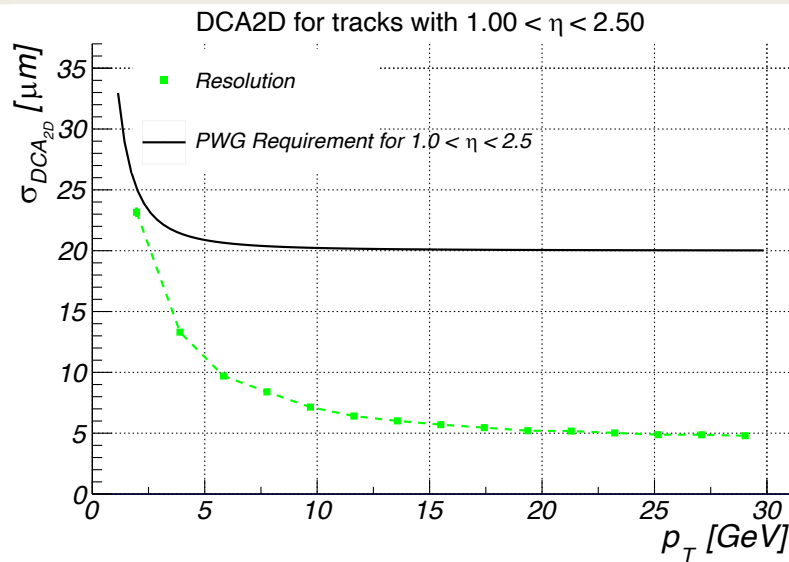
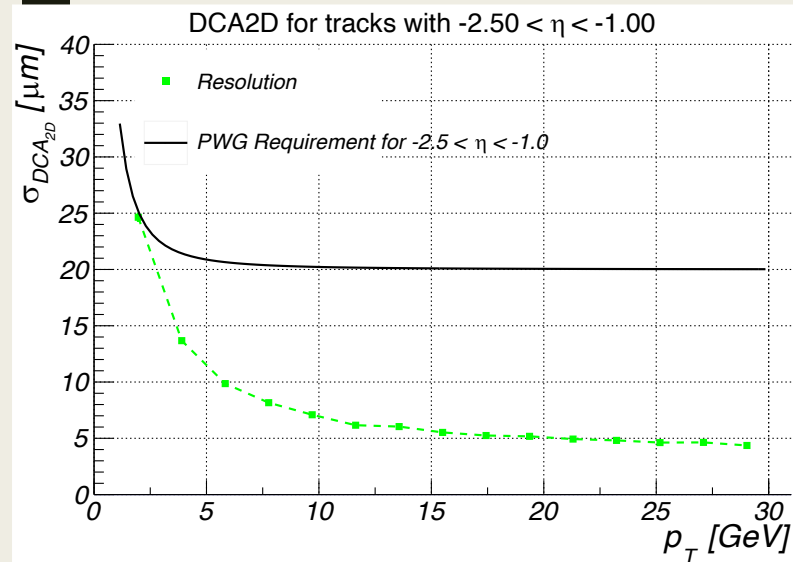
Resolution for tracks with $2.50 < \eta < 3.50$



Angular Resolution at mid-gas dRICH



Transverse Pointing Resolution



Longitudinal Pointing Resolution

