ePIC Tracking Updates

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RNC EIC Meeting

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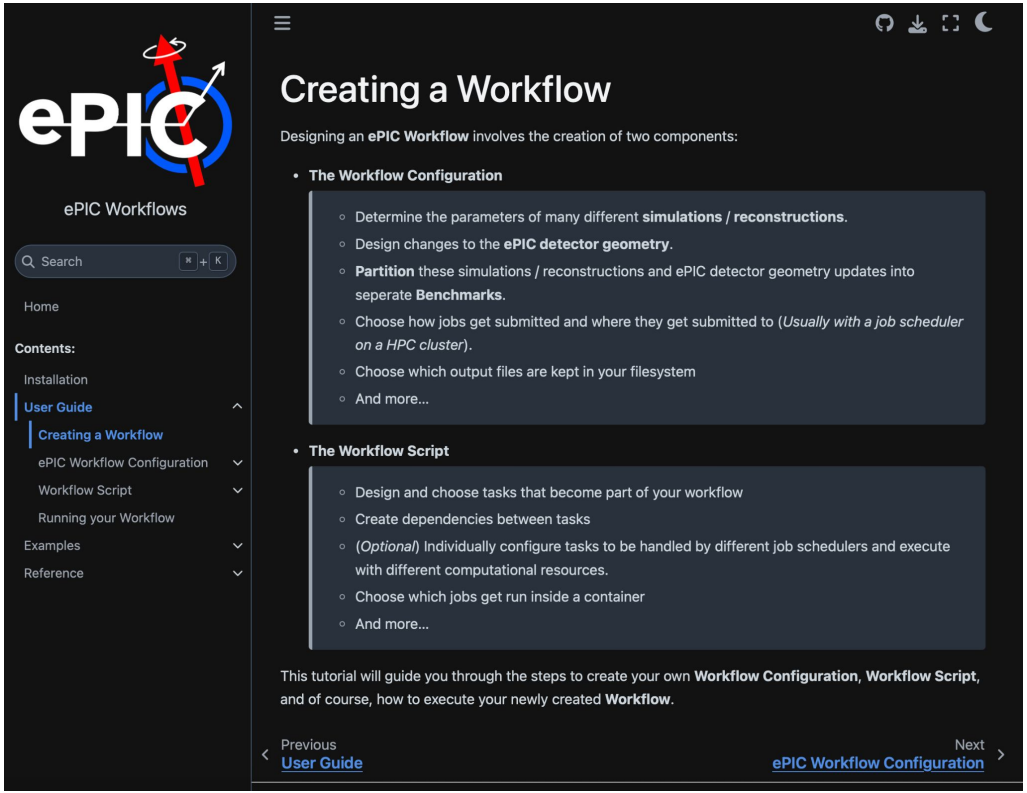
ePIC Workflow Package

Documentation Ready!

Link: https://epic-benchmark-lib.readthedocs.io/en/latest/

- A guide on:
  - Installing and activating the package
  - Configuring workflow parameters
  - Writing individual tasks
  - Creating a workflow with task dependencies
  - Executing your workflow on Perlmutter (and other HPCs)
- Examples of workflow configurations and scripts
- Has API reference



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Performance Study Configuration

Simulation + Reconstruction Settings

- Number of Events : 20,000
- Particle : π^+
- Distribution : Uniform in Eta
- Momenta (GeV) : 0.5, 1, 2, 5, 10, 15
- Eta Ranges :
  - -3.5 → -2.5
  - -2.5 → -1.0
  - -1.0 → 1.0
  - 1.0 → 2.5
  - 2.5 → 3.5
- Material Map : ePIC Default

Analysis Configuration

- Dataset boundaries for Fitting : $(-2\sigma \leftrightarrow 2\sigma)$
- Outlier Cut Percentiles :
  - Cuts made to ensure half of all bins within $\pm 2\sigma$
  - Cuts (%) $\in [0.0, 0.5, 1.0, \ldots, 10.0]$

ePIC Repository + ContainerConfiguration

- ePIC Commits by Study :
  - Silicon & Non-Silicon Missing Layers :
    - Branch : *Main*
    - Title : *fix: remove local mutable state in FieldMapB in favor of locals (#844)*
    - ID : *4f29e57*
  - Material Thickness :
    - Branch : *pr/makeshift_fix_ETOF_resolution*
    - Title : *Merge branch 'main' into pr/makeshift_fix_ETOF_resolution*
    - ID : *65dcb36*
- EIC Software Container image by study :
  - Silicon Missing Layers : *eicweb/eic_xl:25.04.1-stable*
  - Non-Silicon Missing Layers : *eicweb/jug_xl:25.02.0-stable*
  - Material Thickness : *eicweb/jug_xl:25.02.0-stable*

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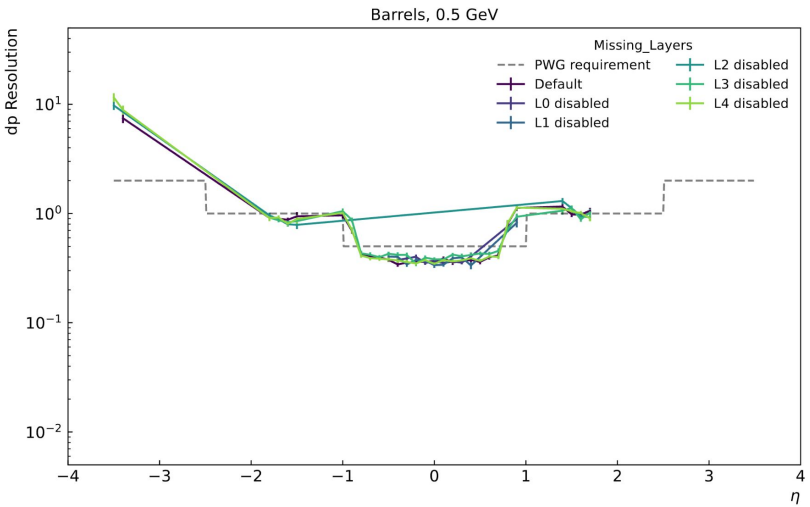
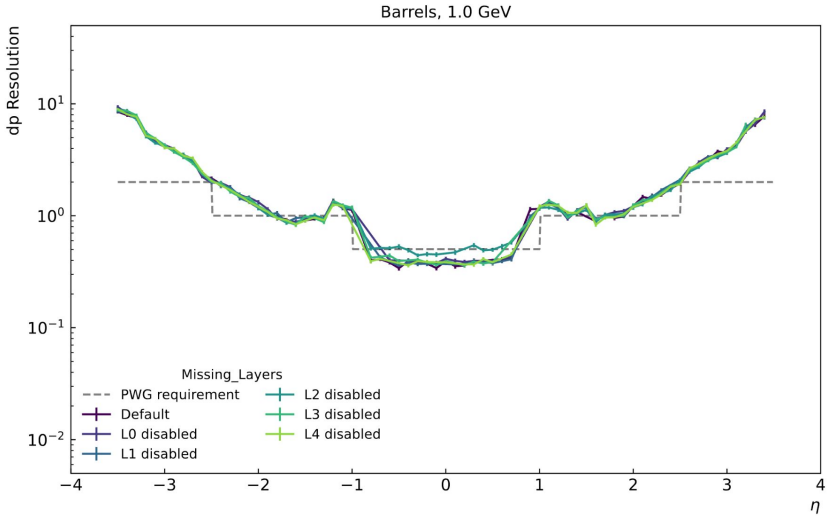
Missing Layers - Silicon Detectors

Silicon Barrels

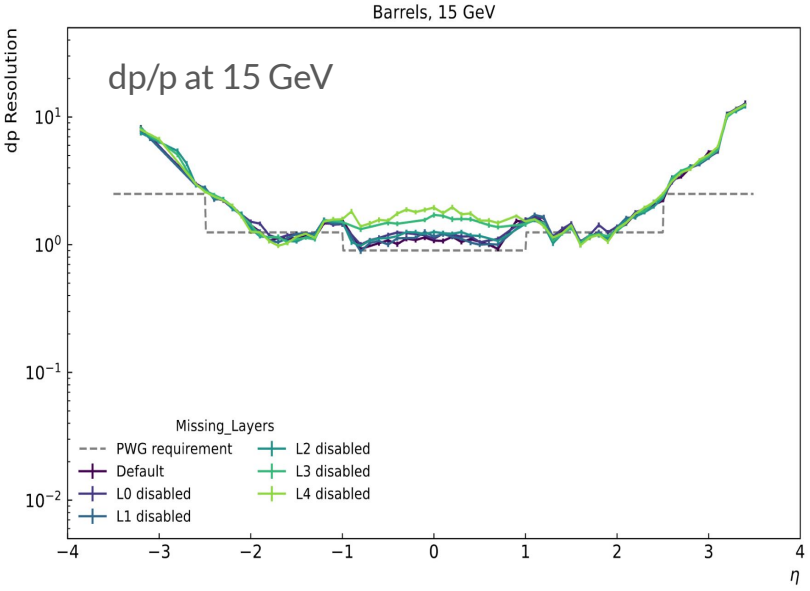
eta Scan at fixed momentum

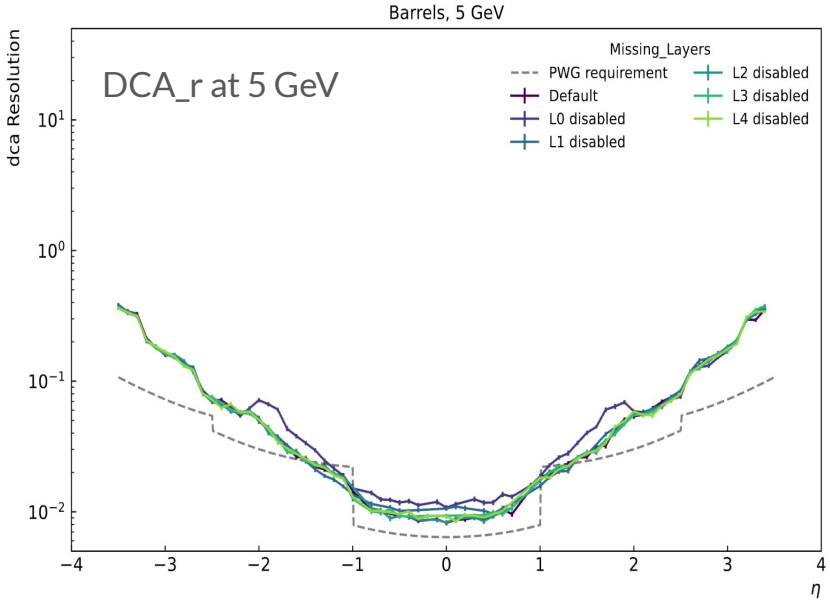




Silicon Barrels

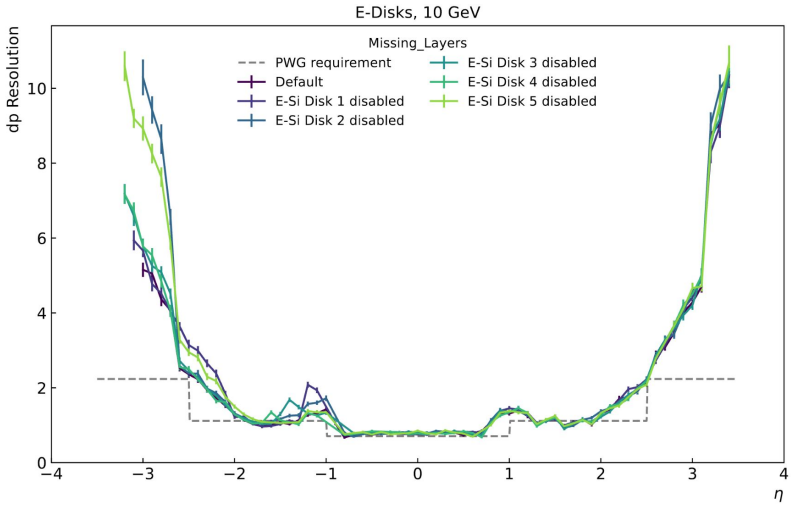
eta Scan at fixed momentum

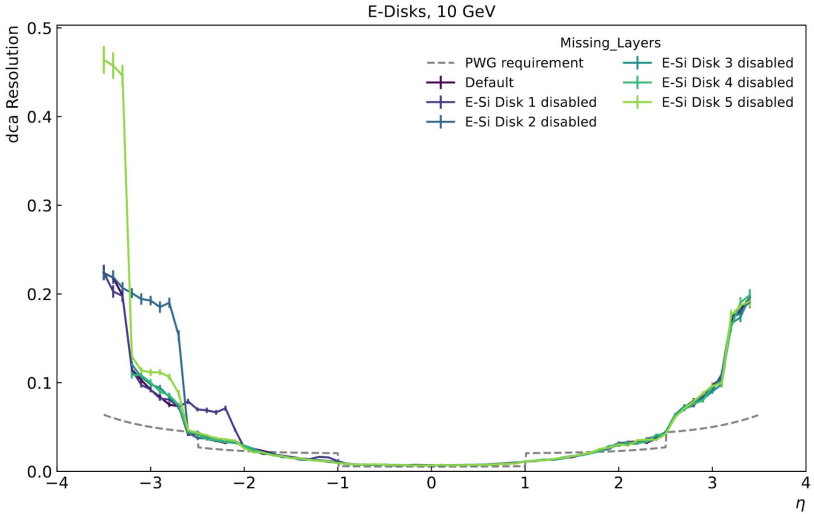




Silicon E-Disks

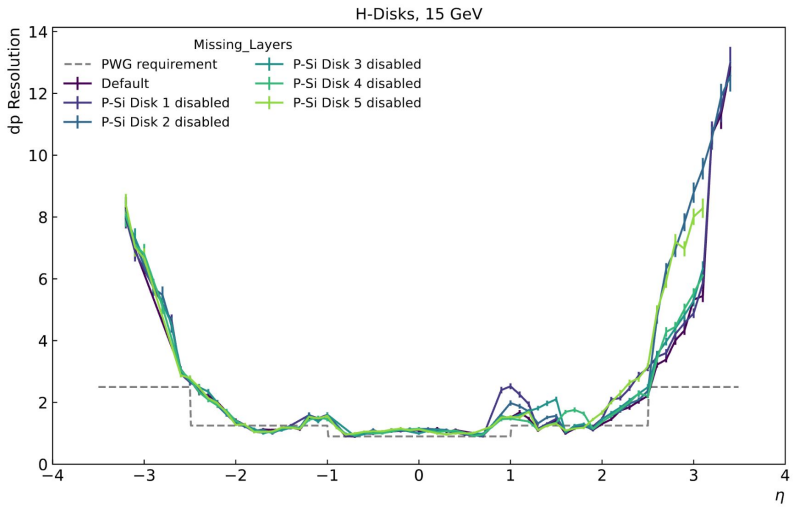
eta Scan at fixed momentum

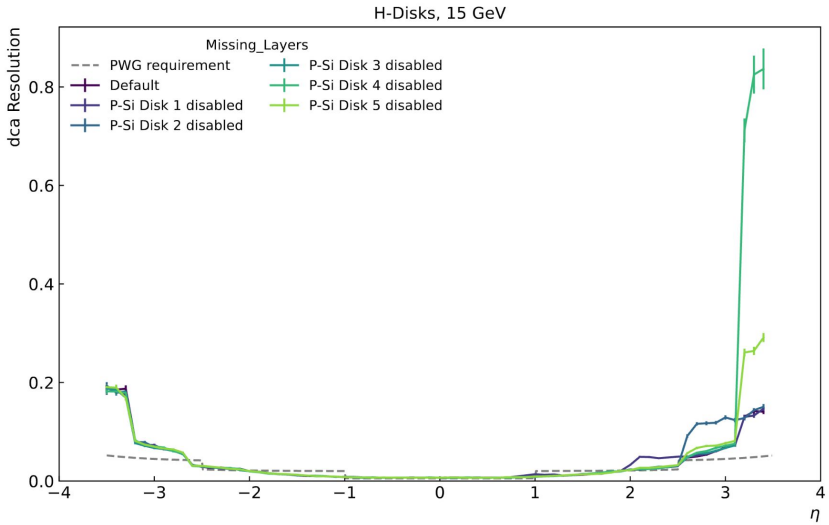




Silicon H-Disks

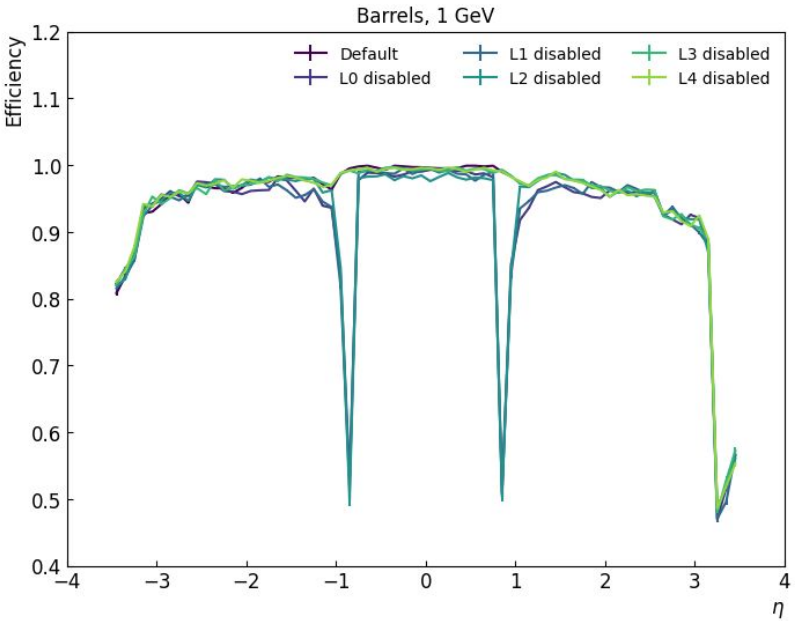
eta Scan at fixed momentum

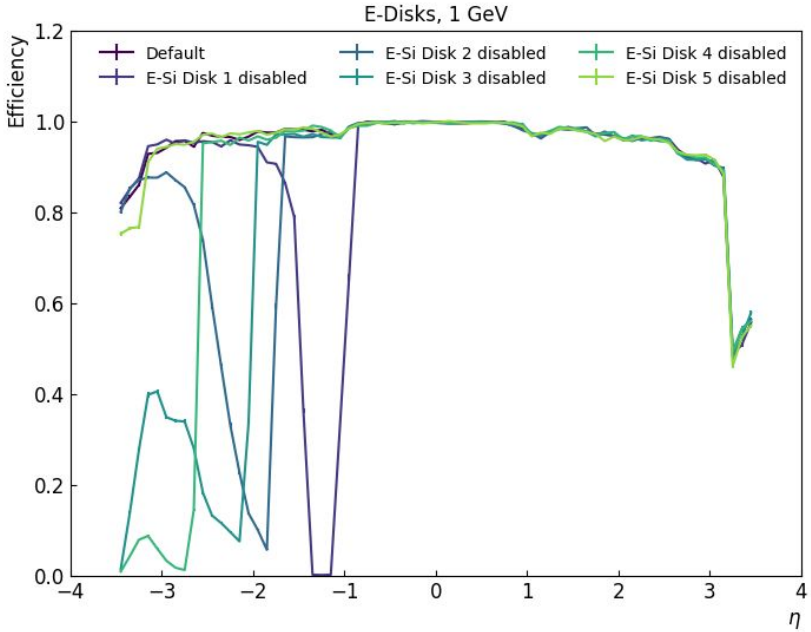




Efficiency

Tracking layers closer to vertex have larger impact on efficiency





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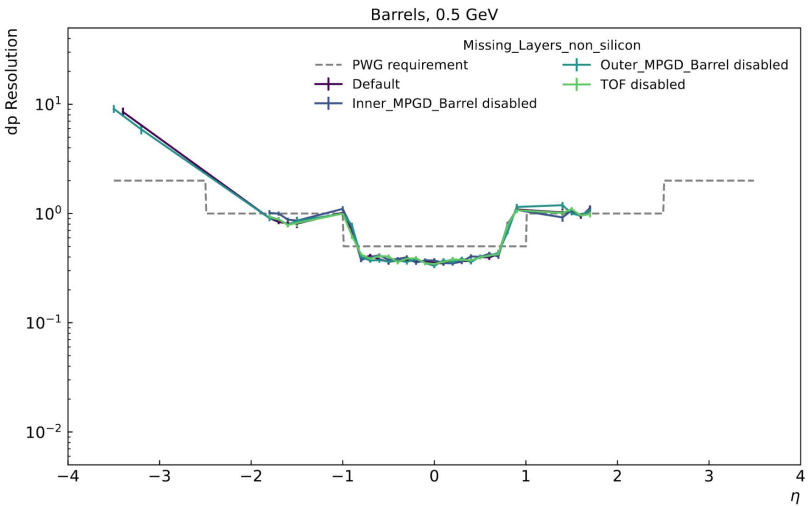
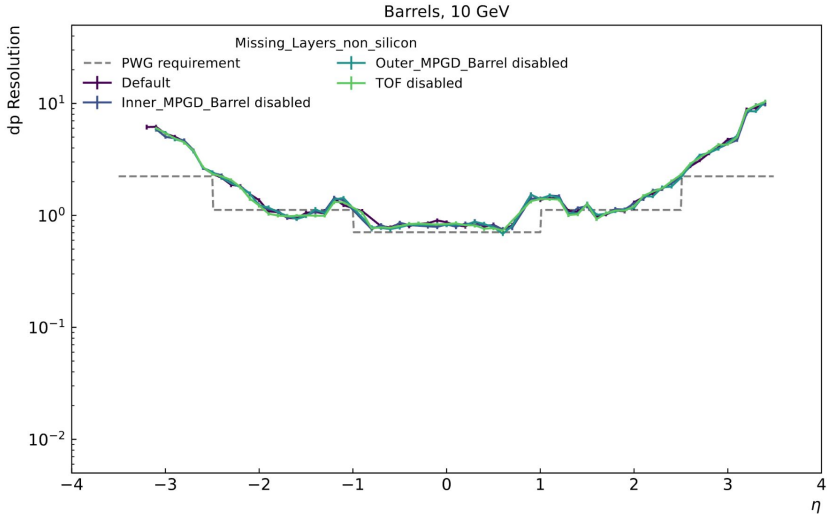
Missing Layers - MPGD & TOF Detectors

MPGD Barrels + TOF (Barrels and H-endcap)

eta Scan at fixed momentum

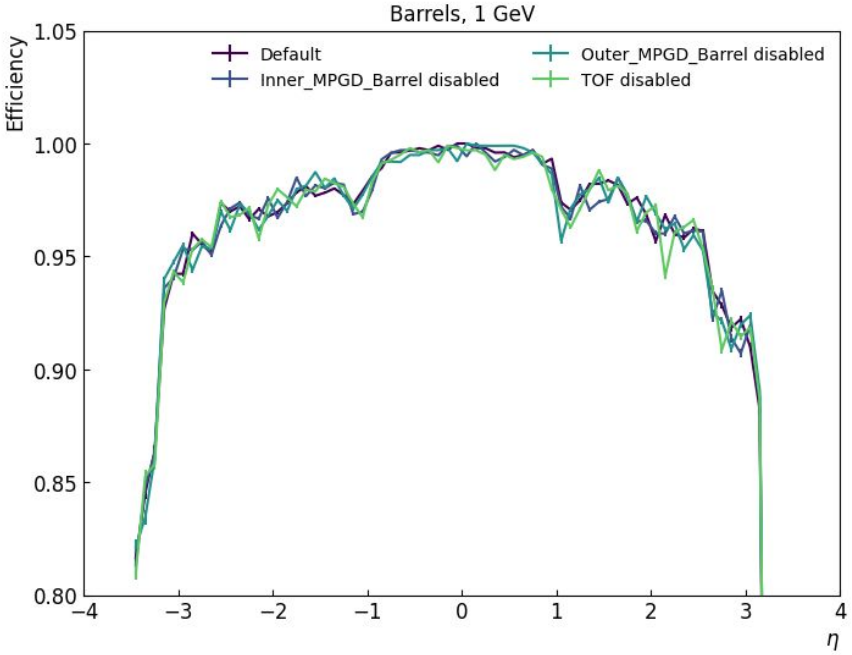


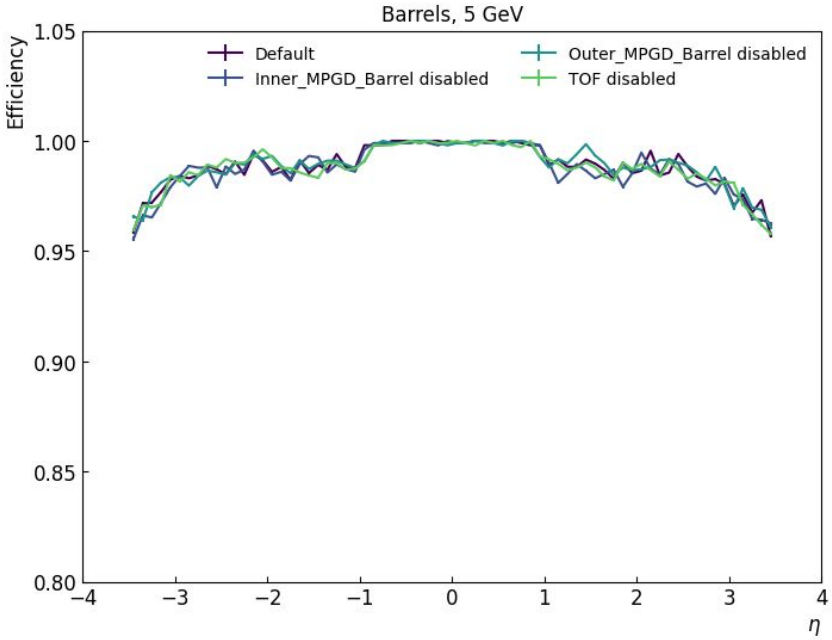


MPGD Barrels + TOF (Barrels and H-endcap)

Efficiency

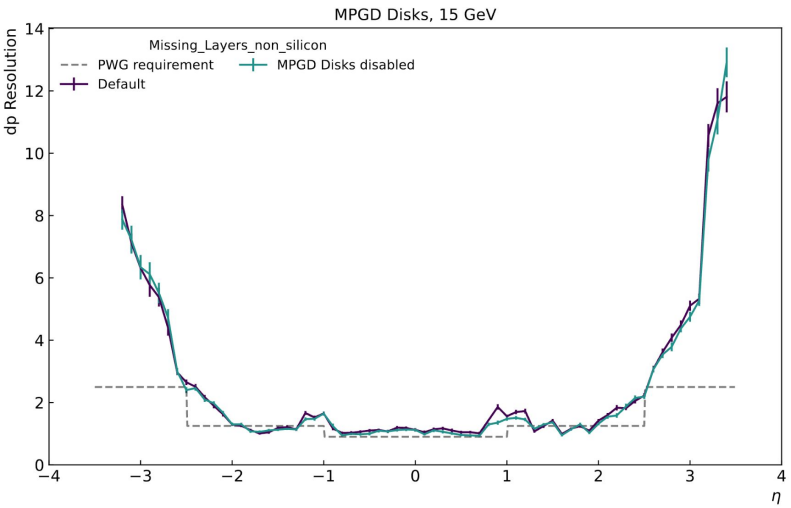
no noticeable difference everywhere

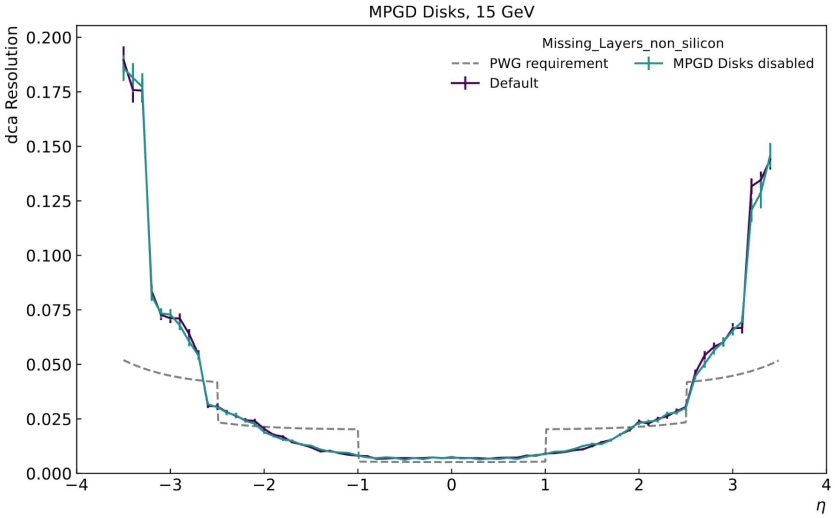




H-MPGD & E-MPGD Disks

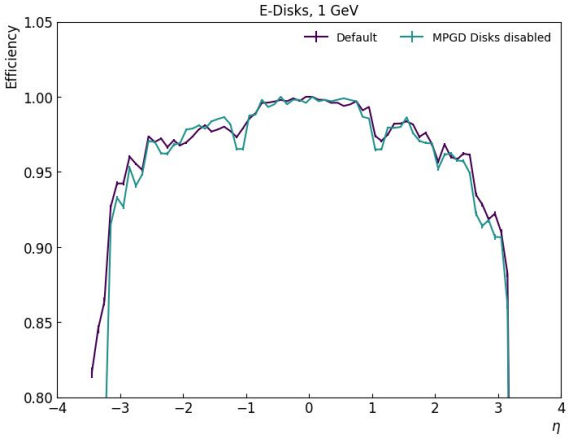
eta Scan at fixed momentum

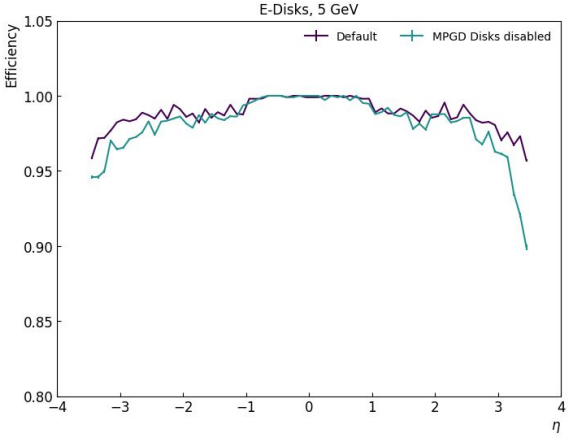


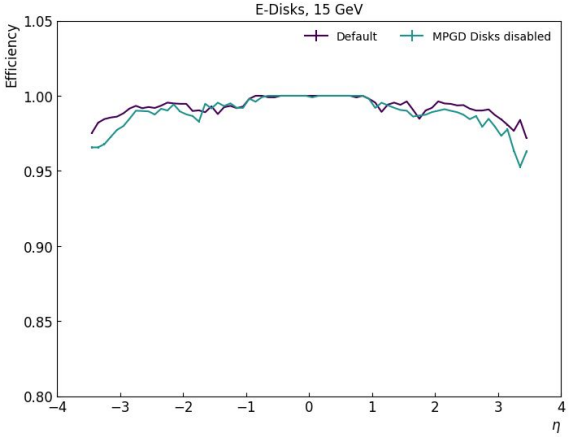


H-MPGD & E-MPGD Disks

Efficiency



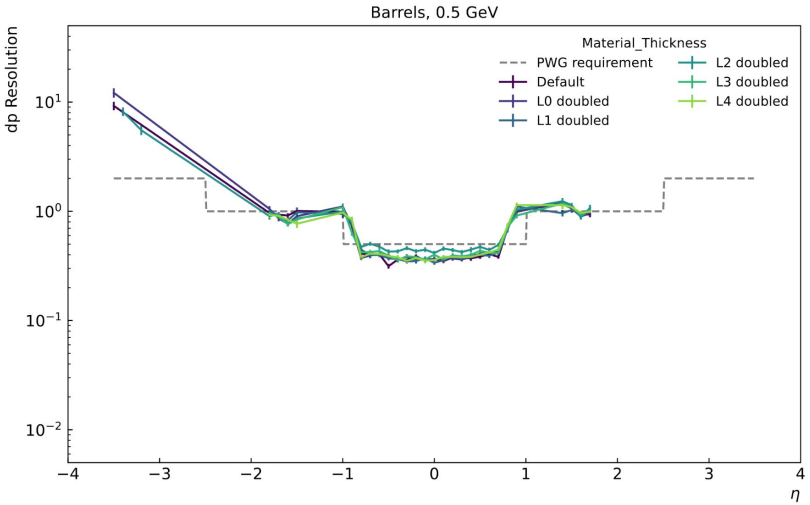


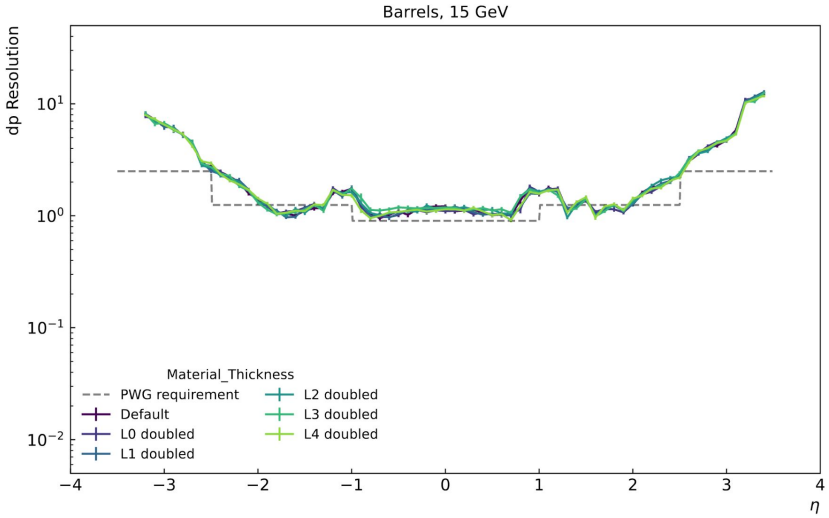


Material Thickness Doubled

Silicon Barrels

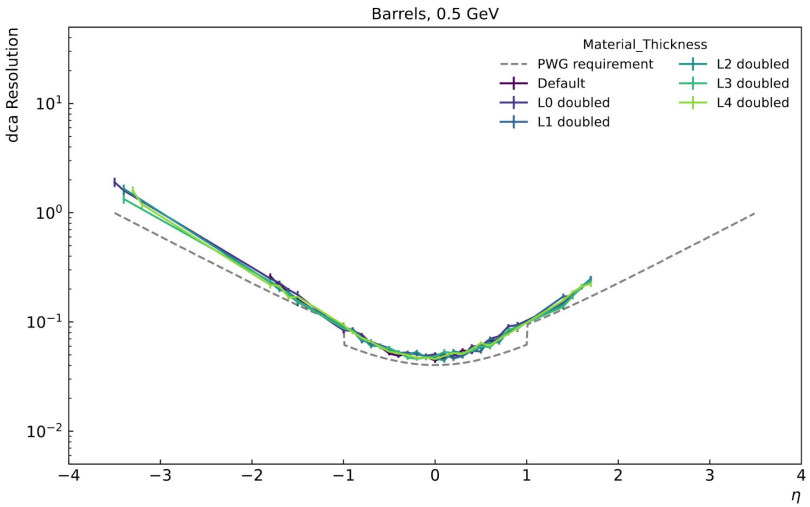
eta Scan at fixed momentum - dp

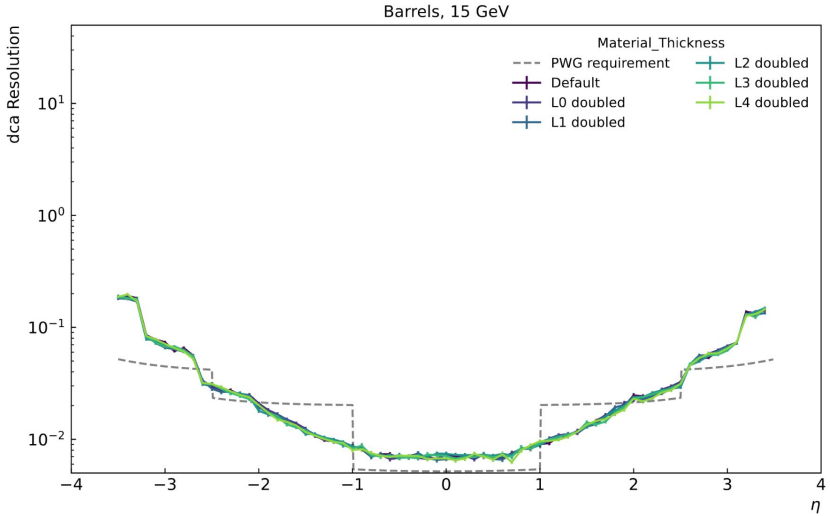




Silicon Barrels

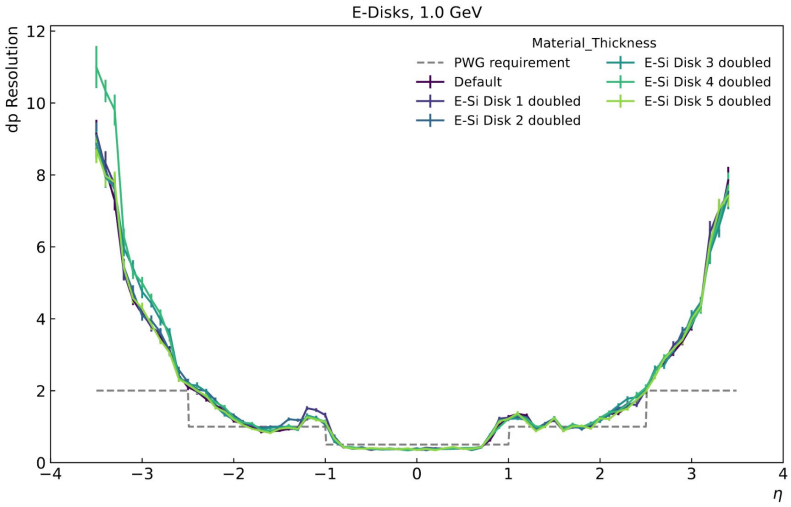
eta Scan at fixed momentum - DCA

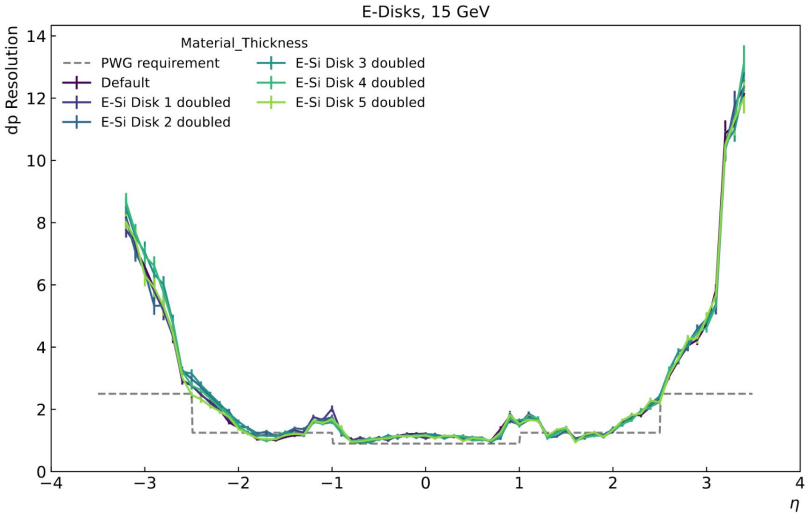




Silicon E-Disks

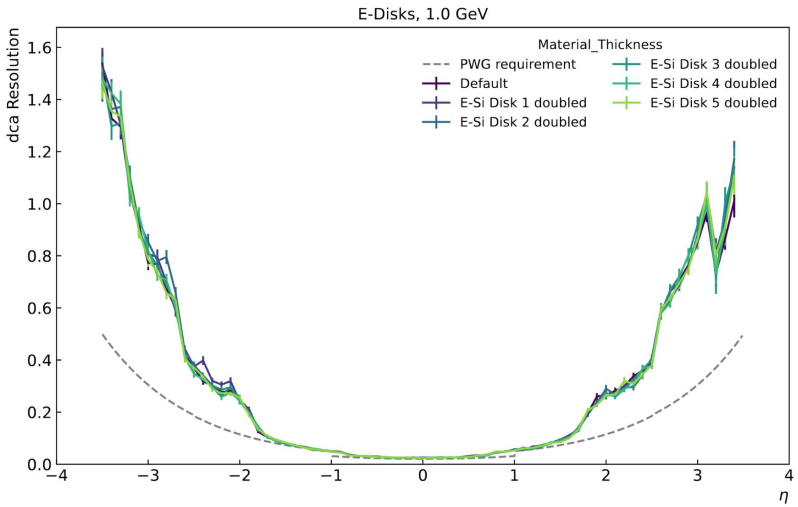
eta Scan at fixed momentum

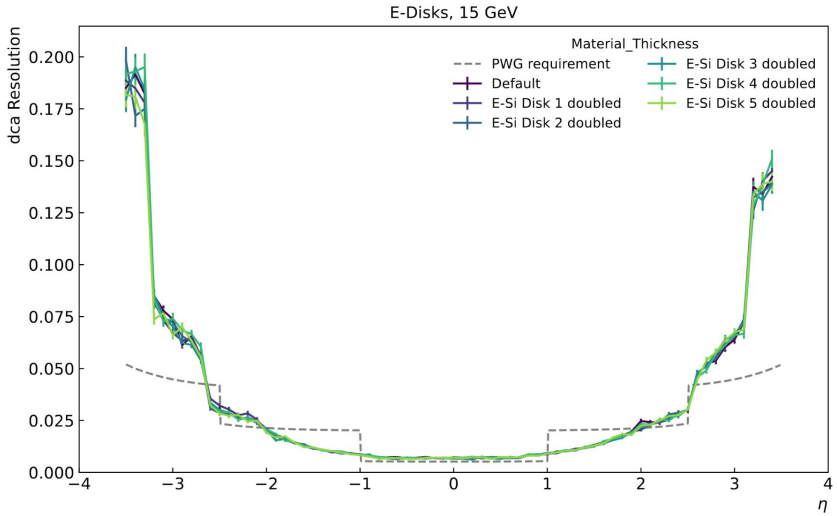




Silicon E-Disks

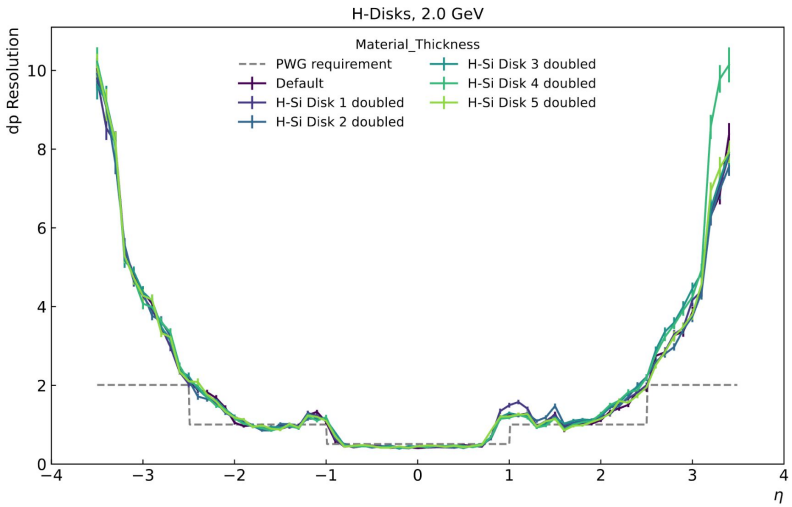
eta Scan at fixed momentum - DCA

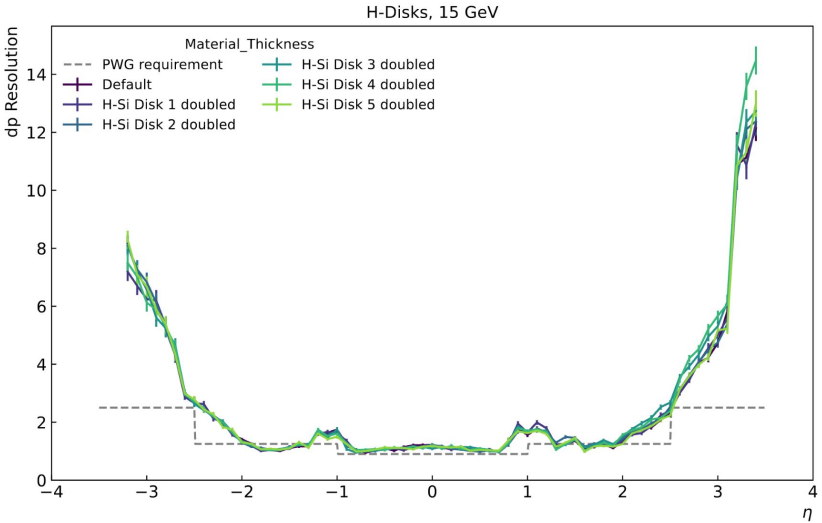




Silicon H-Disks

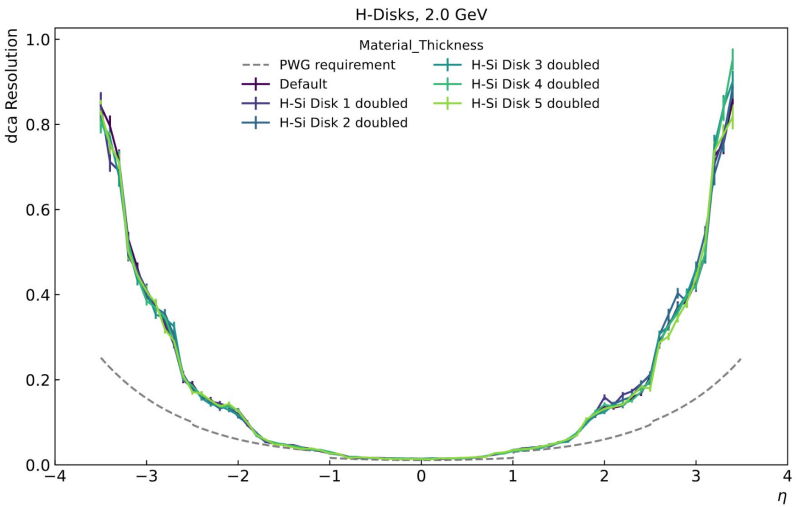
eta Scan at fixed momentum - dp

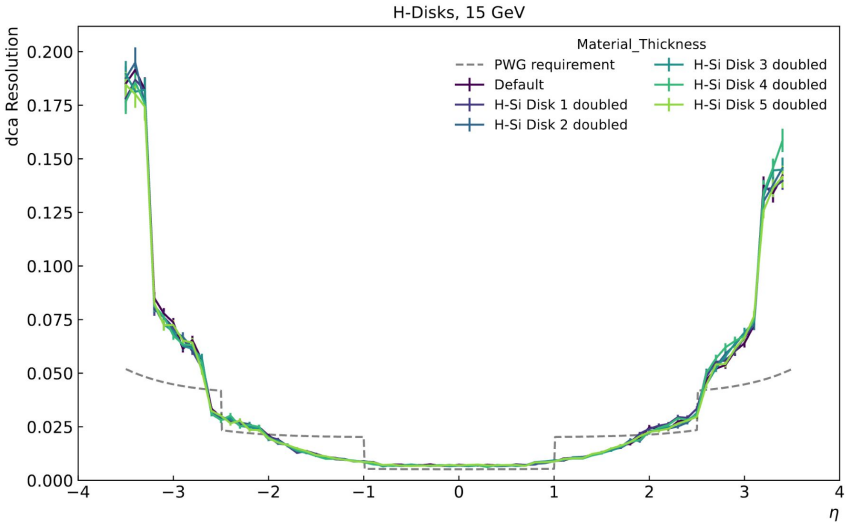




Silicon H-Disks

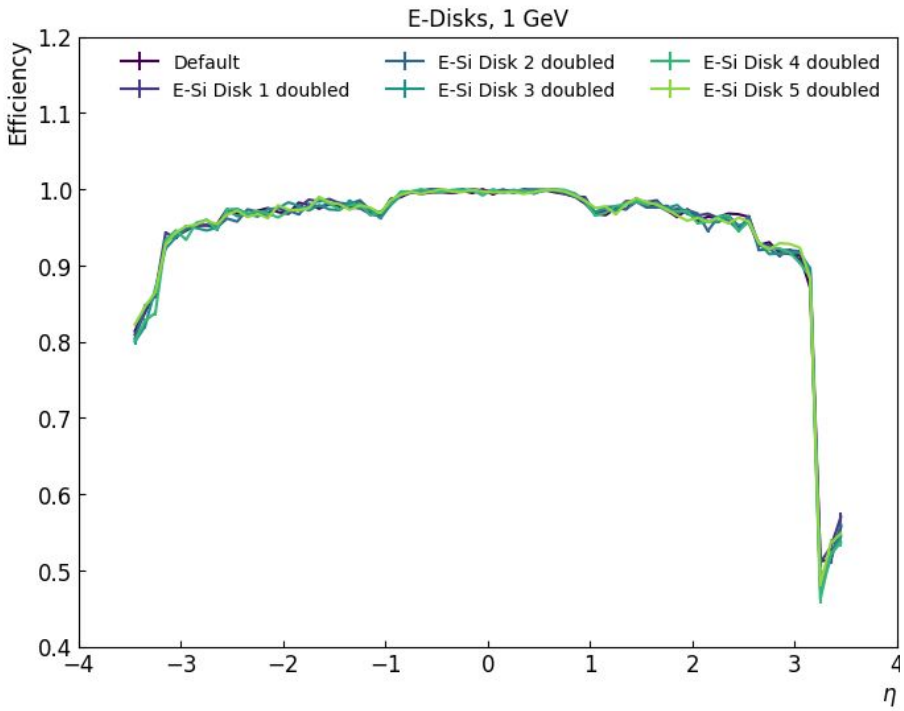
eta Scan at fixed momentum - DCA

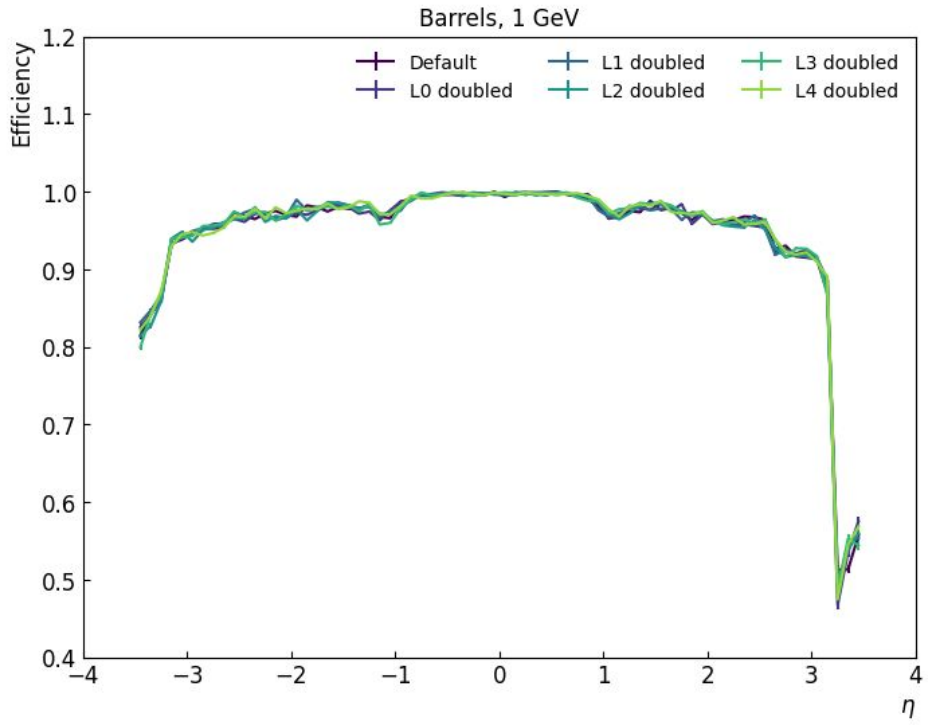




Efficiency

No noticeable impact anywhere with doubled thickness





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Current Issues

ePIC Detector Default Configuration

Fitting failure at low eta + high momentum

- Cannot fit momentum resolution for eta scan:
  - Momentum = 15GeV
  - Eta bin size = 0.1
  - Eta bins < -3.2:
    - -3.5 → -3.4
    - -3.4 → -3.3
    - -3.3 → -3.2
- Plots on right show example for -3.3 → -3.2 eta.