

ePIC Tracking Updates

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June 17, 2025
RNC EIC Meeting



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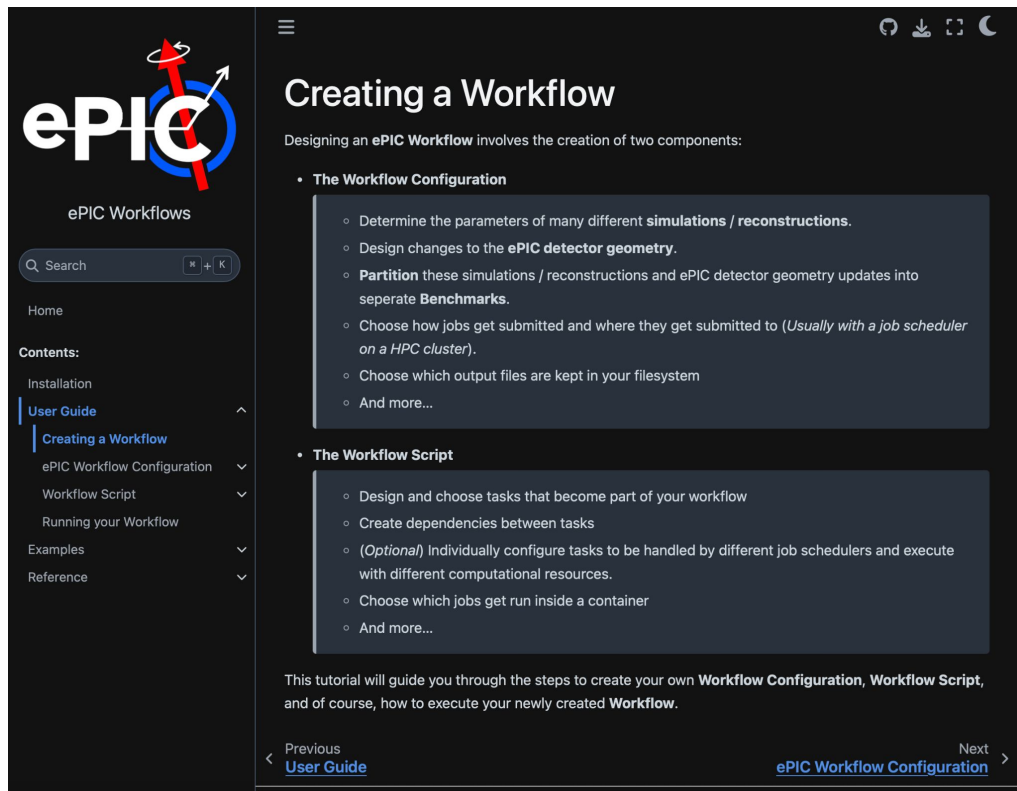
ePIC Workflow Package

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



The screenshot shows the 'ePIC Workflows' documentation page. The left sidebar contains a navigation menu with the following items: Home, Contents (expanded), Installation, User Guide (selected), Creating a Workflow (expanded), ePIC Workflow Configuration, Workflow Script, Running your Workflow, Examples, and Reference. The main content area is titled 'Creating a Workflow' and includes the following text: 'Designing an ePIC Workflow involves the creation of two components:'. Below this, there are two sections: 'The Workflow Configuration' and 'The Workflow Script'. Each section contains a list of bullet points. The 'Workflow Configuration' section lists: 'Determine the parameters of many different simulations / reconstructions.', 'Design changes to the ePIC detector geometry.', 'Partition these simulations / reconstructions and ePIC detector geometry updates into separate Benchmarks.', 'Choose how jobs get submitted and where they get submitted to (Usually with a job scheduler on a HPC cluster).', 'Choose which output files are kept in your filesystem', and 'And more...'. The 'Workflow Script' section lists: 'Design and choose tasks that become part of your workflow', 'Create dependencies between tasks', '(Optional) Individually configure tasks to be handled by different job schedulers and execute with different computational resources.', 'Choose which jobs get run inside a container', and 'And more...'. At the bottom of the page, there is a navigation bar with 'Previous User Guide' and 'Next ePIC Workflow Configuration' links.

ePIC Workflows

Search [x] [K]

Home

Contents:

- Installation
- User Guide**
- Creating a Workflow
- ePIC Workflow Configuration
- Workflow Script
- Running your Workflow
- Examples
- Reference

Creating a Workflow

Designing an **ePIC Workflow** involves the creation of two components:

- **The Workflow Configuration**
 - Determine the parameters of many different **simulations / reconstructions**.
 - Design changes to the **ePIC detector geometry**.
 - **Partition** these simulations / reconstructions and ePIC detector geometry updates into separate **Benchmarks**.
 - Choose how **jobs** get submitted and where they get submitted to (*Usually with a job scheduler on a HPC cluster*).
 - Choose which output files are kept in your filesystem
 - And more...
- **The Workflow Script**
 - Design and choose tasks that become part of your workflow
 - Create dependencies between tasks
 - (*Optional*) Individually configure tasks to be handled by different job schedulers and execute with different computational resources.
 - Choose which jobs get run inside a container
 - And more...

This tutorial will guide you through the steps to create your own **Workflow Configuration**, **Workflow Script**, and of course, how to execute your newly created **Workflow**.

Previous [User Guide](#) [ePIC Workflow Configuration](#) Next



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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 :
 - $-3.5 \rightarrow -2.5$
 - $-2.5 \rightarrow -1.0$
 - $-1.0 \rightarrow 1.0$
 - $1.0 \rightarrow 2.5$
 - $2.5 \rightarrow 3.5$
- 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 (%) $\in [0.0, 0.5, 1.0, \dots, 10.0]$

ePIC Repository + Container Configuration

- 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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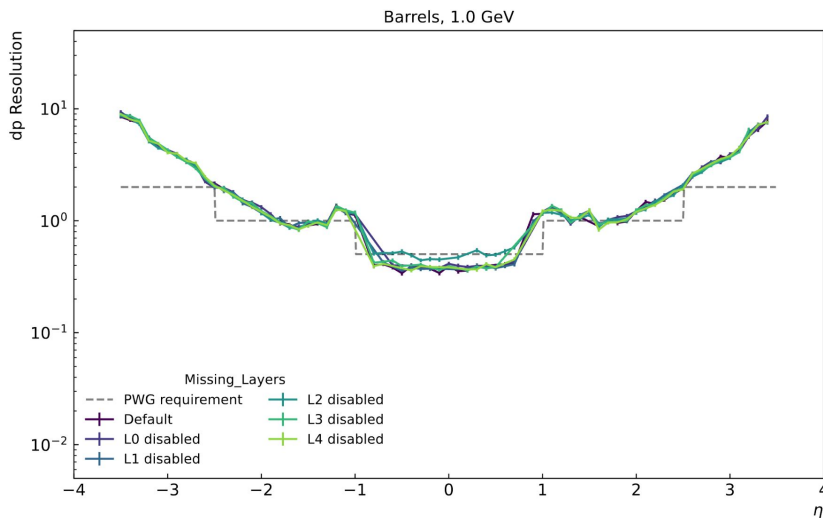
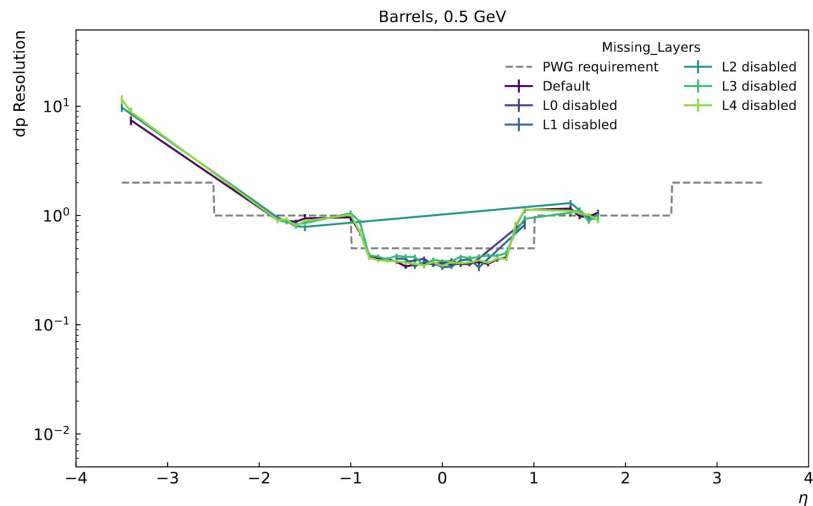


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Missing Layers - Silicon Detectors

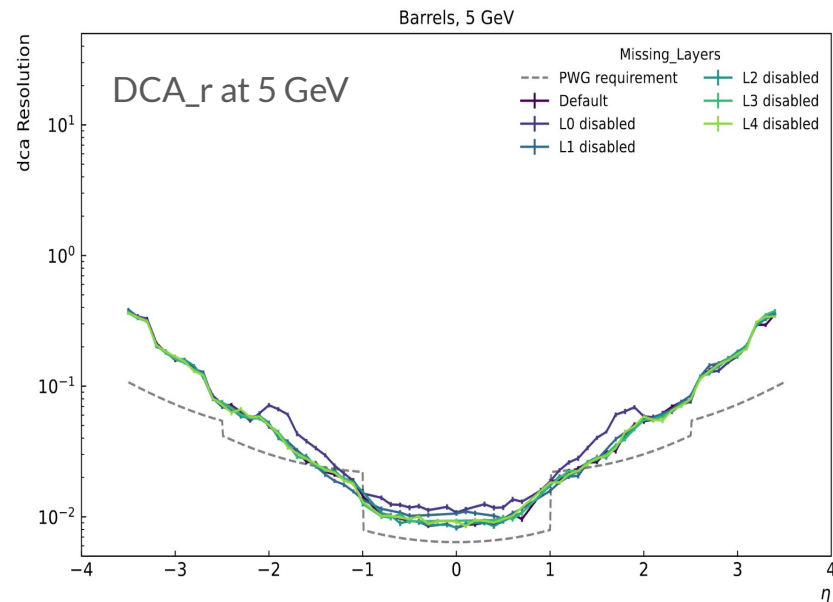
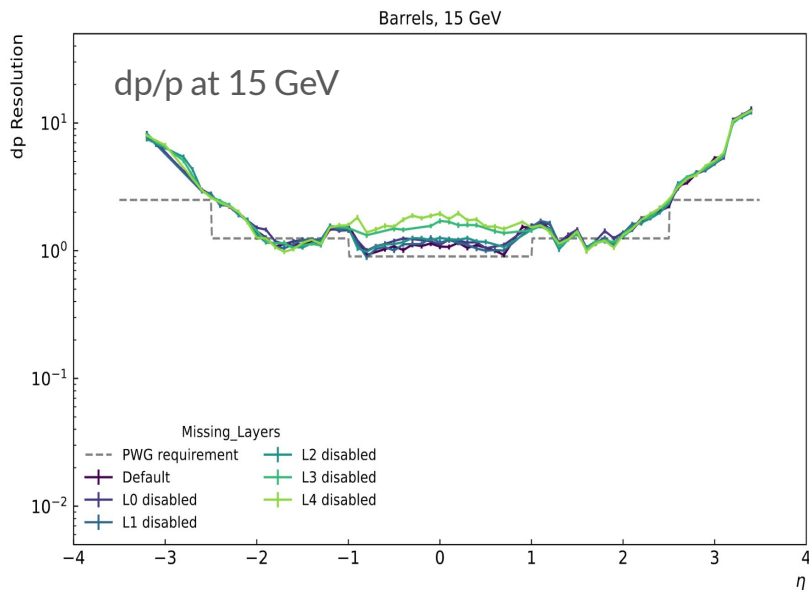
Silicon Barrels

eta Scan at fixed momentum



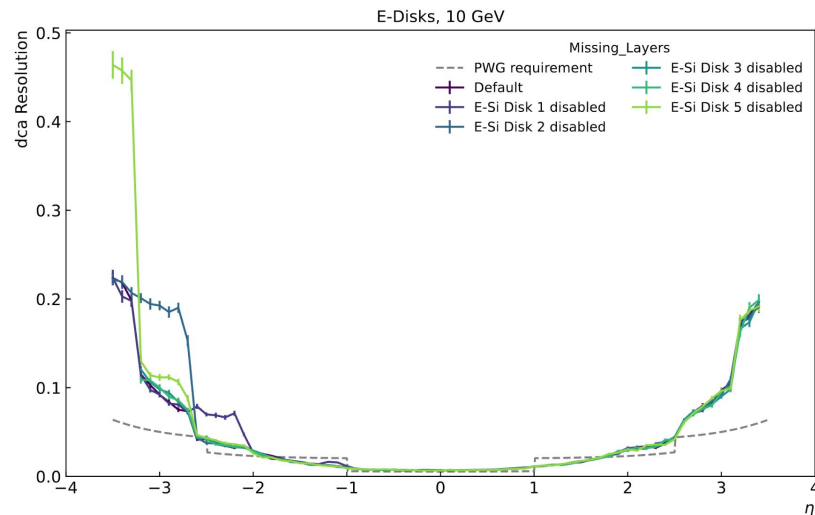
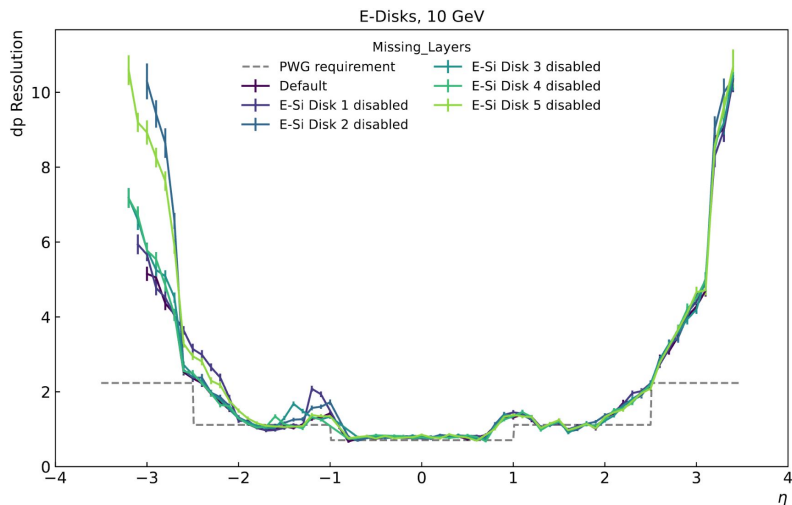
Silicon Barrels

eta Scan at fixed momentum



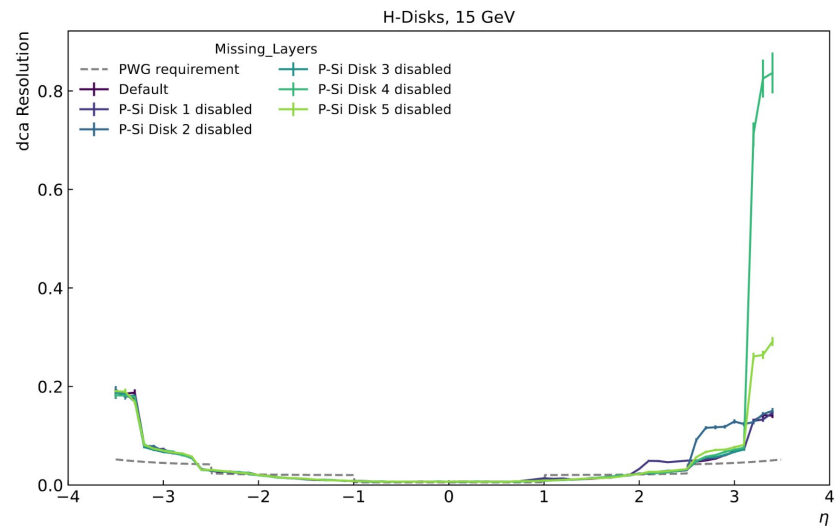
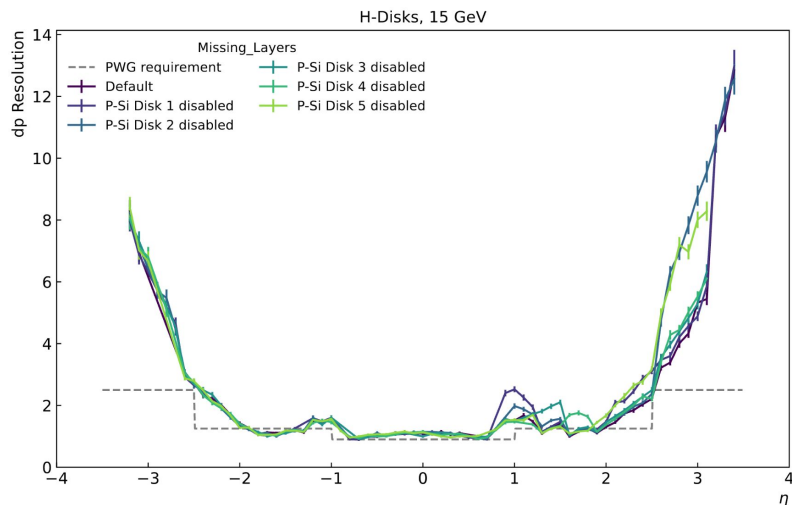
Silicon E-Disks

eta Scan at fixed momentum



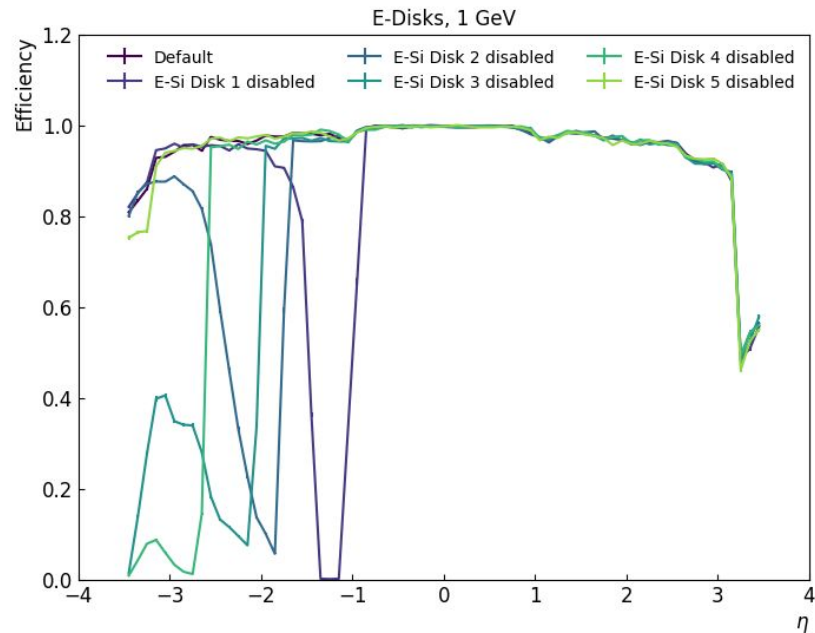
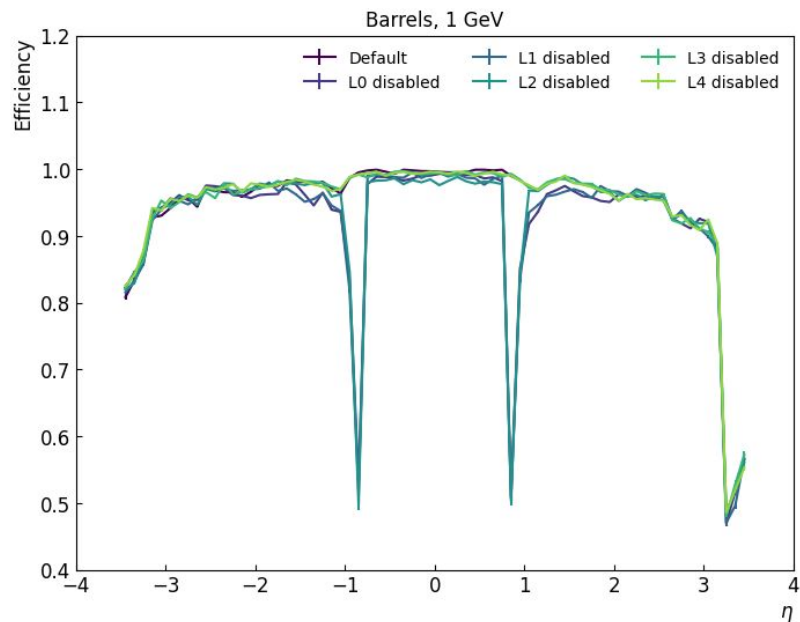
Silicon H-Disks

eta Scan at fixed momentum



Efficiency

Tracking layers closer to vertex have larger impact on efficiency





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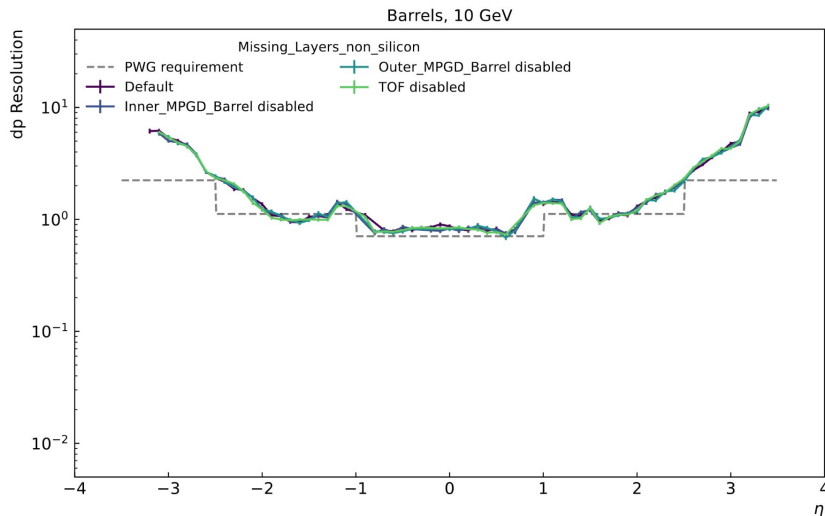
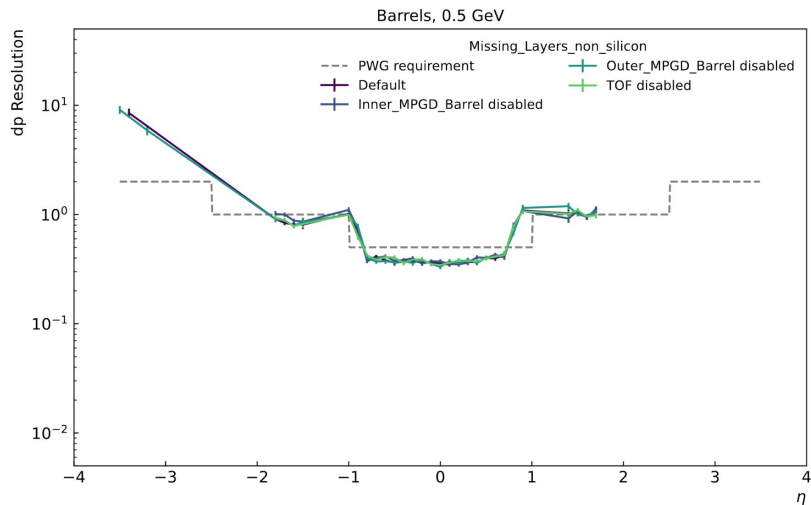


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Missing Layers - MPGD & TOF Detectors

MPGD Barrels + TOF (Barrels and H-endcap)

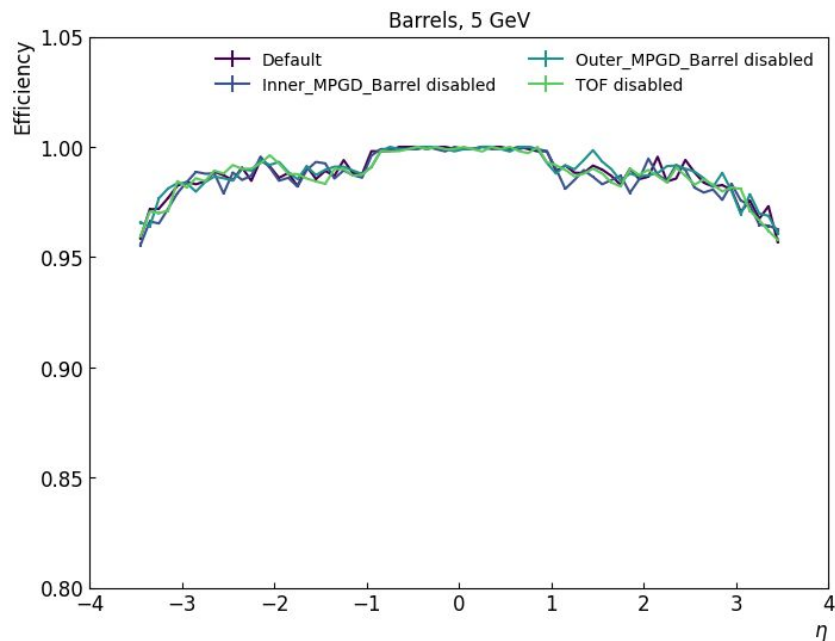
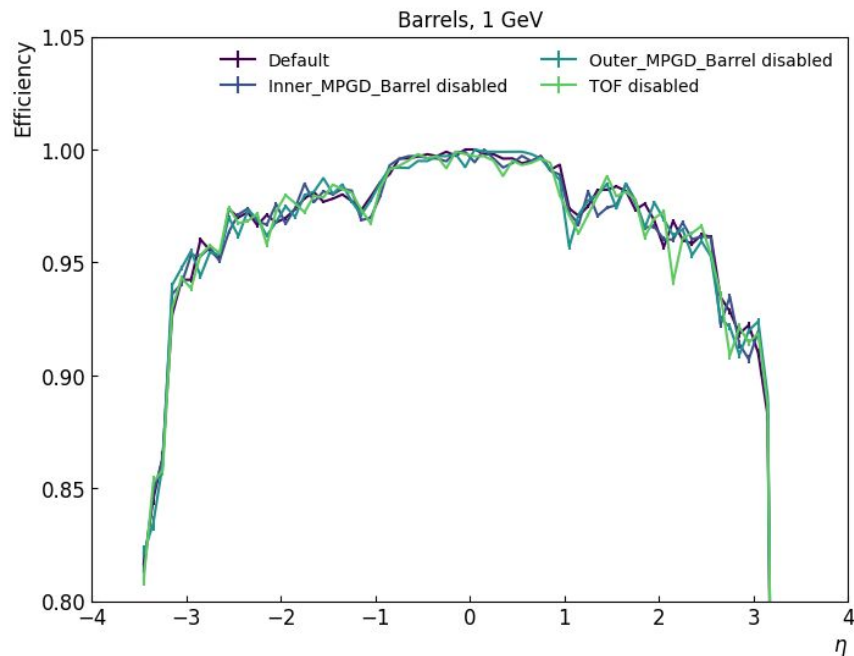
eta Scan at fixed momentum



MPGD Barrels + TOF (Barrels and H-endcap)

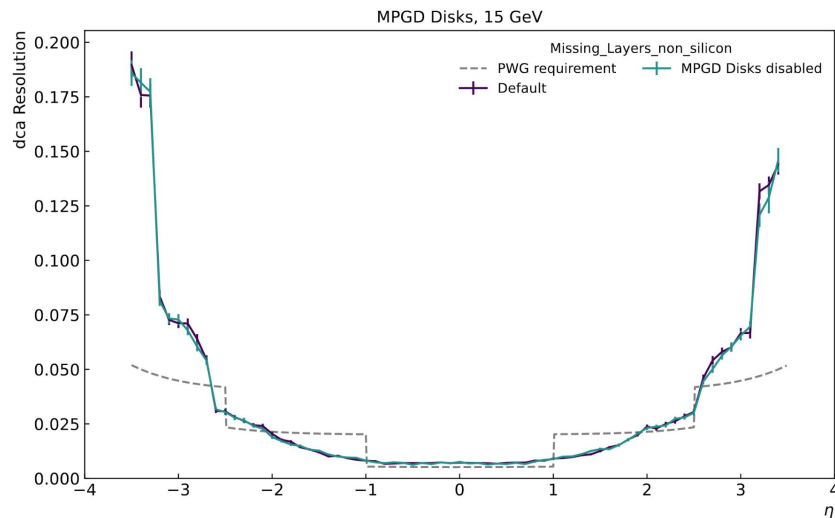
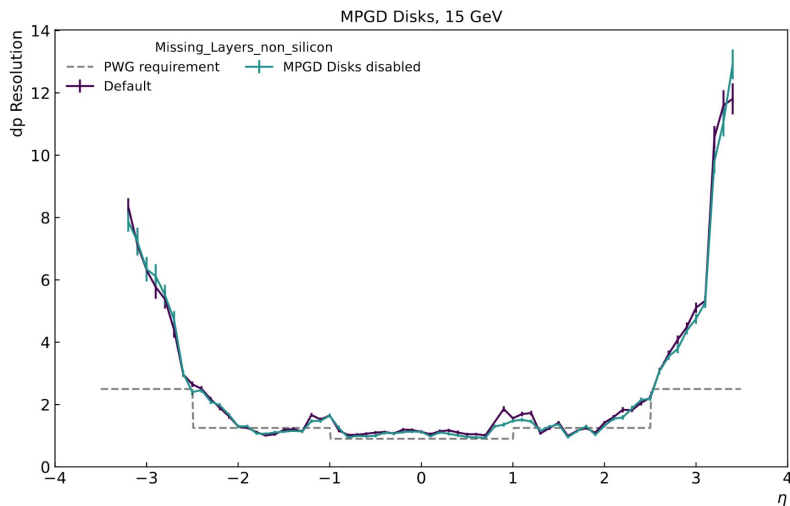
Efficiency

no noticeable difference everywhere



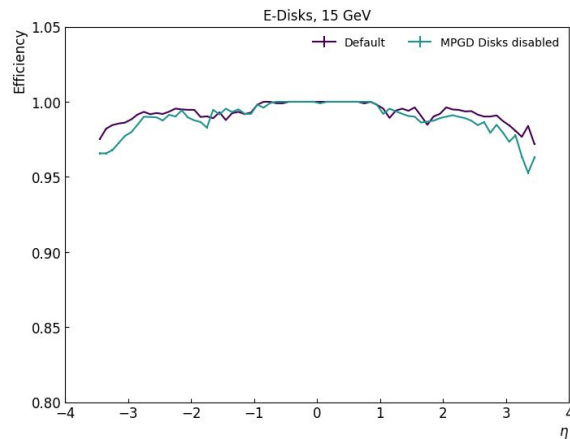
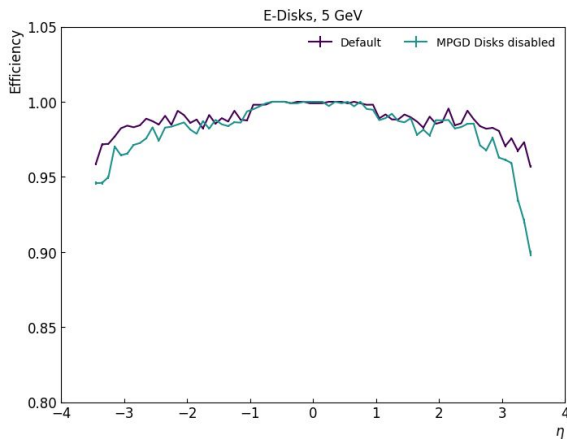
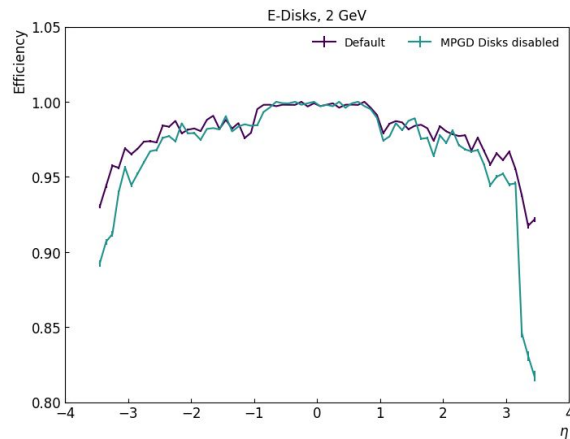
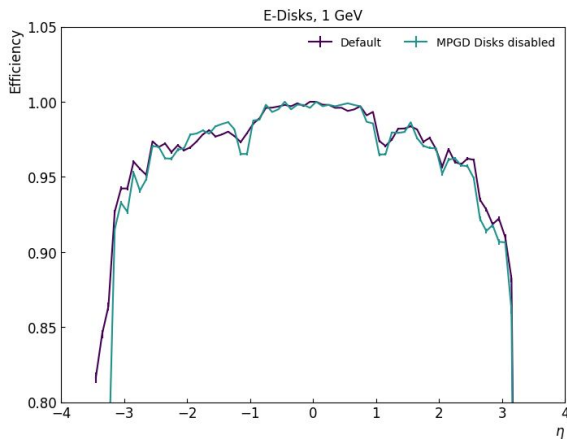
H-MPGD & E-MPGD Disks

eta Scan at fixed momentum



H-MPGD & E-MPGD Disks

Efficiency





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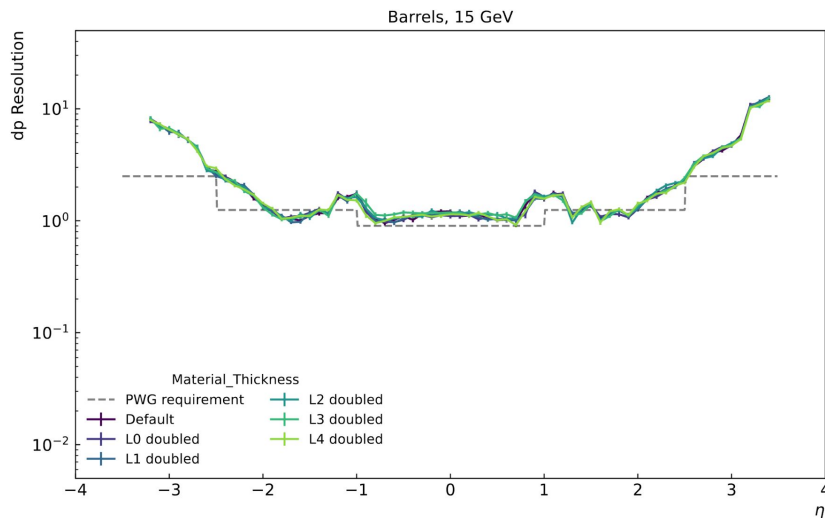
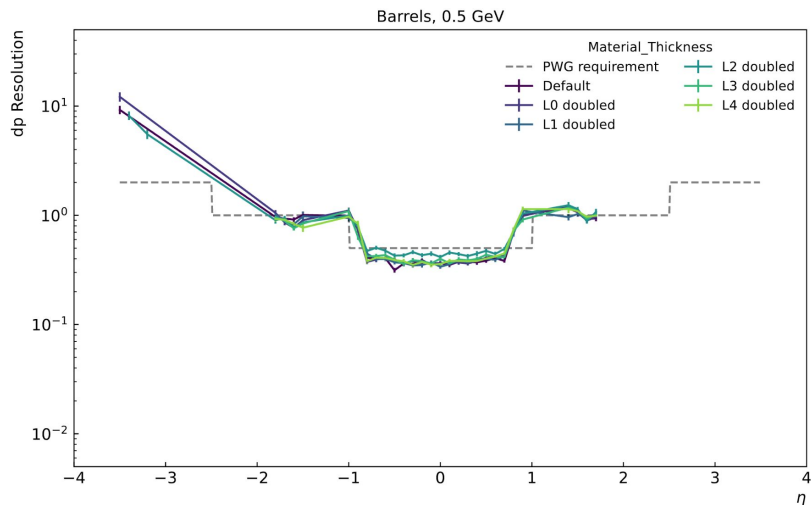


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Material Thickness Doubled

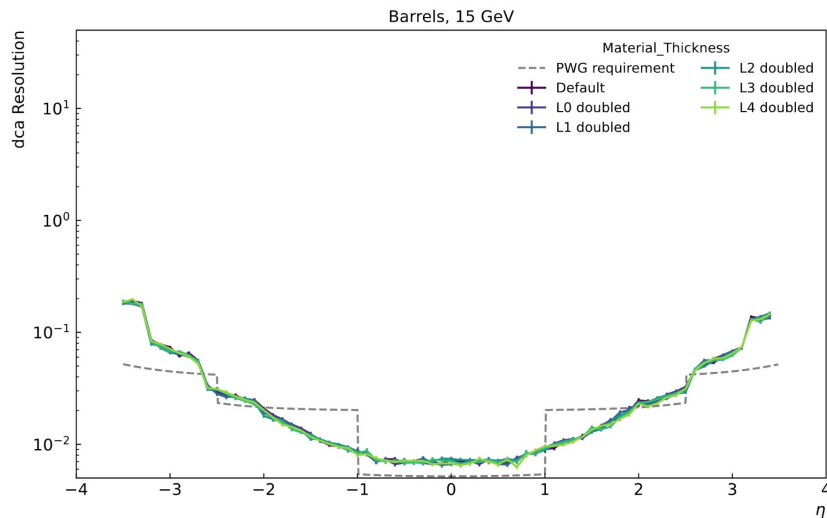
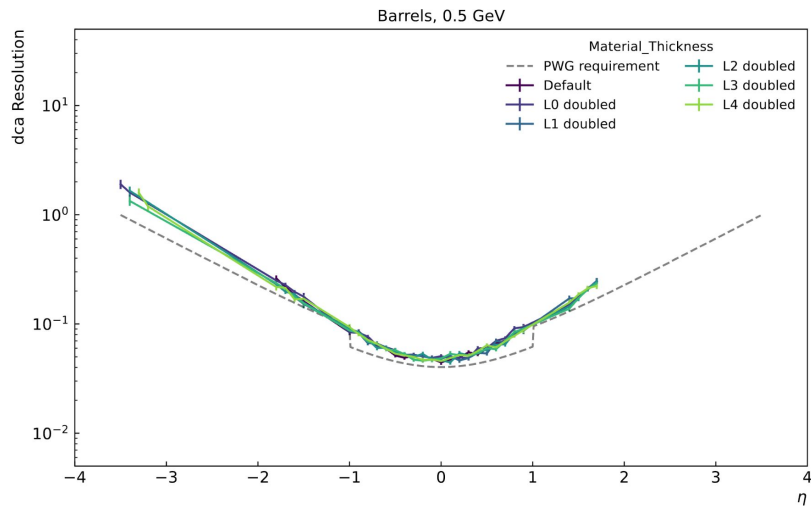
Silicon Barrels

eta Scan at fixed momentum - dp



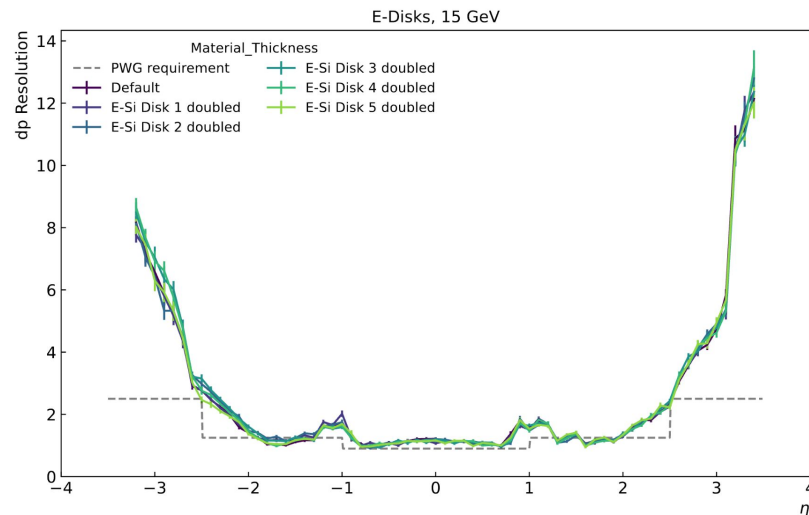
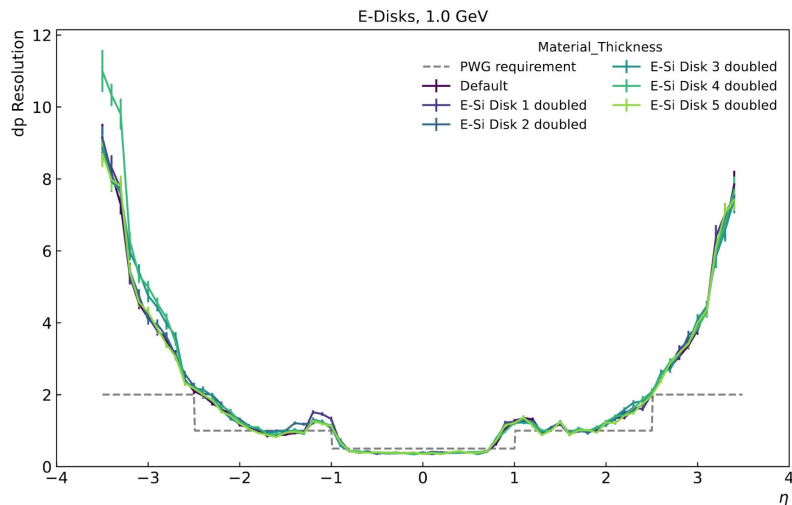
Silicon Barrels

eta Scan at fixed momentum - DCA



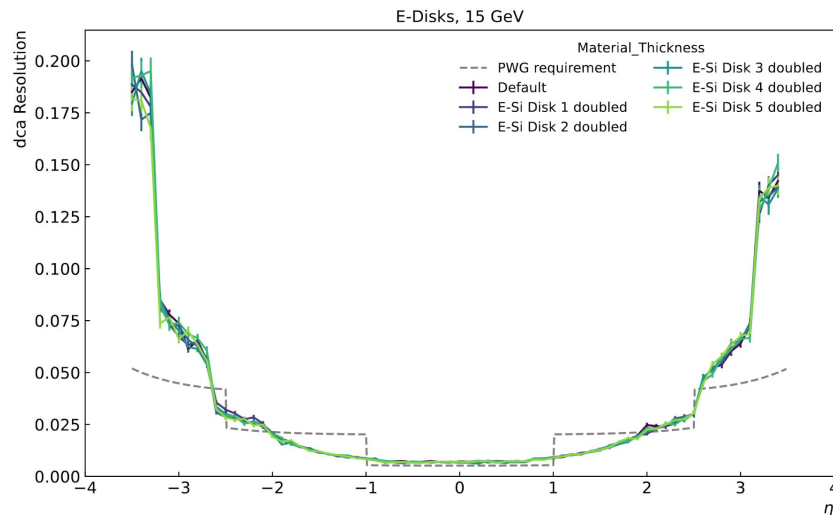
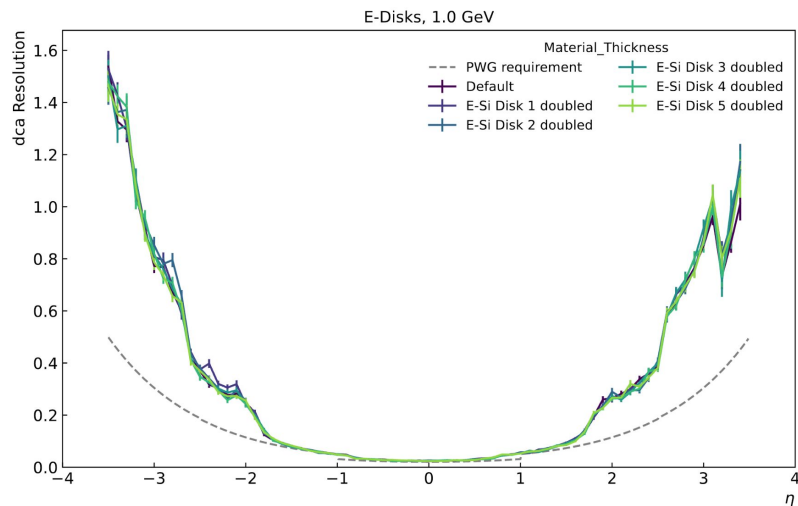
Silicon E-Disks

eta Scan at fixed momentum



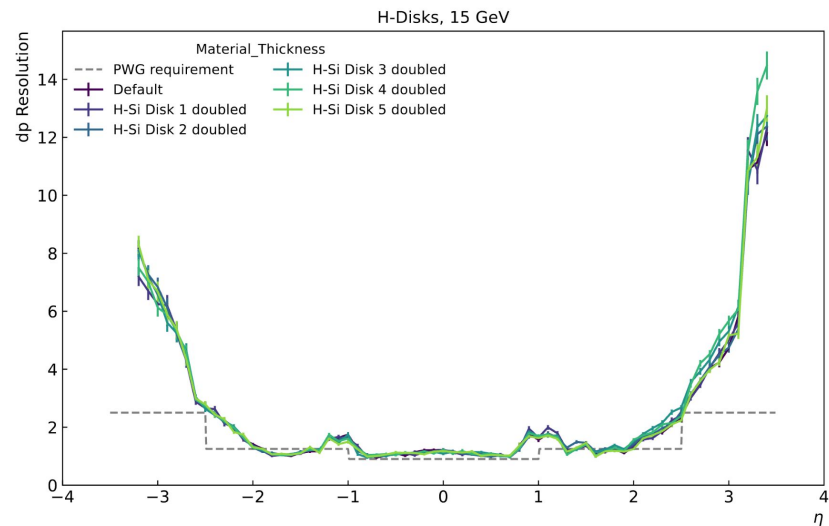
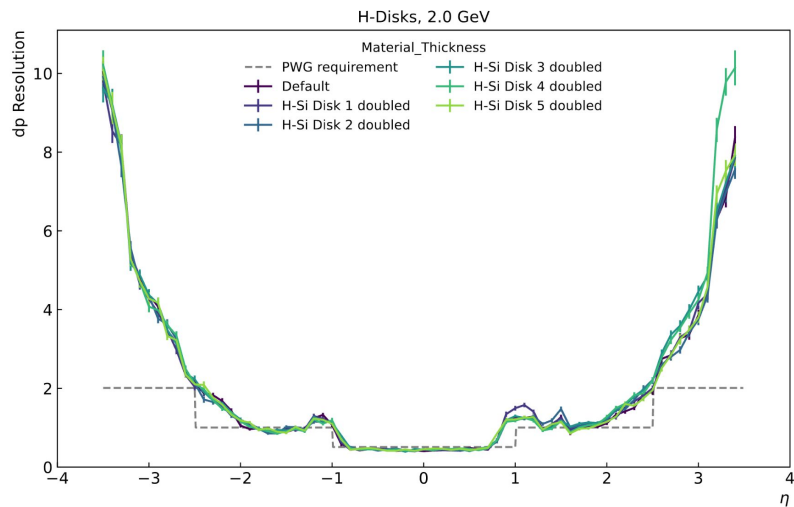
Silicon E-Disks

eta Scan at fixed momentum - DCA



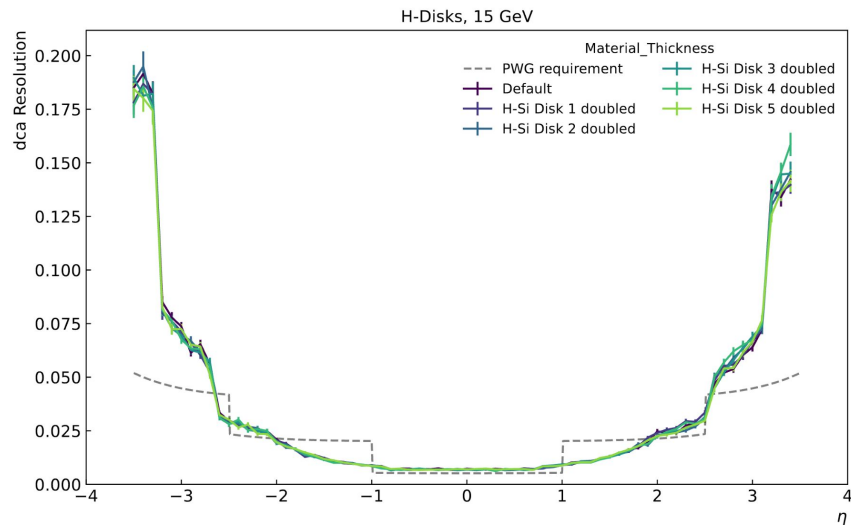
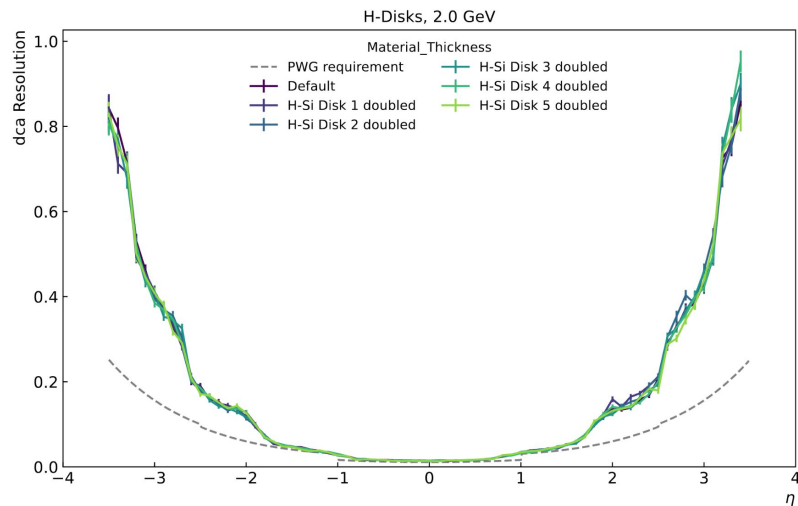
Silicon H-Disks

eta Scan at fixed momentum - dp



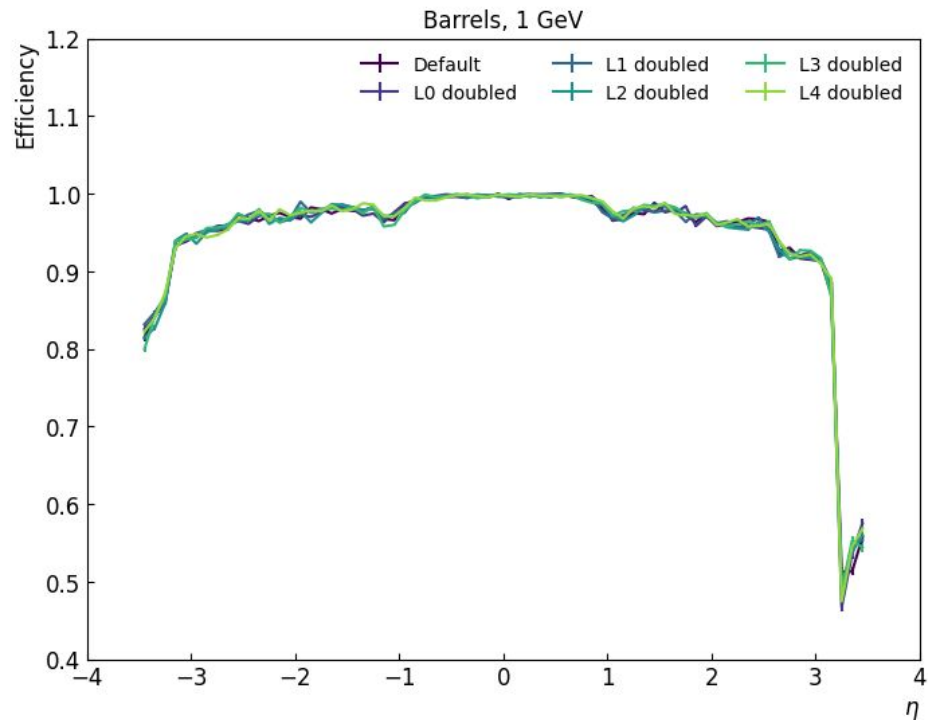
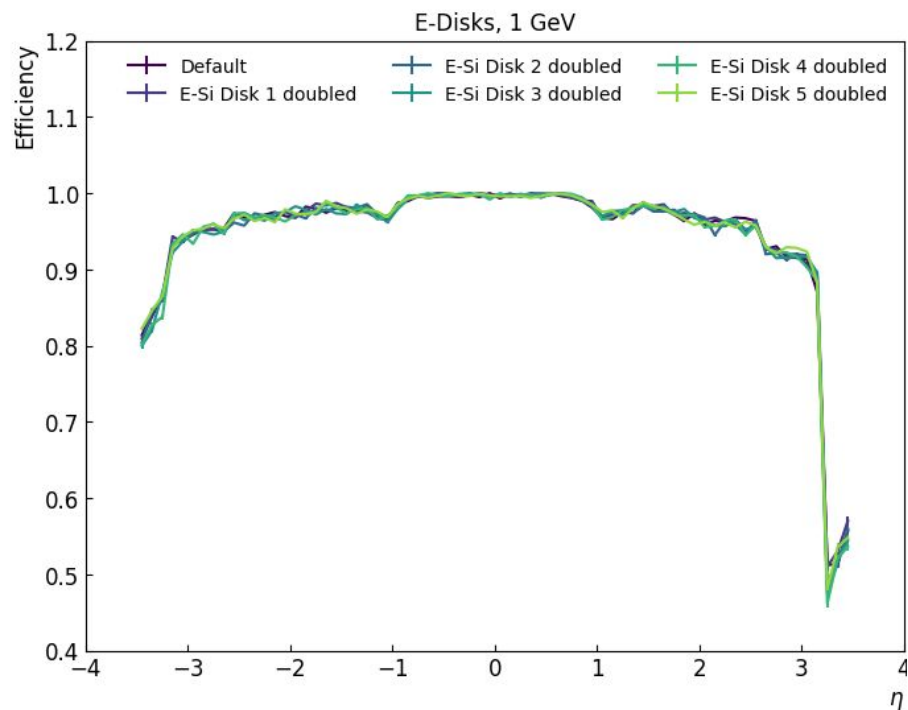
Silicon H-Disks

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 $\rightarrow$ -3.4
 - -3.4 $\rightarrow$ -3.3
 - -3.3 $\rightarrow$ -3.2
- Plots on right show example for -3.3 $\rightarrow$ -3.2 eta.

-3.30 < eta < -3.20 in eicrecon_eta_-3.5_to_-2.5_15GeV

