

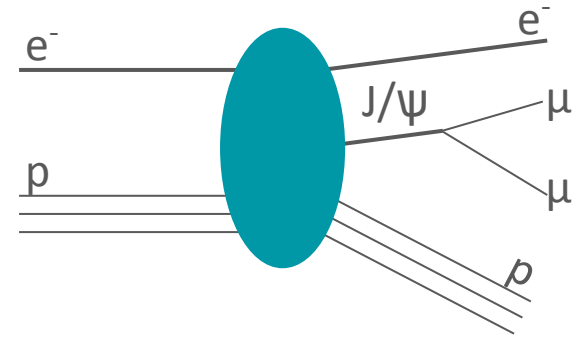


Identifying Muons at ePIC

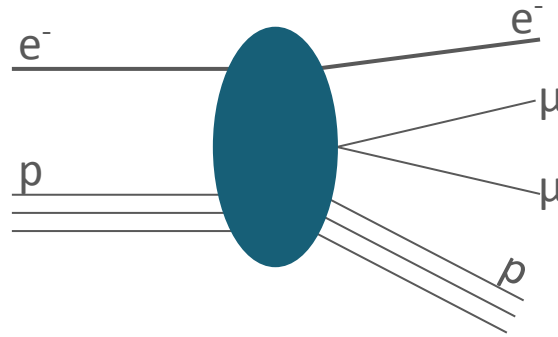
Tracking Workfest 16/09/26

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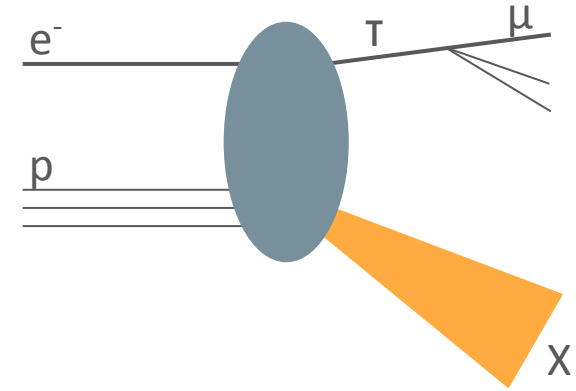
Motivation



DVMP



TCS



CLFV

And more

Challenges

- No dedicated muon detectors.
- Main source of contamination comes from pions.

μ

$$J = \frac{1}{2}$$

Mass $m = 0.1134289259 \pm 0.0000000025$ u

Mass $m = 105.6583755 \pm 0.0000023$ MeV

Mean life $\tau = (2.1969811 \pm 0.0000022) \times 10^{-6}$ s

$\pi^{\pm}$

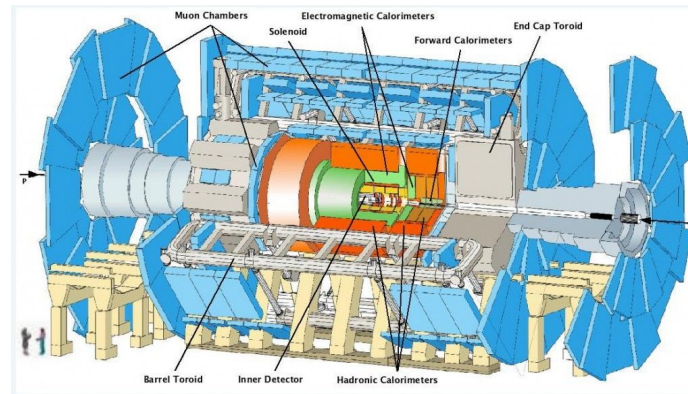
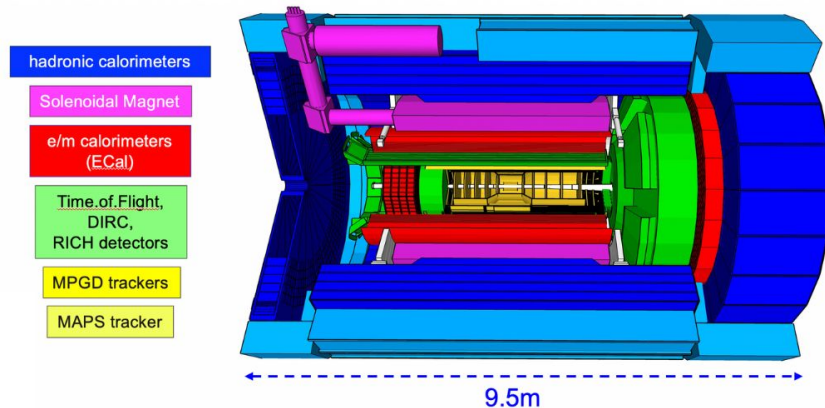
$$I^G(J^P) = 1^-(0^-)$$

Mass $m = 139.57039 \pm 0.00018$ MeV (S = 1.8)

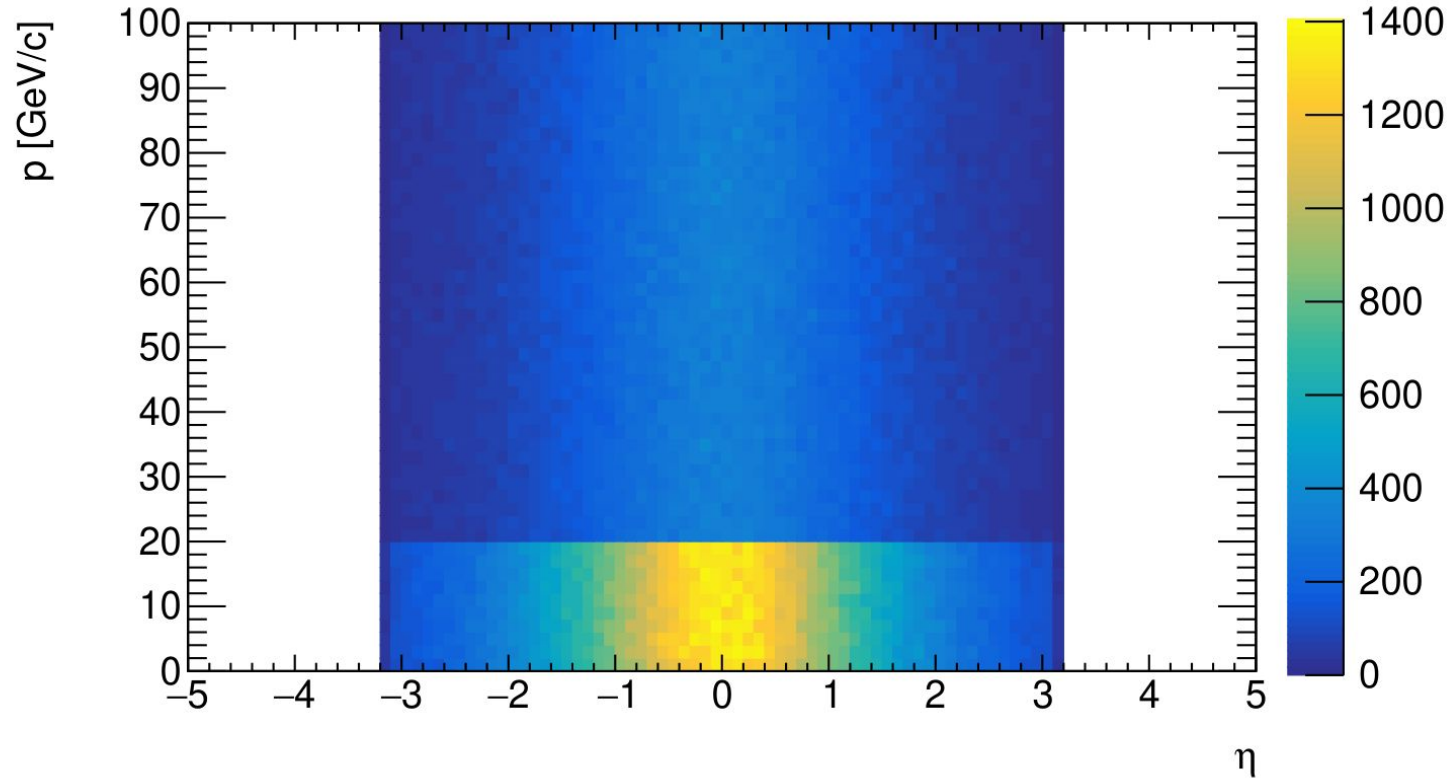
Mean life $\tau = (2.6033 \pm 0.0005) \times 10^{-8}$ s (S = 1.2)



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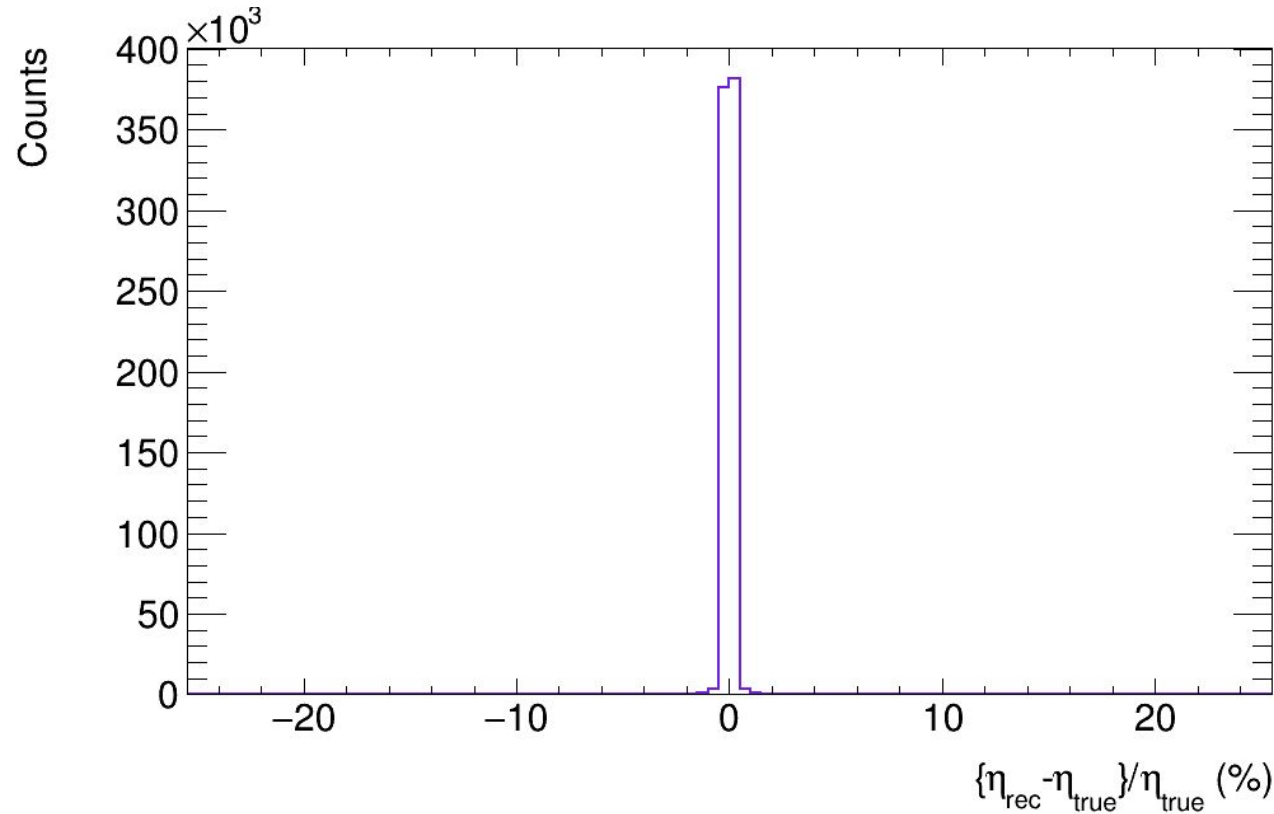
Muon/Pion Sample



Tracker Performance (μ)



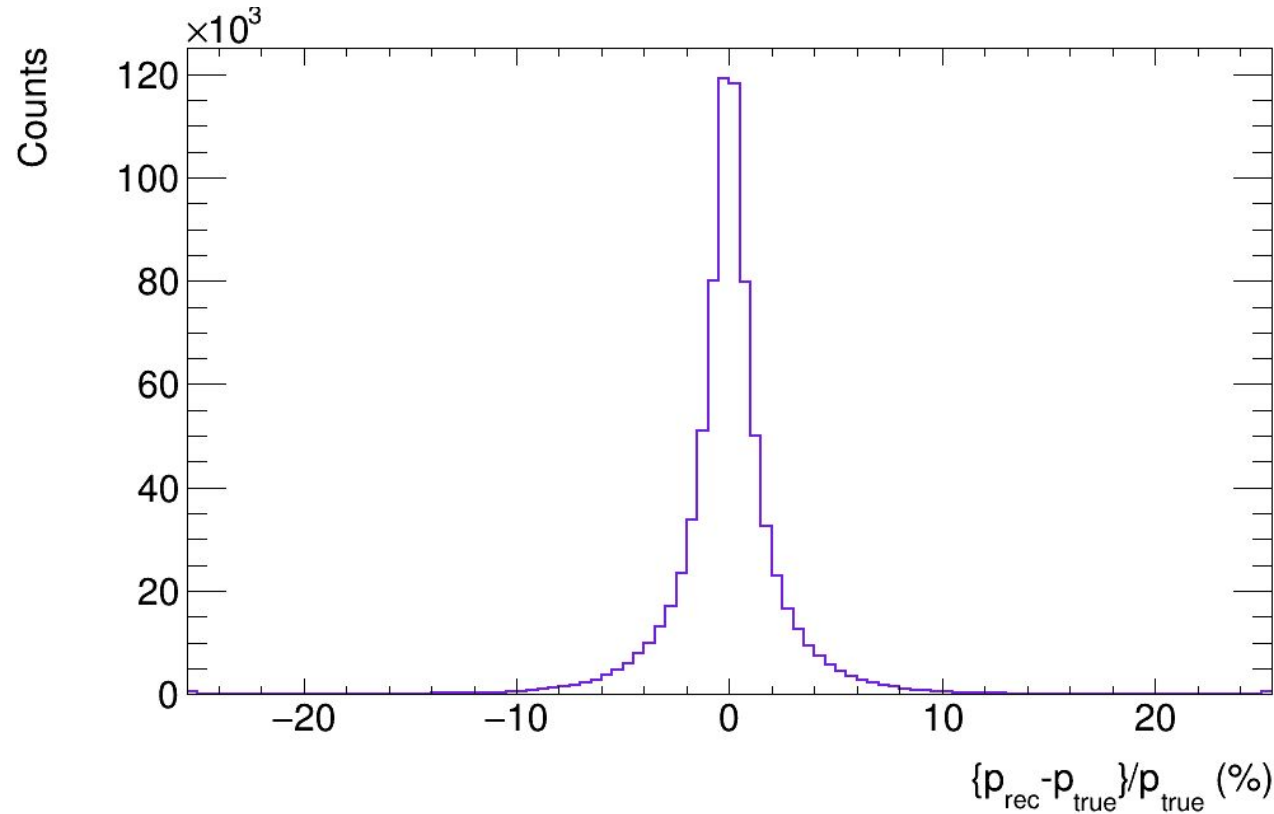
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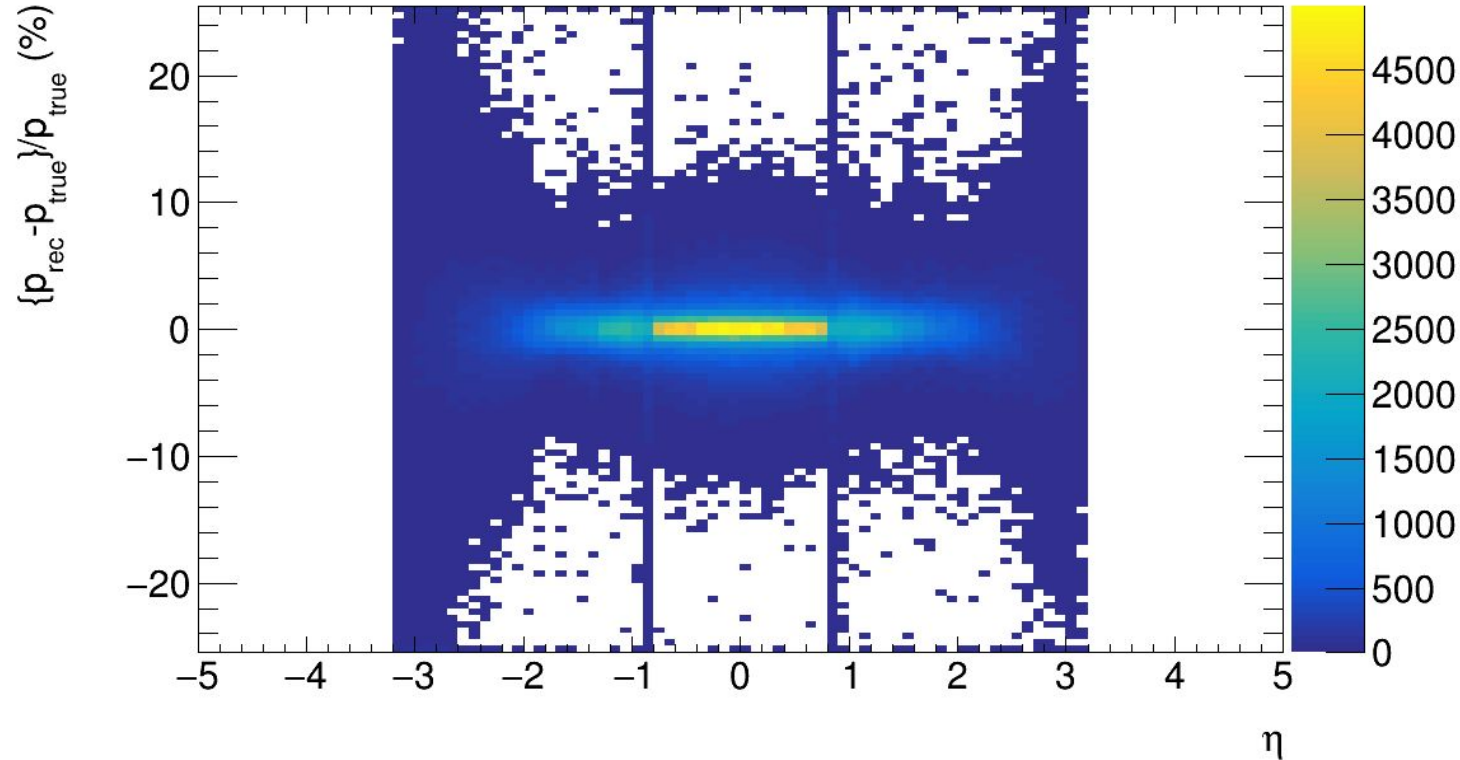
Tracker Performance (μ)



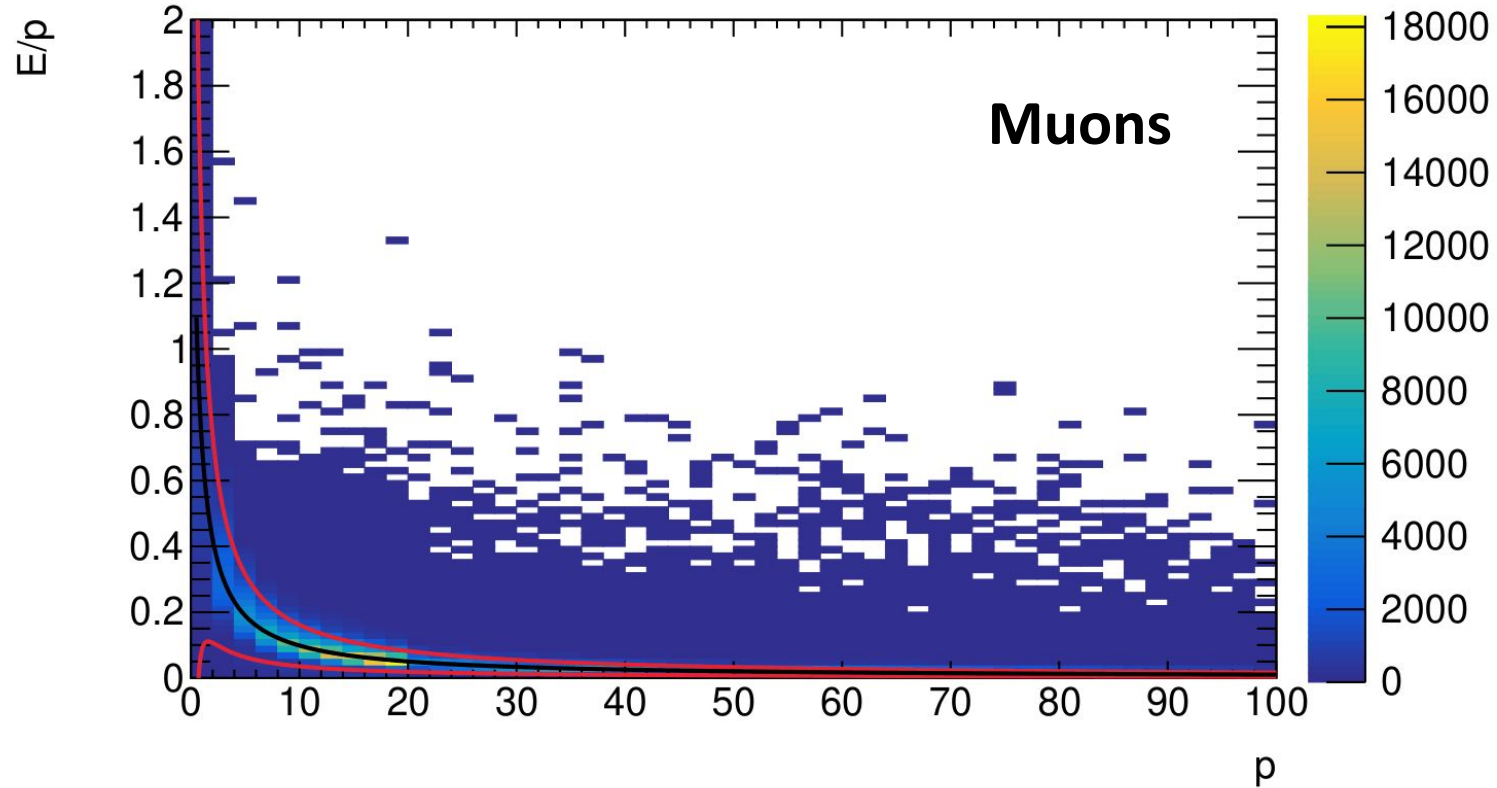
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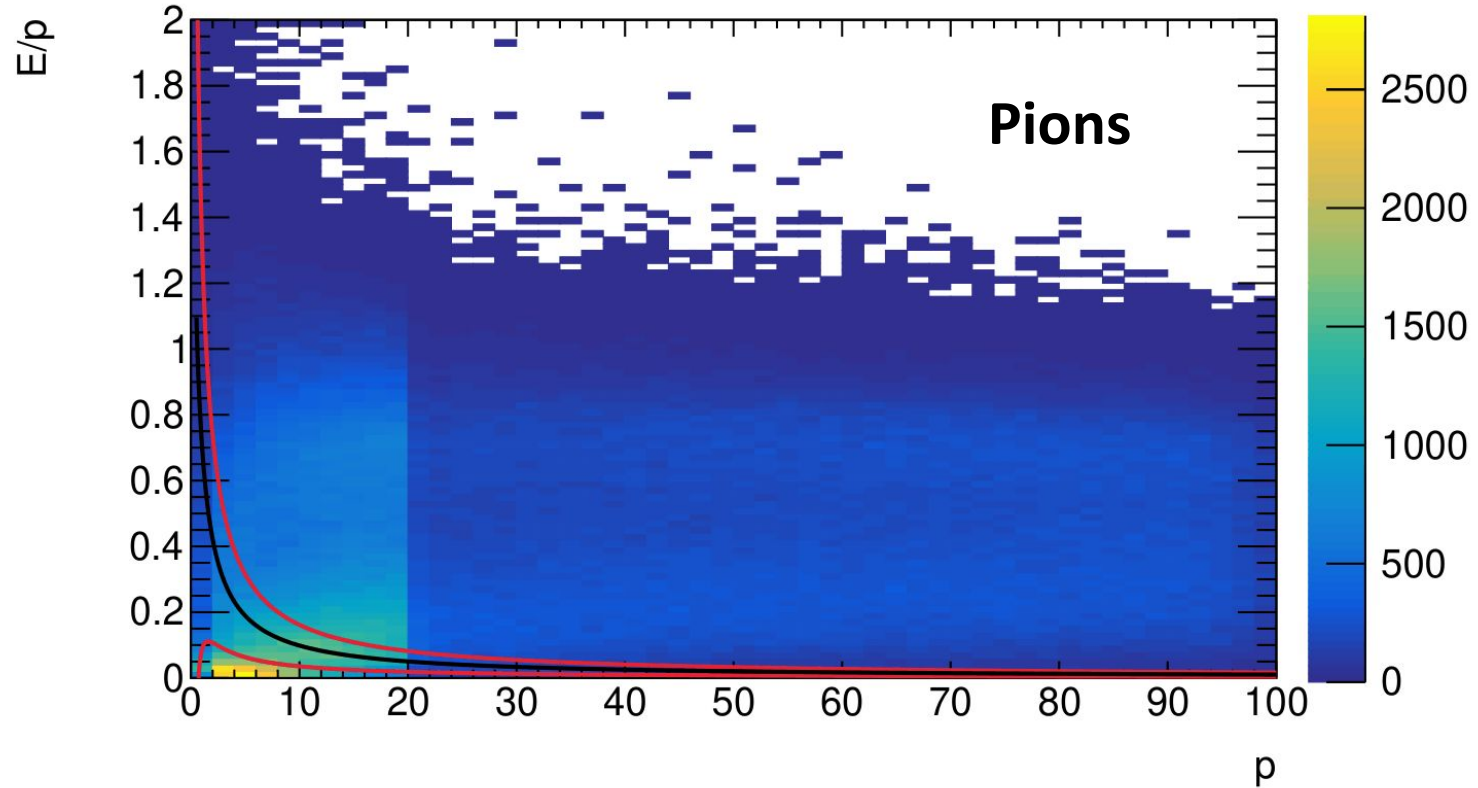
Tracker Performance (μ)



Initial Hcal E/p Cuts



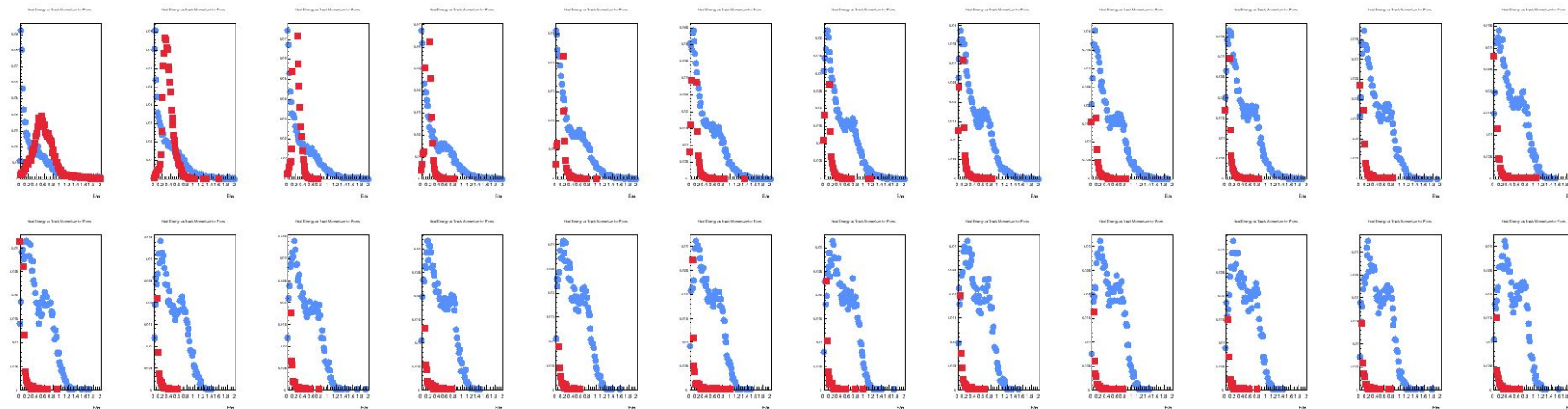
Initial Hcal E/p Cuts



Likelihood Approach



- Need to provide flexibility for analysers.
- Consider each calorimeter individually.
- Combine multiple variables associated with tracks.
 - E/p , number of hits, cluster radius, etc...



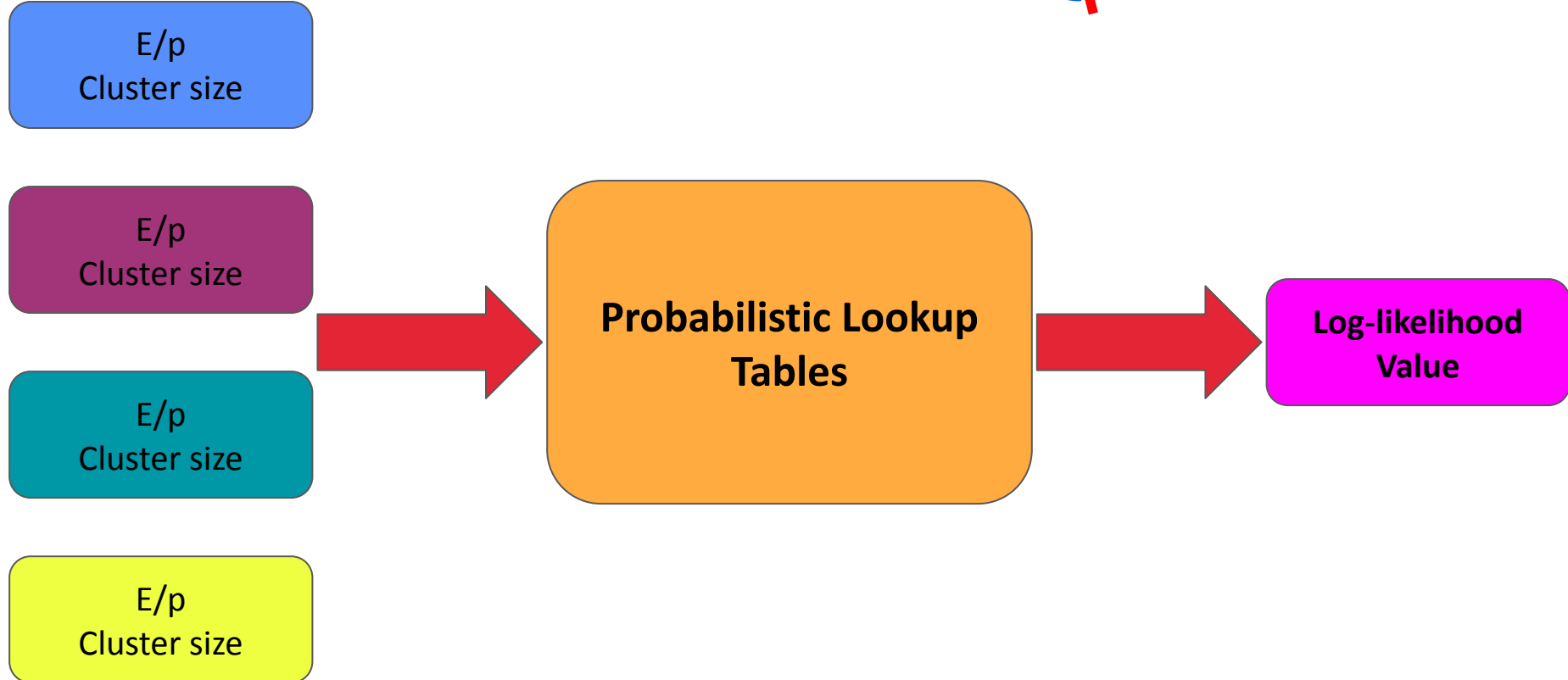
Red = Muons

Blue = Pions

Likelihood Approach



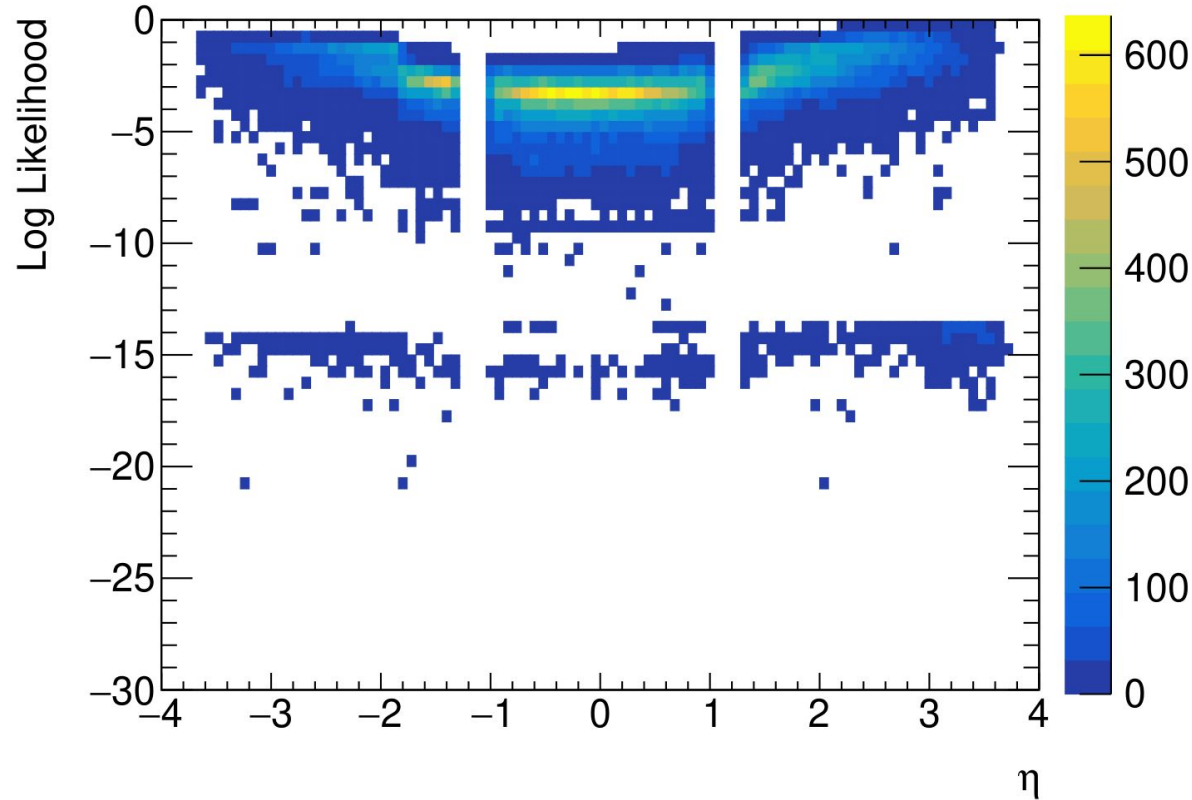
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J/ψ Log-likelihood



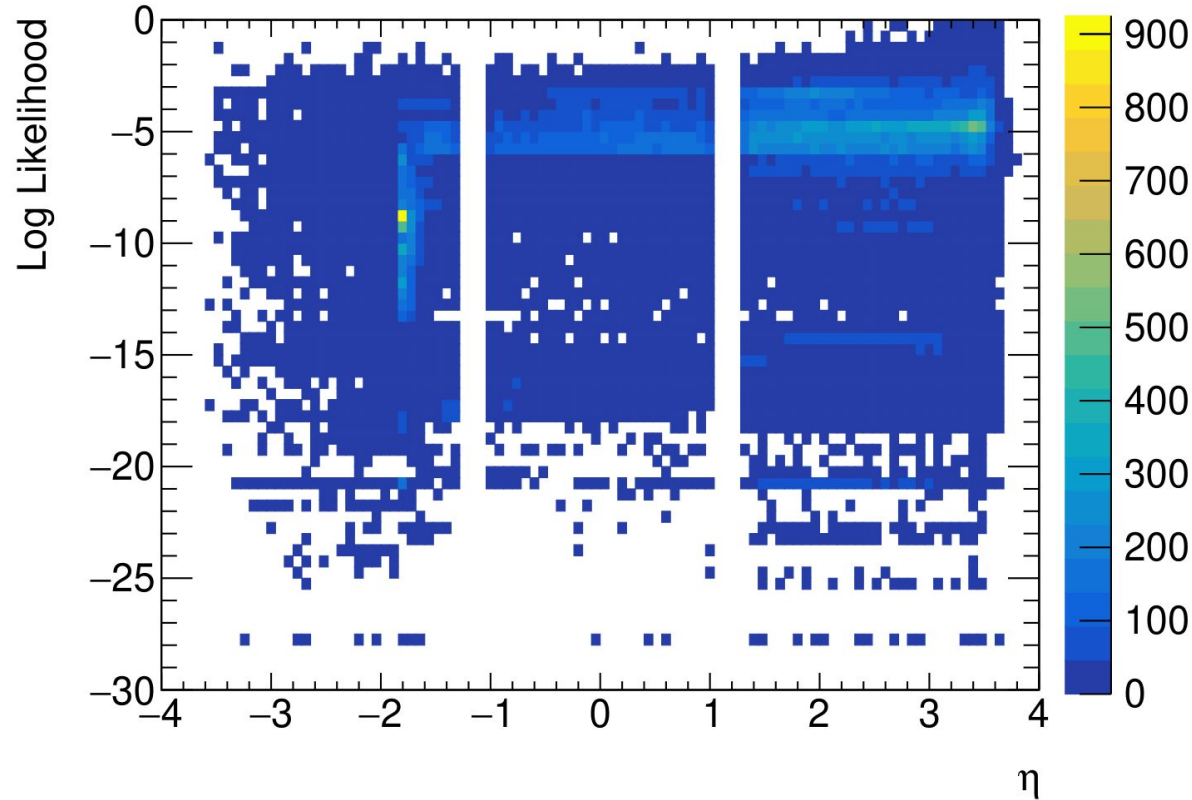
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DIS π Log-likelihood



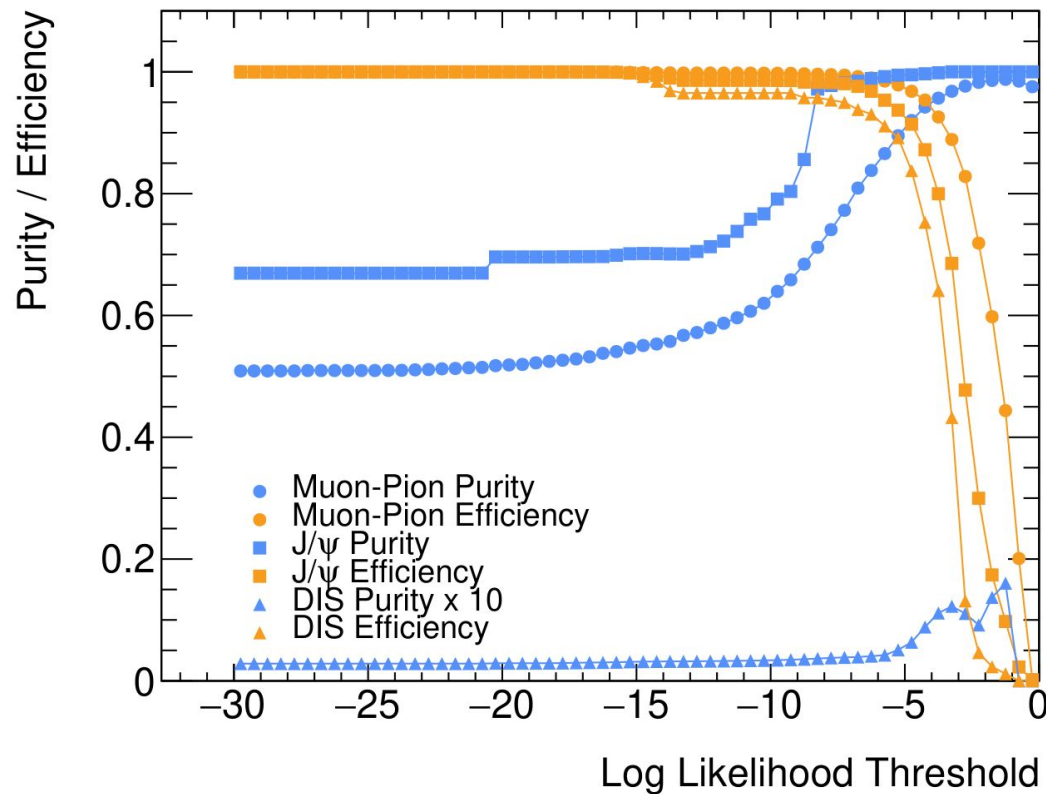
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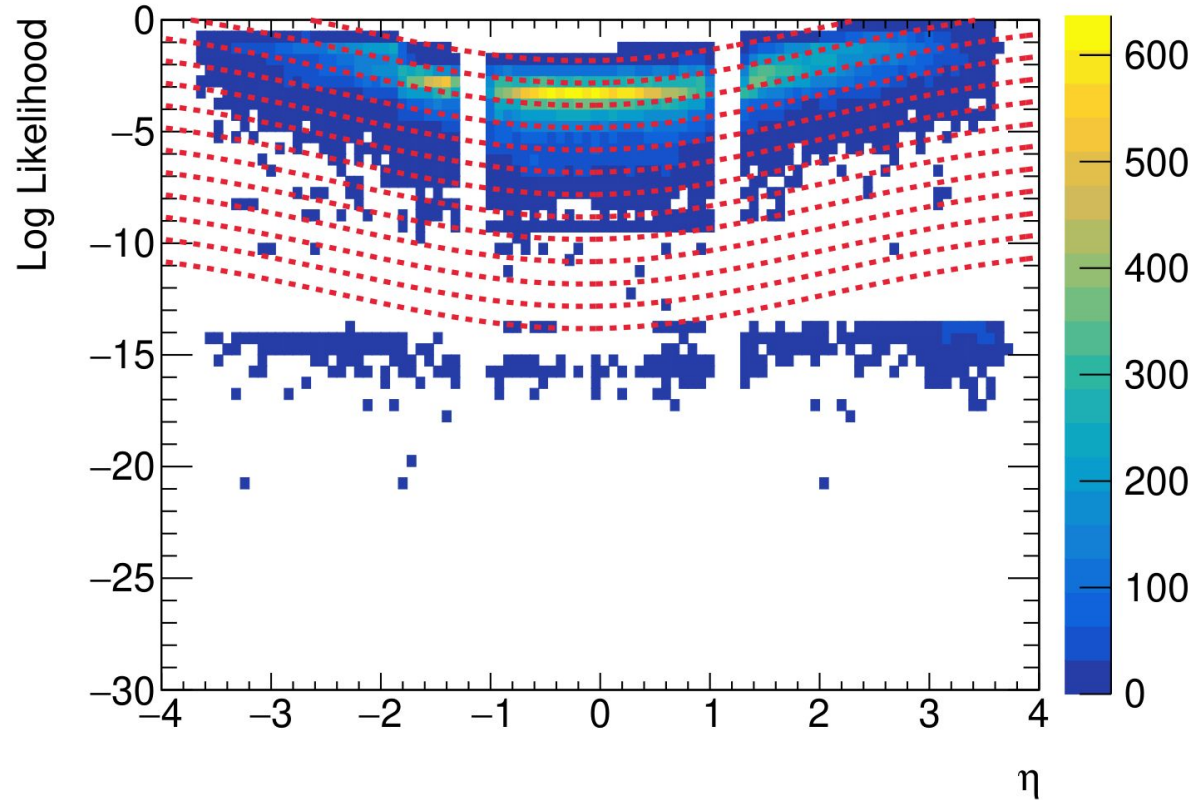
Efficiency and Purity



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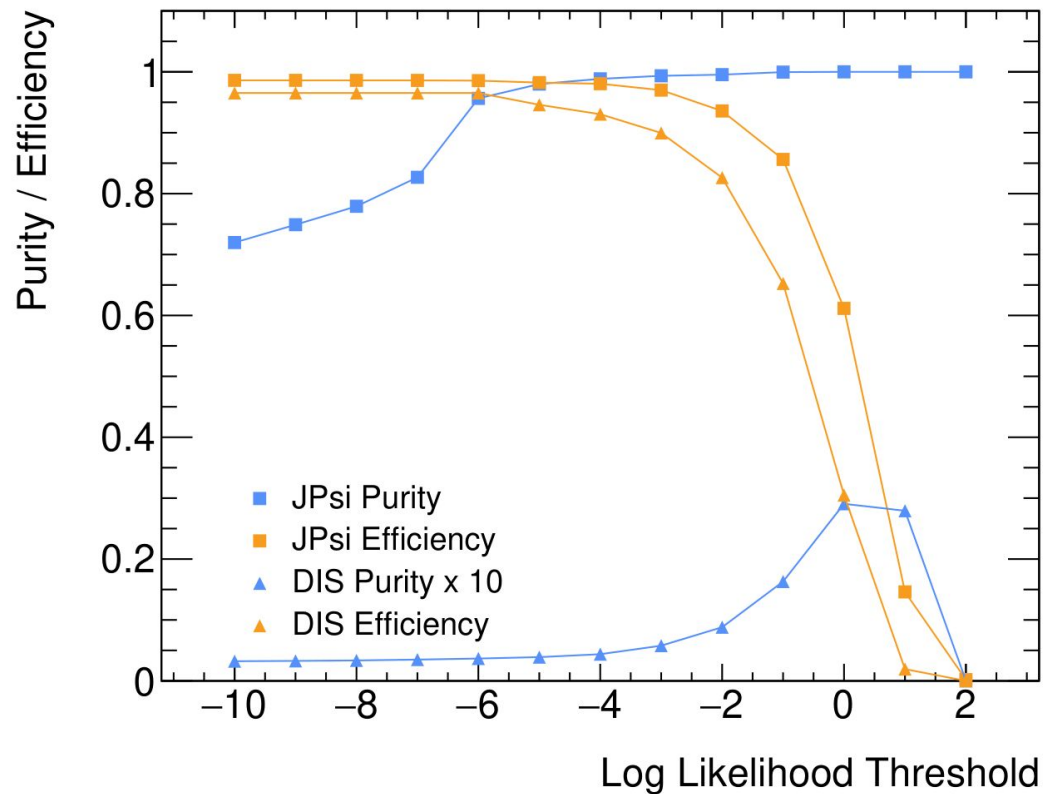
Pseudorapidity cuts?



Efficiency and Purity



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Conclusions



- ePIC can identify muons!
- Tracker performance for muons is very good.
- Additional channel based cuts can be used to improve purity.
 - DVJ/ ψ P can use invariant mass etc...
- Options to extend the cuts to consider more variables or use other techniques.
 - Cluster radius is not currently considered - shown to be powerful but costly.
 - Option to use machine learning such as boosted decision trees.
- Muon Task Force Meetings are every other Monday at 08:00 AM EDT.
 - Join the Mattermost <https://chat.epic-eic.org/main/channels/muonid-task-force>