Muon Kinematics Check for Muon Detector

Jihee Kim (jkim11@bnl.gov)

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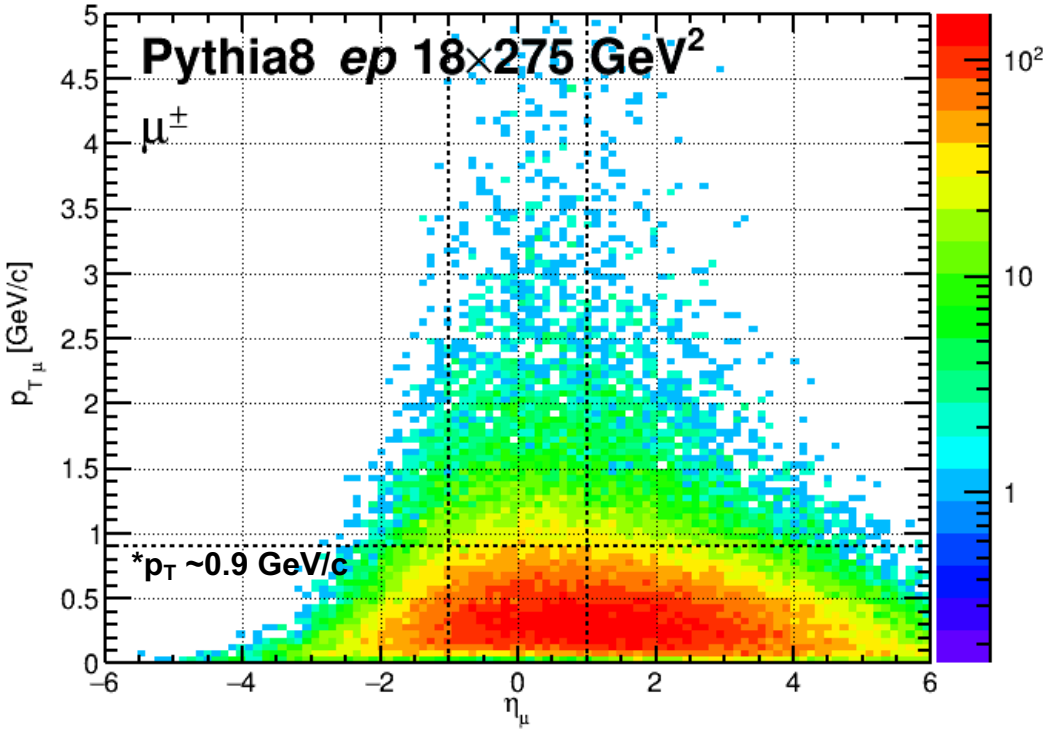
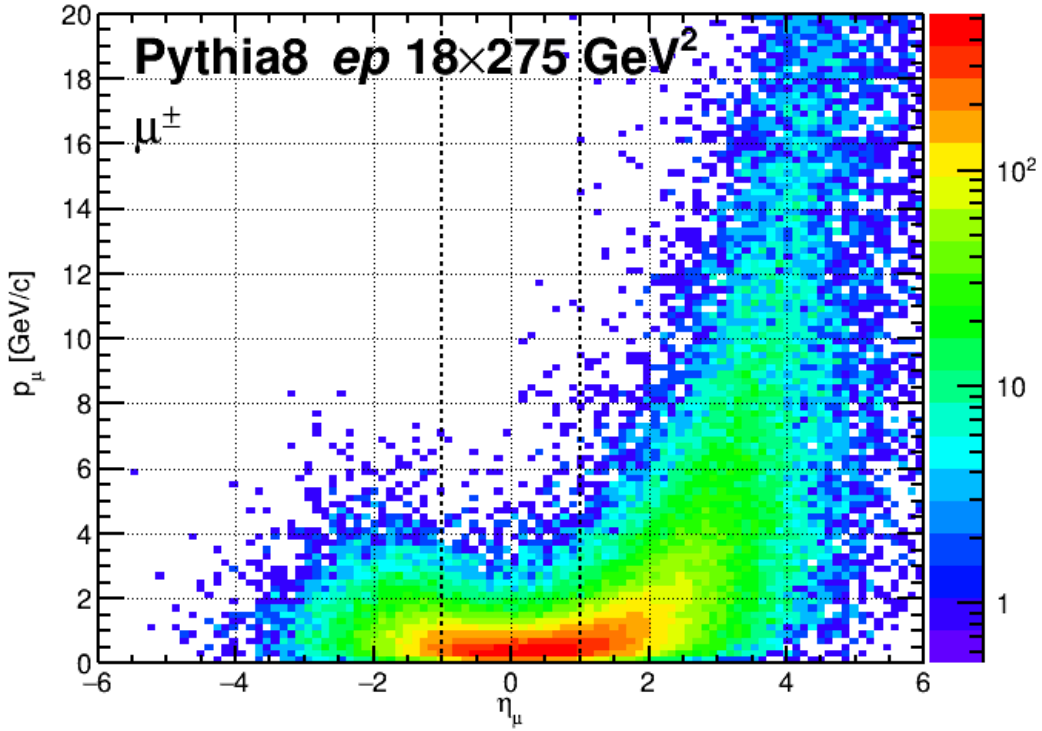
Sample and Goal

- **Pythia8 NC DIS ep 5×41, 10×100, and 18×275 GeV²**
  - **10M** events each beam configuration
  - Only **J/ψ and** $\Upsilon \rightarrow \mu^+\mu^-$ channel
  - $Q^2_{\min}$ **> 1 GeV²**

- **Muon kinematics**
  - **Question:** Worth having Muon ID in the forward region for 2nd Detector?
  - $\mathbf{p_T}$ and **p** in different regions of **pseudo-rapidity**
  - **Decay channels** to muons

Kinematics – 18×275 GeV²

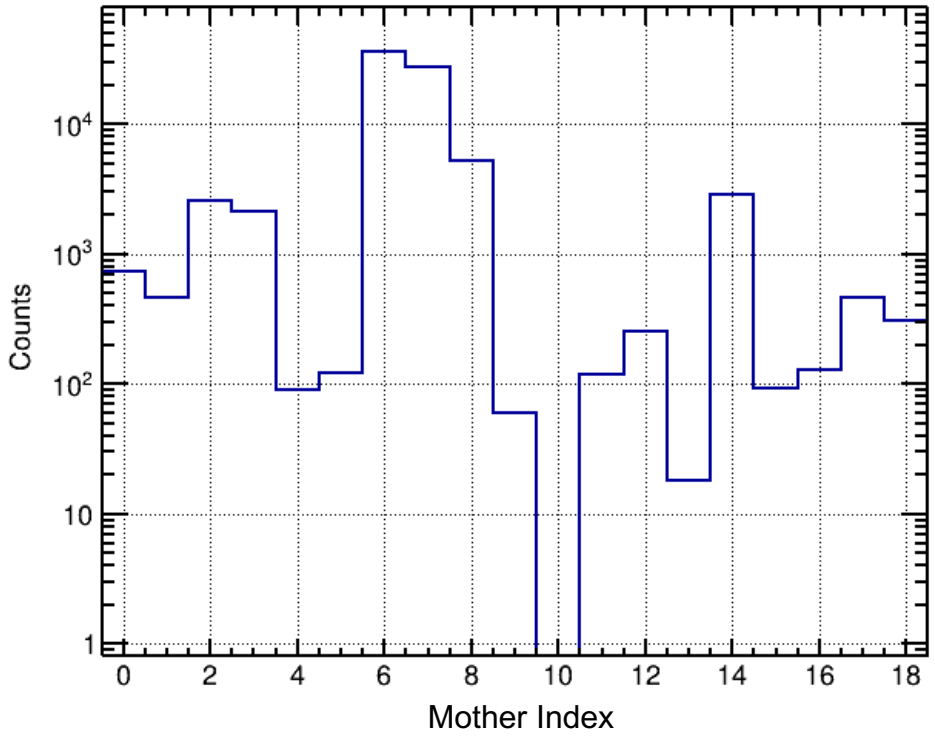




There are muons going beyond mid-rapidity ($|\eta| > 1$)
Muon PID might be important in the forward/backward region

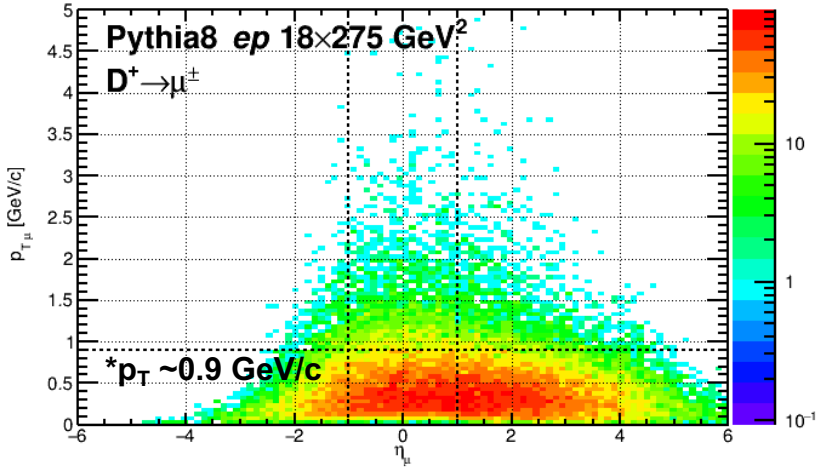
*evaluated based on 1.7 T and R_{max} of solenoid of ePIC

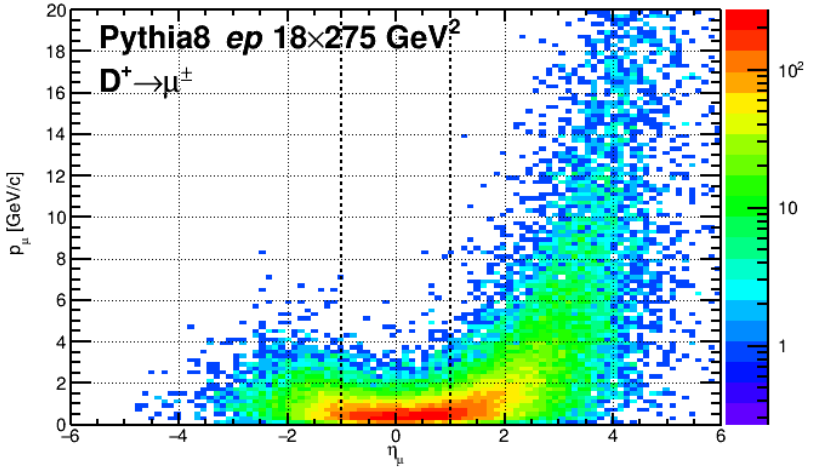
Kinematics – 18×275 GeV²

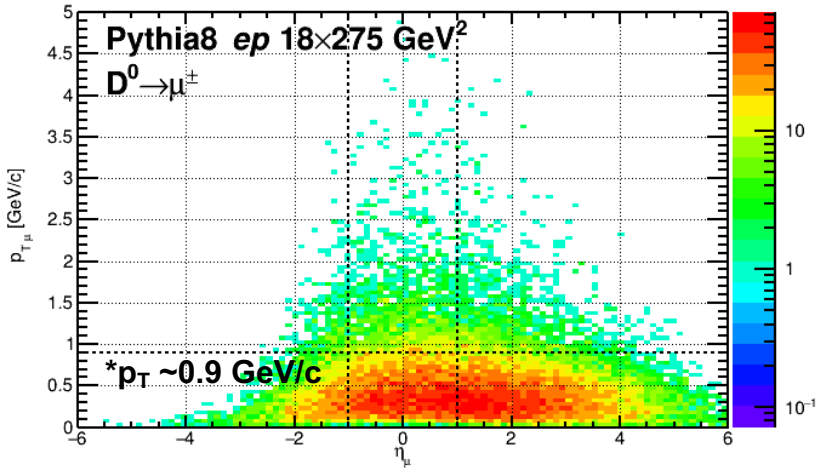


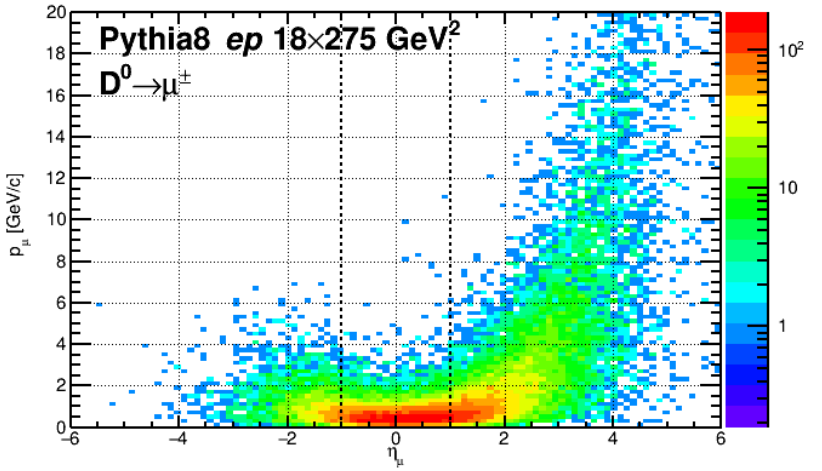
[0]	τ	[10]	Υ
[1]	ρ^0	[11]	Σ^-
[2]	η	[12]	Λ
[3]	ω	[13]	Ξ^-
[4]	η'	[14]	Λ_c^+
[5]	ϕ	[15]	Ξ_c^0
[6]	$\boldsymbol{D^+}$	[16]	Ξ_c^+
[7]	$\boldsymbol{D^0}$	[17]	$\mu^\pm$
[8]	D_s^+	[18]	the rest (ex. B^+, B^0, …)
[9]	J/ψ		

Kinematics – 18×275 GeV²









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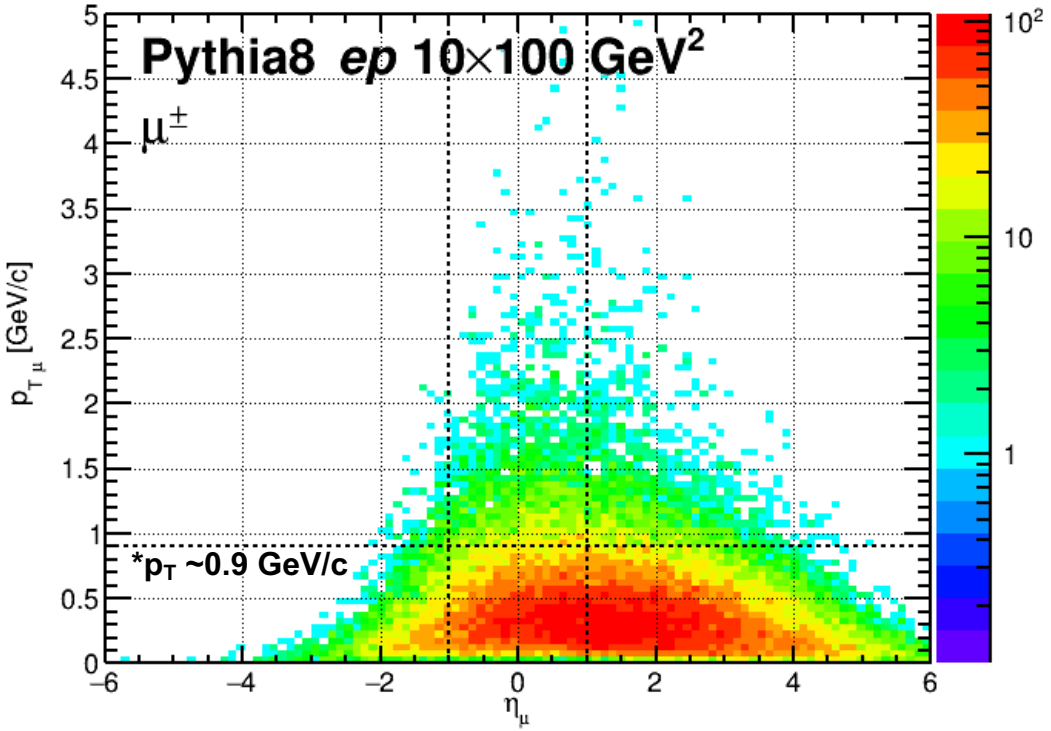
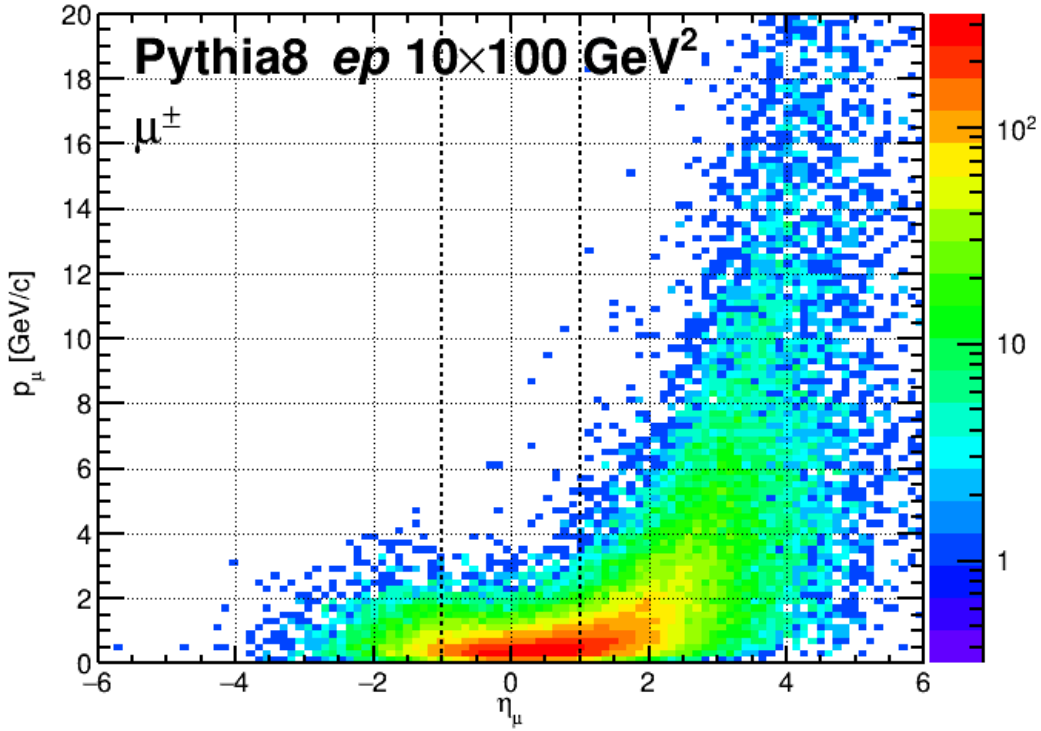
Kinematics – 10×100 GeV²





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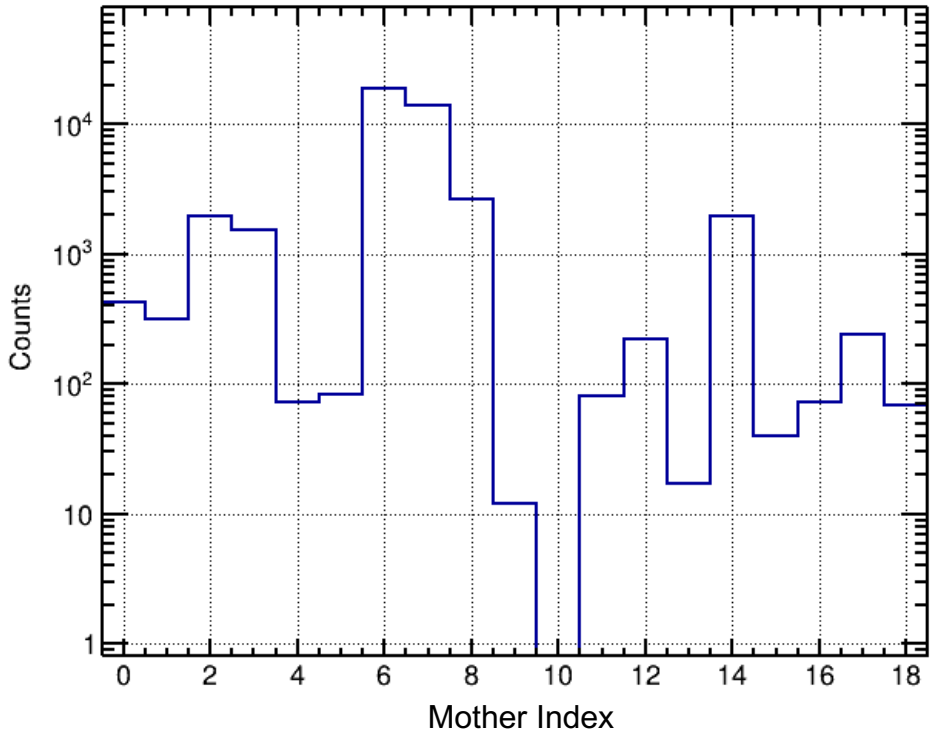
Kinematics – 10×100 GeV²



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[1]	ρ^0	[11]	Σ^-
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[8]	D_s^+	[18]	the rest (ex. B^+, B^0, …)
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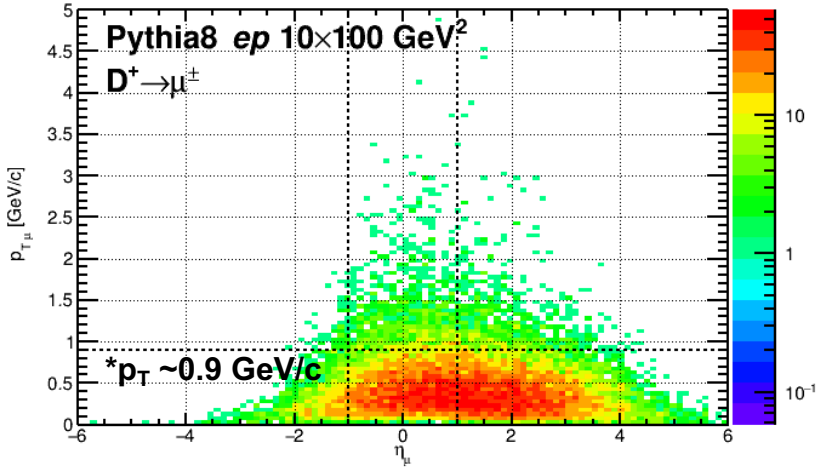
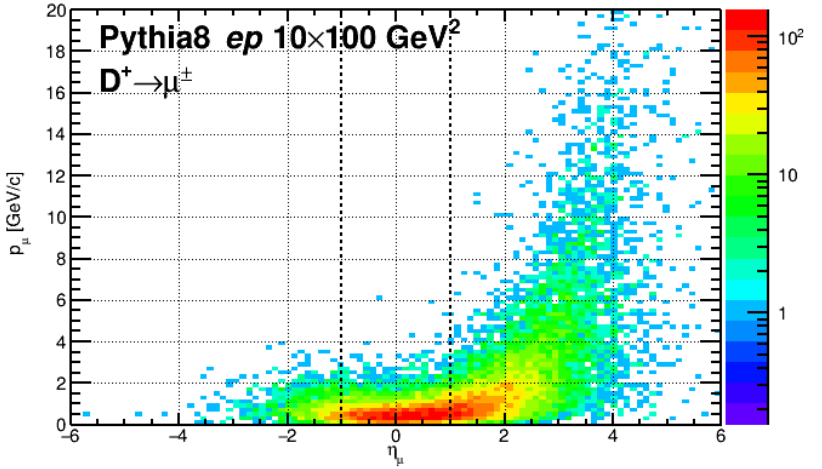
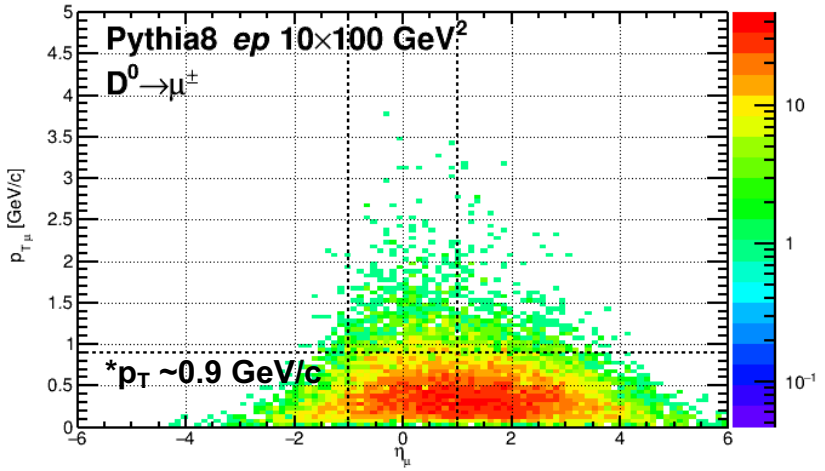
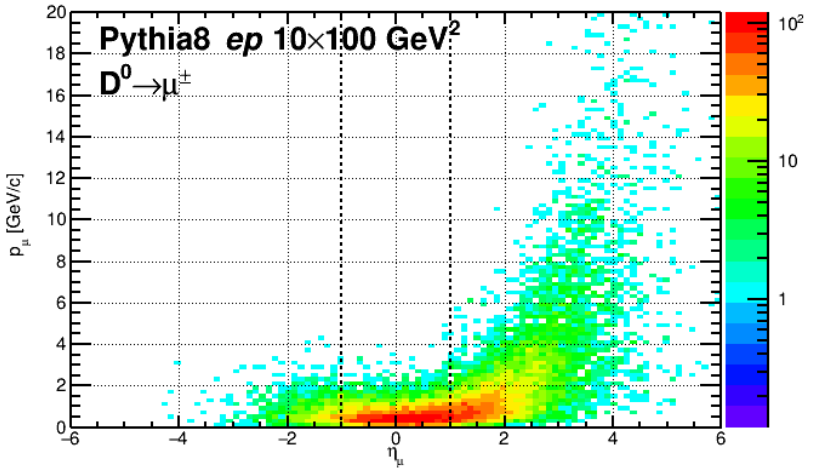
Kinematics – 10×100 GeV^2









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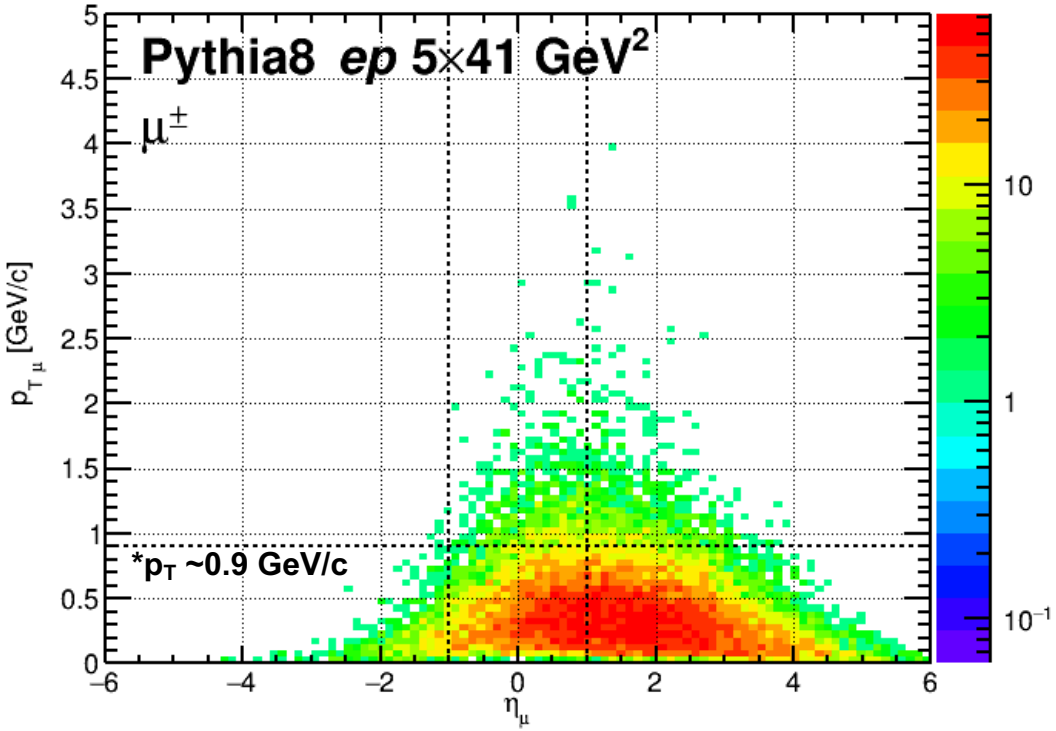
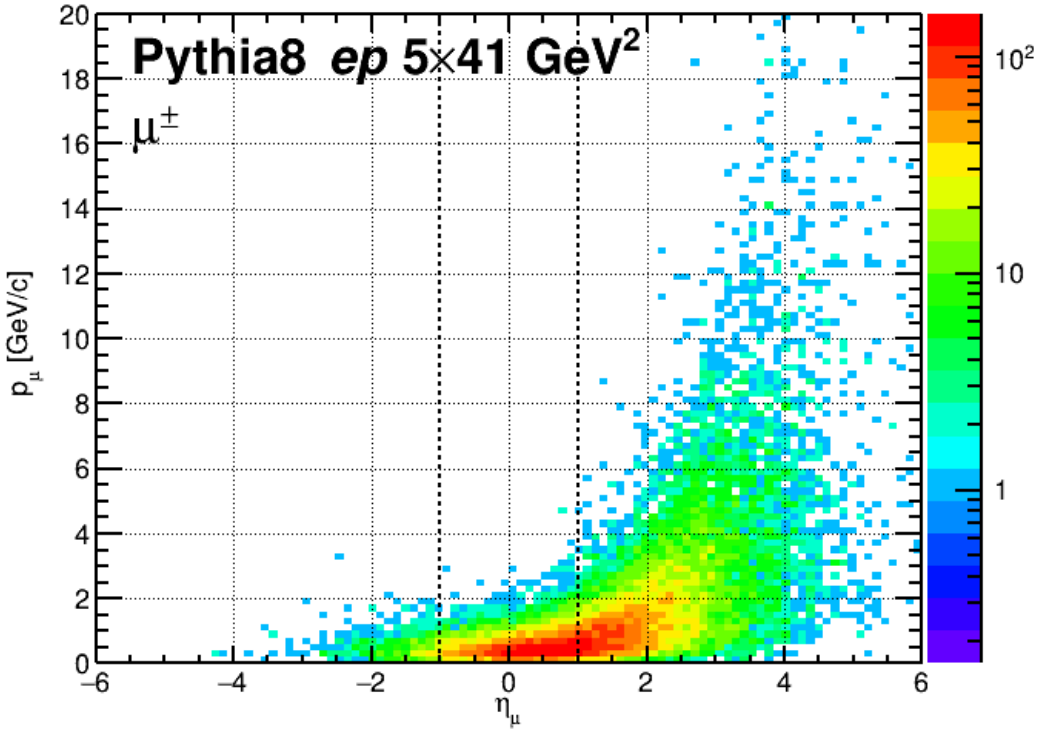
Kinematics – 5×41 GeV²





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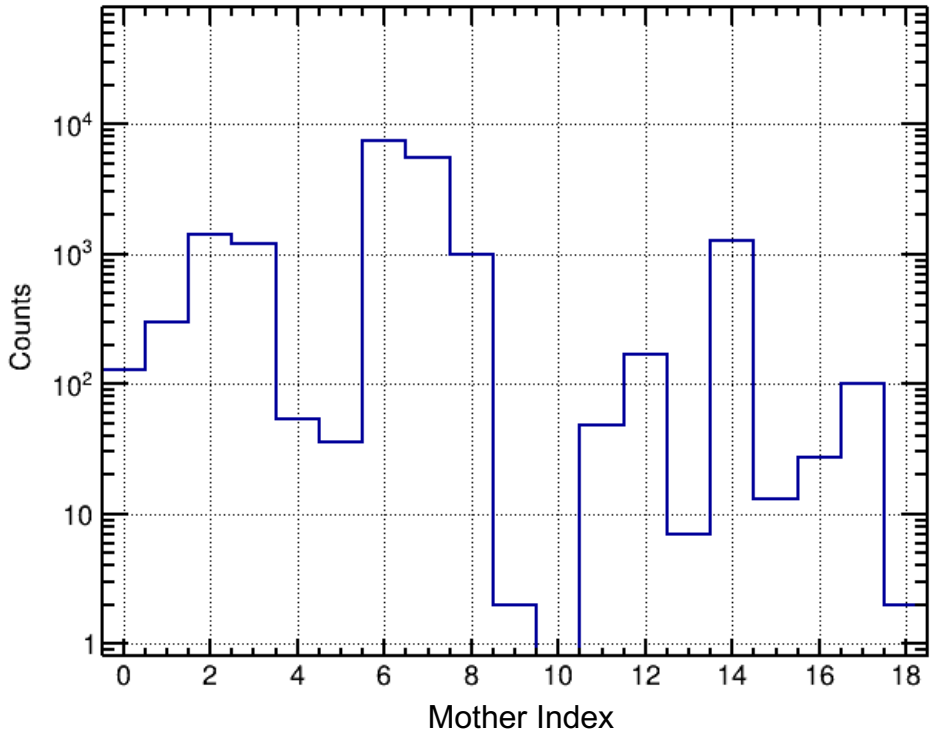
Kinematics – 5×41 GeV²



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[1]	ρ^0	[11]	Σ^-
[2]	η	[12]	Λ
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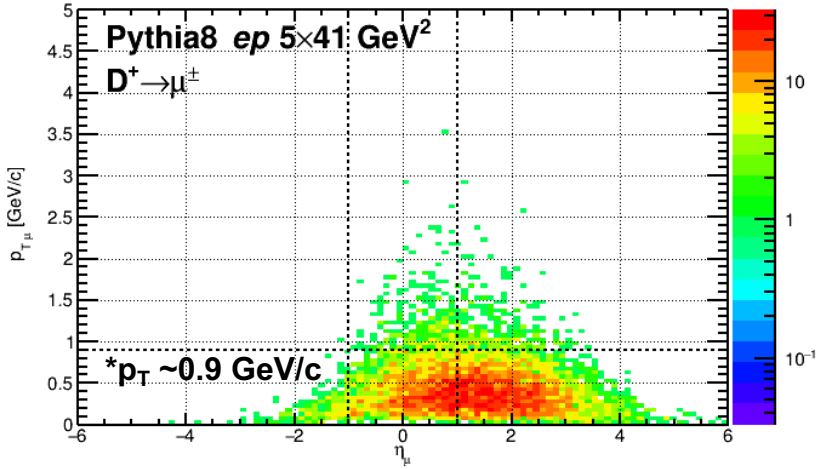
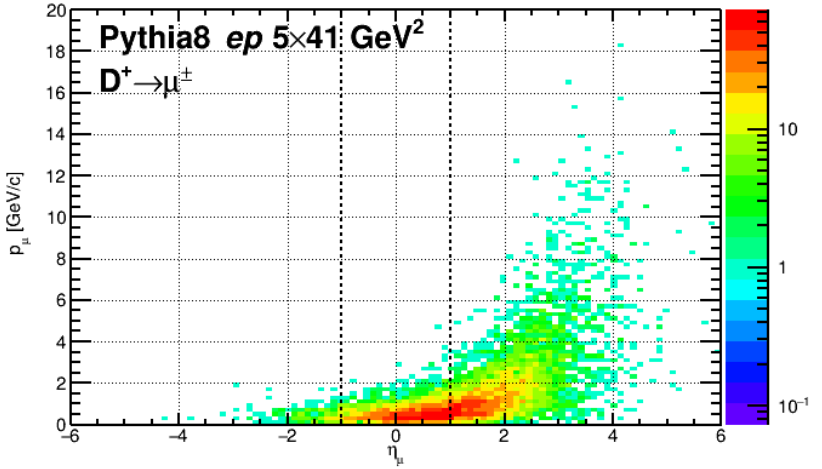
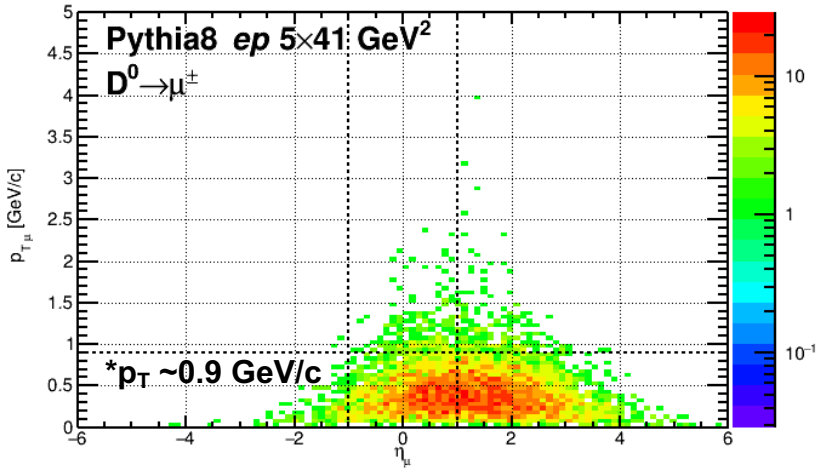
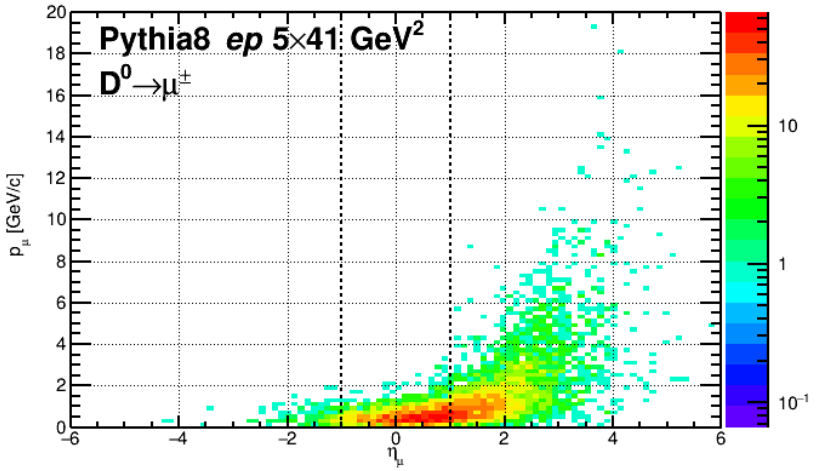
Kinematics – 5×41 GeV²









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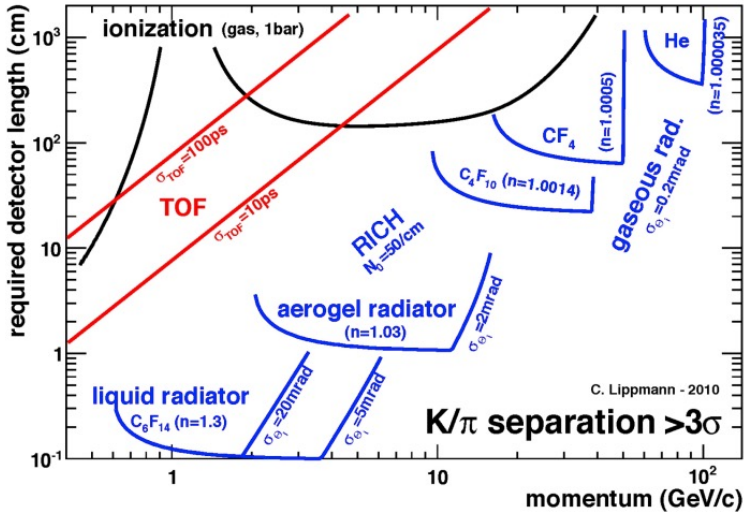
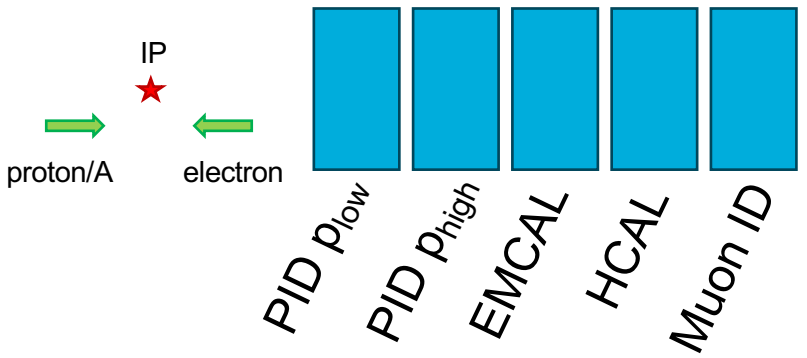
Summary

- Looked at sample of **Pythia8 NC DIS ep 5×41, 10×100, and 18×275 GeV²** with $Q^2_{\min}$ **> 1 GeV² – Muon kinematics**
- Found that there are **muons going beyond mid-rapidity (|η| > 1)** and **muon PID might be important in the forward/backward region**
- Many muons are **decayed from D, η, ω, Λ_c^+, …**
- ****Question?** Worth having Muon ID in the forward region for 2nd Detector?

**ePIC is able to do muon ID using ECAL and HCAL in backward/barrel/forward regions





In the forward region
Space constraint?

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