

$^{12}\text{C}(\gamma, \pi^+ \pi^- pp)X$ Update

Data and AV18 MC

January 13, 2025

Executive Summary

- Goal: Test np-dominance using ρ^0 p channel (with recoil p or not)
 - Couple to ρ^- p channel to see relative abundance of pp-pairs

Preliminary event selection cuts are shown between data and reconstructed AV18 simulation.

Workflow Architecture

- Data Collection / Simulation generation
- Reaction Filter
- DSelector
- Filter 1
- Filter 2

Workflow Architecture

- Data Collection / Simulation generation
- Reaction Filter -> Select for final state particles and constrain momentum and vertex
- DSelector
- Filter 1
- Filter 2

Workflow Architecture

- Data Collection / Simulation generation
 - Reaction Filter
 - DSelector -> Preliminary Cuts:
 - Filter 1 KinFit CL
 - Filter 2 PIDFOM CL
- $6 \text{ GeV} < \gamma < 10.8 \text{ GeV}$
- Proton sorting

Workflow Architecture

- Data Collection / Simulation generation

- Reaction Filter Additional Cuts:

- DSelector $50 \text{ cm} < z_{pLead} < 80 \text{ cm}$

- Filter 1 -> $\theta_{pLead} > 10^\circ$

- Filter 2 $p_{pLead} > 1 \text{ GeV}$

$$|t| > 1 \text{ GeV}$$

$$p_{miss} = p_{pLead} + p_{\rho^0} - p_{\gamma} > 0.4 \text{ GeV}$$

$$-3 \text{ GeV} < \text{Energy Balance (Nucleon at Rest)} < 3 \text{ GeV}$$

$$0.3 \text{ GeV} < p_{pRecoil} < 0.8 \text{ GeV}$$

Simulation Details

- $^{12}C(\gamma, \pi^+ \pi^- pp)X$
- gen_gcf plugin to glueX_mcwrapper
- AV18
- genFactor = 10,000
- 10 M events

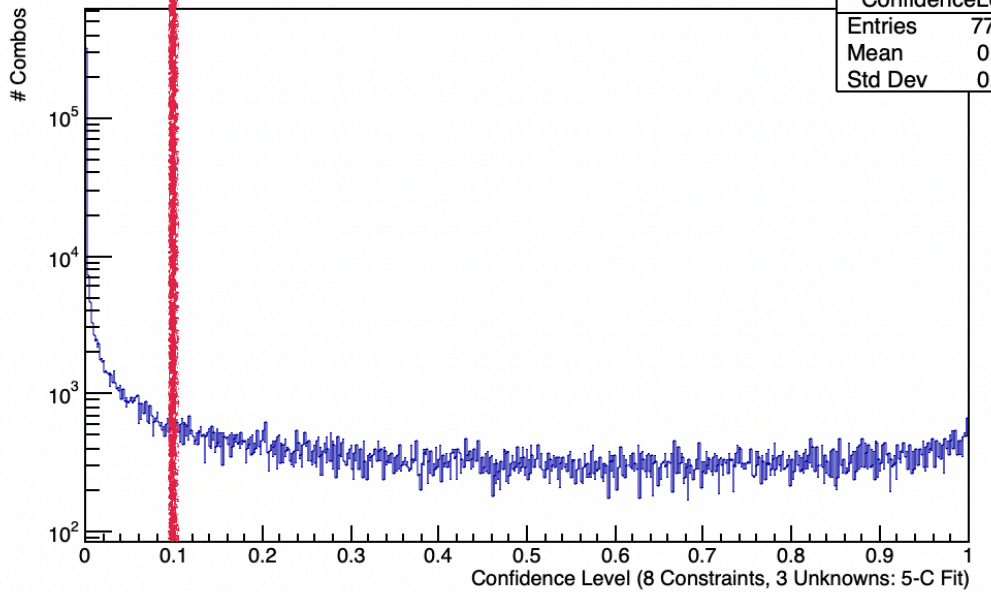
KinFit CL > 0.1

Run 090295

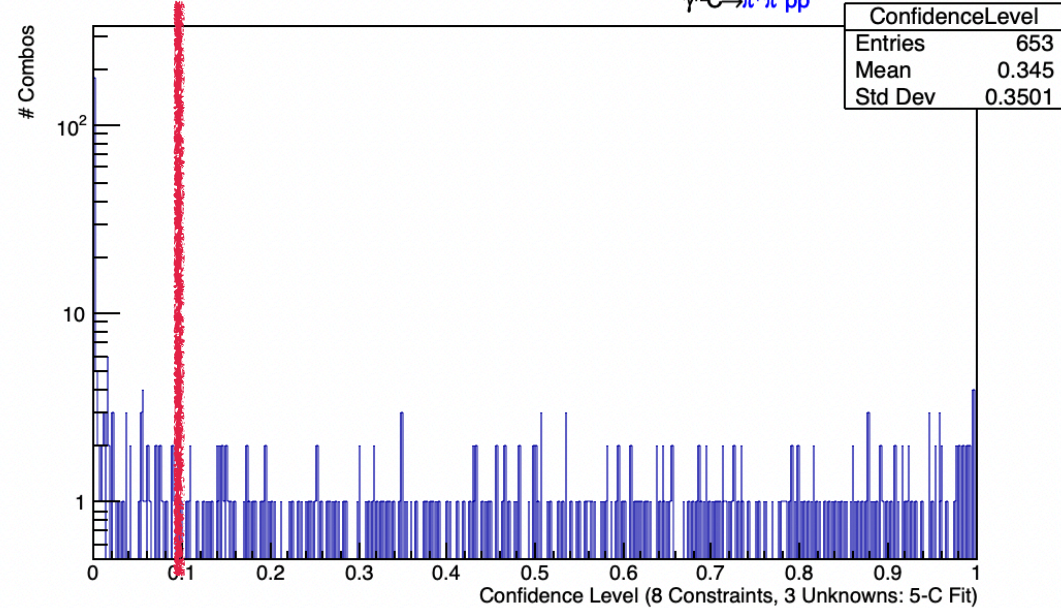
Data

AV18

Kinematic Fit Constraints: $\chi^3_{\gamma^2 C \rightarrow \pi^+ \pi^- pp}$



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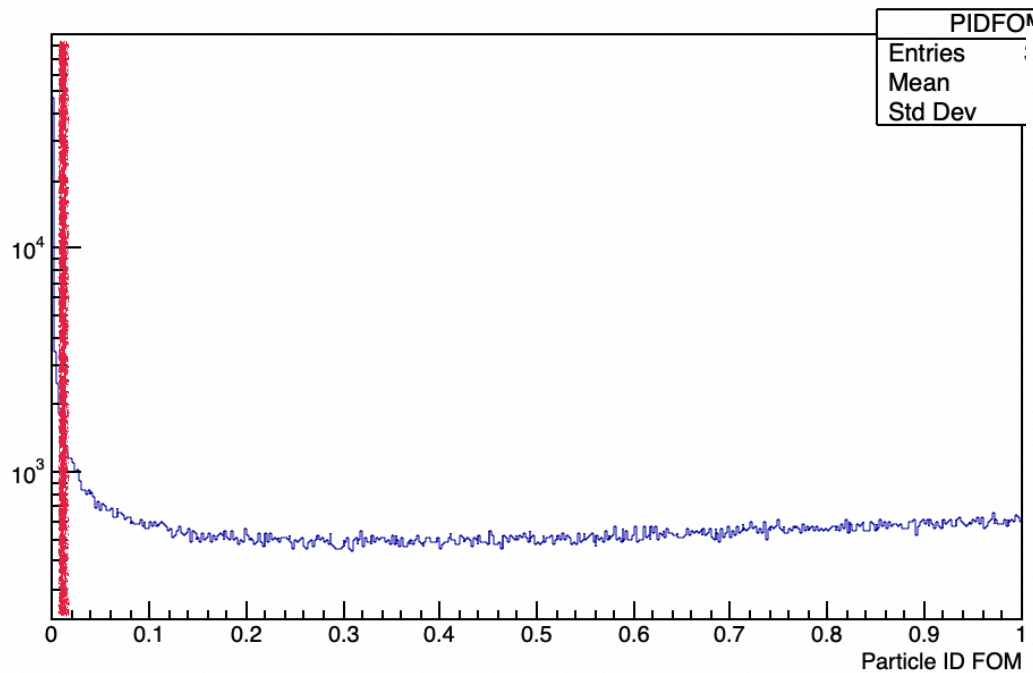


PID FOM CL > 0.01

Run 090295

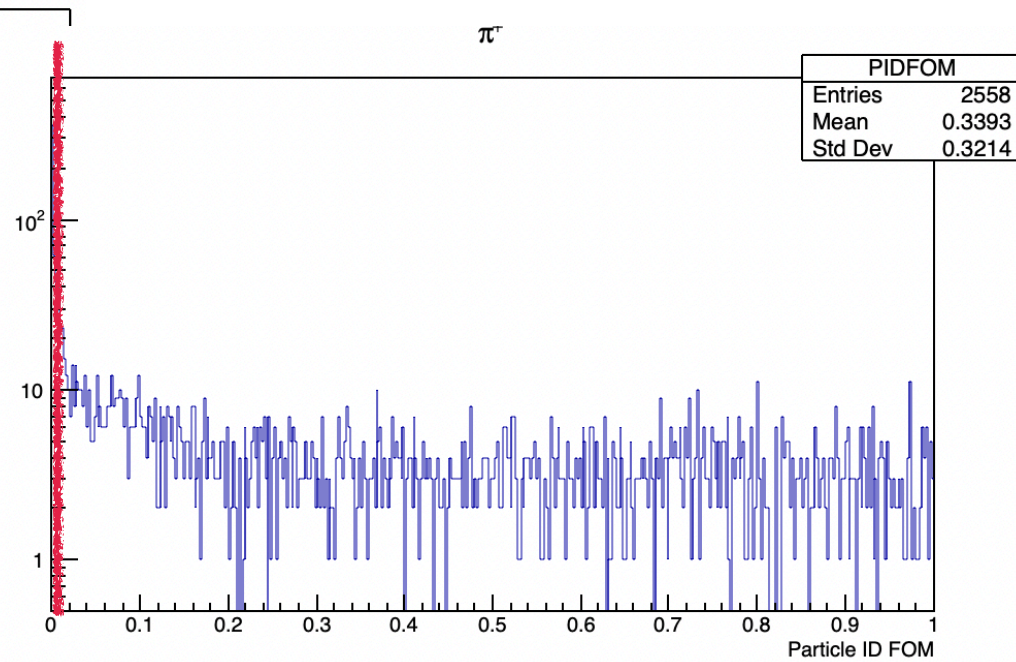
Data

π^+



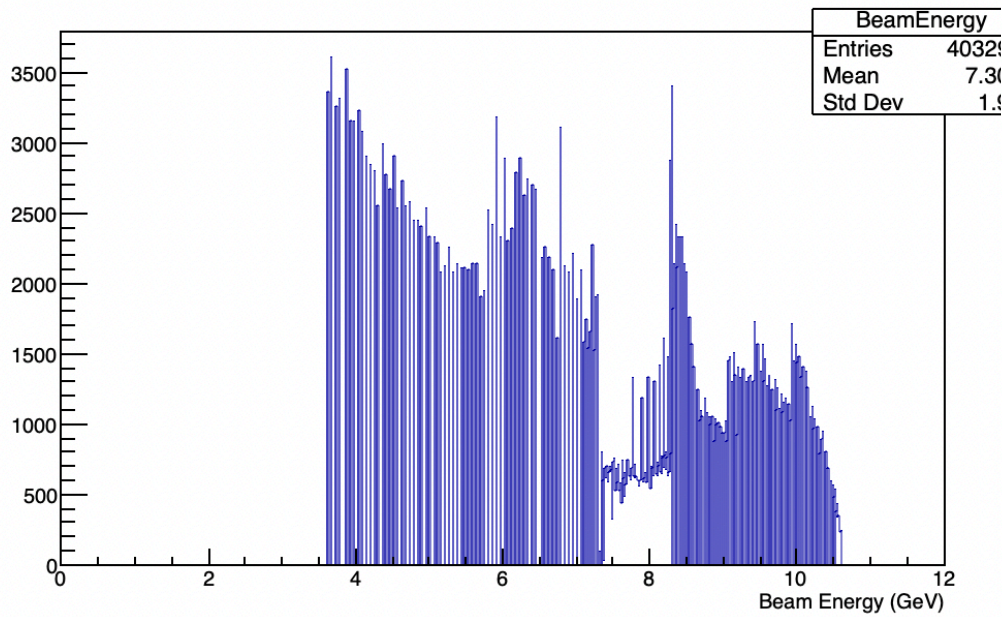
AV18

π^+

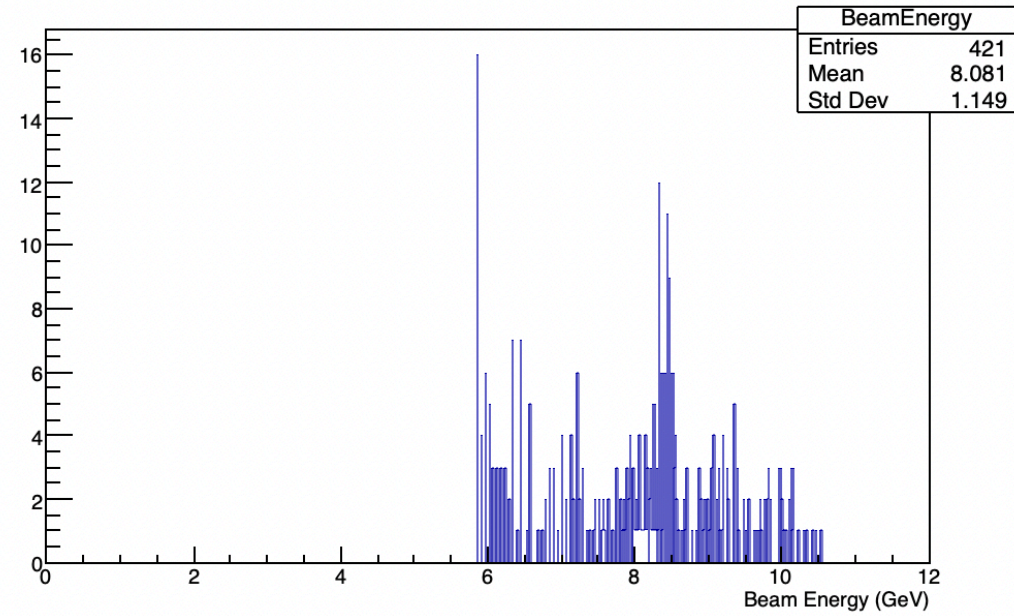


$6 \text{ GeV} < \gamma < 10.8 \text{ GeV}$

Data

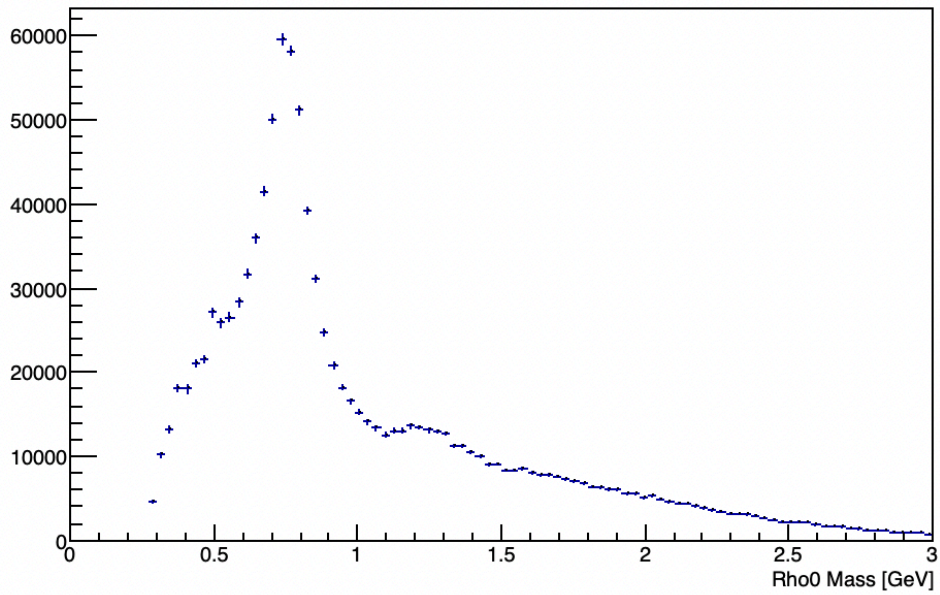


AV18

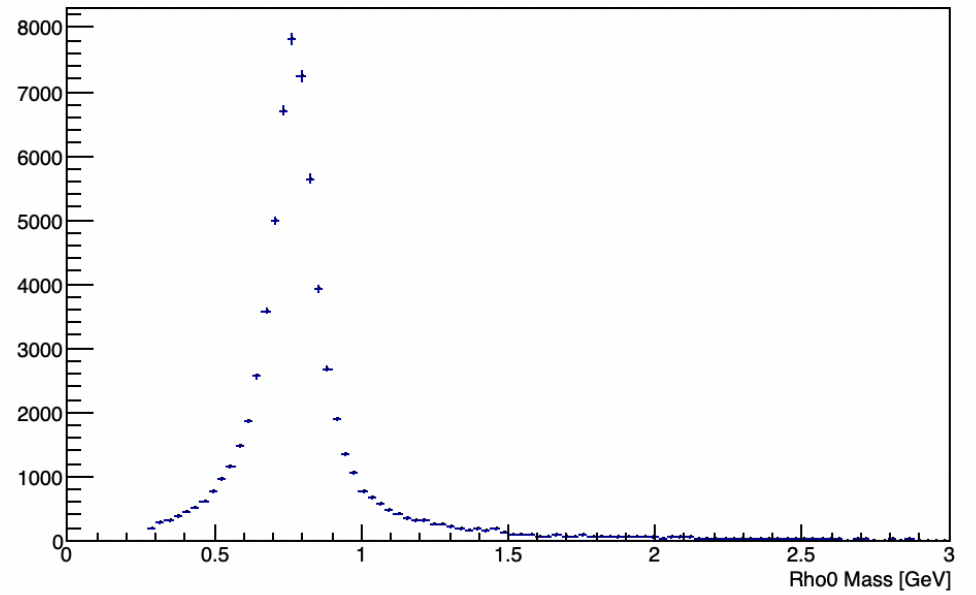


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Data

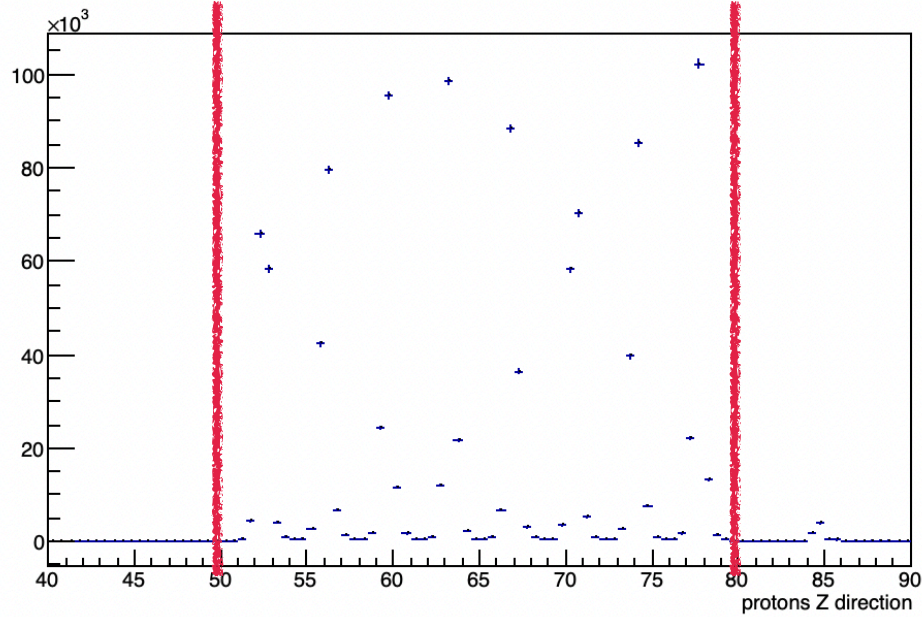


AV18

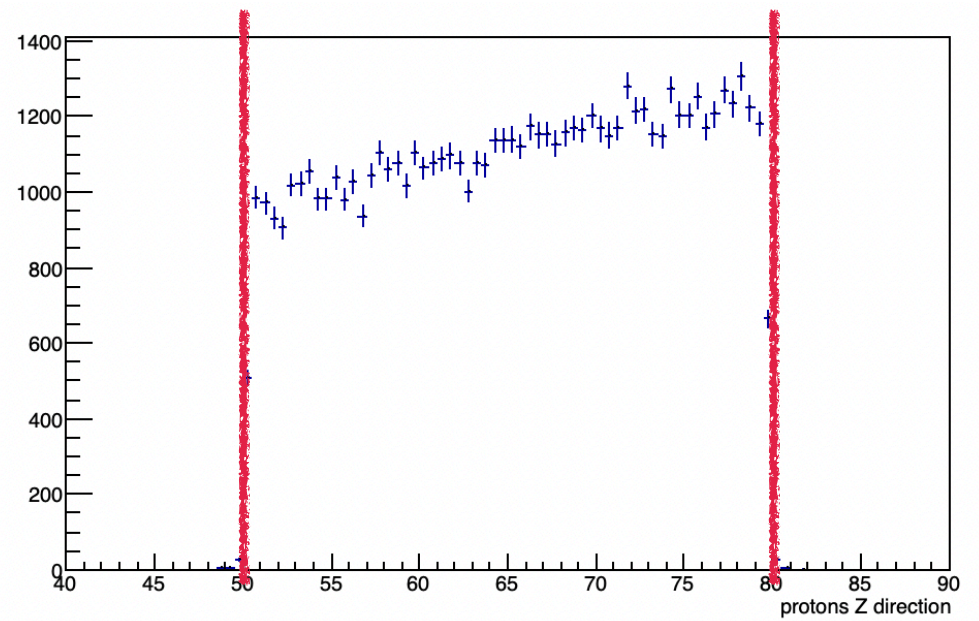


$$50 \text{ cm} < z_{pLead} < 80 \text{ cm}$$

Data

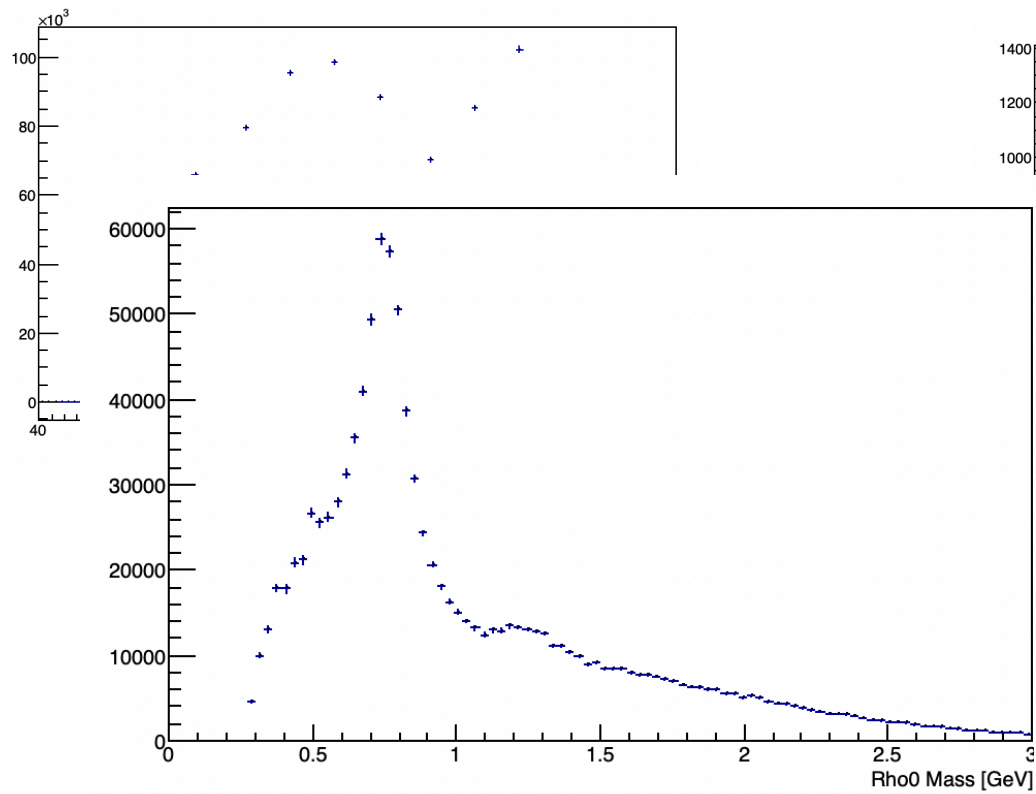


AV18

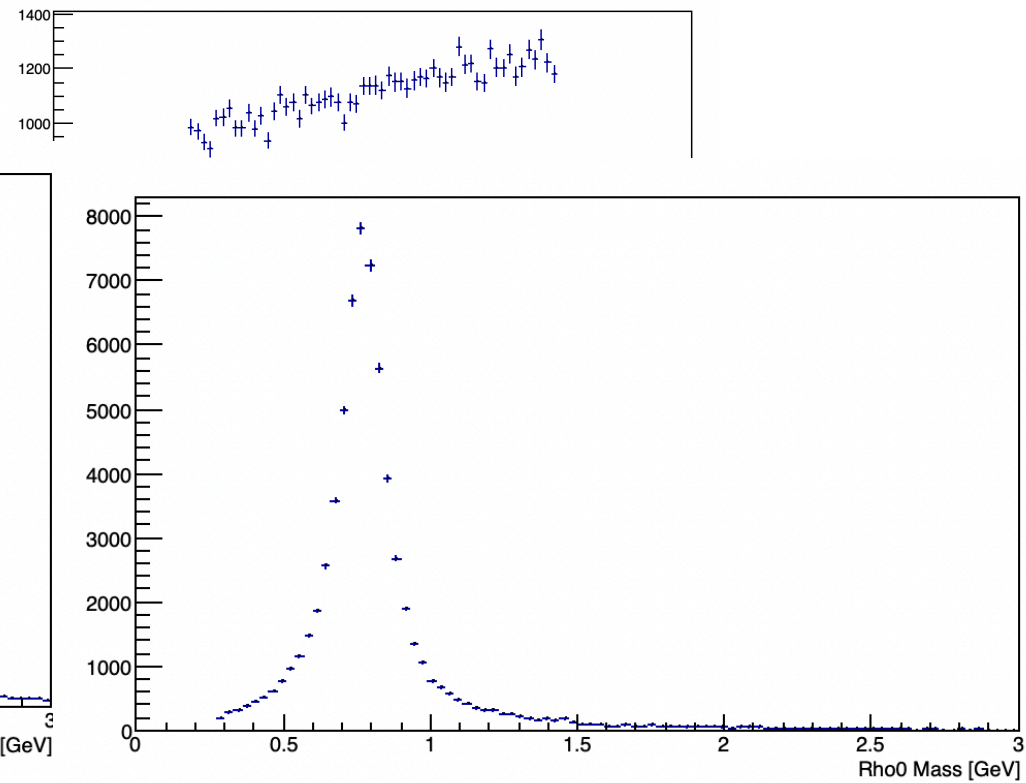


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Data

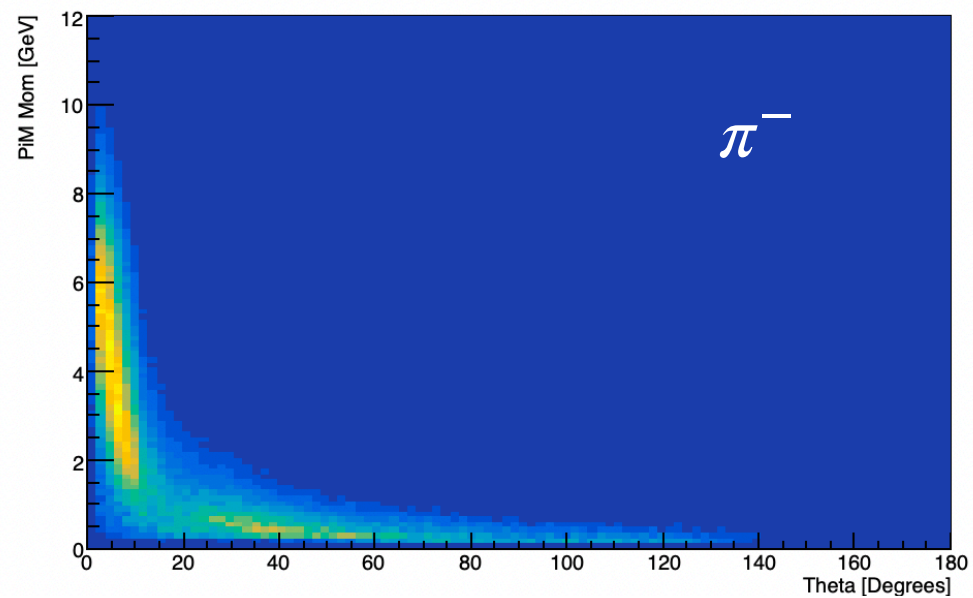
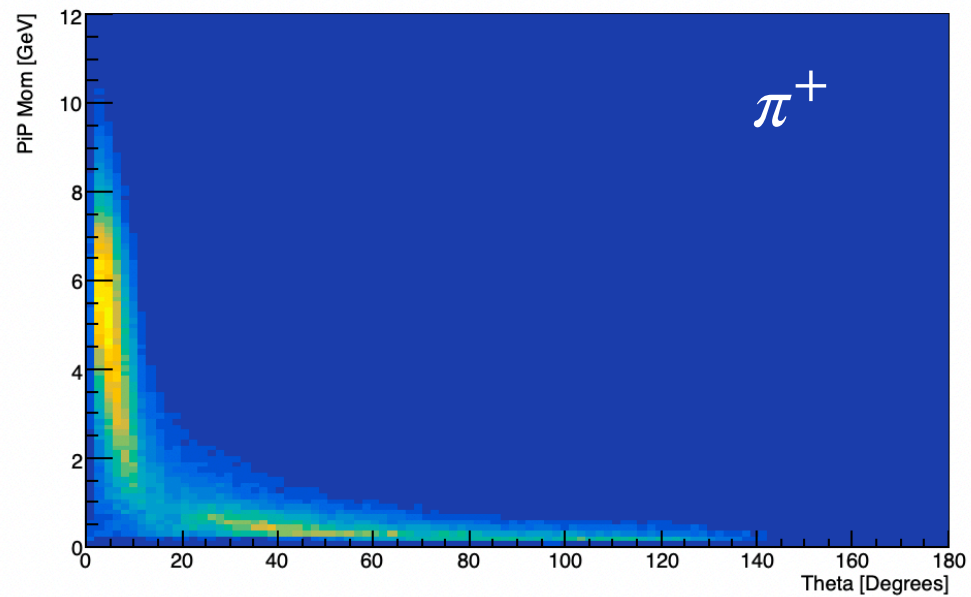
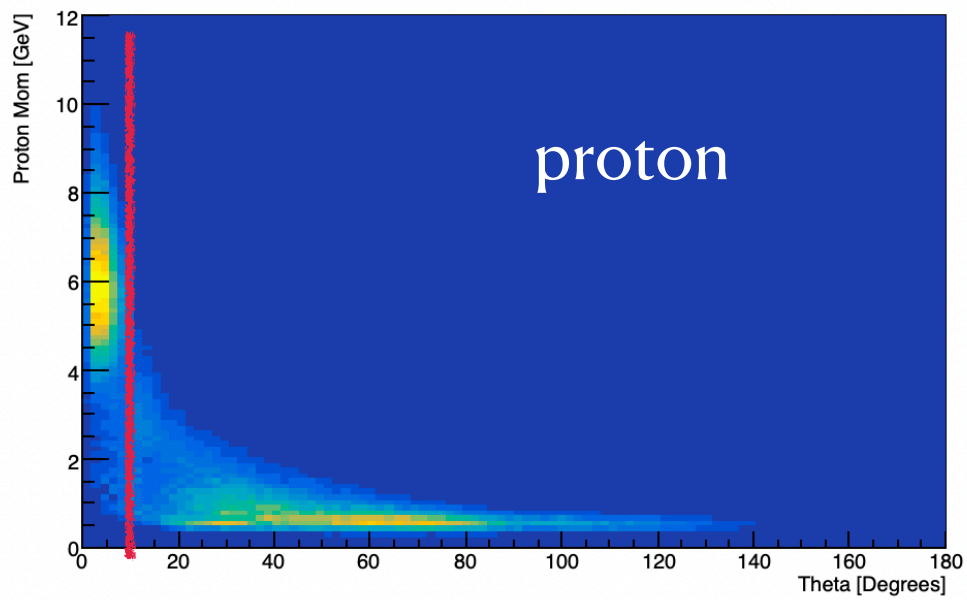


AV18



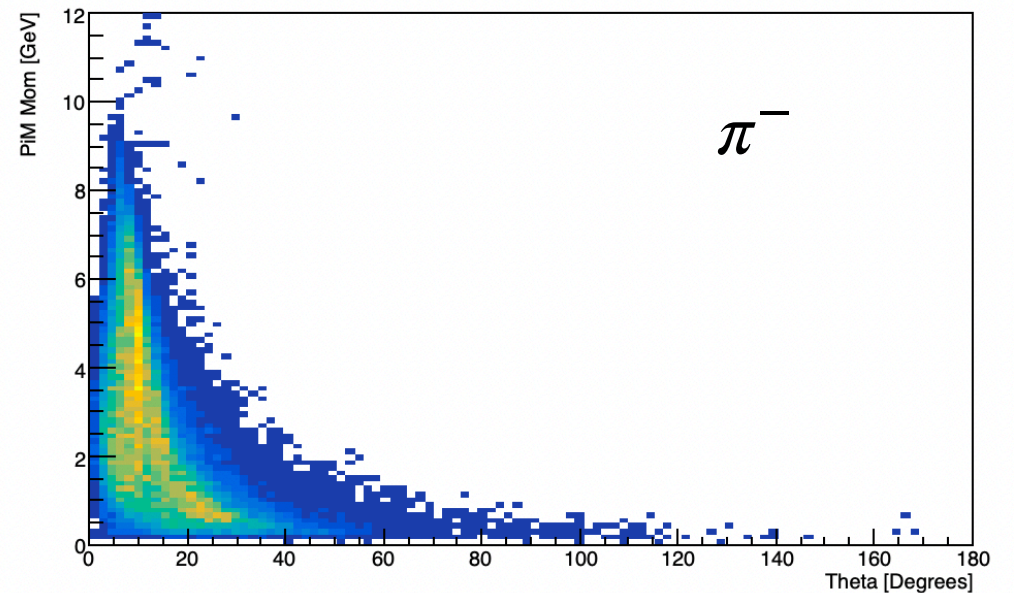
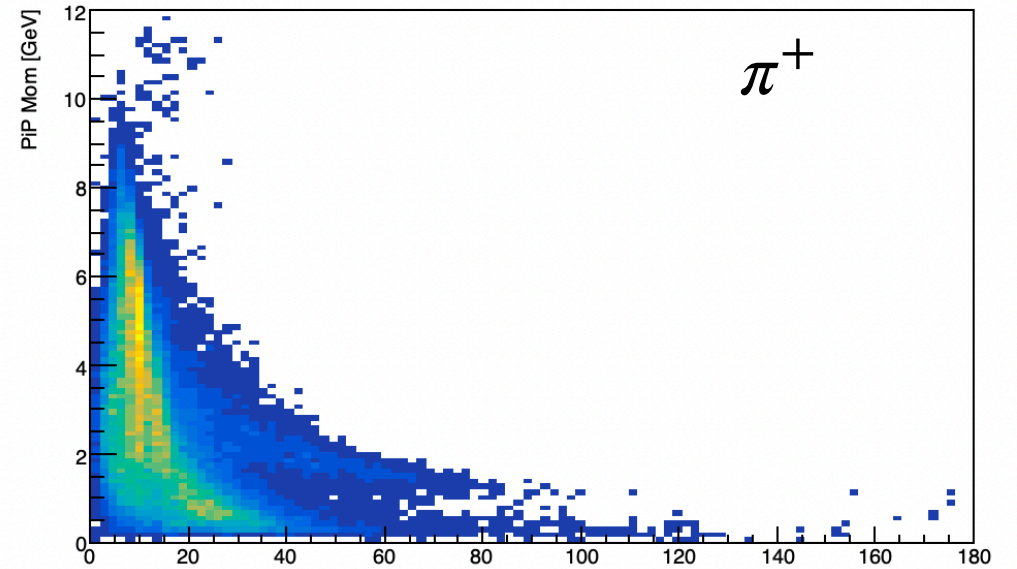
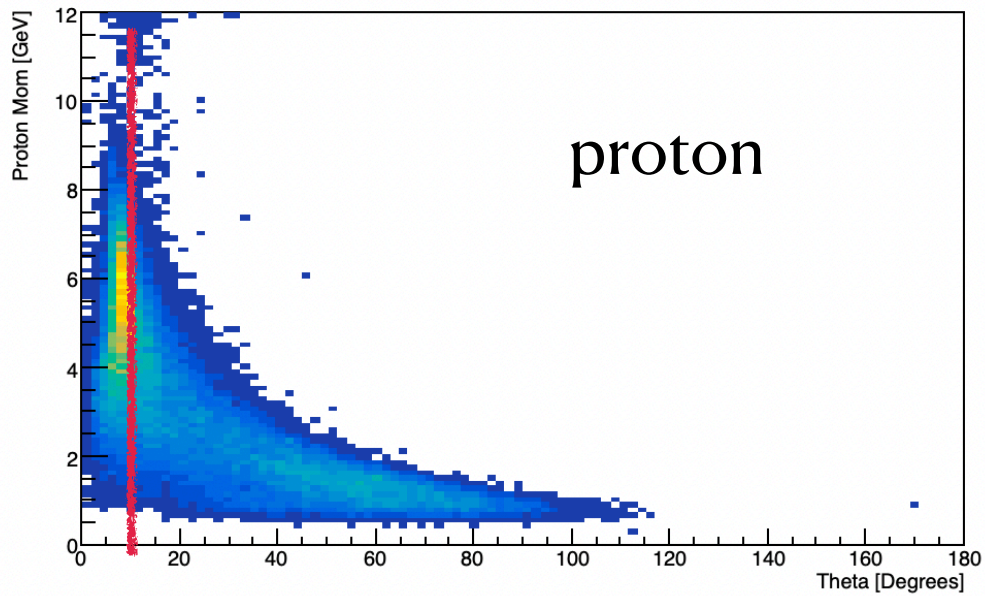
$$\theta_{pLead} > 10^\circ$$

Data



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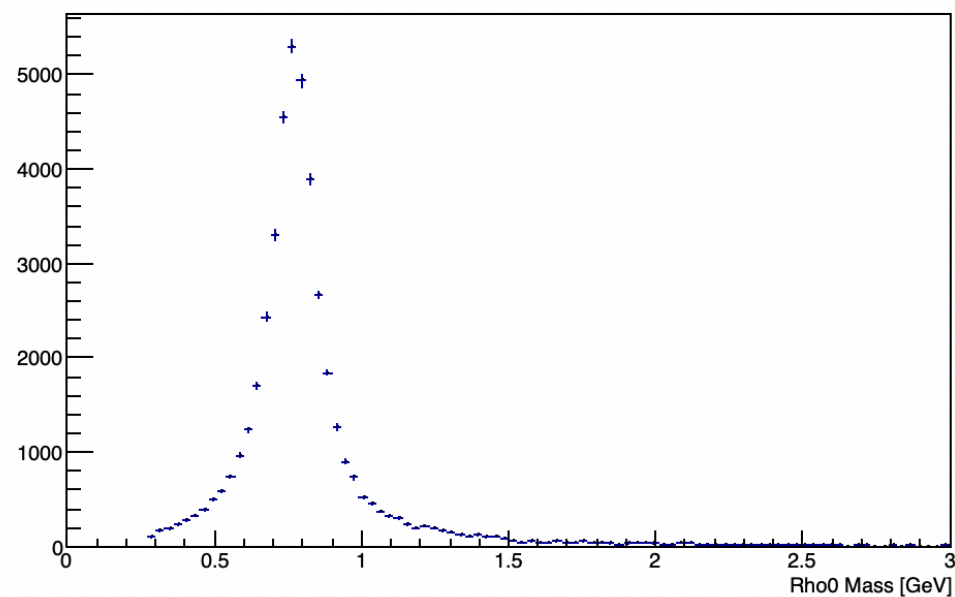
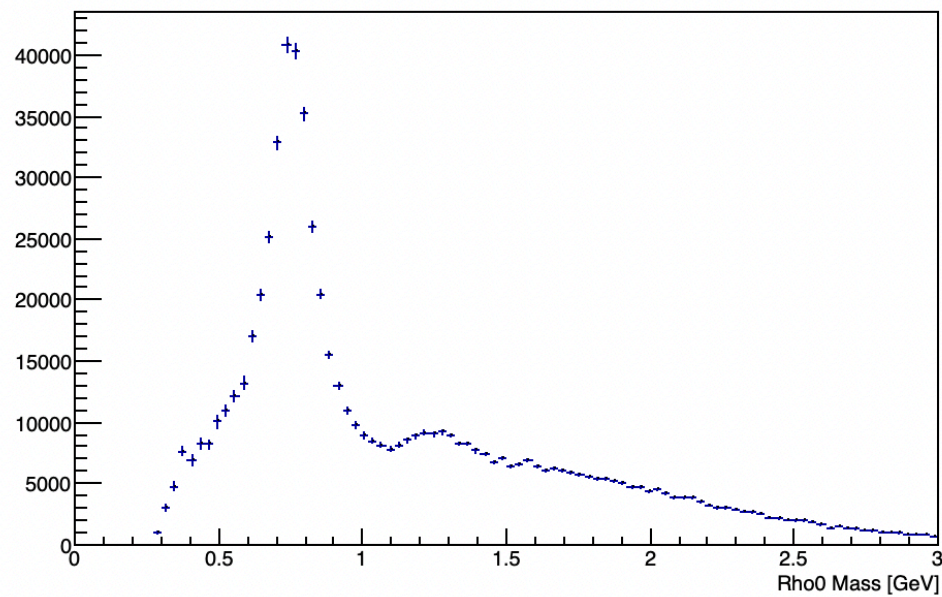
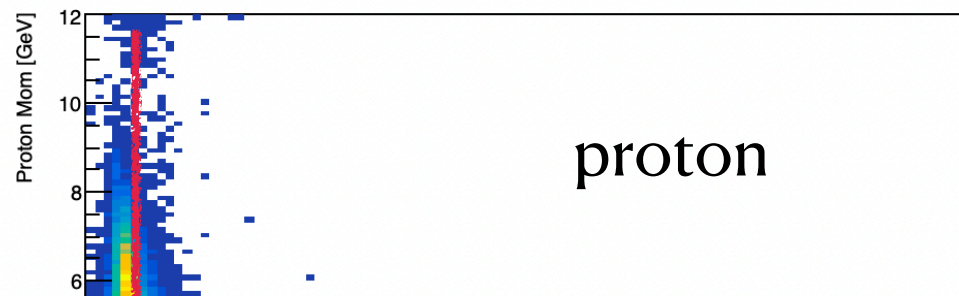
AV18



$$\theta_{pLead} > 10^\circ$$

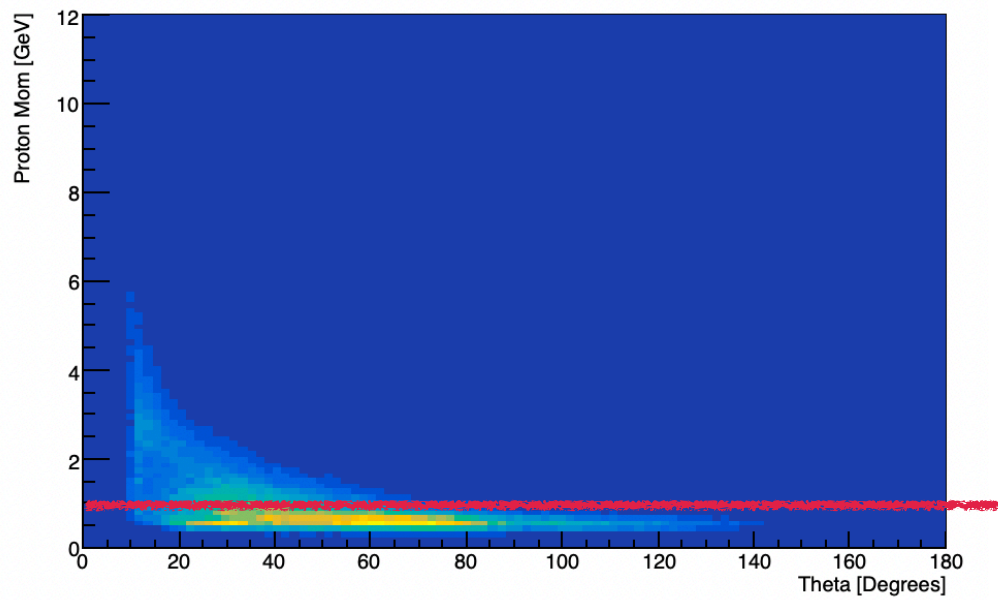
Data

AV18

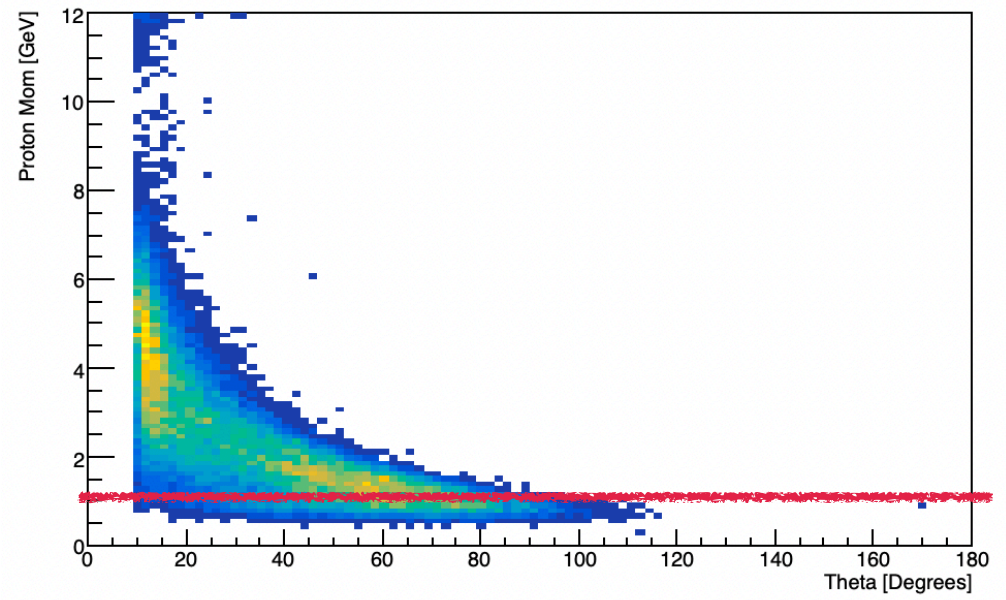


$$p_{pLead} > 1 \text{ GeV}$$

Data



AV18

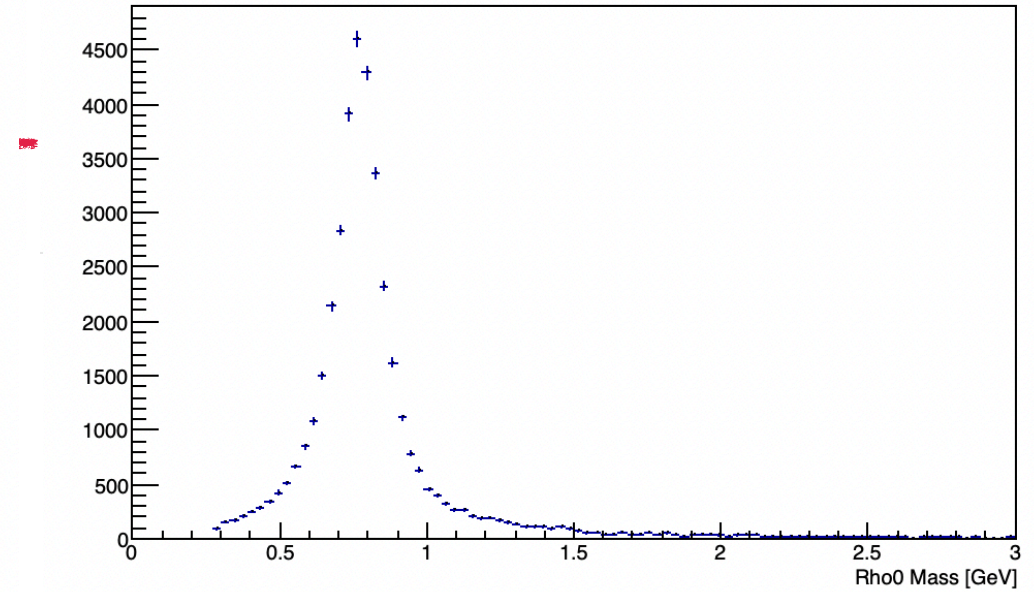
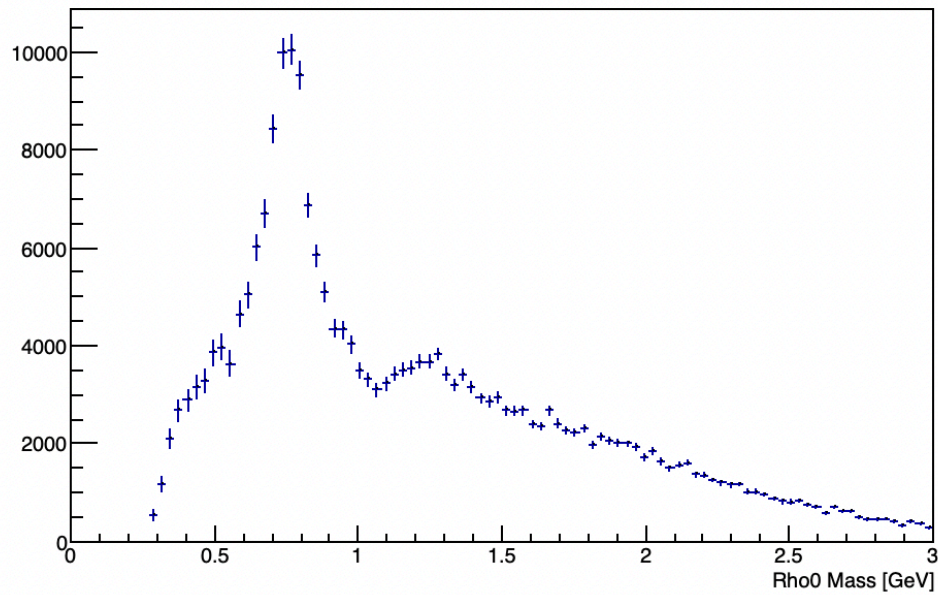
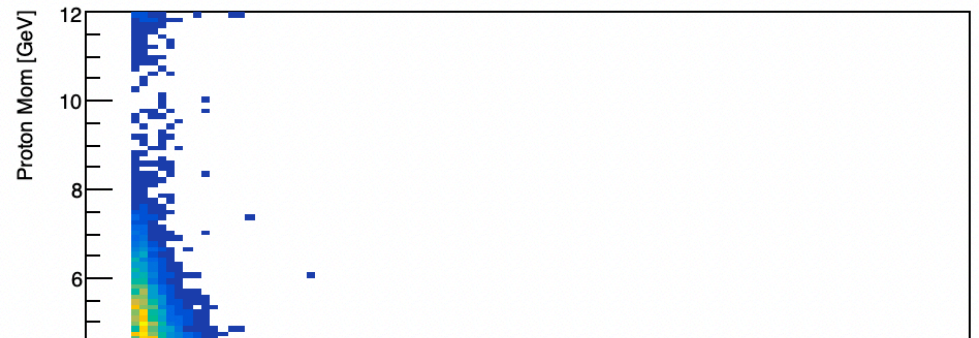


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Data

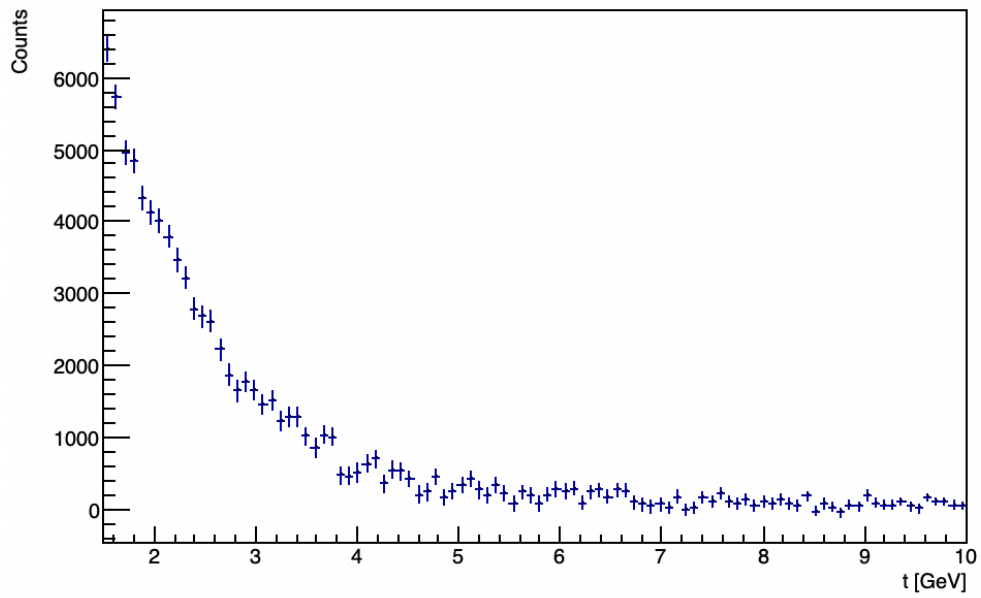


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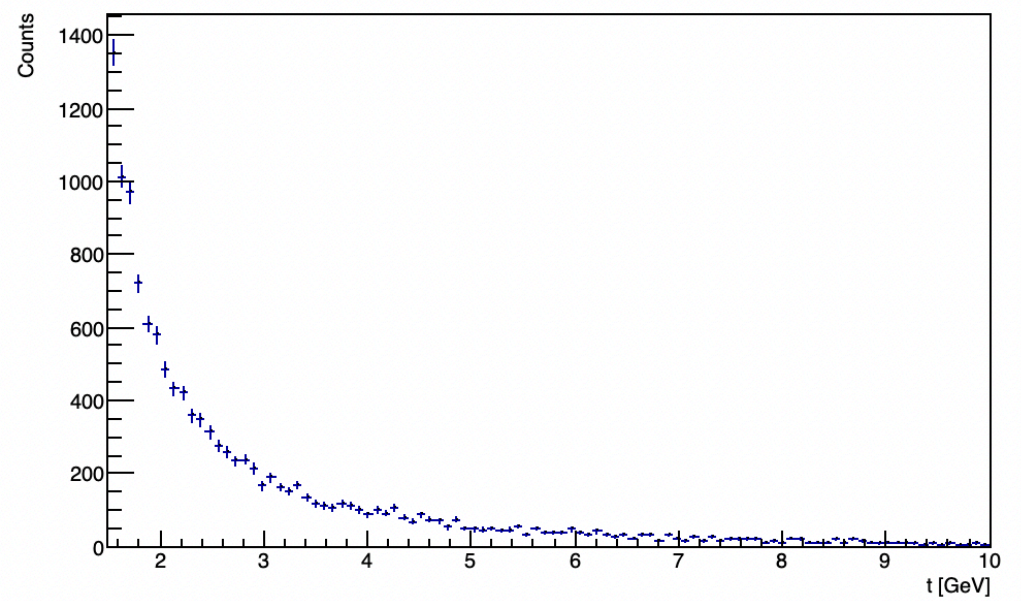


$$|\mathbf{t}| > 1 \text{ GeV}$$

Data



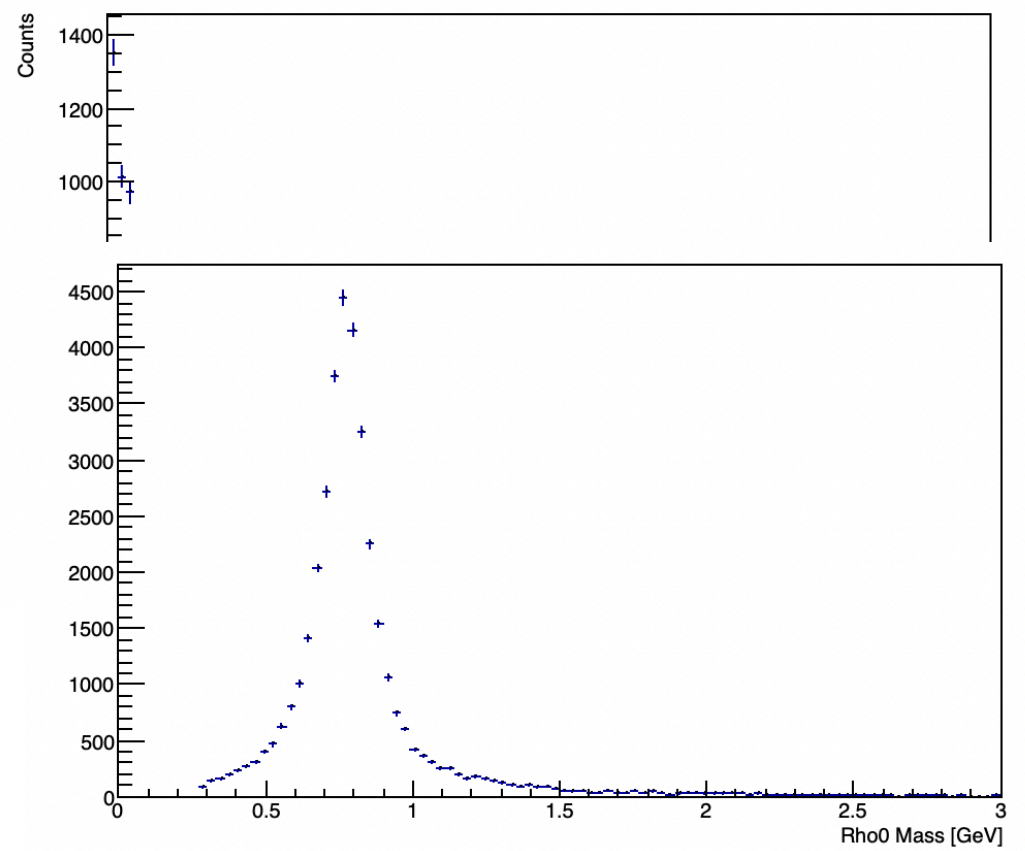
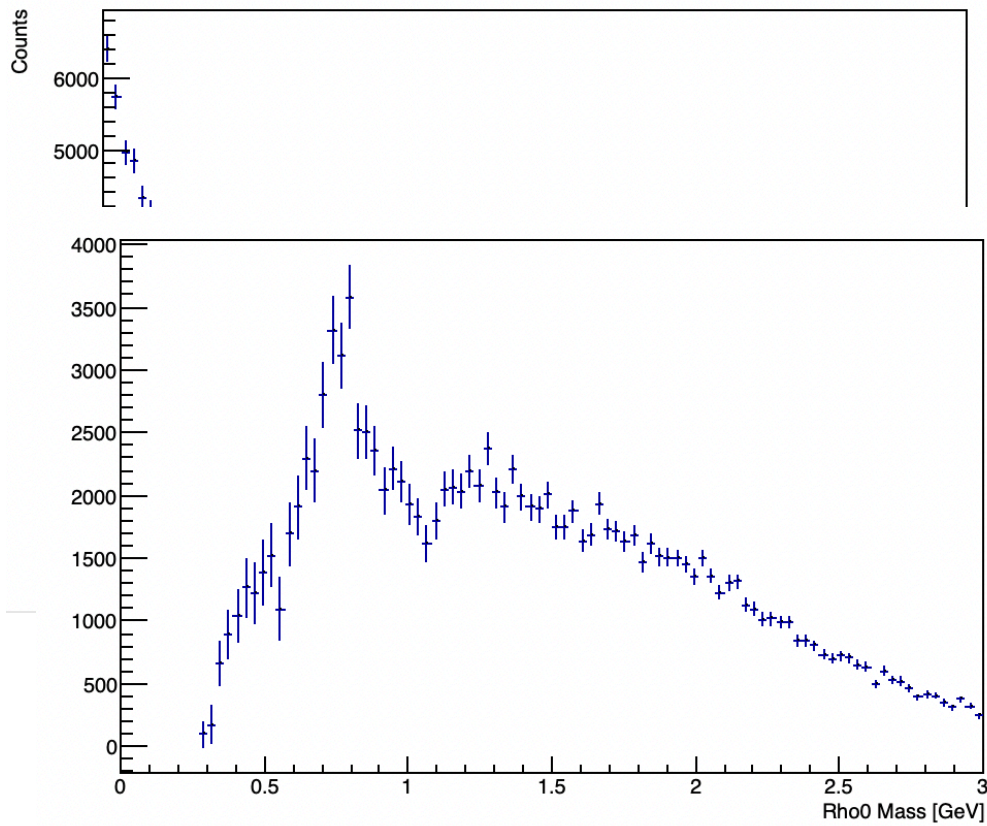
AV18



$|\mathbf{t}| > 1 \text{ GeV}$

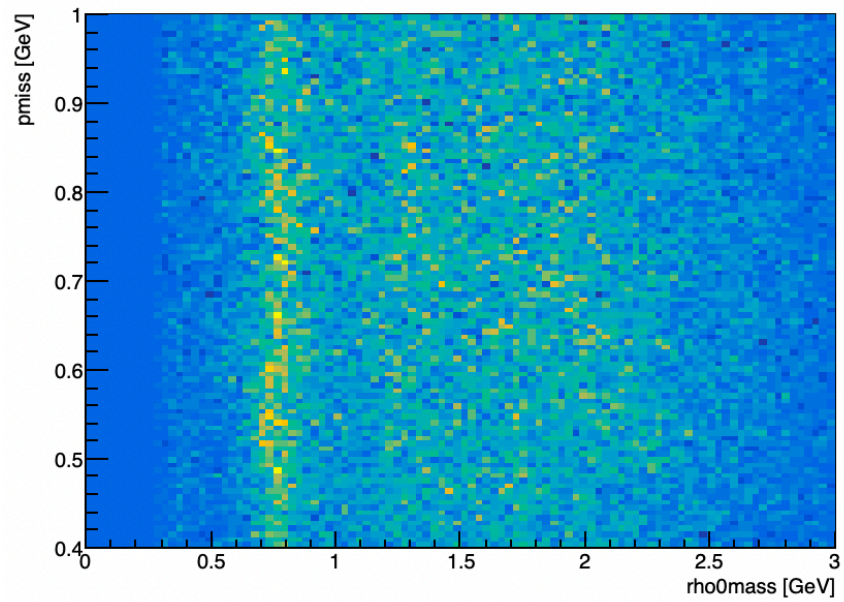
Data

AV18

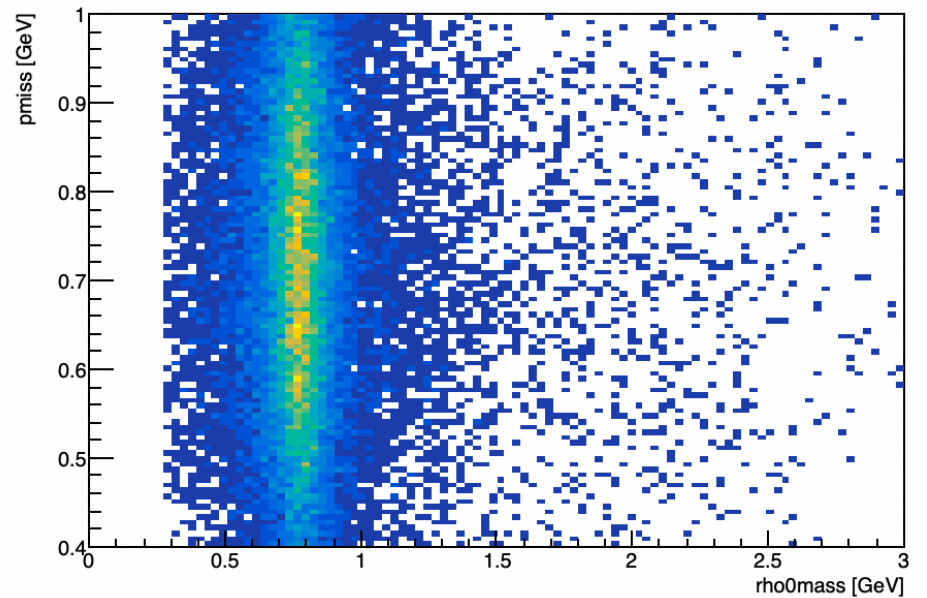


$$\mathbf{p_{miss}} = p_{pLead} + p_{\rho^0} - p_{\gamma} > \mathbf{0.4 GeV}$$

Data

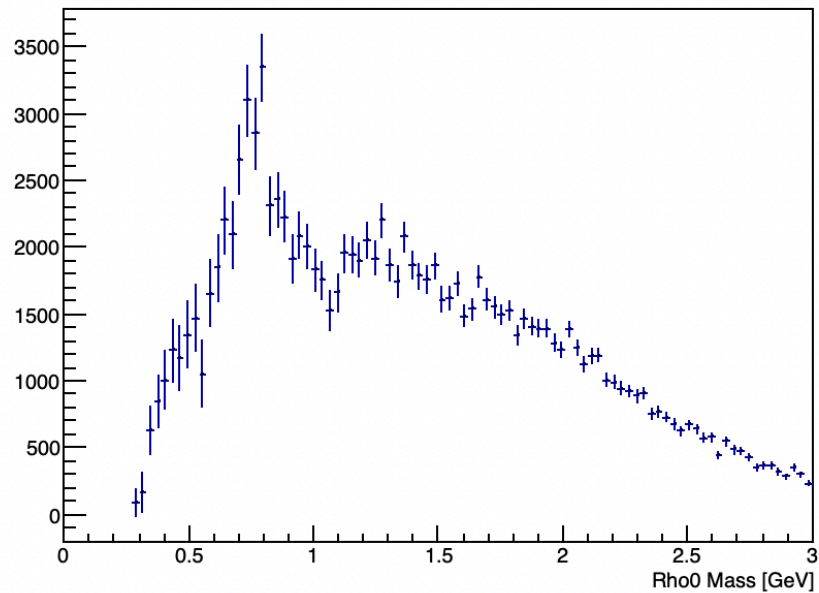
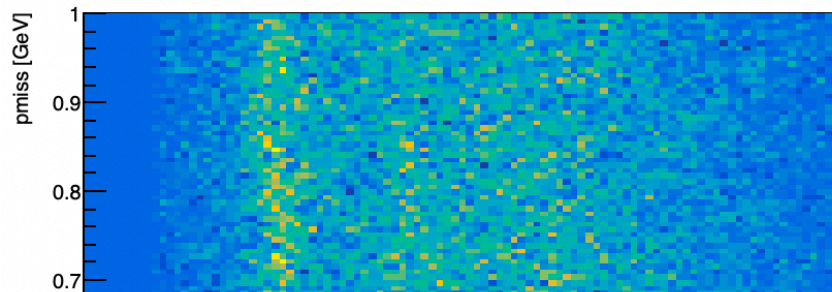


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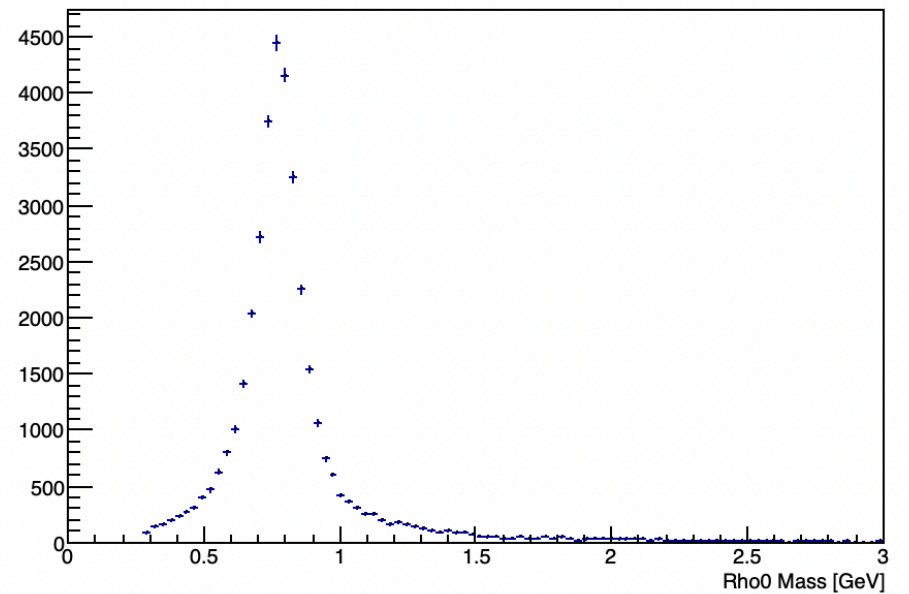
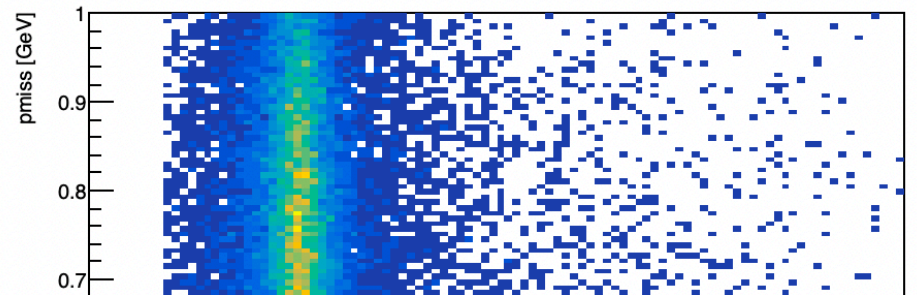


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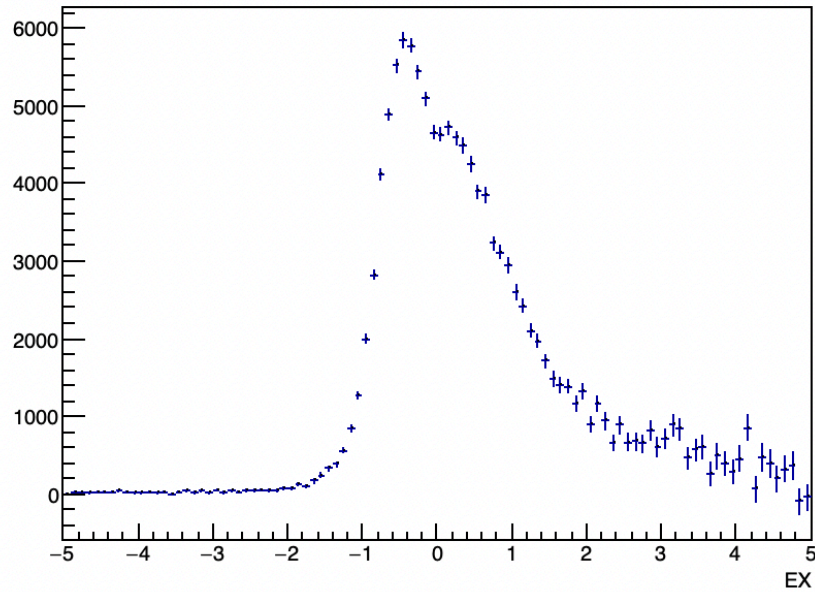


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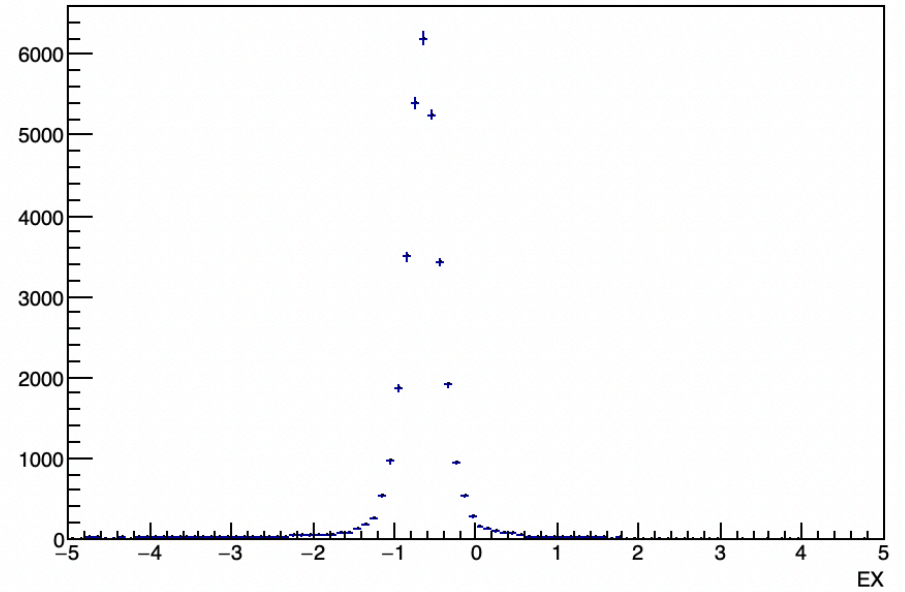


$-3 \text{ GeV} < \text{Energy Balance (Nucleon at Rest)} < 3 \text{ GeV}$

Data

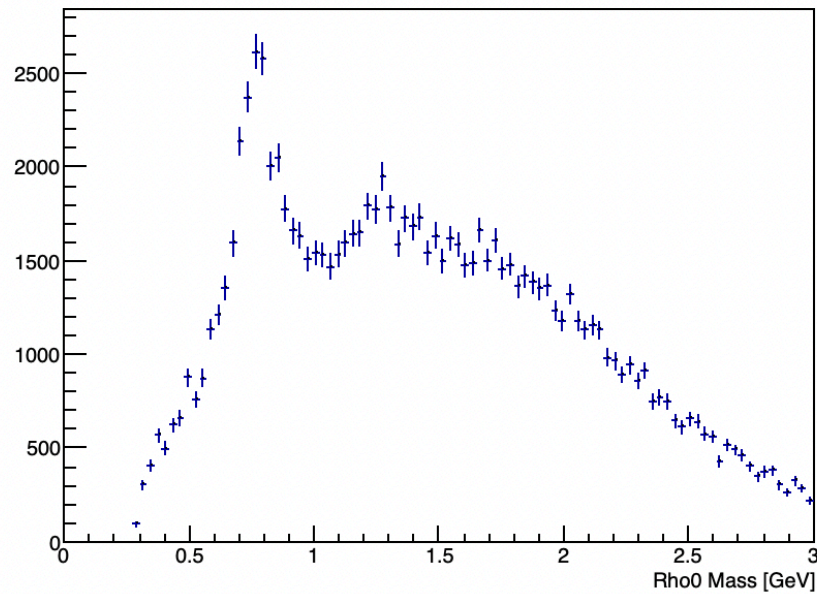
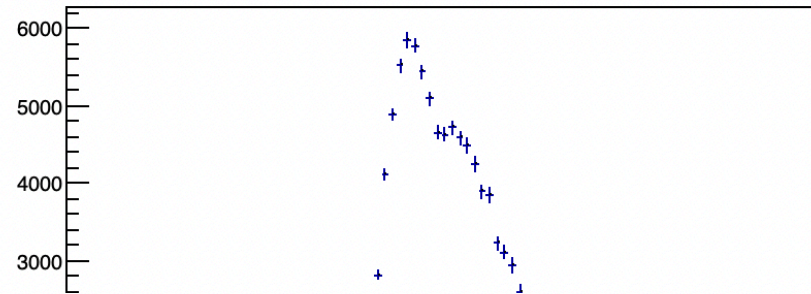


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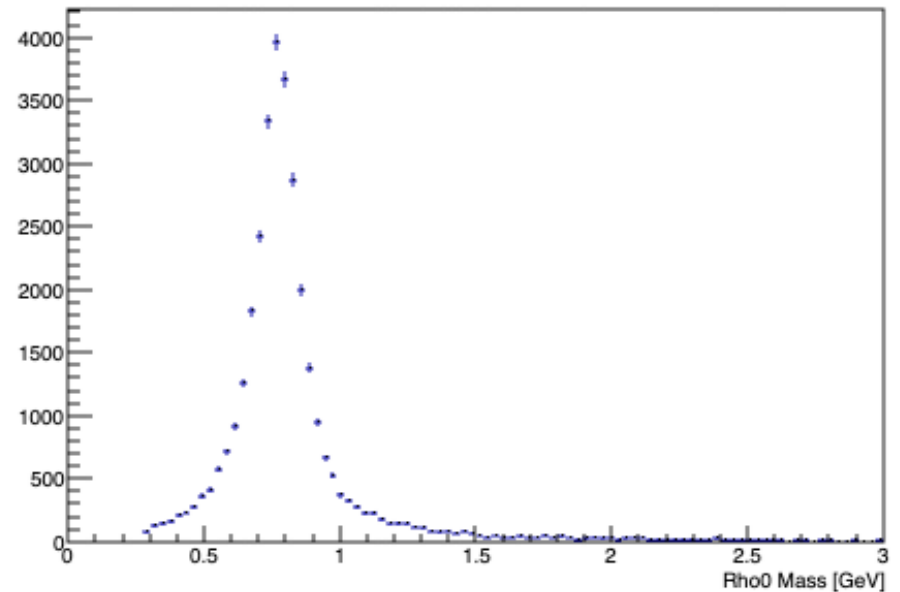
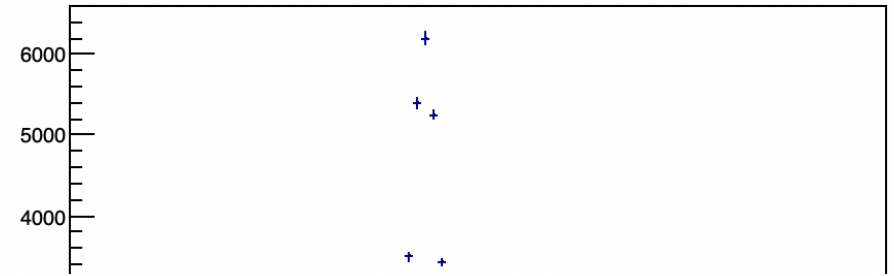


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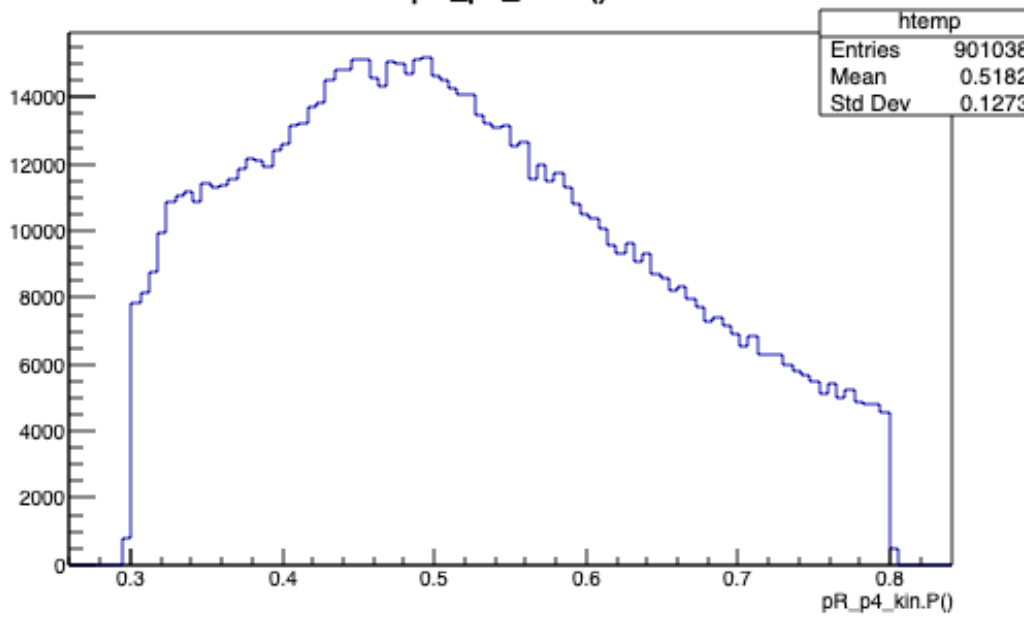
AV18



$$0.3 \text{ GeV} < p_{pRecoil} < 0.8 \text{ GeV}$$

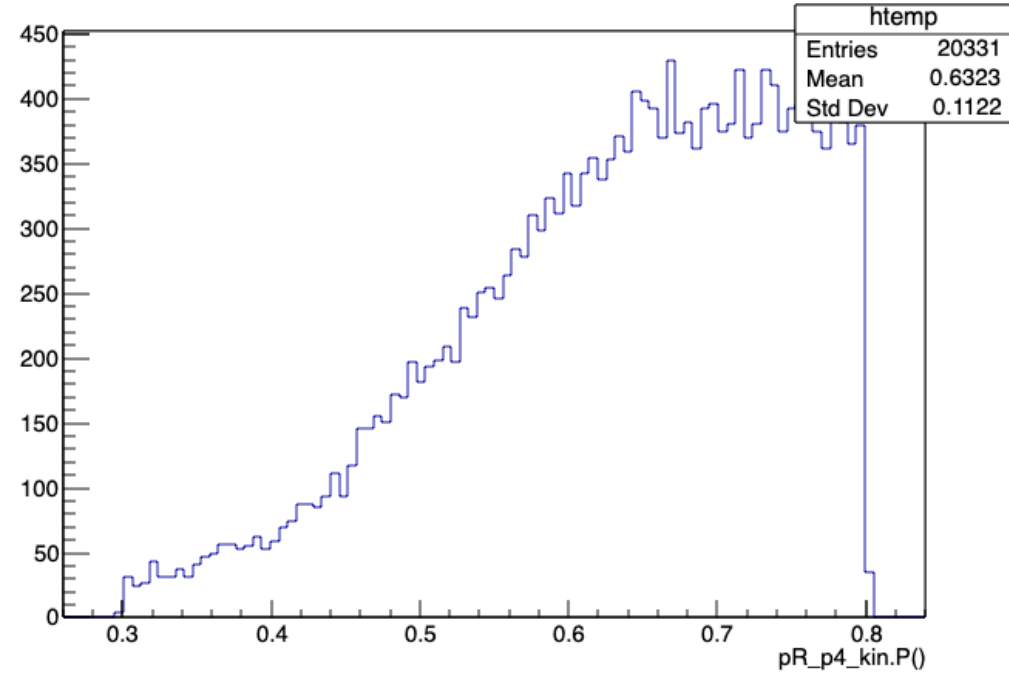
Data

pH_p4_kin.P()



AV18

pR_p4_kin.P()



Next Steps

- Finish pushing through filter2 for more physics-analysis
- continue bringing simulation and data to local computer
- look at D 2p data for diffractive background
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