

D0 Reconstruction using PYTHIA8 Sample

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Motivation:

- In DIS, Charmed Quarks are expected to be produced via the Boson-Gluon Fusion mechanism,

$$\gamma g \longrightarrow c \bar{c}$$

the observation of Inclusive Charm Hadrons (like D^0) serves as a direct probe of the gluon density in nucleons.

Objectives:

- To Reconstruct D0 mesons and Jet
- And, To calculate the **Fragmentation Function** of D0 meson:

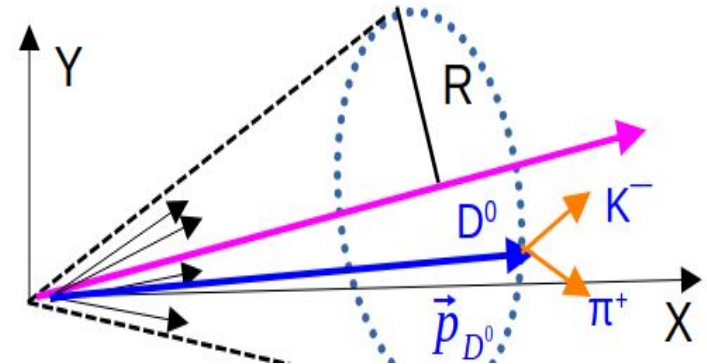
$$p_{TD0}/ p_{TJet}$$

Data Sample:

- Reconstruction Version : 25.10.3
- Beam Energy : 10 X 100 GeV
- SIDIS ep :
 - PYTHIA 8.306
 - $Q^2 \text{ min} = 1 \text{ GeV}^2$

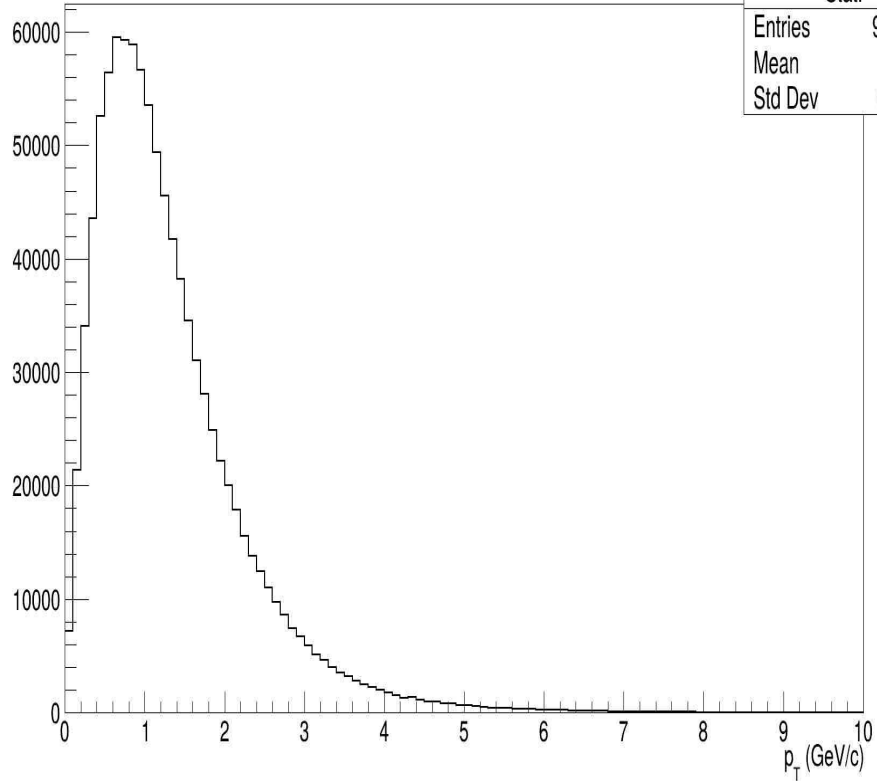
D0 Major Decay Modes:

- ❑ **D0** $\longrightarrow K^- + \pi^+$ (3.9%)
- ❑ **D0** $\longrightarrow K^- + \pi^+ + \pi^0$ (14.4%)

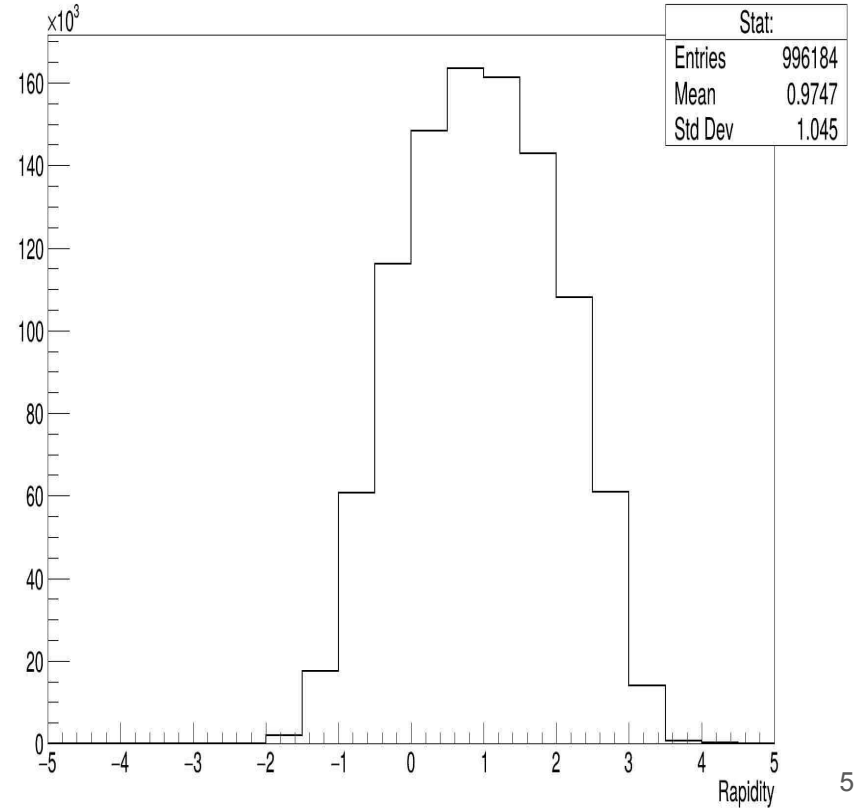


MC D0:

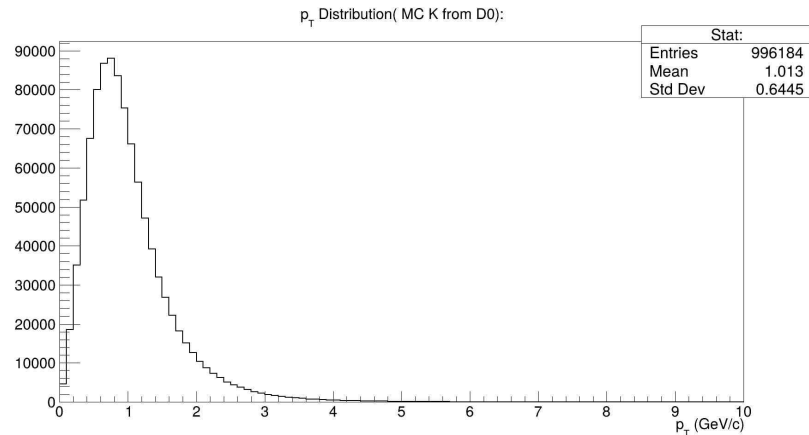
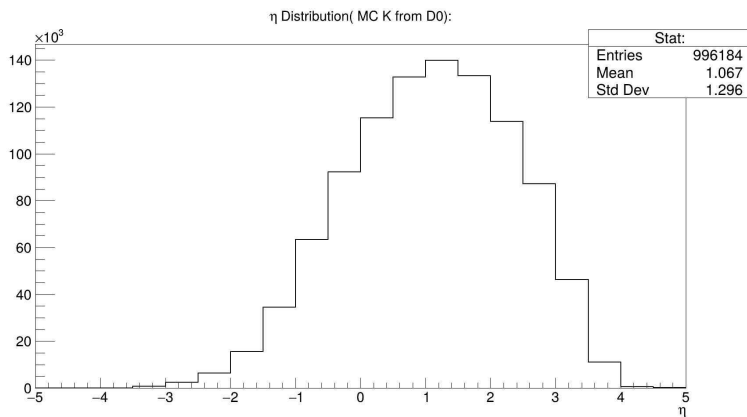
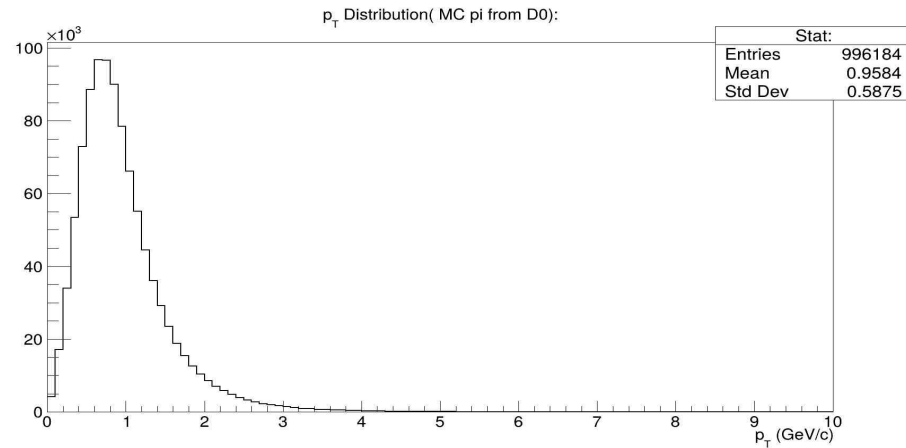
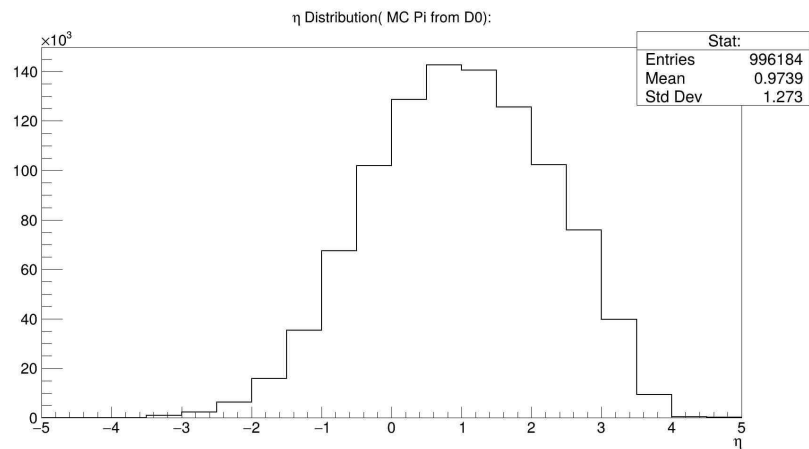
p_T Distribution(MC D0):



Rapidity Distribution(MC D0):

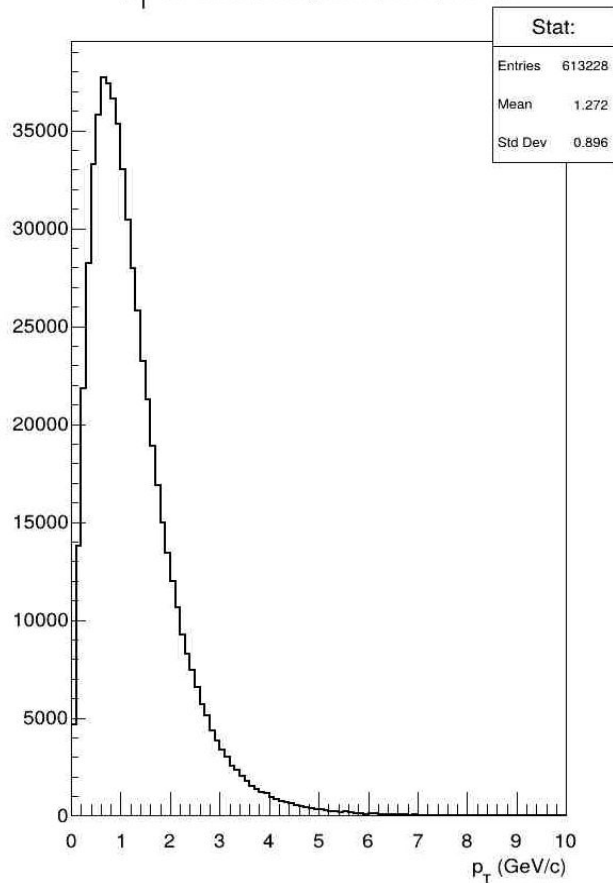


MC Charged pi and K Daughters of D0:

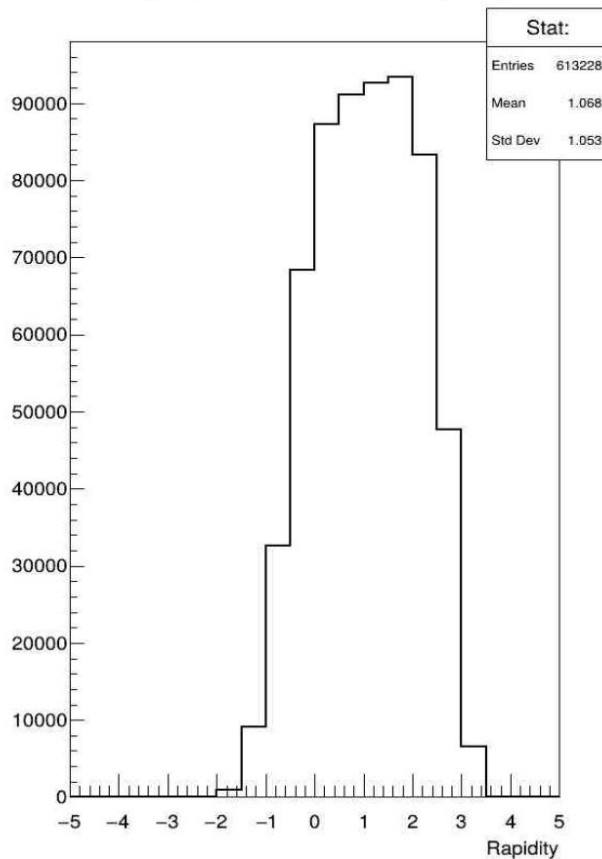


RC Charged pi-k pairs from D0 Parent:

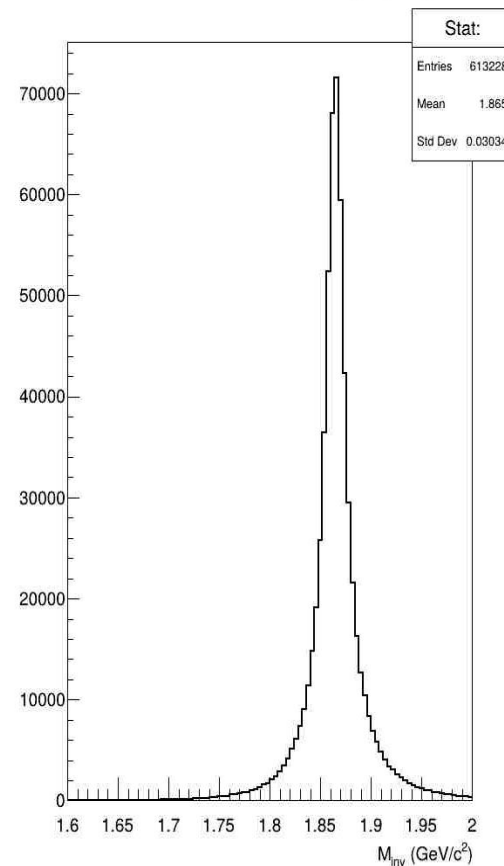
p_T Distribution(RC pi-k pairs):



Rapidity Distribution(RC pi-k pairs):



Invariant Mass Distribution(RC pi-k pairs):



To Do Next:

- Jet Reconstruction using the Anti-KT Algorithm, in order to get pT Jet.
- Calculating the Fragmentation Function.