

D0 Reconstruction using PYTHIA8 Sample

Gurtaj Singh

Supervisor: Prof. Lokesh Kumar

In Collaboration with Shyam Kumar and Rongrong Ma

Department of Physics, Panjab University Chandigarh
Jan 13, 2026

Motivation:

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



the observation of Inclusive Charm Hadrons (like D0) 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:

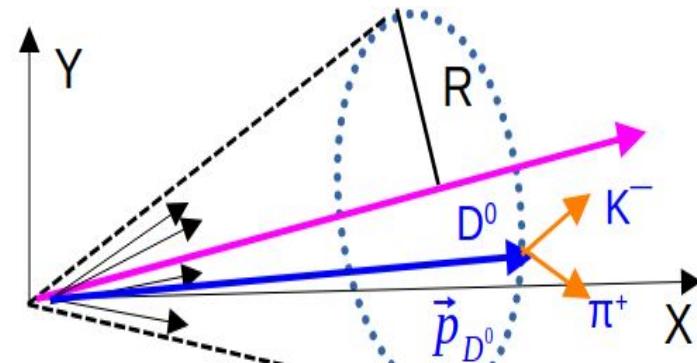
$$pT D0 / pT Jet$$

Data Sample:

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

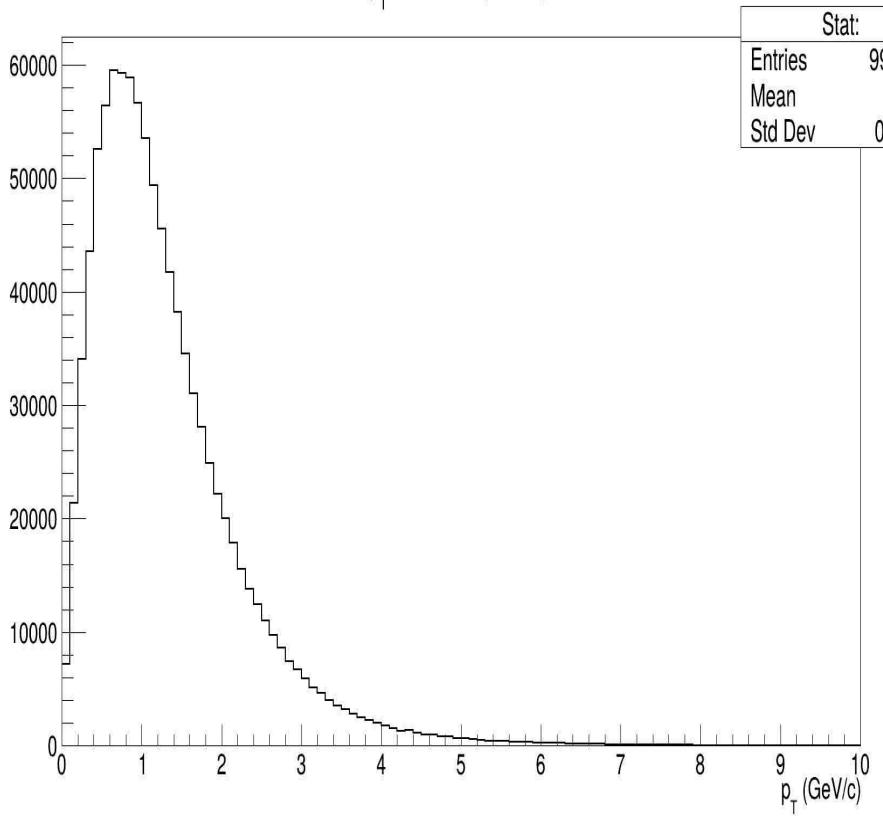
D0 Major Decay Modes:

- $D^0 \rightarrow K^- + \pi^+$ (3.9%)
- $D^0 \rightarrow K^- + \pi^+ + \pi^0$ (14.4%)

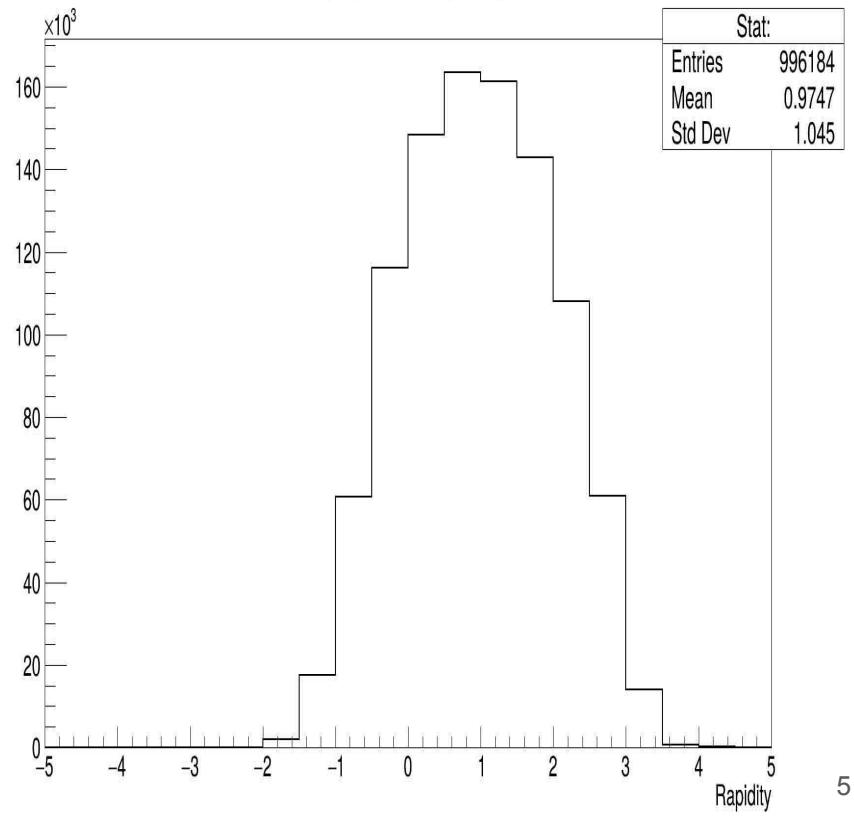


MC D0:

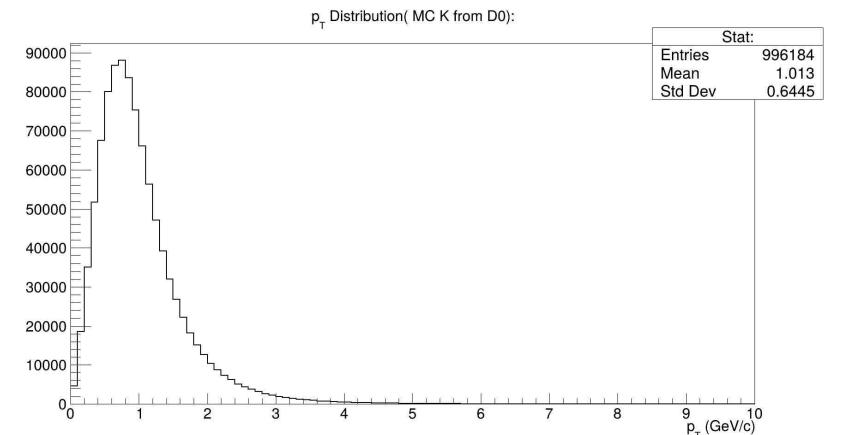
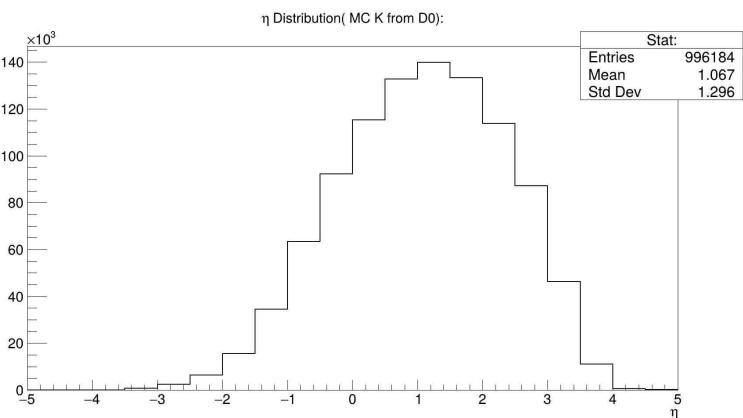
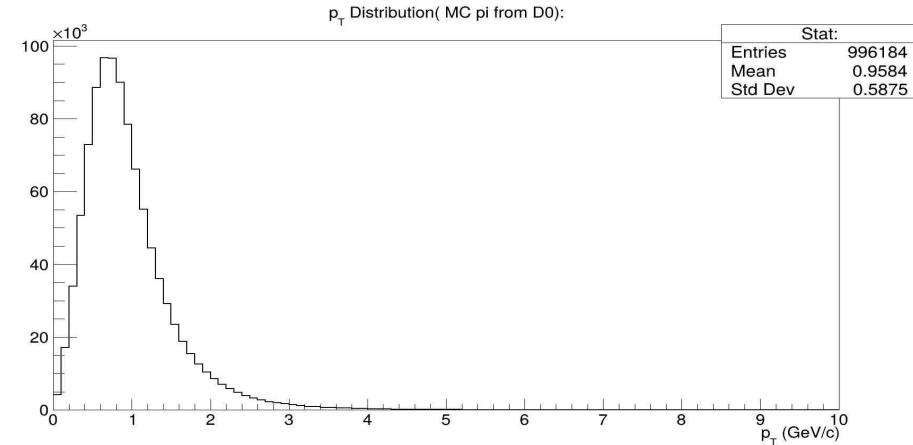
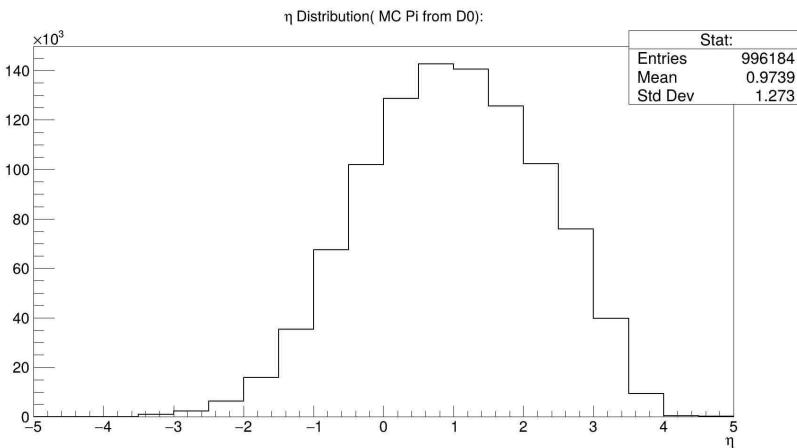
p_T Distribution(MC D0):



Rapidity Distribution(MC D0):

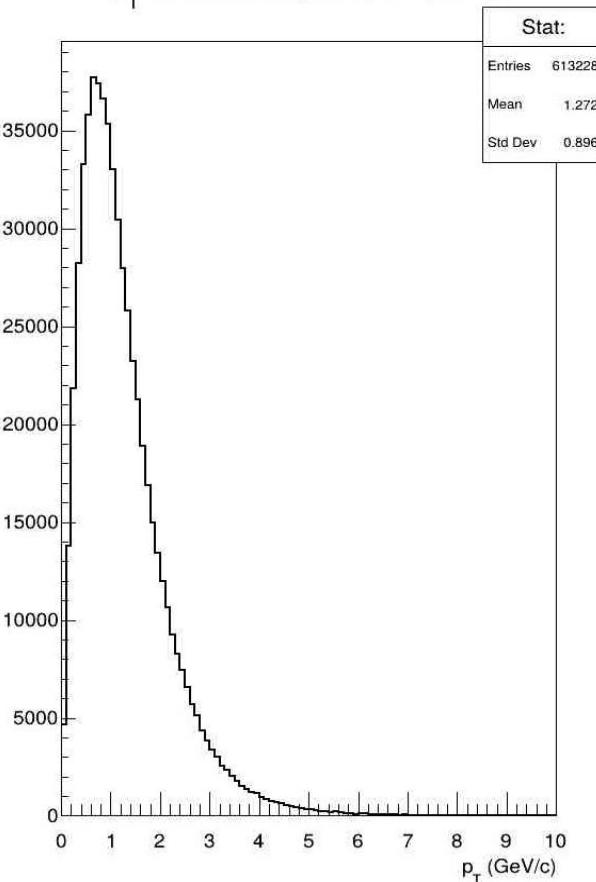


MC Charged pi and K Daughters of D0:

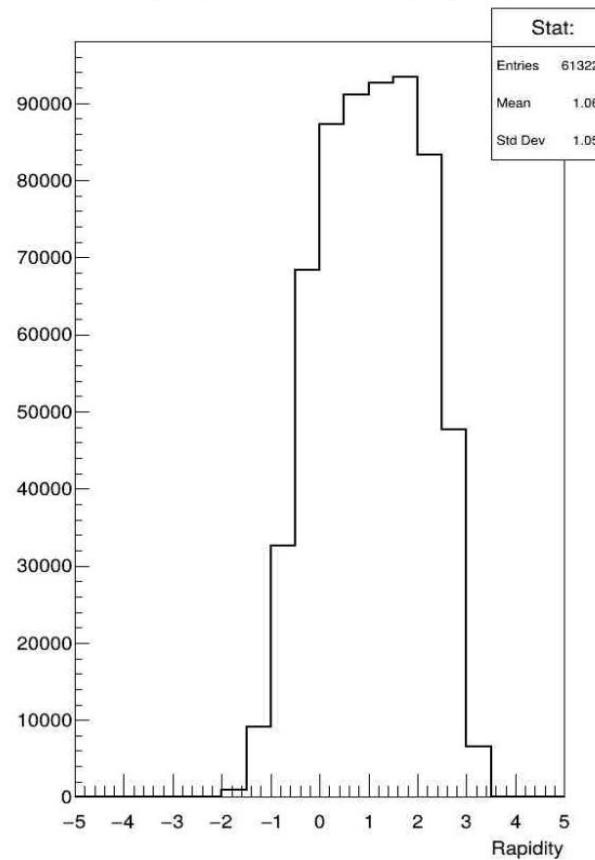


RC Charged pi-k pairs from D0 Parent:

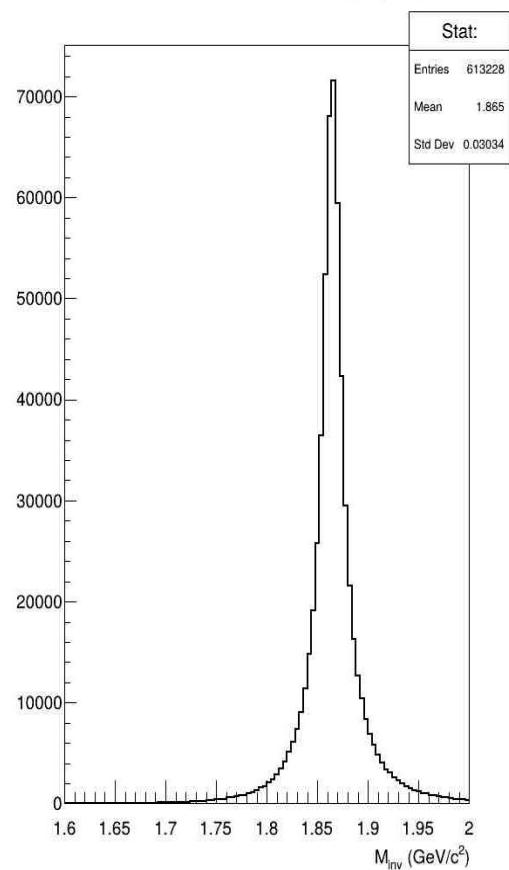
p_T Distribution(RC pi-k pairs):



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.