

# Charm Reconstruction based on $K\text{-}\pi$ Charged Particle ID

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Open Charm LDRD

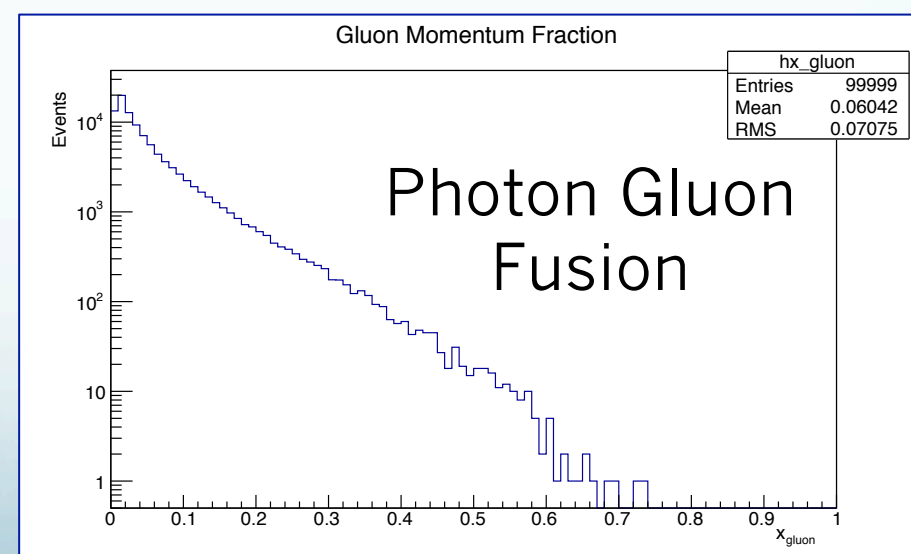
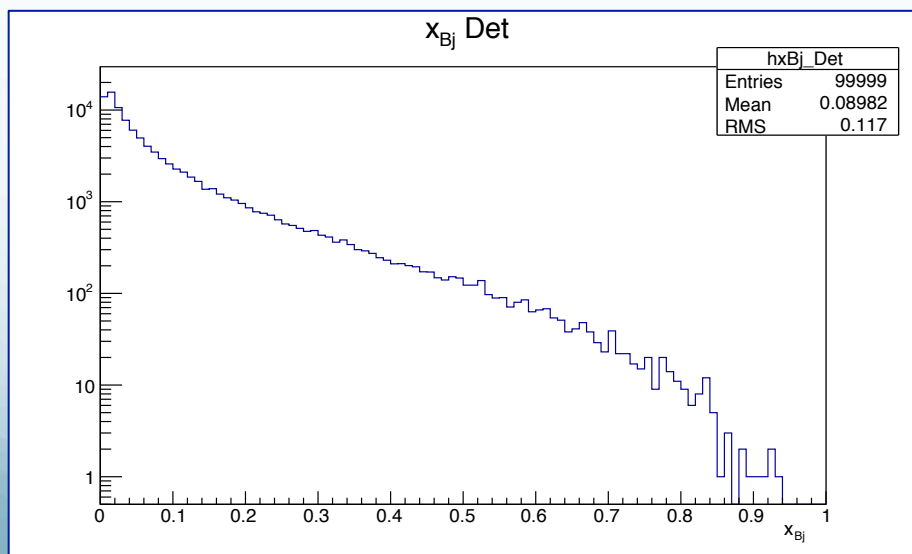
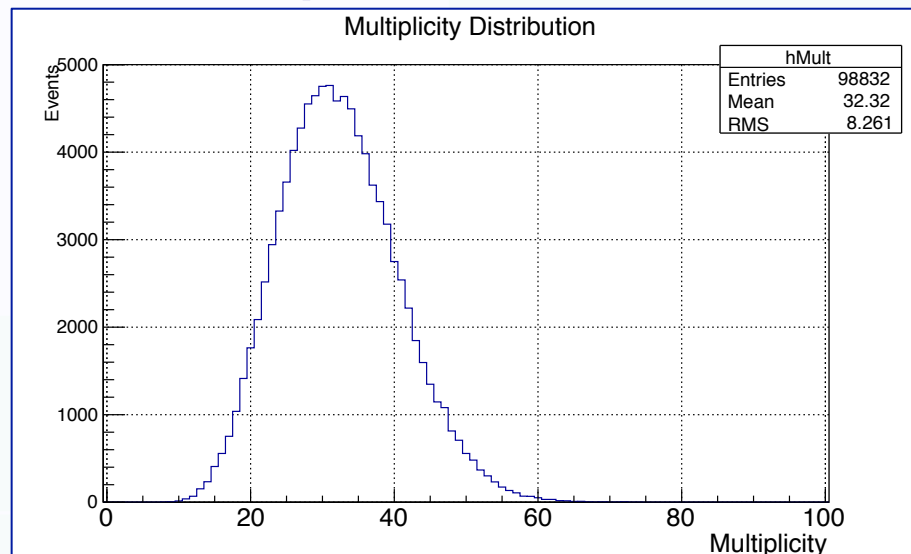
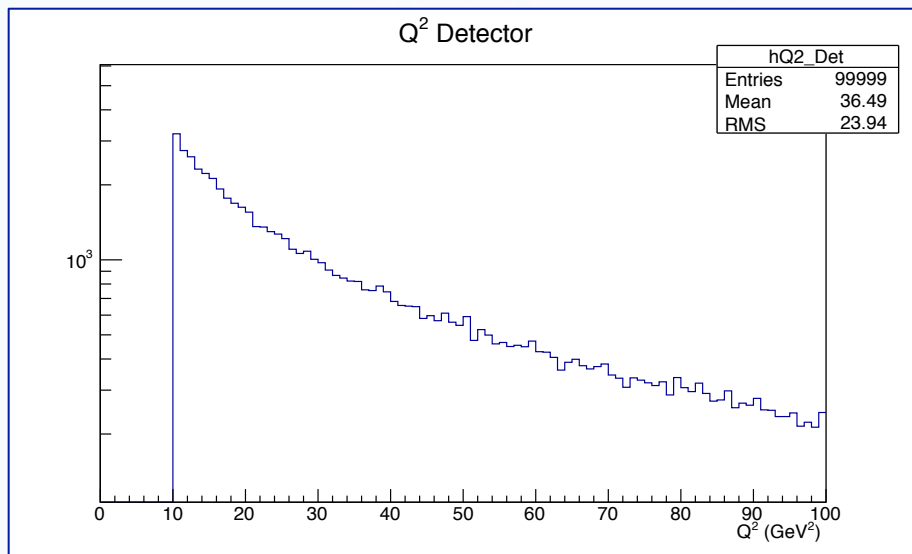
# 100,000 Photon-Gluon Fusion Events from Pythia

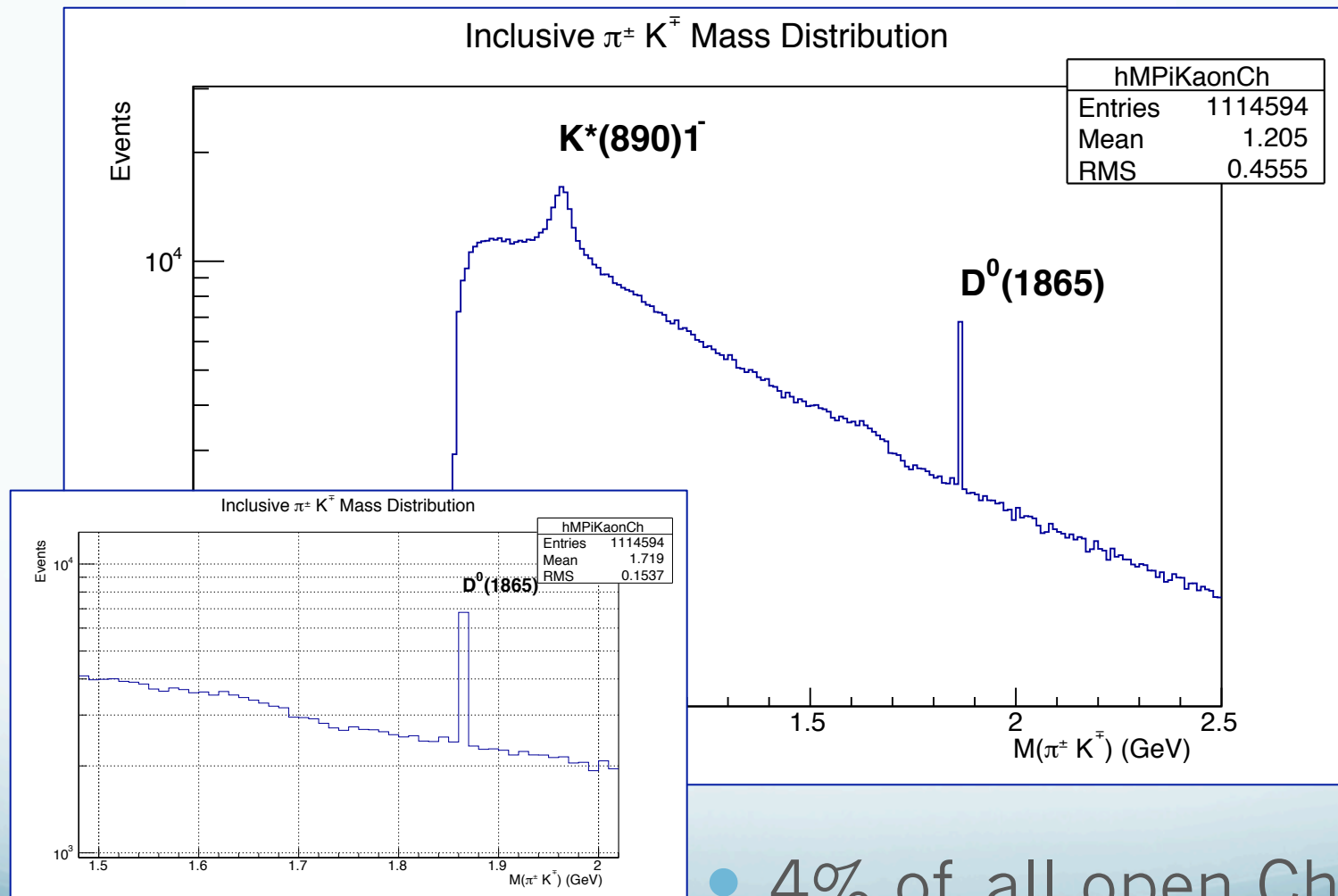
- $Q^2 \geq 10 \text{ GeV}^2$
- No cut on  $x_{Bj}$
- No detector acceptance cuts or resolution effects.
- Assume perfect  $K/\pi$  particle ID.
- No Vertex cut on D or D\*
  - Vertex cut proposed for  $K_S \rightarrow \pi^+\pi^-$
- Backgrounds are photon-gluon fusion combinatorics only, no Minimum Bias DIS.

# $D^0$ and $D^\pm$ Reconstruction

- Search for pure charged particle decay modes.
- $D^0(1865)$ 
  - $\rightarrow K^- \pi^+$  3.9%
  - $\rightarrow K^0_S \pi^+ \pi^-$  2.8%  $\otimes$   $K^0_S \rightarrow \pi^+ \pi^-$  62%
- $D^+(1870)$  or  $D^- \rightarrow$  charge conjugate state
  - $\rightarrow K^- \pi^+ \pi^+$  9.5%
  - $\rightarrow K^0_S \pi^+ \pi^+$  2.8%  $\otimes$   $K^0_S \rightarrow \pi^+ \pi^-$  62%

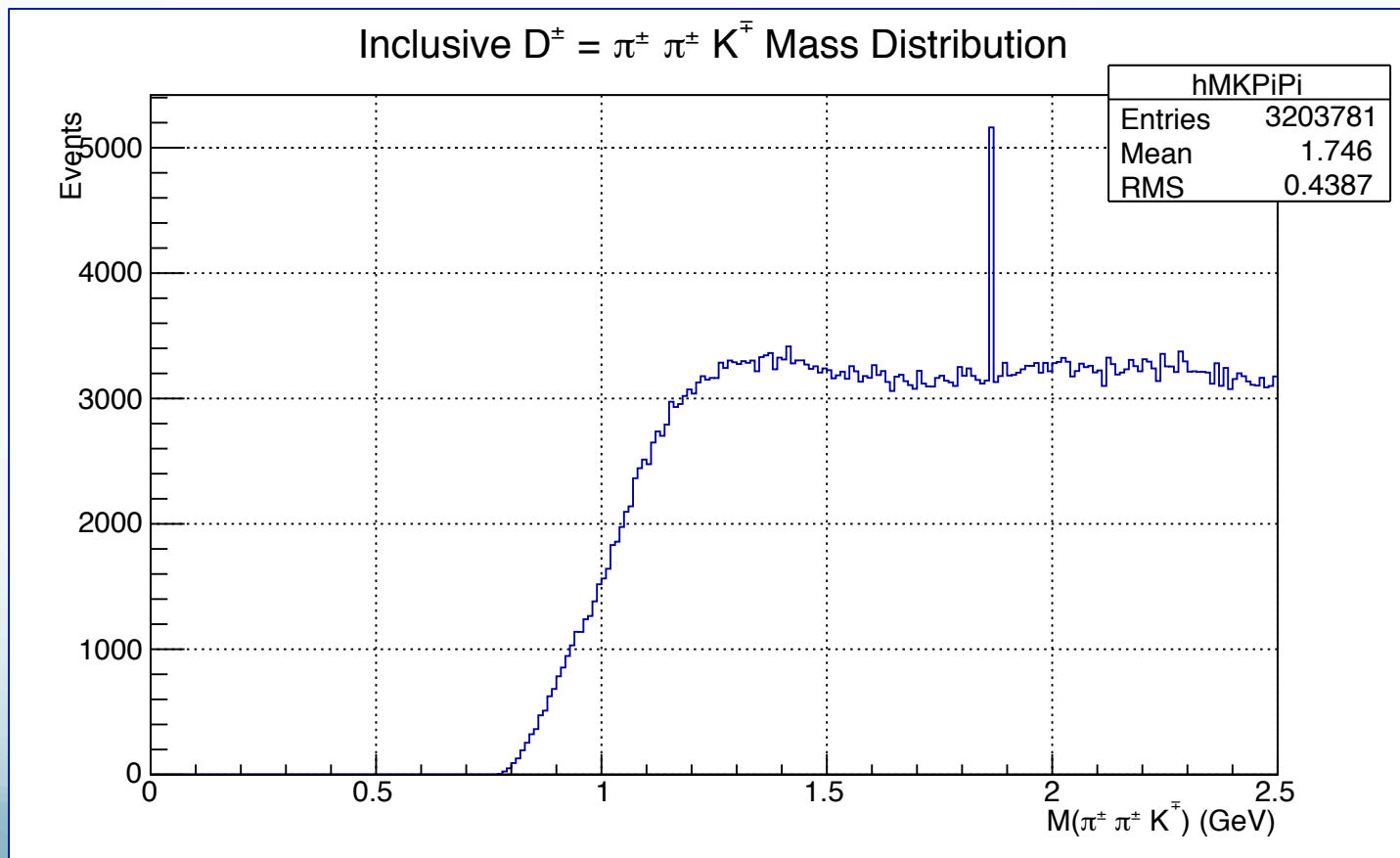
# Kinematic Sample



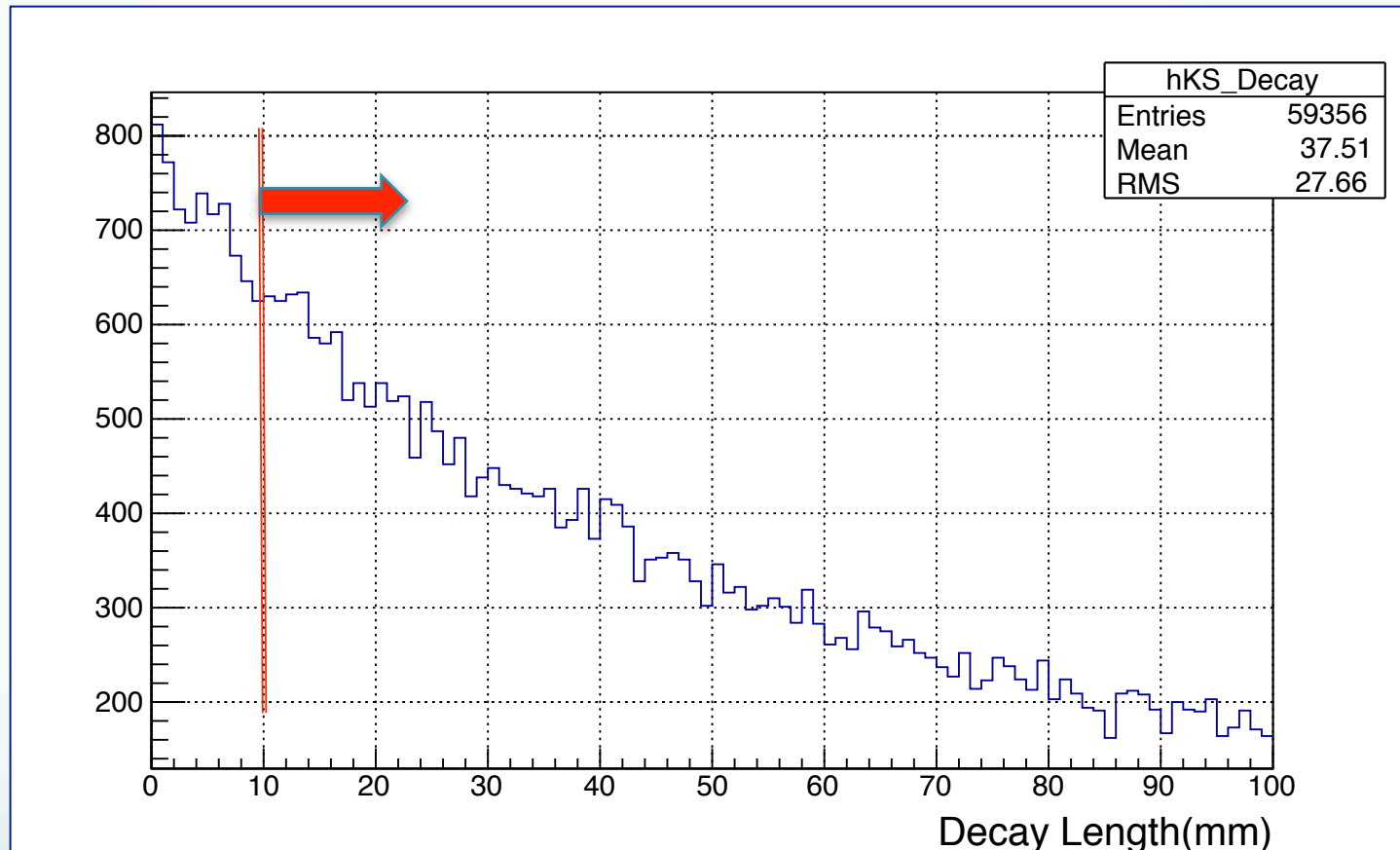


$$D^{\pm}(1870) \rightarrow K^{\mp} \pi^{\pm} \pi^{\pm}$$

- 2% of all open charm events



# K-Short Decay Distribution



- A  $L > 10$  mm cut is easy to achieve, and will eliminate only a small fraction of K-Short candidates

# In progress

- Suppress combinatorial background from  $K_S$  decays in previous plots.
- $D \rightarrow K_S^0 \pi\pi$  Reconstruction (only  $\sim 2\%$ )
- $P_{perp}(D)$  distributions relative to event-by-event  $\gamma^*+P$  light-cone axis



# Future

- Semi-Analytic Resolution smearing
- Semi-Analytic PID performance
- Minimum Bias DIS combinatorial background
- xBj Selection
- Leptons from Charm vs Min Bias Leptons
- Particle distributions