Charm Reconstruction based on K-π Charged Particle ID

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Open Charm LDRD

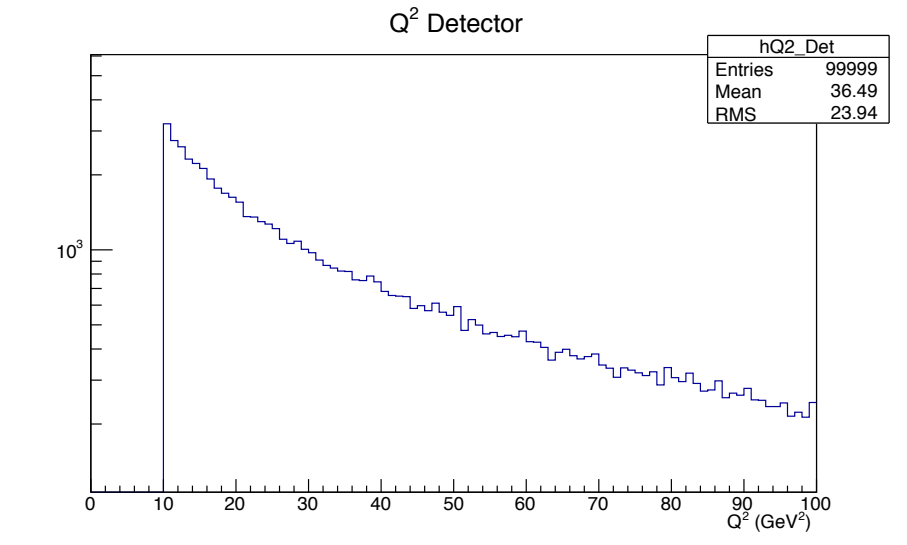
100,000 Photon-Gluon Fusion Events from Pythia

- $Q^2 \geq 10$ GeV^2
- No cut on x_{Bj}
- No detector acceptance cuts or resolution effects.
- Assume perfect K/π 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.

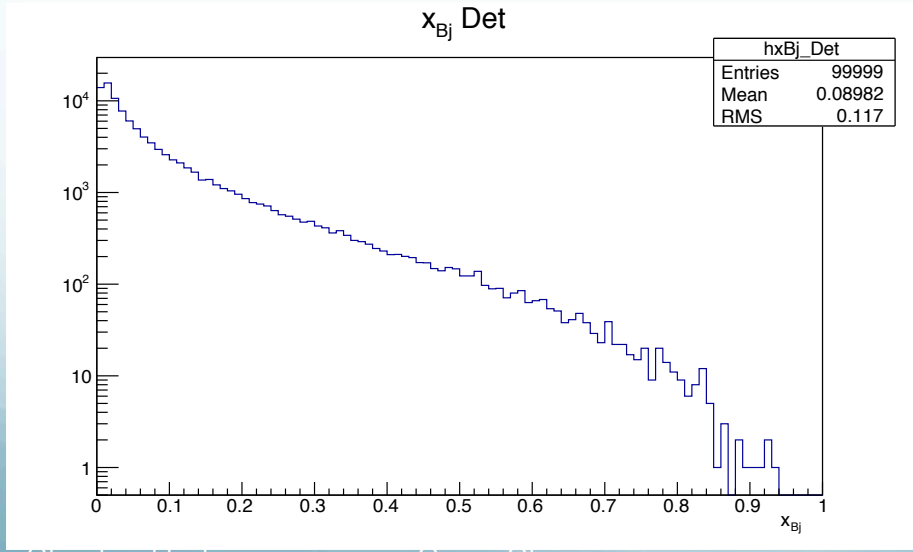
D^0 and $D^{\pm}$ Reconstruction

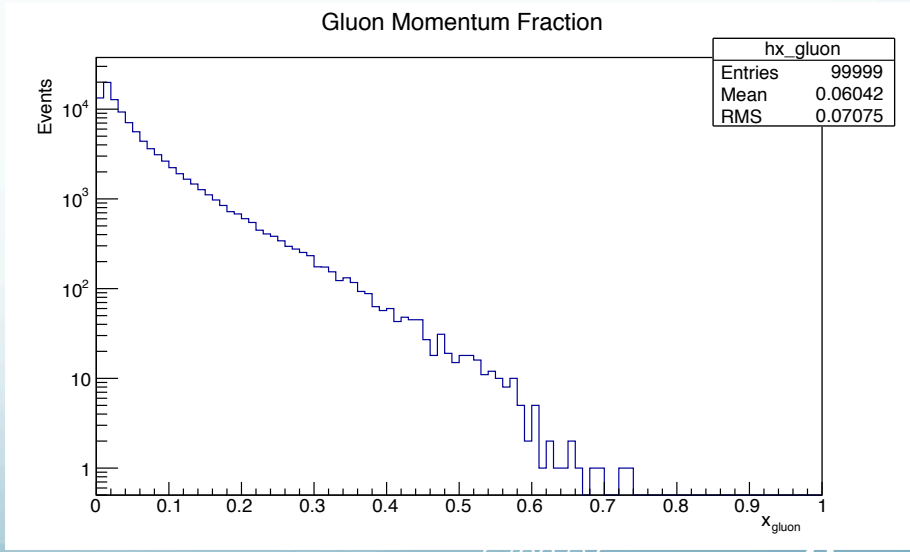
- Search for pure charged particle decay modes.
- *$D^0(1865)$*
  - → $K^- \pi^+$ 3.9%
  - → $K^0_S \pi^+\pi^-$ 2.8% ⊗ $K^0_S \rightarrow \pi^+\pi^-$ 62%
- *$D^+(1870)$* or *D^-* → charge conjugate state
  - → $K^- \pi^+\pi^+$ 9.5%
  - → $K^0_S \pi^+\pi^+$ 2.8% ⊗ $K^0_S \rightarrow \pi^+\pi^-$ 62%

Kinematic Sample

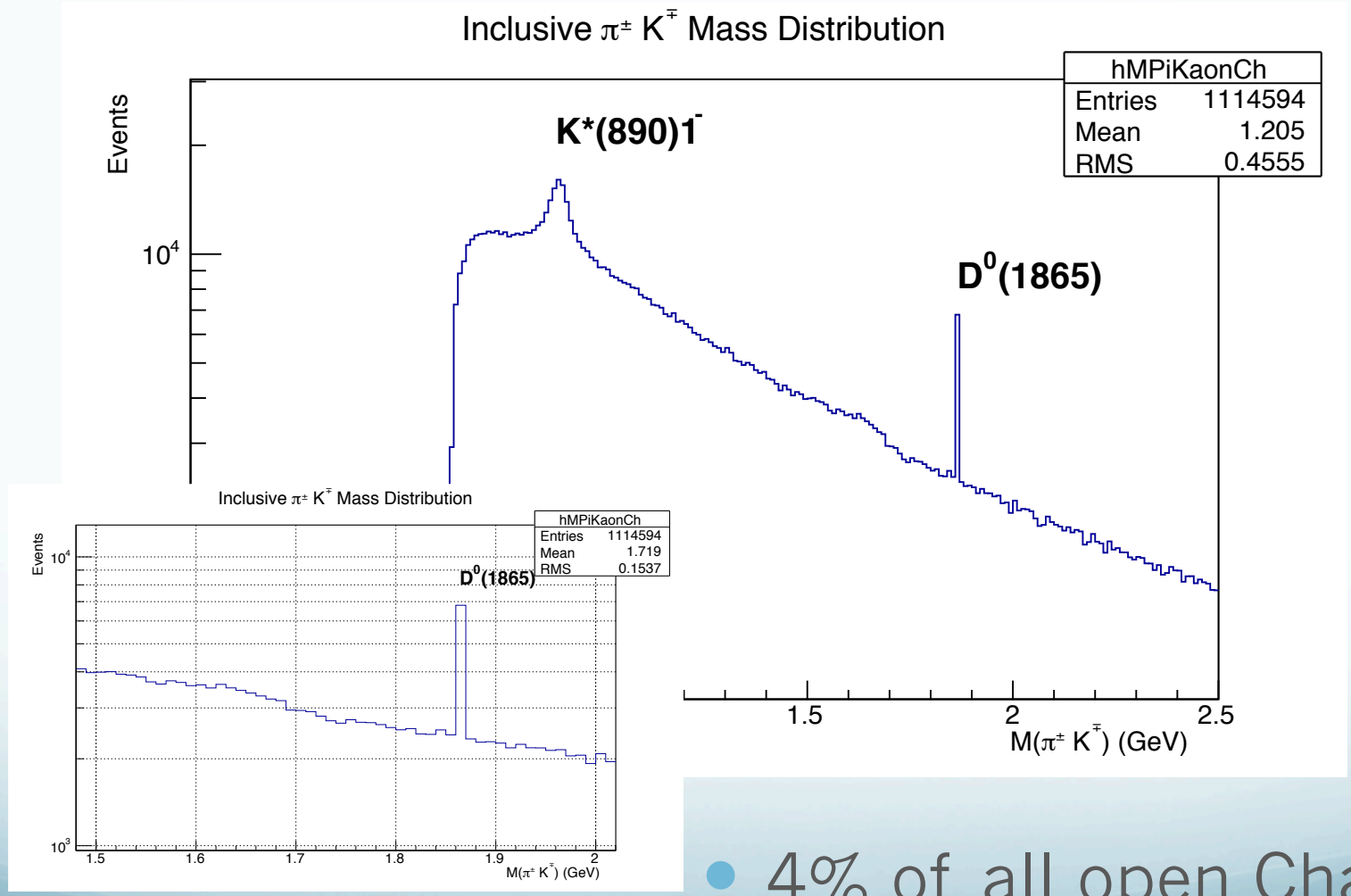


Photon Gluon Fusion





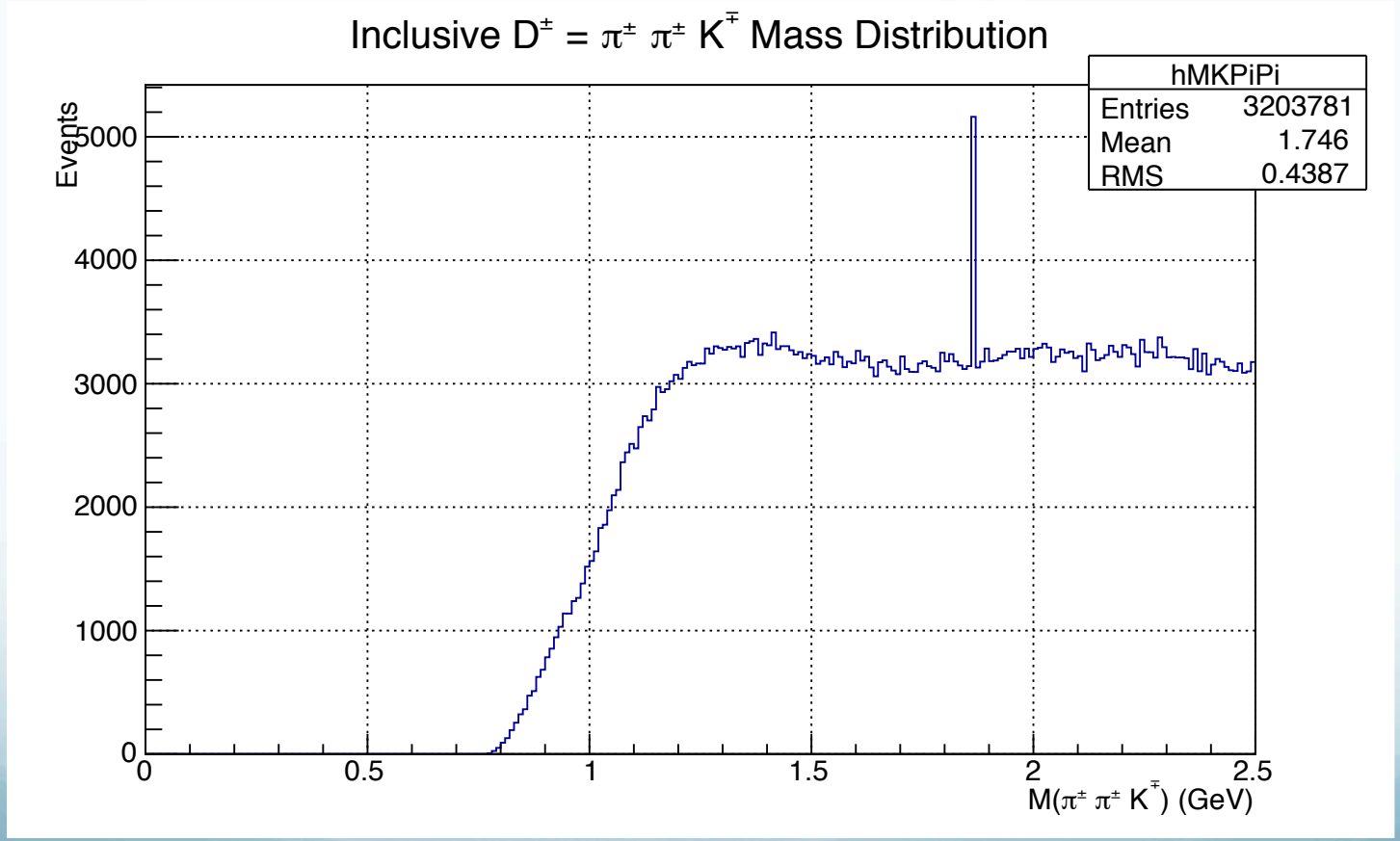
$D^0(1865) \rightarrow K^- \pi^+$



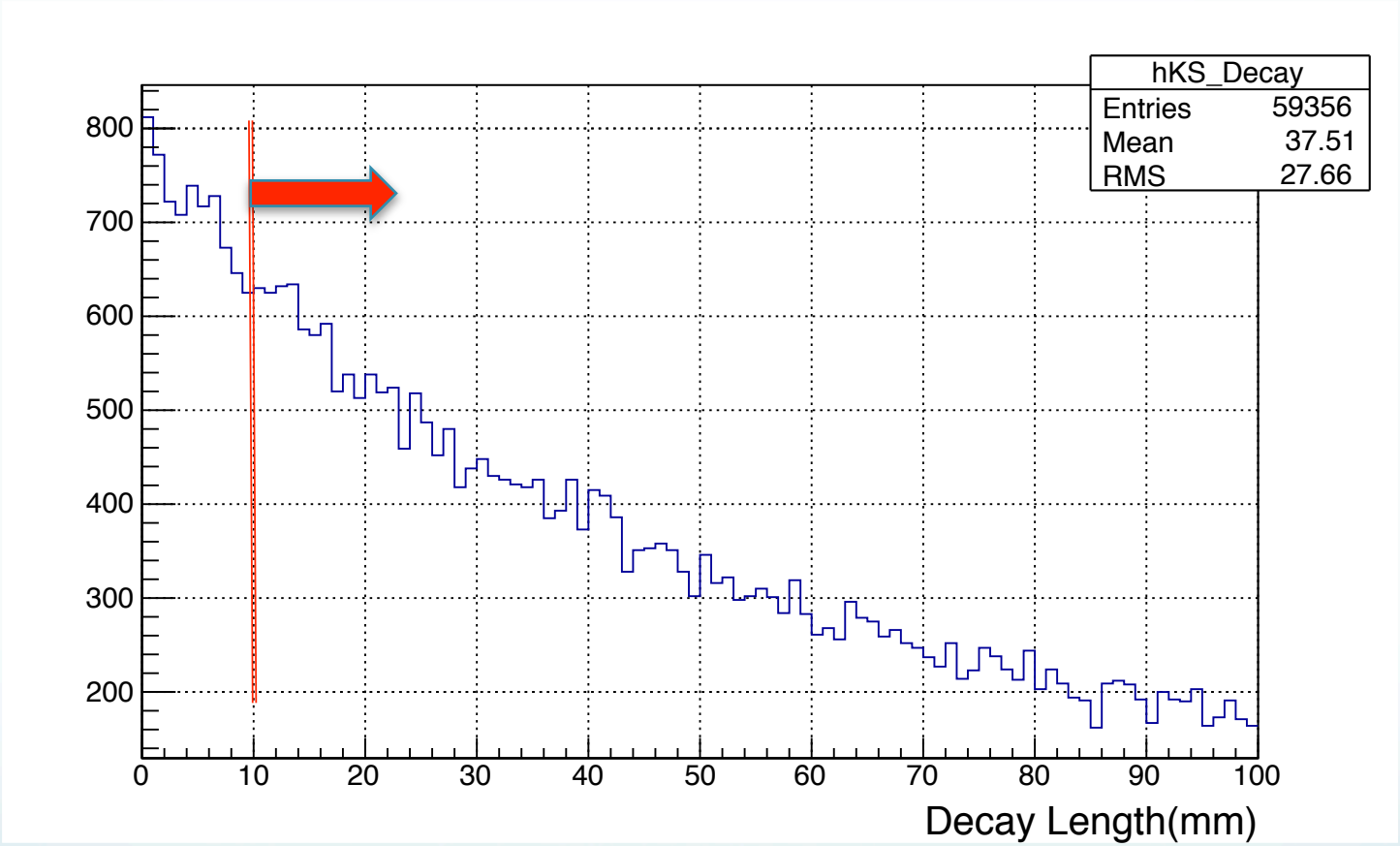
- 4% of all open Charm!

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

- 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.
- $D \rightarrow K^0_S \pi\pi$ Reconstruction (only ~ 2%)
- $P_{perp}(D)$ distributions relative to event-by-event $q+P$ 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