Measurement of the bb cross section using $B \rightarrow \mu D^0 X$

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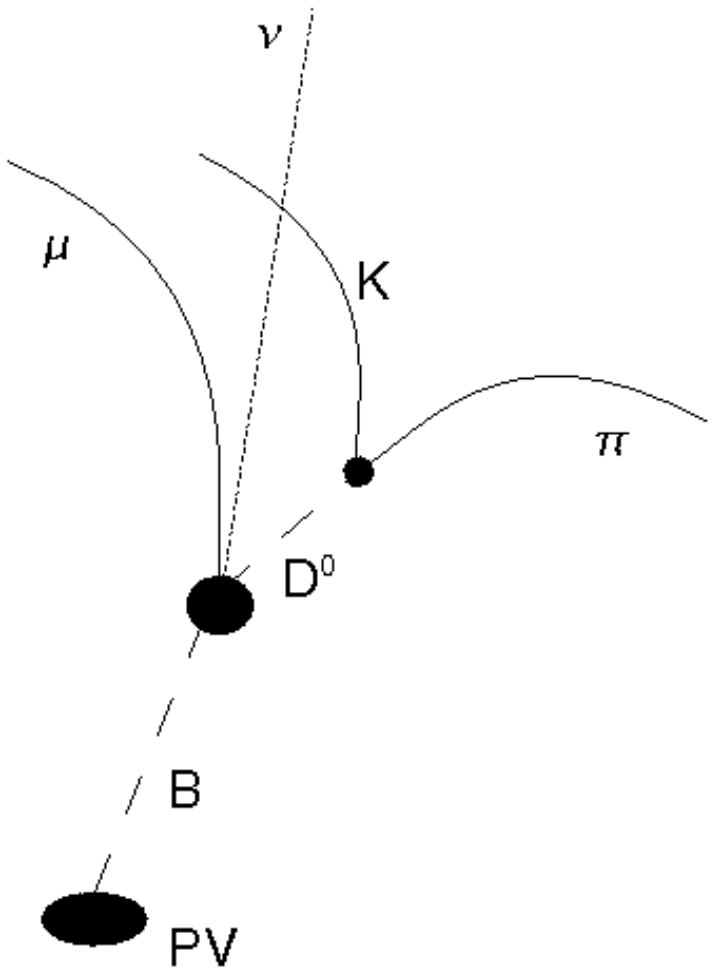
Motivation

- Heavy flavor quark production provides a good test of pQCD
- *b* quarks make up a background (or potential signal) for many other measurements
  - Higgs boson, top quark, new physics

Cross-Section Measurement

- Measure bb cross section using $B \rightarrow \mu D^0 X$, $D^0 \rightarrow K\pi$
- Cover large range in p_T, $|\eta|$
- Overlap with LHCb measurement ($2.0 < |\eta| < 6.0$)

  (doi: 10.1016/j.physletb.2010.10.010)
- Limited to data from 2010
  - Require low p_T single muon trigger – quickly prescaled
- QCD Monte Carlo using Pythia6 (D6T tune)



Cross-Section Measurement

Differential cross section:

$$\frac{d\sigma}{dp_T} = \frac{N(\mu D^0)}{L * \varepsilon * B * \Delta p_T} \qquad \frac{d\sigma}{d\eta} = \frac{N(\mu D^0)}{L * \varepsilon * B * \Delta \eta}$$

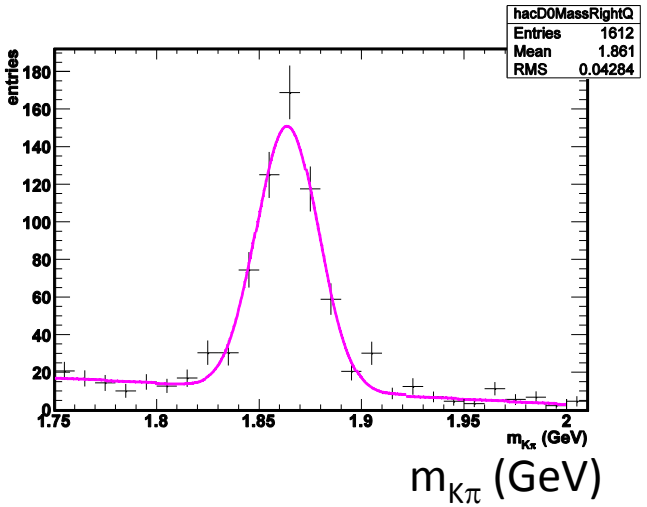
N: # reconstructed μD^0 candidates
L: luminosity *B*: branching ratio
ε: efficiency Δp_T, $\Delta \eta$: bin width

Luminosity
RunA: 285 nb^{-1}
RunB: 24 pb^{-1}
MC: 1.23 pb^{-1}

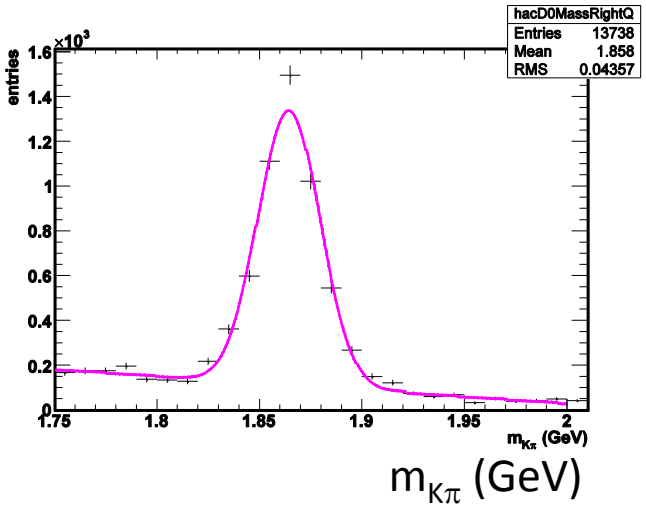
Efficiency
$\varepsilon = \varepsilon_{acc} * \varepsilon_{sel} * \varepsilon_{trig}$
$\varepsilon_{acc} * \varepsilon_{sel} = \varepsilon_{cut}$
ε_{trig} applied by weighting events

D^0 Invariant Mass Fits

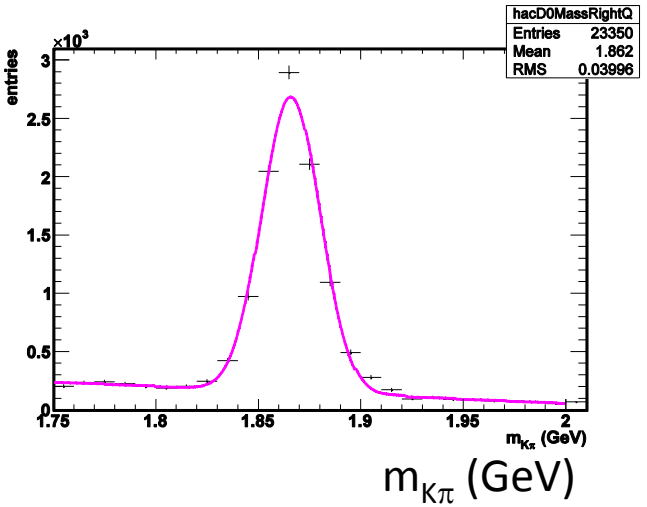
- Fit invariant mass distribution with a linear background plus Gaussian signal
  - Get number of D^0's from signal fit → N(μD^0) reconstructed
  - Do in bins of p_T and η
- Working on systematics now



Run 2010A



Run 2010B



MC