Update on Charm/Bottom Separation

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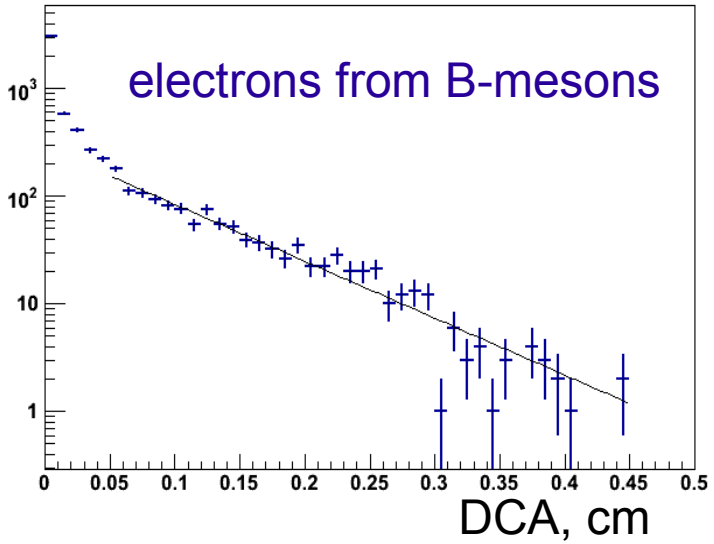
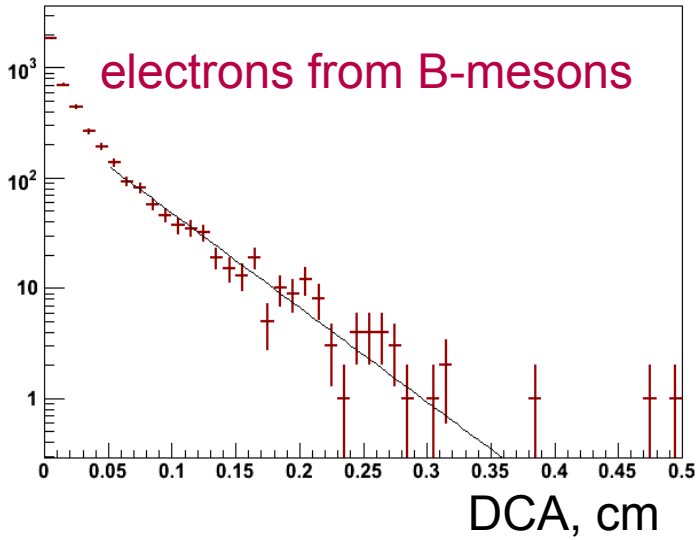
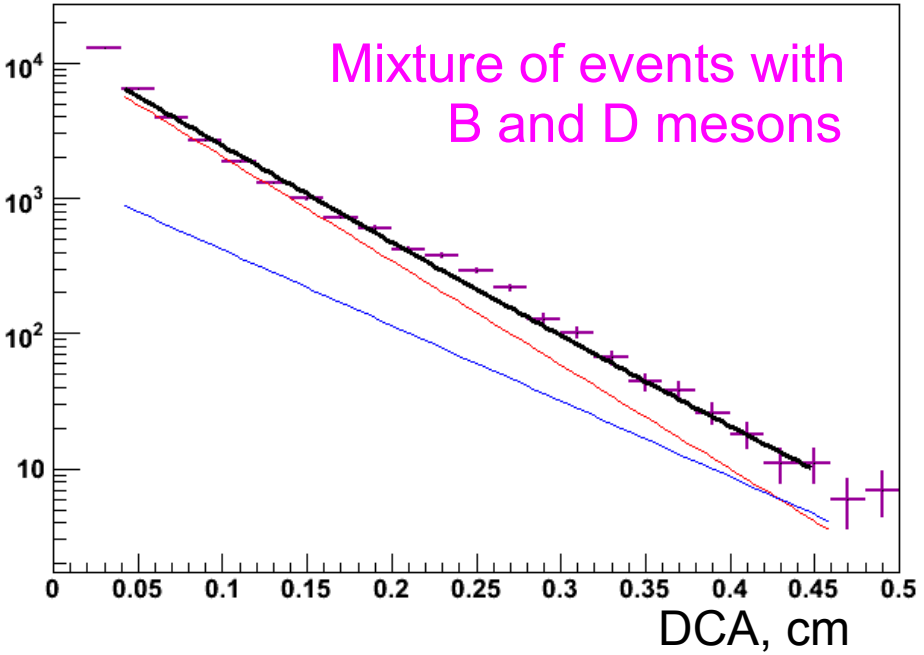
Reminder

- Embed electrons from B and D meson decays in p+p PYTHIA events
- Run full simulation and reconstruction, DCA from Kalman Fit
  - Fit DCA distributions for charm and bottom separately with an exponential for each pT bin, obtain slopes.
- Mix events with charm and bottom, fit DCA distribution for the mixture with two exponentials with the slopes from previous step (for each pT bin).

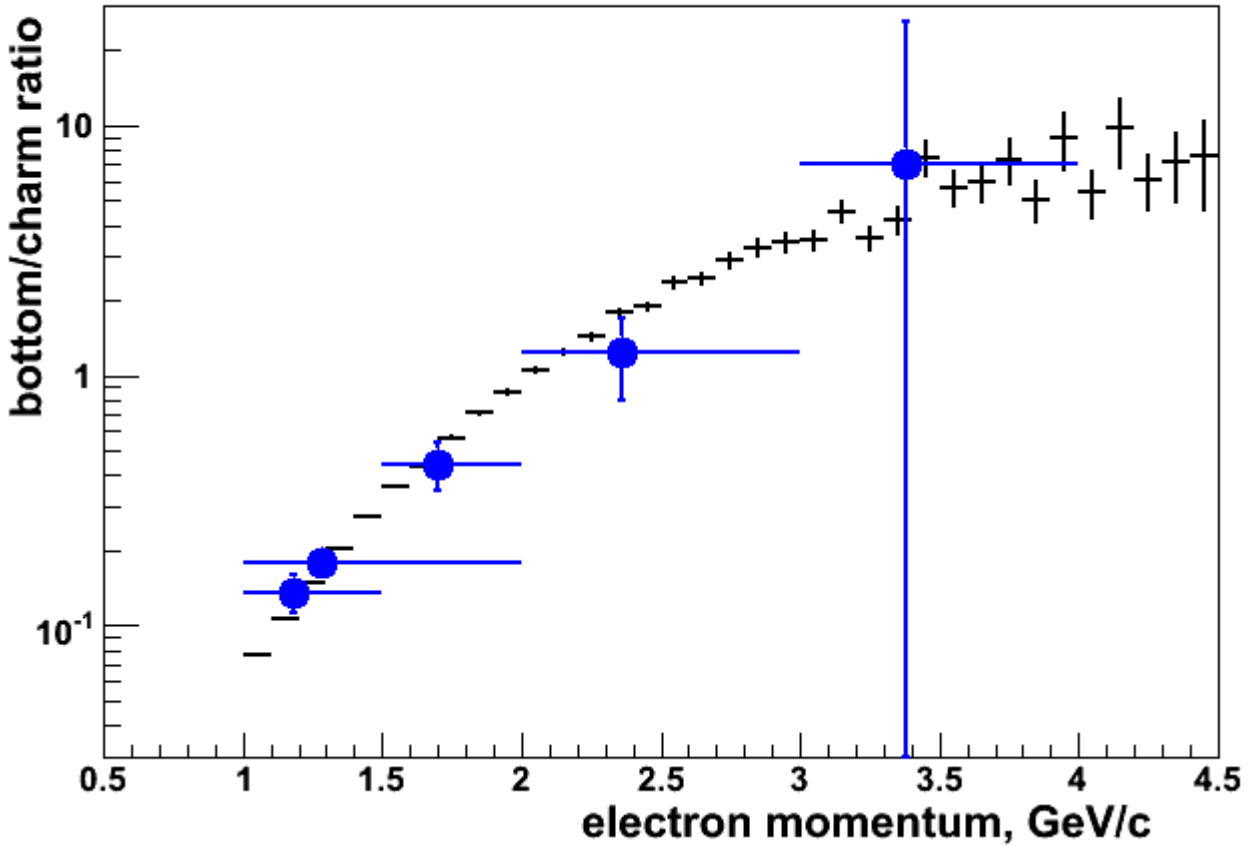






August Result

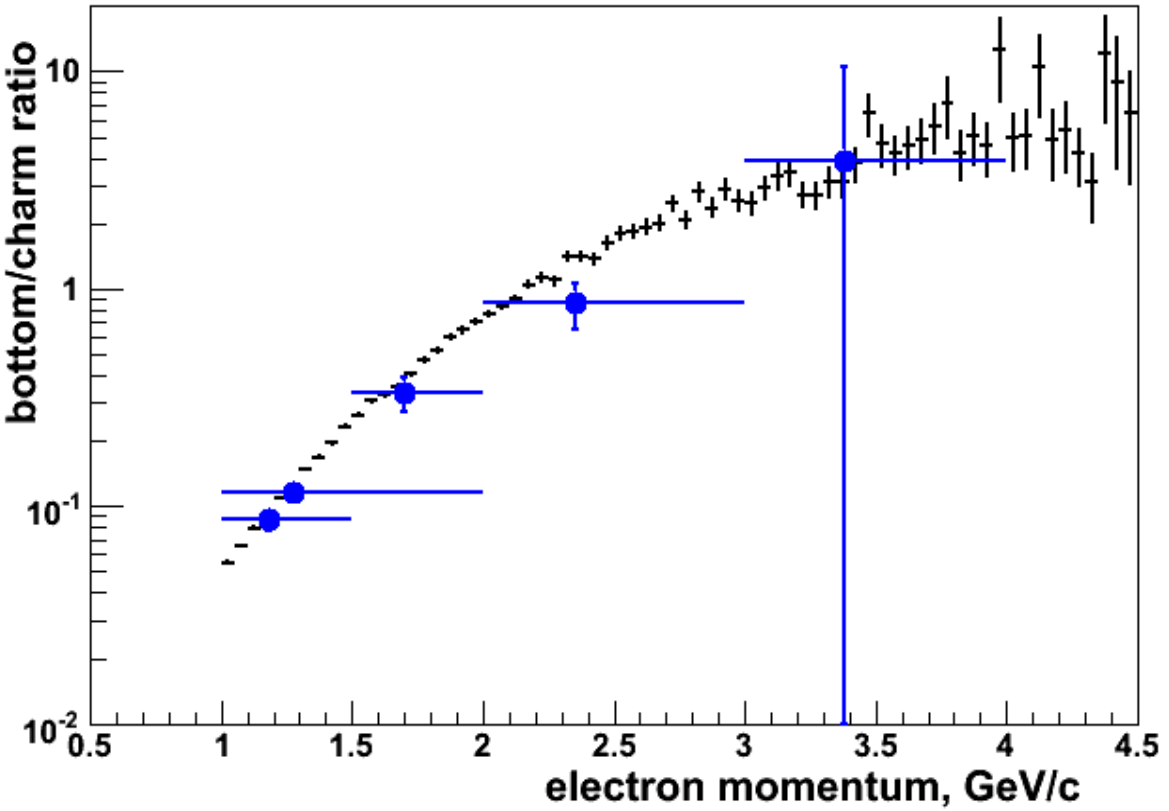
Black: true bottom/charm ratio (from fkin table)
Blue: reconstructed bottom/charm ratio



Two bugs were found since then (volume overlap, and big wheel cover thickness). Fixed the bugs, re-run simulation and reconstruction.

New Result

Black: true bottom/charm ratio (from fkin table)
Blue: reconstructed bottom/charm ratio



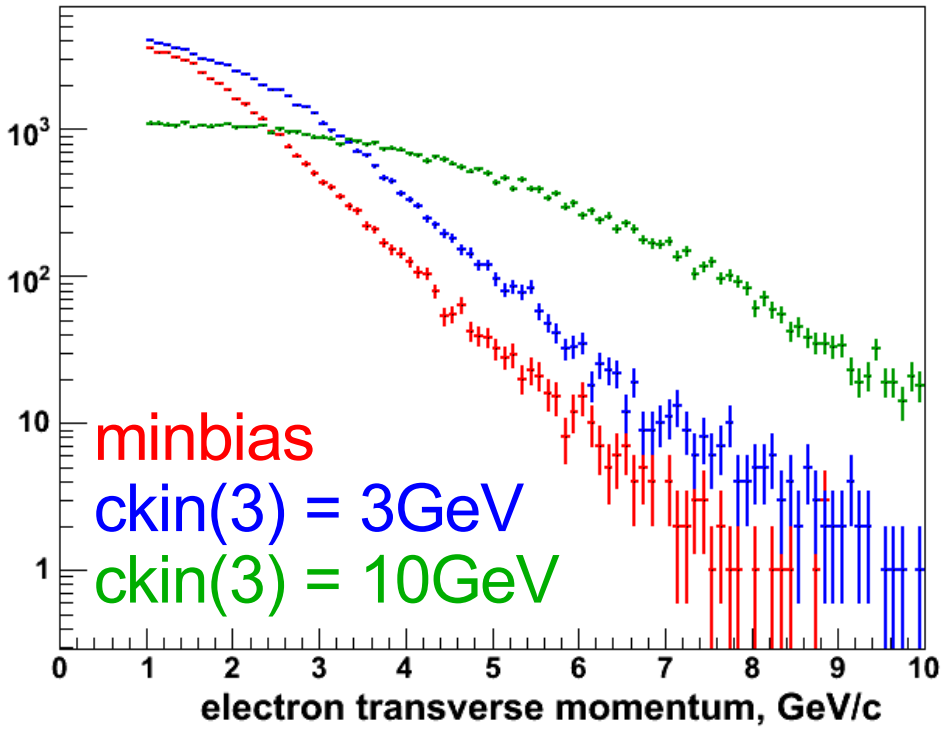
No changes, as expected, these bugs did not affect the procedure.

Assumptions: a) we know pT distributions for B and D mesons
b) signal embedded in every event, so the background is small

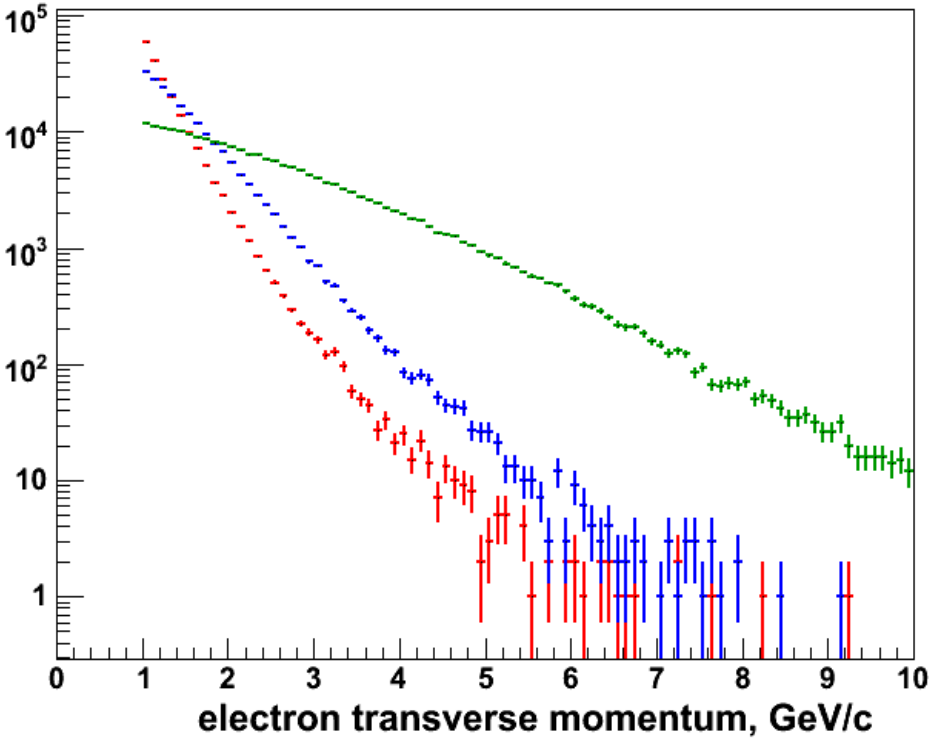
Two new data sets

- Generated PYTHIA events with ckin(3) = 3GeV and ckin(3) = 10GeV in order to see how knowledge of pT distribution affects the procedure

electrons from B mesons

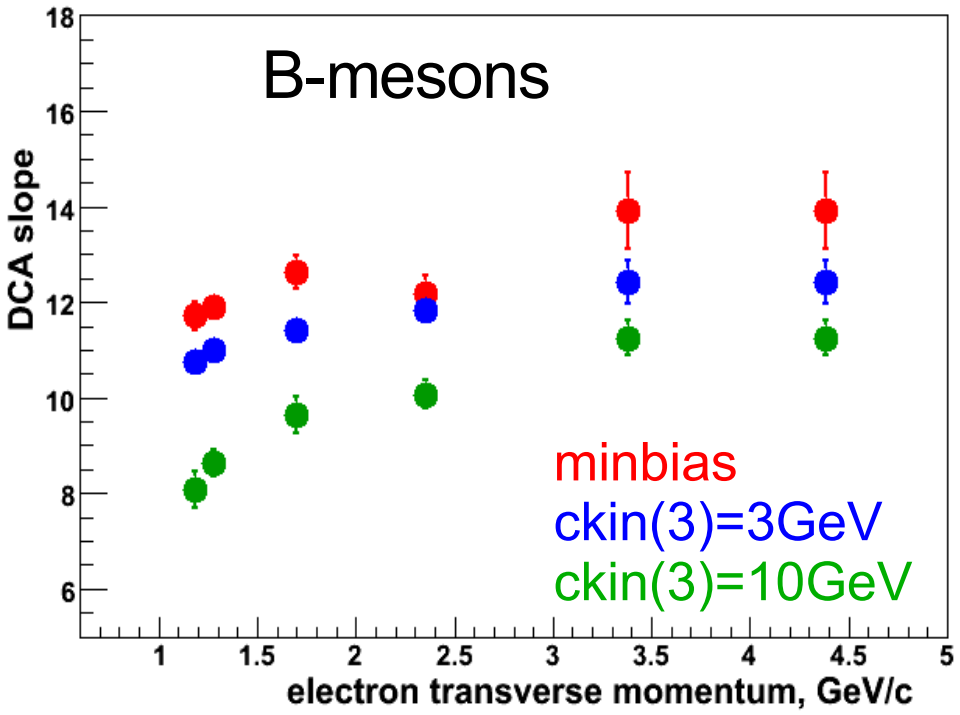


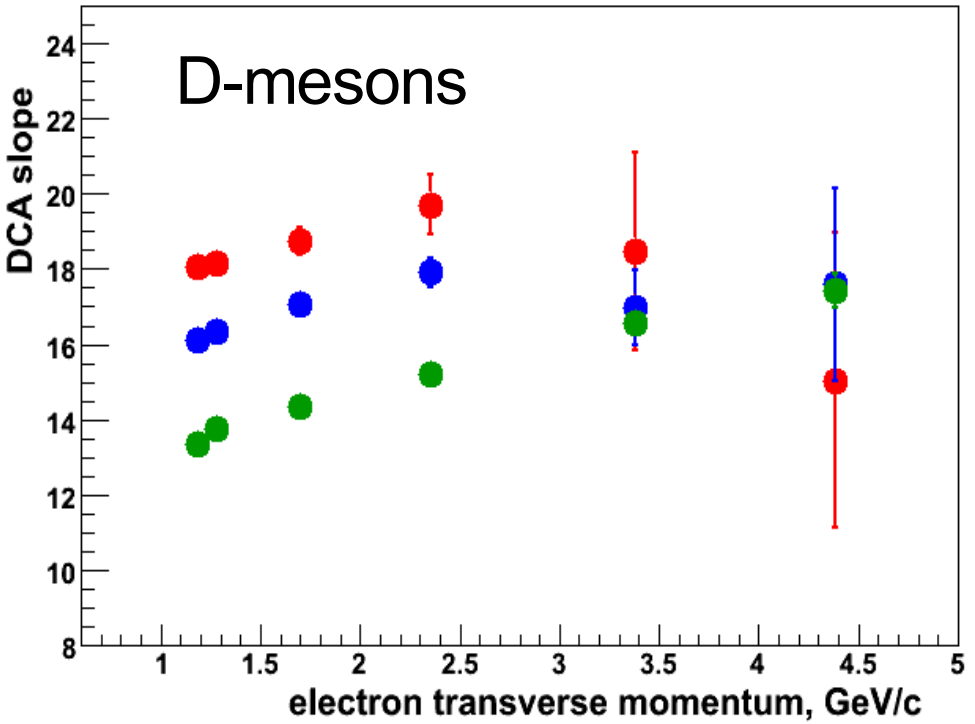
electrons from D mesons



DCA Slopes

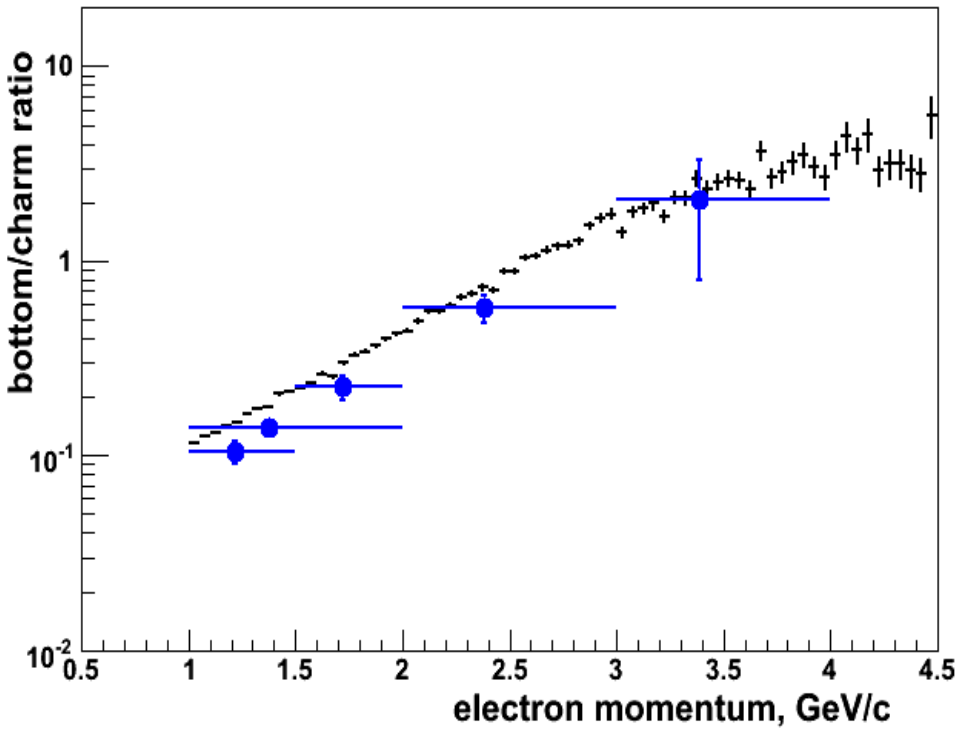
- Initially, slopes seemed to be almost pT independent, but with more statistics one can see that the slope increases with increasing pT.
- Slope depends on pT distribution of B/D mesons.
- First attempt to use slopes from one dataset to separate charm and bottom from another one failed (points jump all over the place).

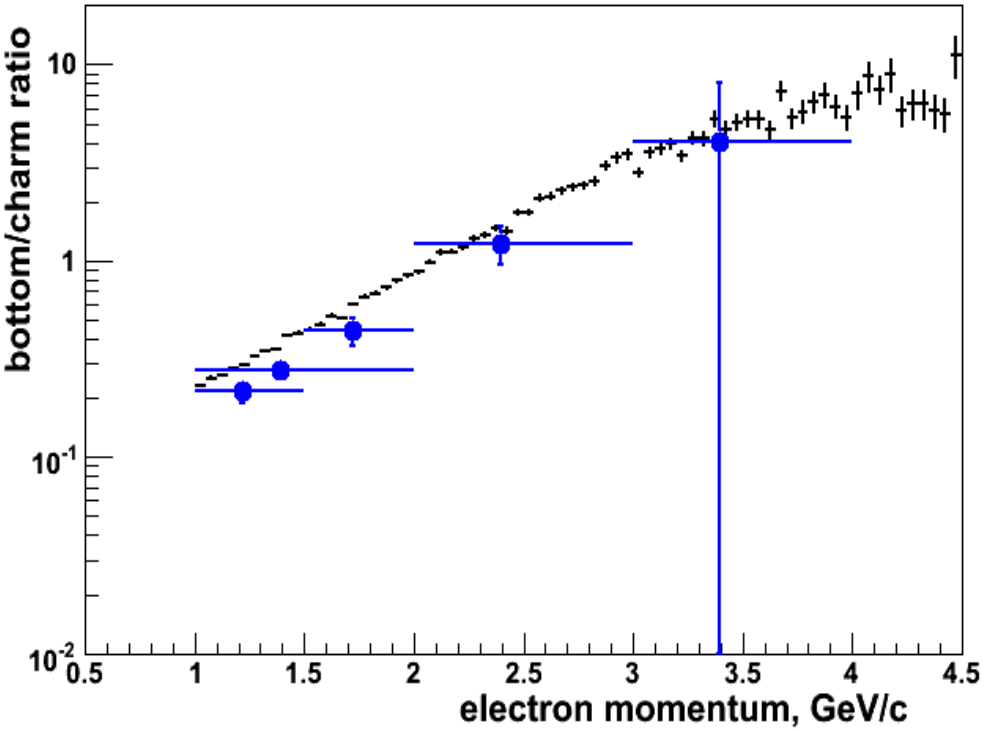




ckin(3)=3GeV

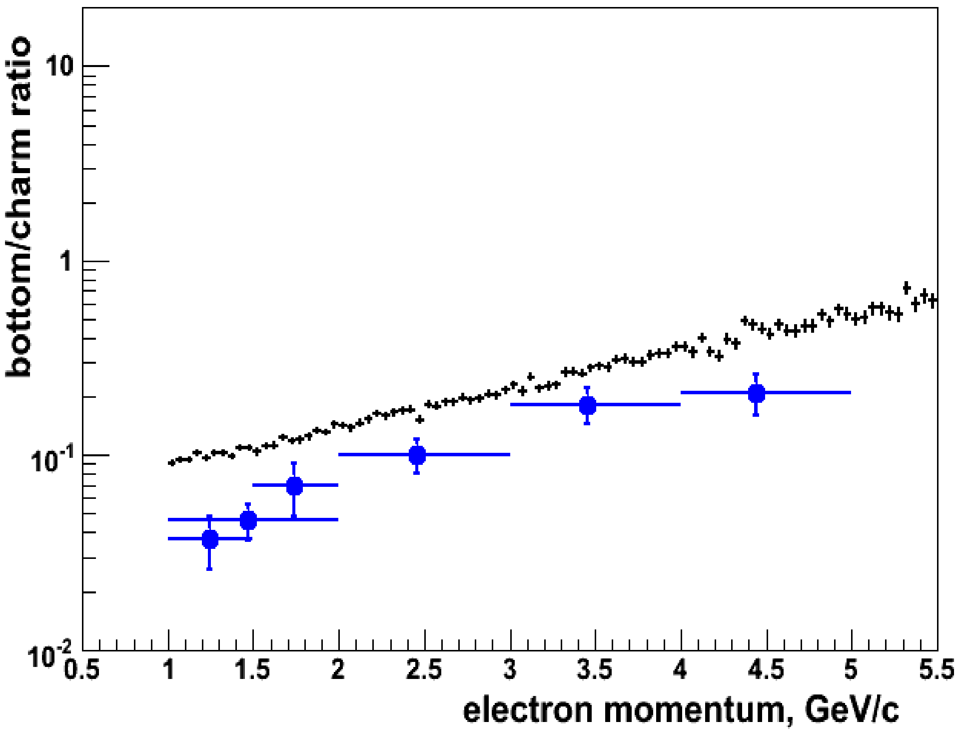
The two plots have different charm/bottom mixture

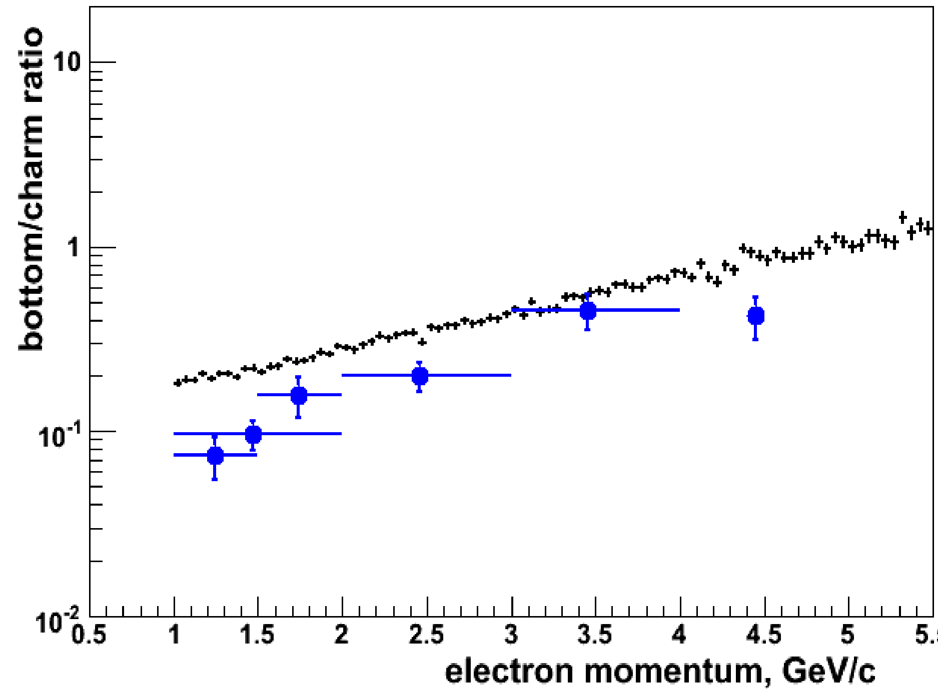


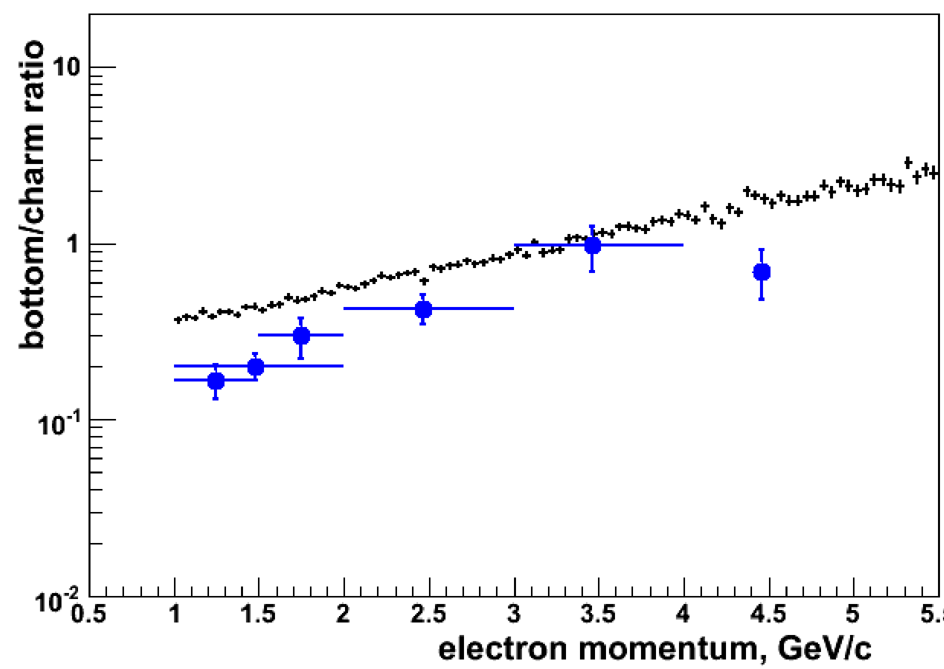


ckin(3)=10GeV

The plots have
different charm/bottom mixture

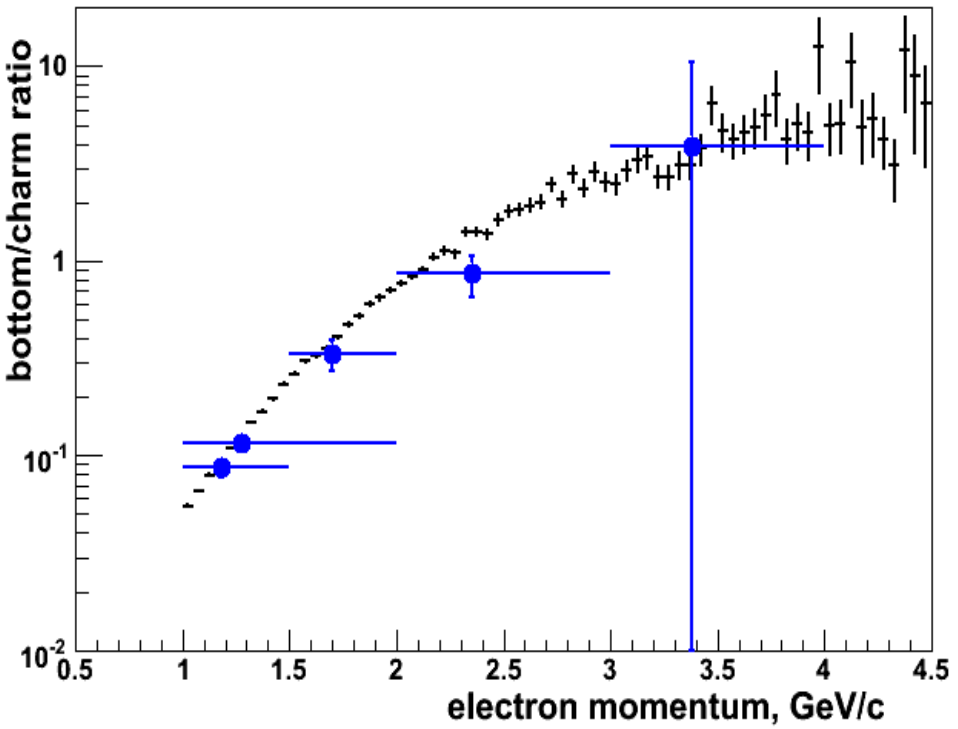


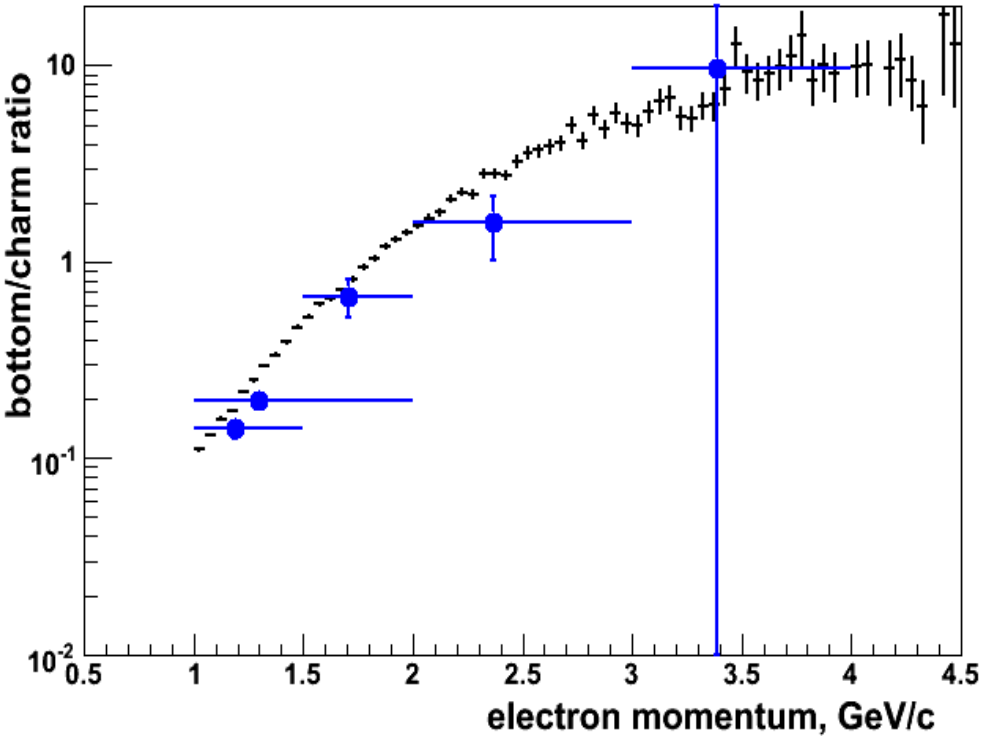




Minimum bias (see slide 4)

The two plots have different charm/bottom mixture





Summary and Plans

- From all these plots, it appears that there is systematic underestimate of the B/C ratio, larger for steeper pT distributions

  - The way I calculate "true" B/C ratio?
    Currently it is the ratio of electrons in fkin table in a given pT range.
    Maybe fraction of electrons that hit sensitive volumes but are not reconstructed changes with pT?

  - Horizontal position? I take it to be mean pT of a B and D meson mixture (reconstructed).

- If wrong slope is used, separation fails. What to do about it?

  - successful fit can be seen by smooth pT dependence of the calculated ratio. When I use slopes from one dataset for another one, points jump all over the place.

Backup Slides