Simulation for sPhenix update

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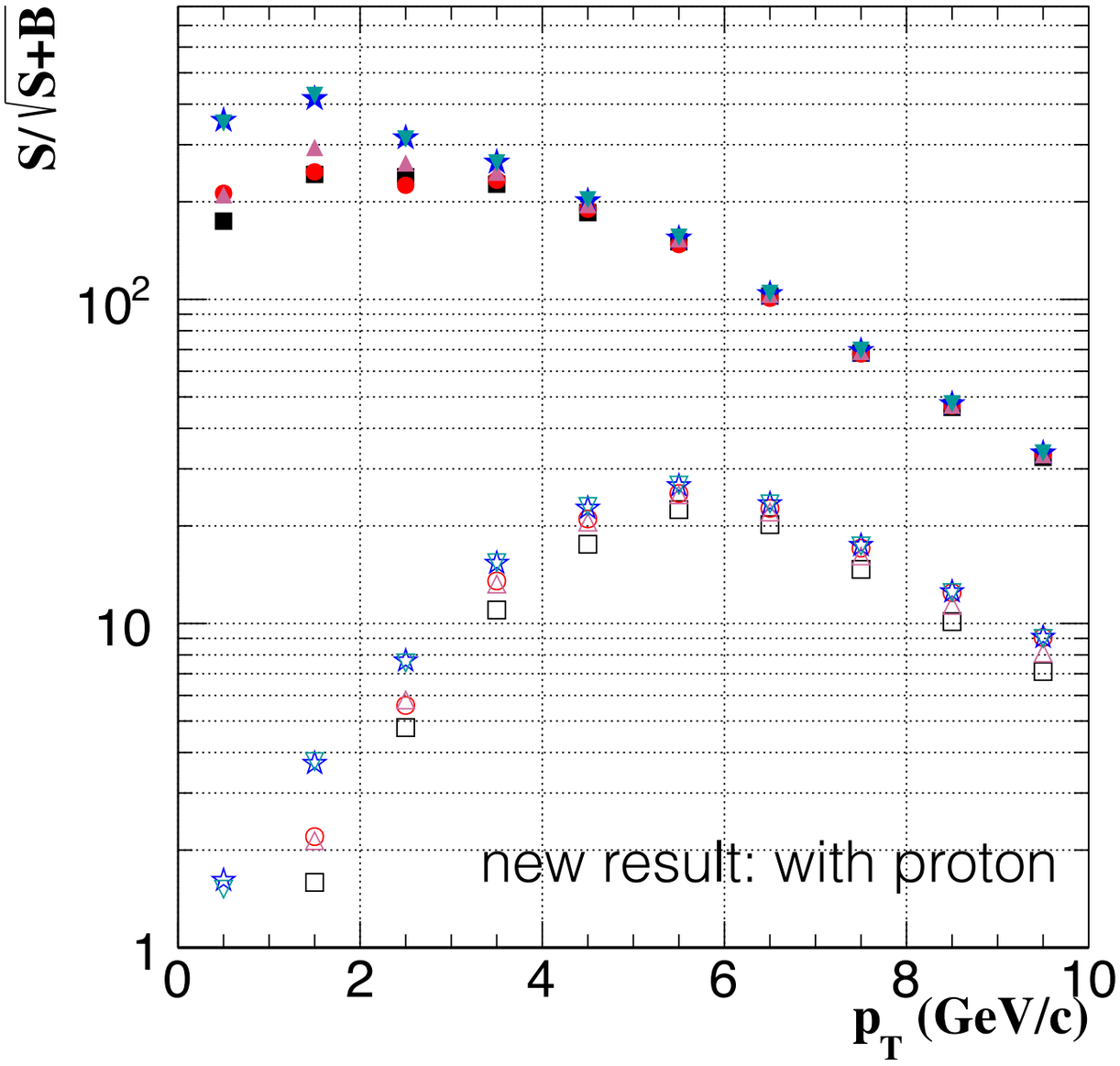
Xiaolong Chen, Gunannan Xie, Xin Dong

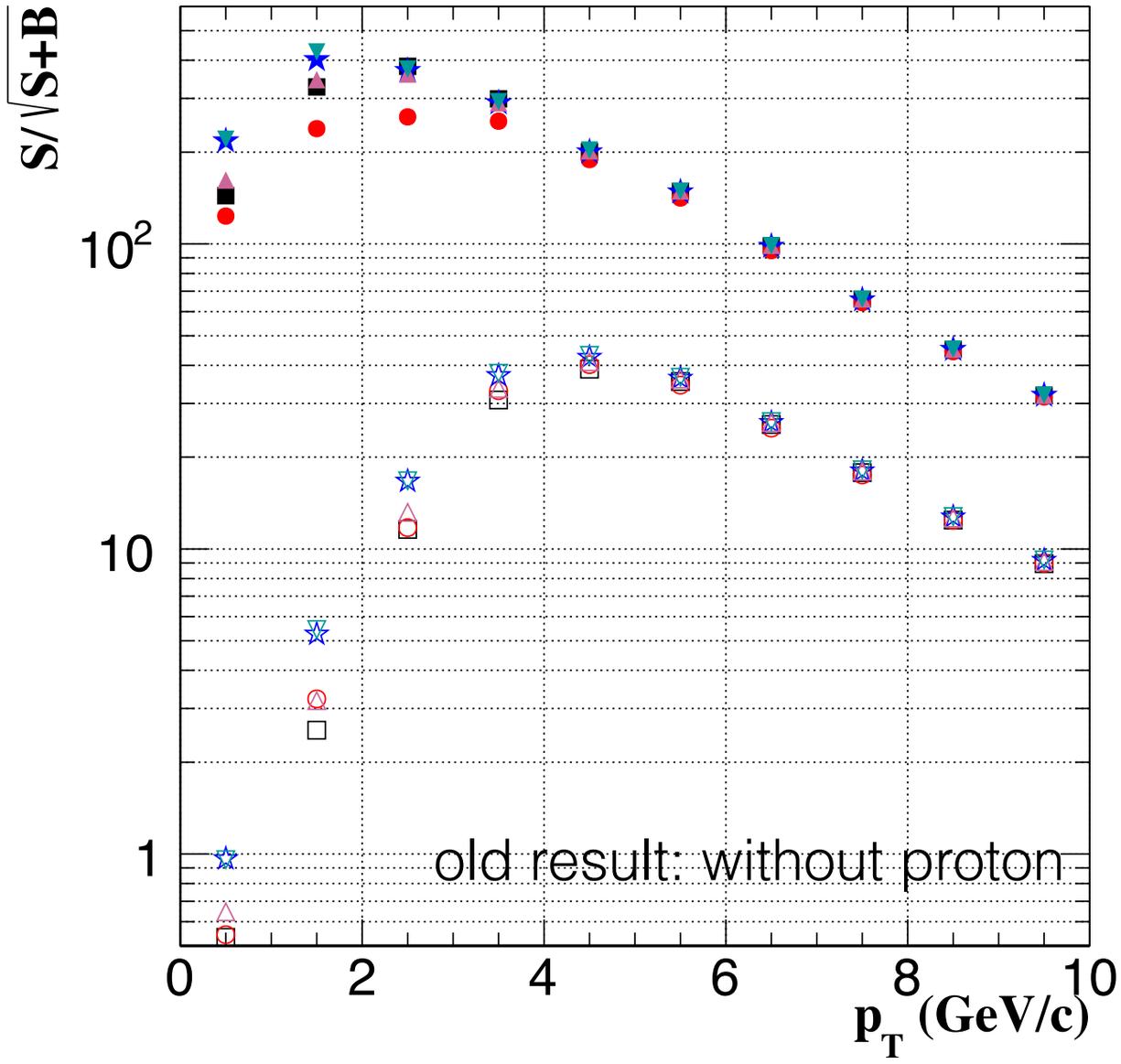
Outline

- B to D0 update
  — check the background increase after add proton
  — improve the cosTheta cut at low pT

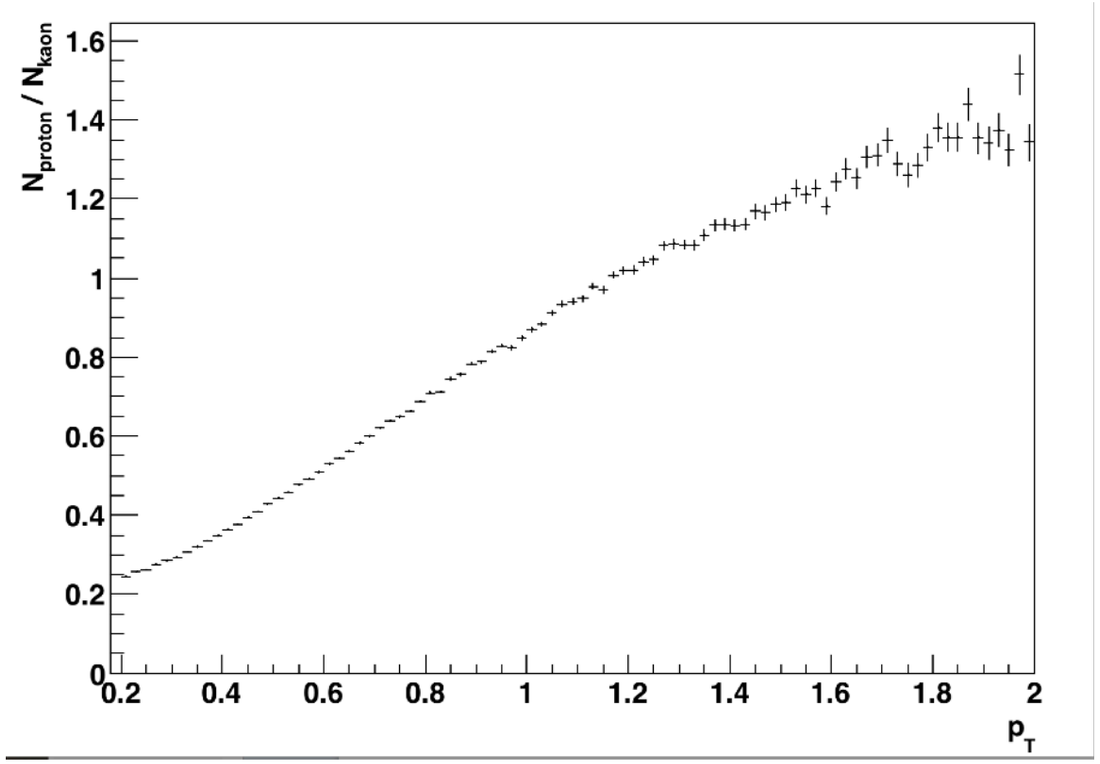
- Direct reconstruction for B+

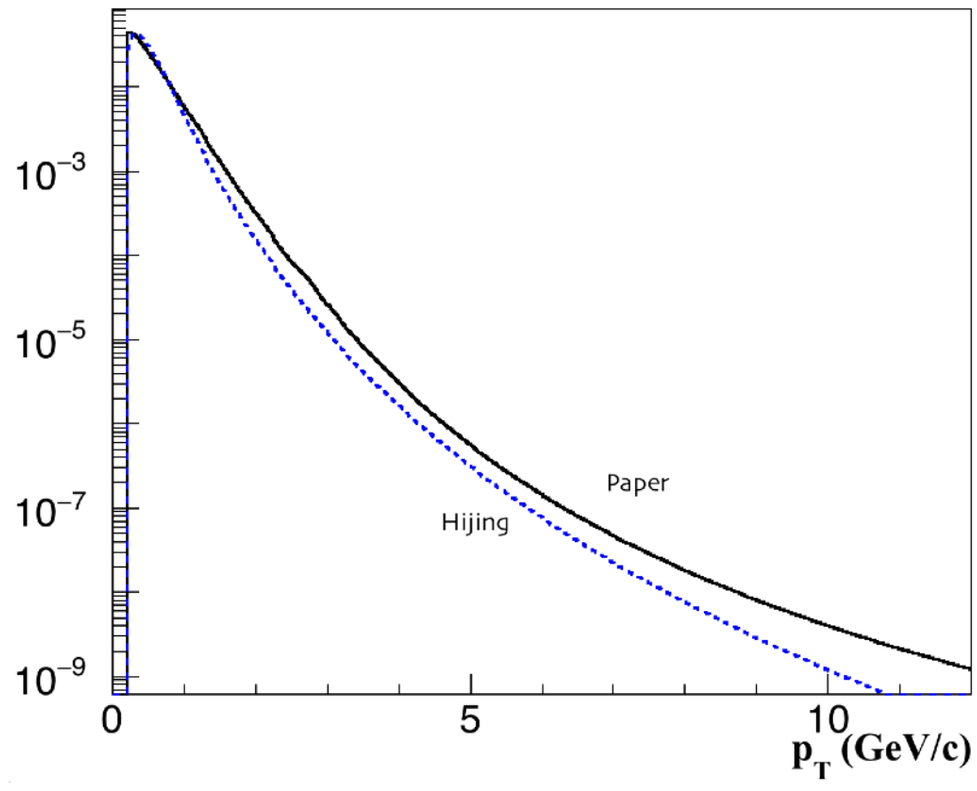
Big difference





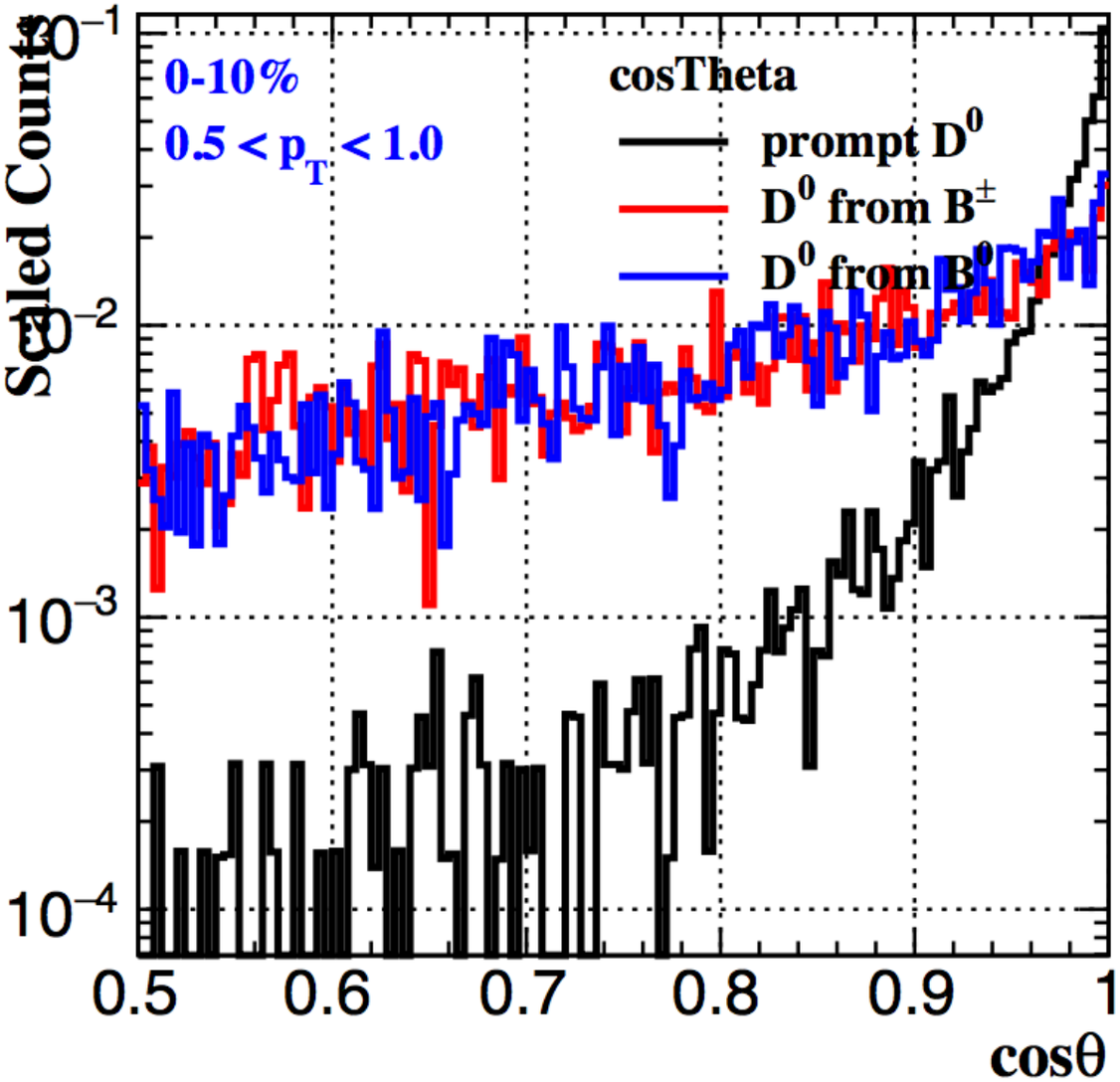
Reason

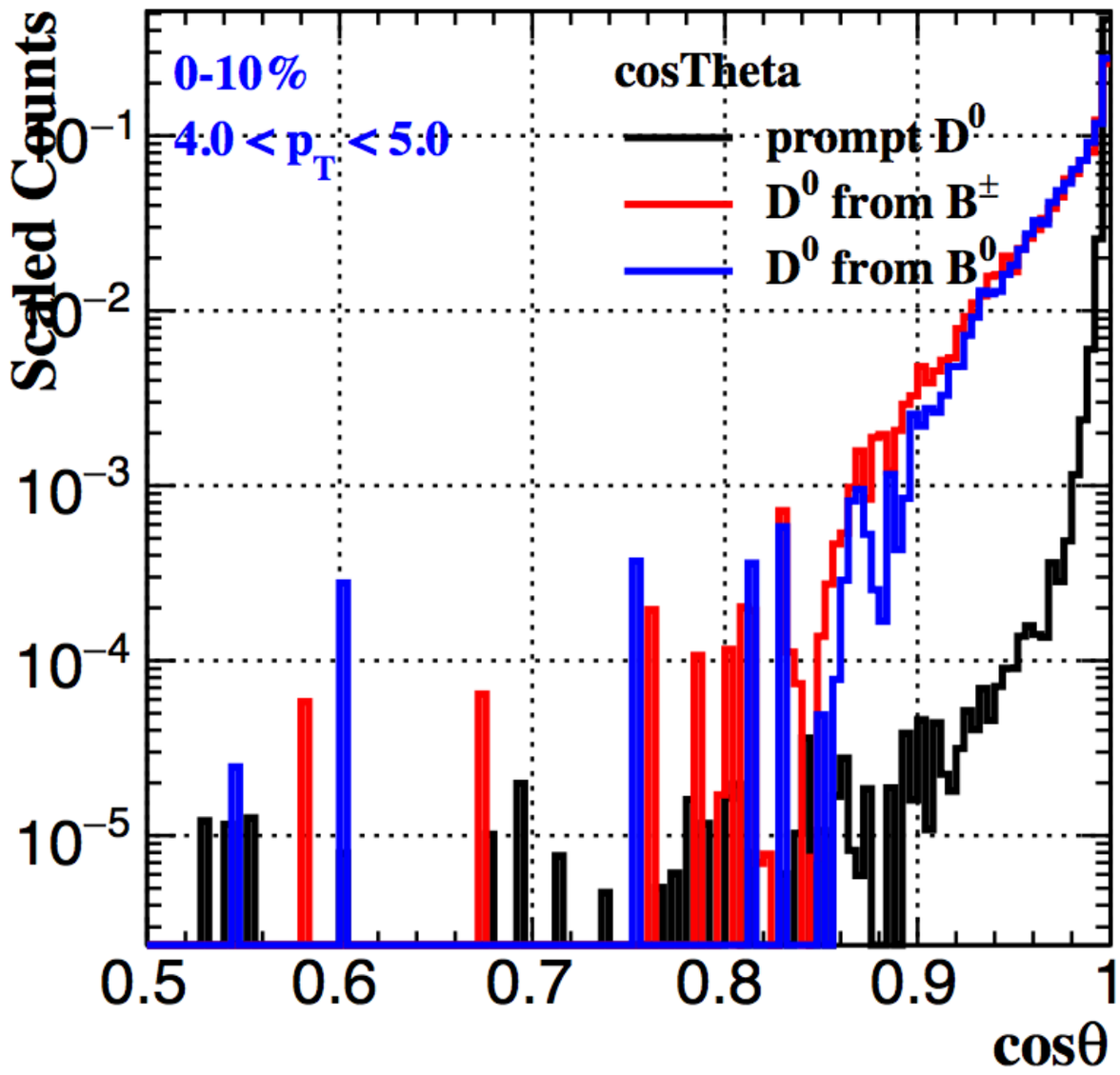




- Previous input kaon number is only k^- and pion is only π^+, now is $k^{+/-}$ and $\pi^{+/-}$ — 4 times for background
- Proton number is higher than kaon at pT>1.2GeV — another 2 times
- The input pi/k pT spectra changes, now (from paper) is higher than previous except very low pT

cosTheta



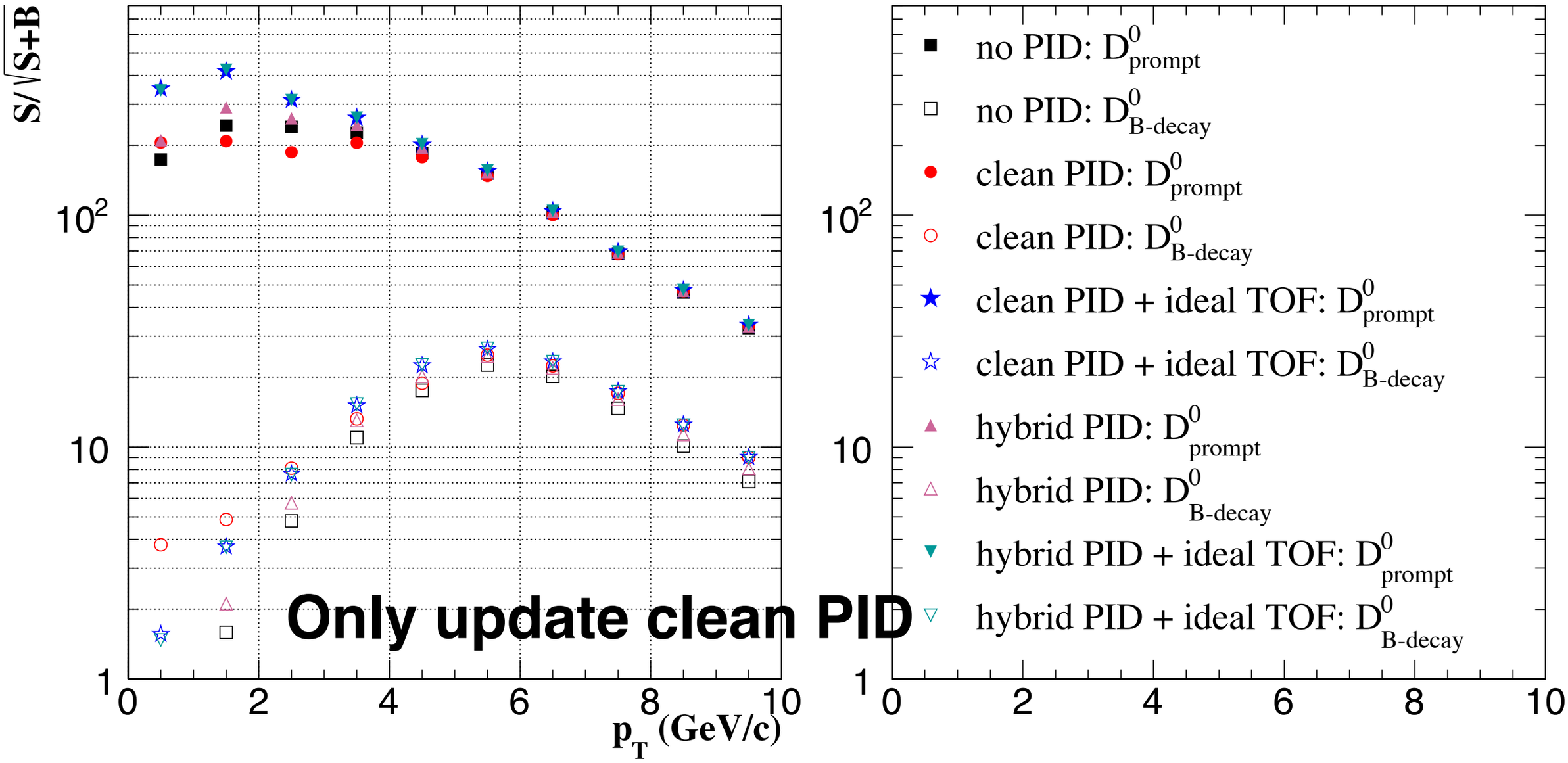


In the past, cosTheta>0.95, the cut didn't consider pT dependence

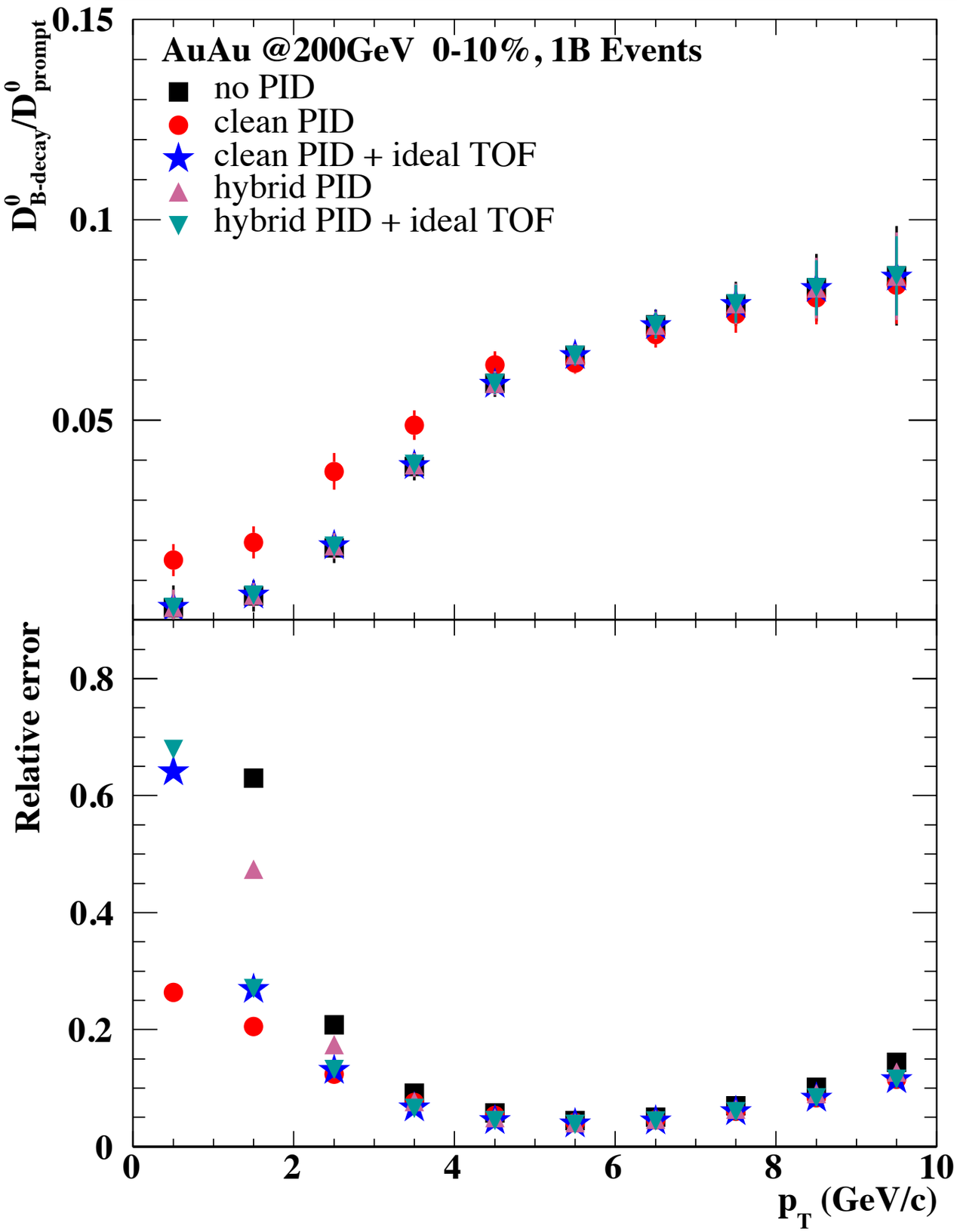
https://drupal.star.bnl.gov/STAR/system/files/cosTheta_0.pdf

New CosTheta cut—Significance

pT range	0-1	1-2	2-3	3-5	5-15
old cosTheta cut	>0.95	>0.95	>0.95	>0.95	>0.95
new cosTheta cut	>-1	>0.6	>0.75	>0.9	>0.95



New CosTheta cut—B to D ratio



Only update clean PID

0-1GeV is possible

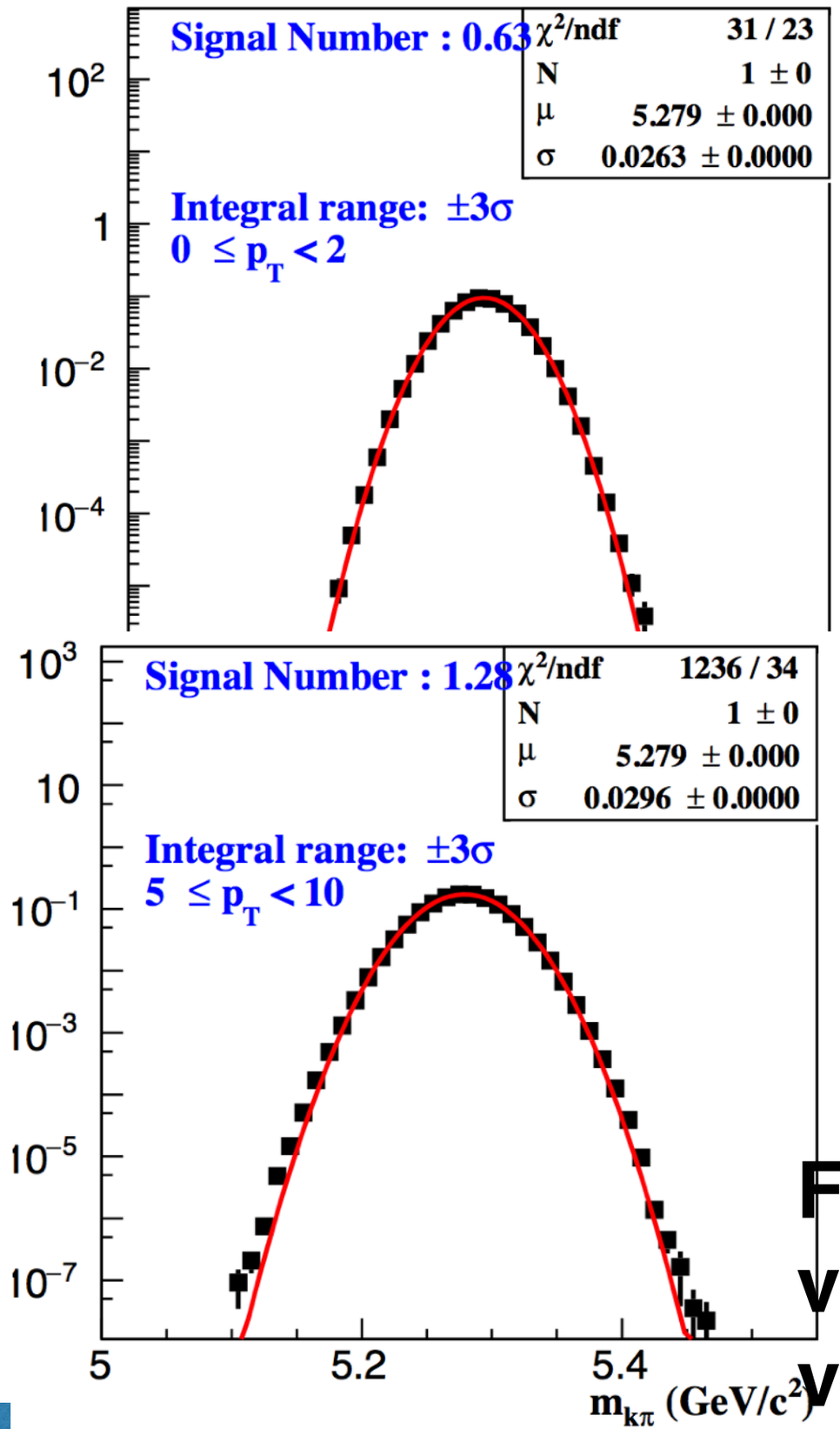
B-meson direct reconstruction

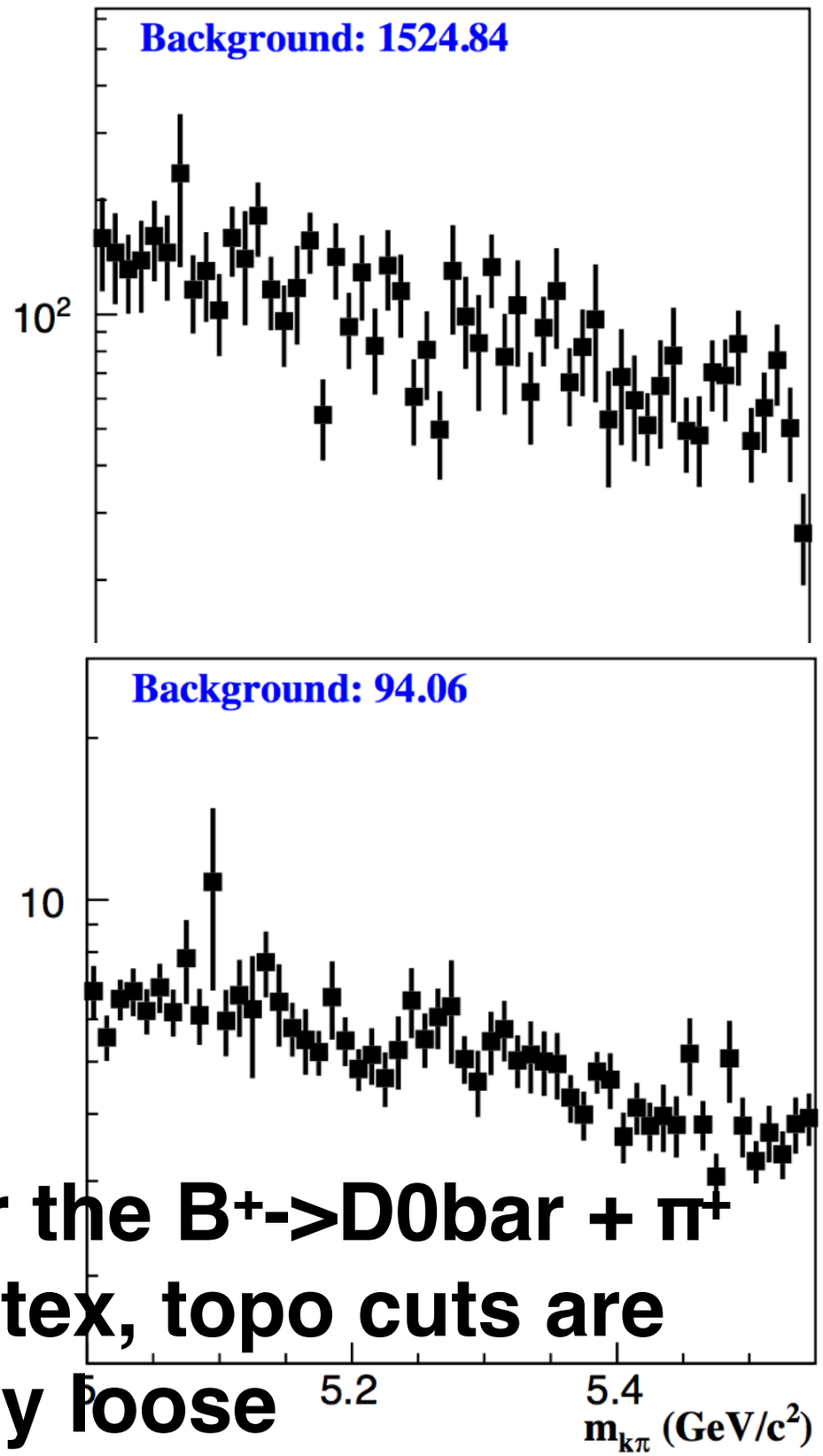
- Decay channel： B^+->D0bar + π^+, 0.481%, 491μm
  D0bar->k^+ + π^-, 3.88%, 123μm

- Now the statistics is not enough, have not optimize the topology cuts
  — Fixed cuts: k/pi/pi dca, D0 decay length, DcaDaughters(D0)
  — Need adjust: B decay length, B Dca, D0 Dca, DcaDaughters(B), cosTheta,

Particle	$c\tau(\mu m)$	**Mass**(GeV/c^2)	$q(c,b) \rightarrow X(FR)$	$X \rightarrow D^0(\overline{D^0})$ (BR)
D^0	123	1.865	0.565	-
B^0	459	5.279	0.40	0.081(0.474)
B^+	491	5.279	0.40	0.086(0.790)

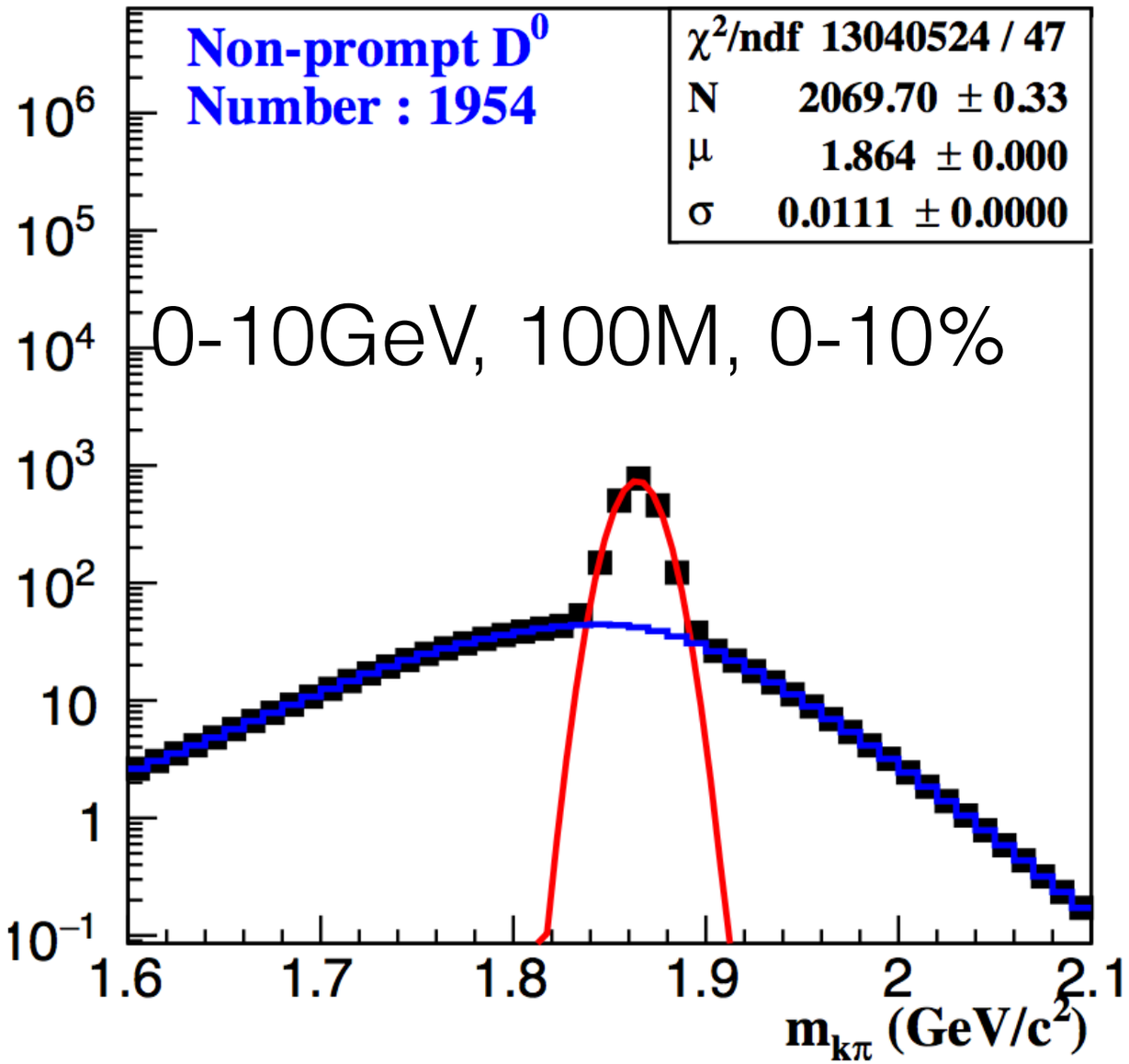
Previous Result—**200M**





For the B^+->D0bar + π^+ vertex, topo cuts are very loose

Impossible ?



From B^+ ~ 1000 counts per 100M

Multiple the Branch Ratio 0.48%, ~ 5 counts

Now add one more track, efficiency get lower, just the TPC track eff and TOF Match eff is 0.7*0.6, We only have 2 B^+ per 100M.

Less than 20 counts from 1B events.

So adjust the whole topo cuts?

Or abandon this…

Summary and next to do

- B to D0
  1. Solved the inconsistency of last week (Background increase)
  2. Improve the cosTheta cut, B decayed D0 Significance at 0-1GeV is ~4

- Direct B+ reconstruction pre-study
  we only can get less than 20 counts from 1B central events

- Next:
  B->Jpsi simulation

Backup

Like-sign CosTheta