

B to D₀ simulation for sPhenix

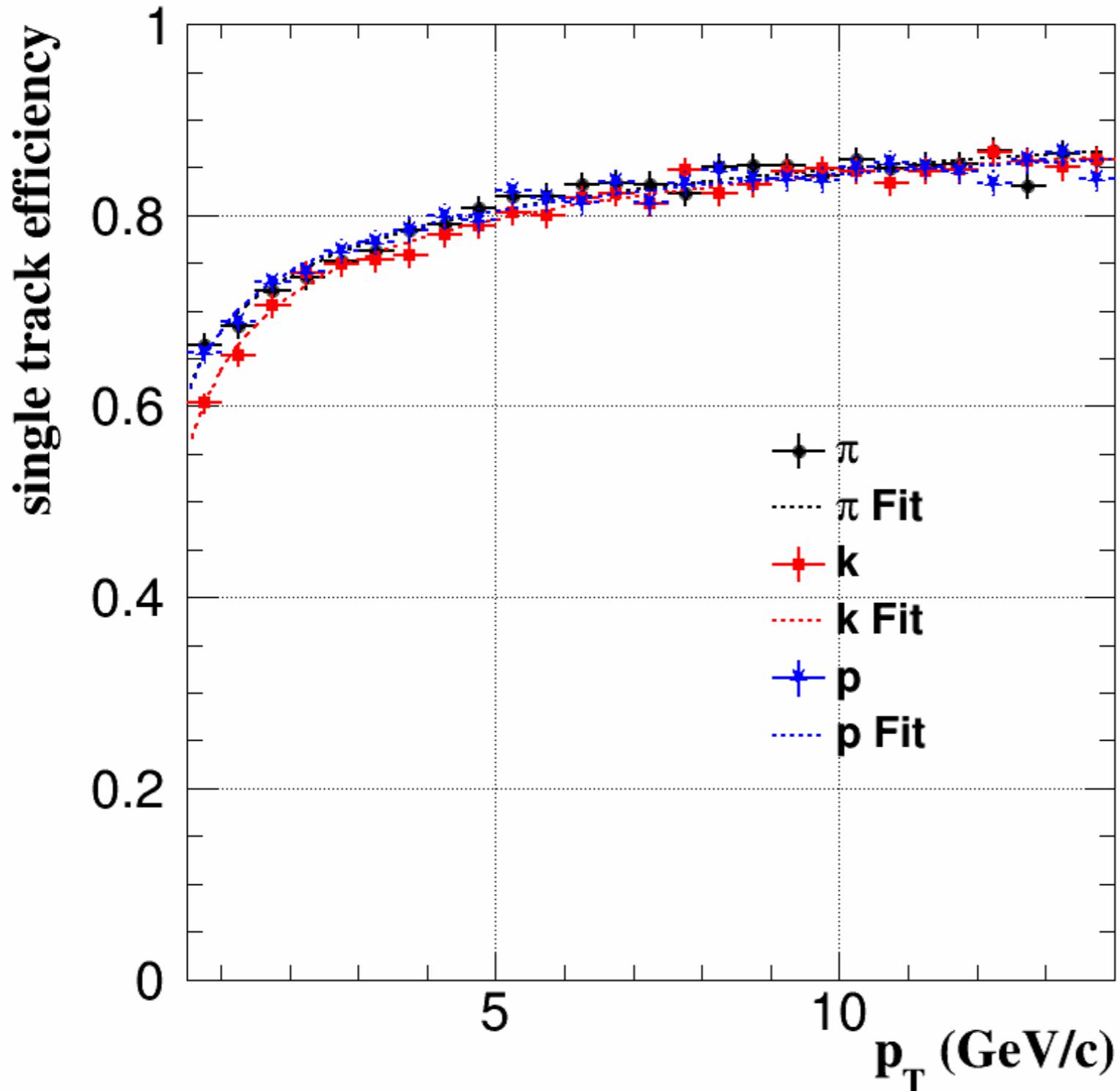
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1/20/2017

OverView

- Full geant simulation
 - Single track efficiency
 - momentum resolution
 - DcaXY and DcaZ resolution
 - DcaXY vs DcaZ distribution
- Fast simulation
 - input from full geant
 - background simulation
 - prompt and non-prompt D0 signal

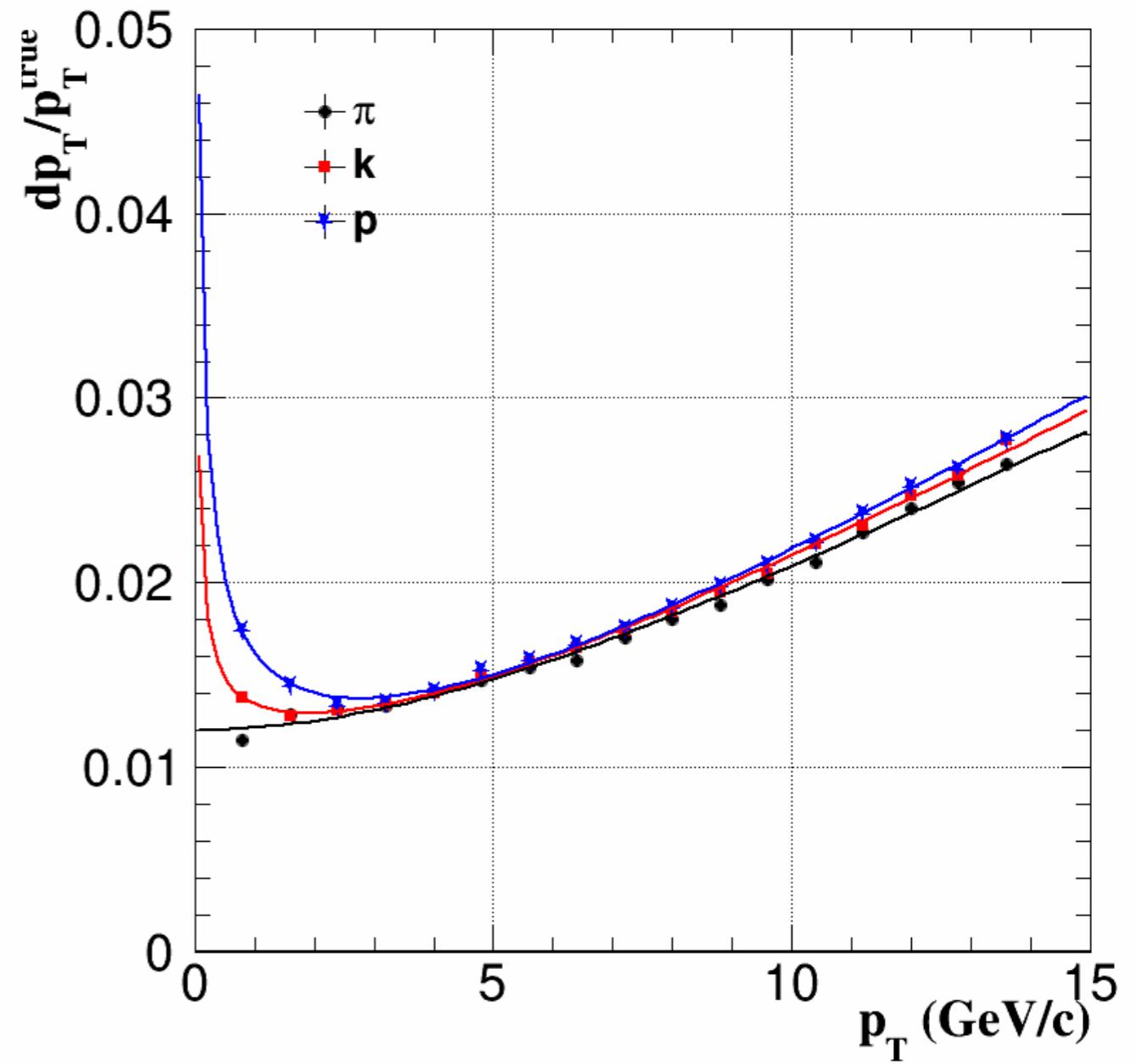
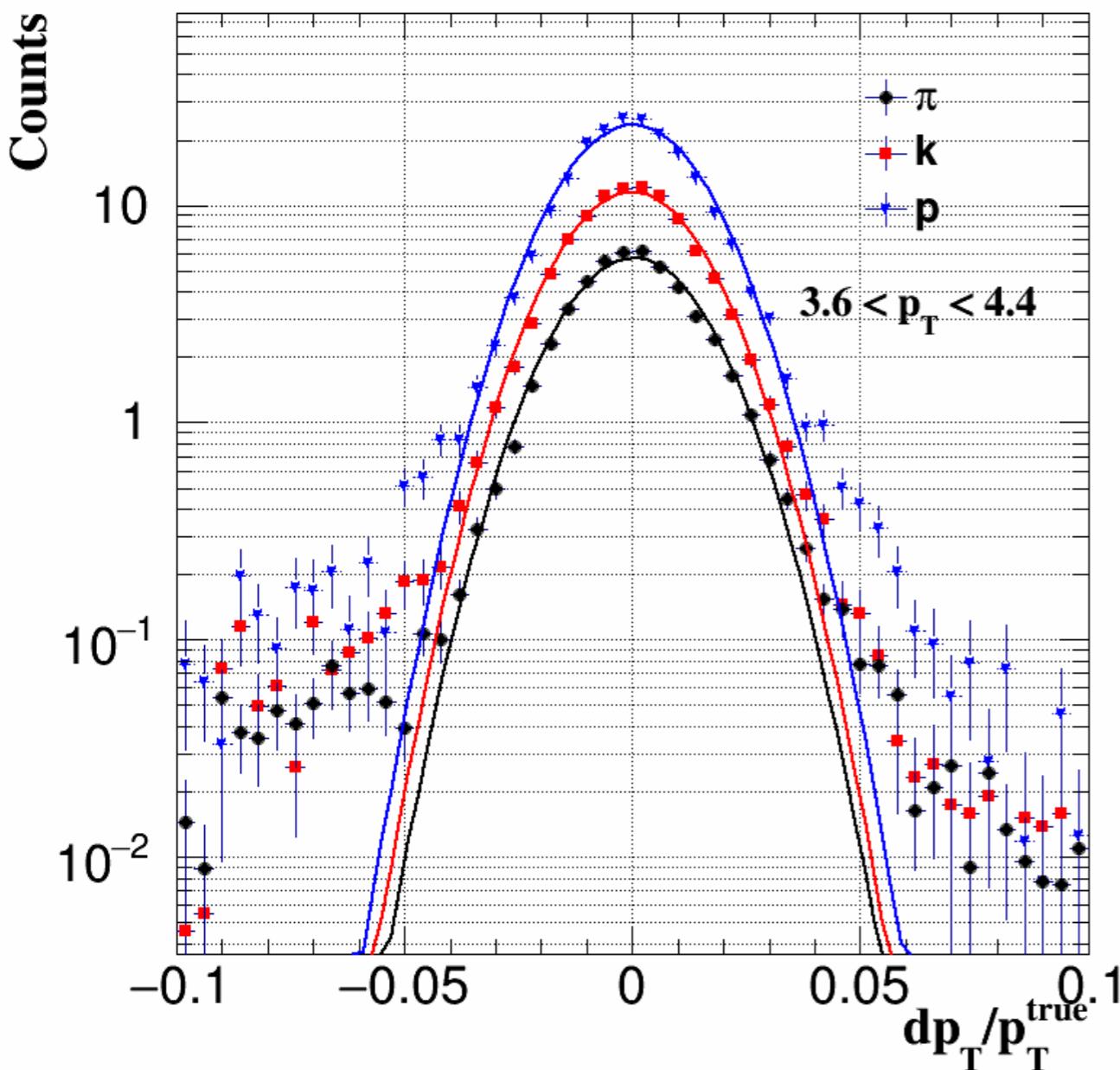
Single track efficiency



30 $\pi/k/p$ respectively
embedded
0-10% hijing

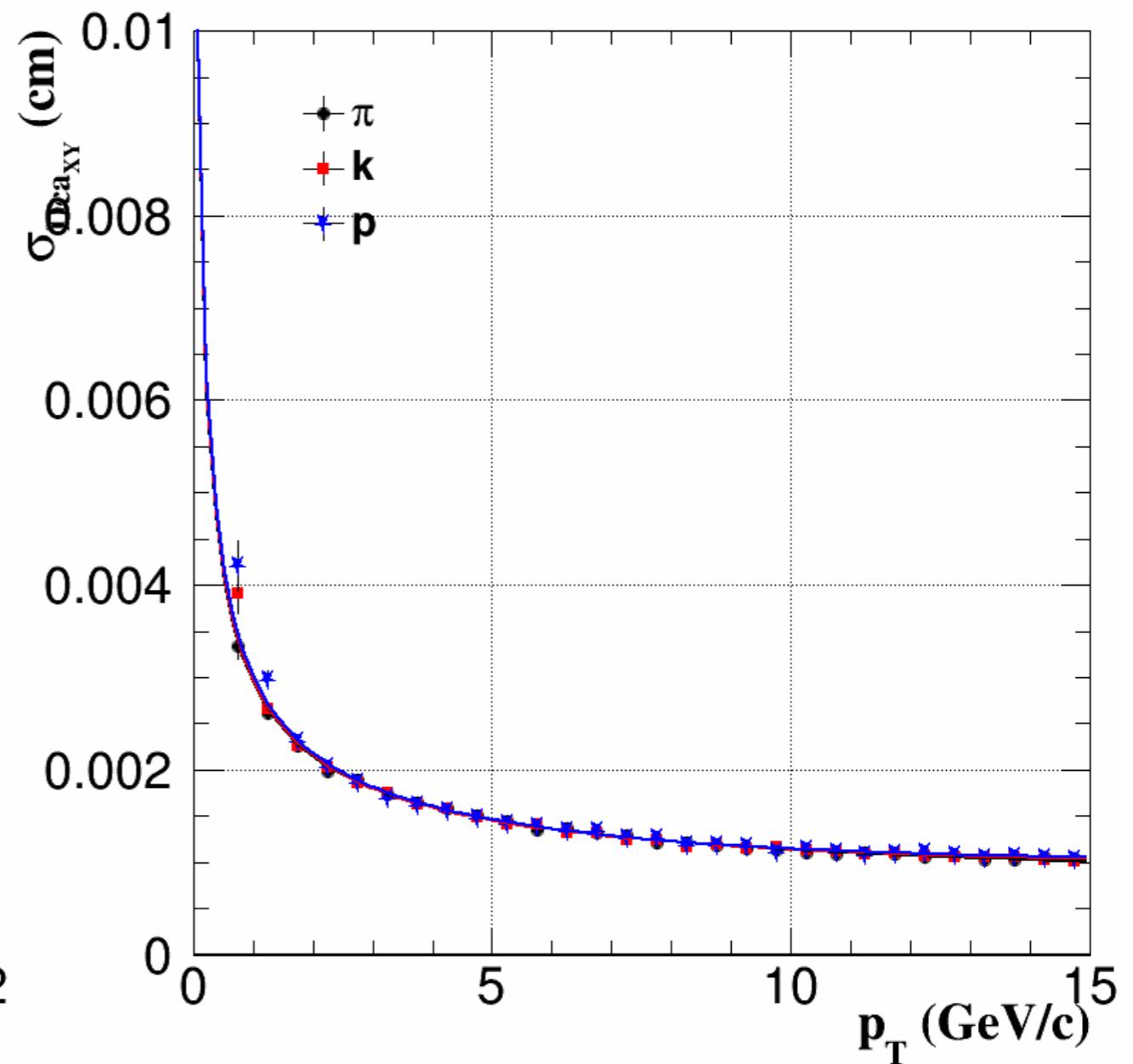
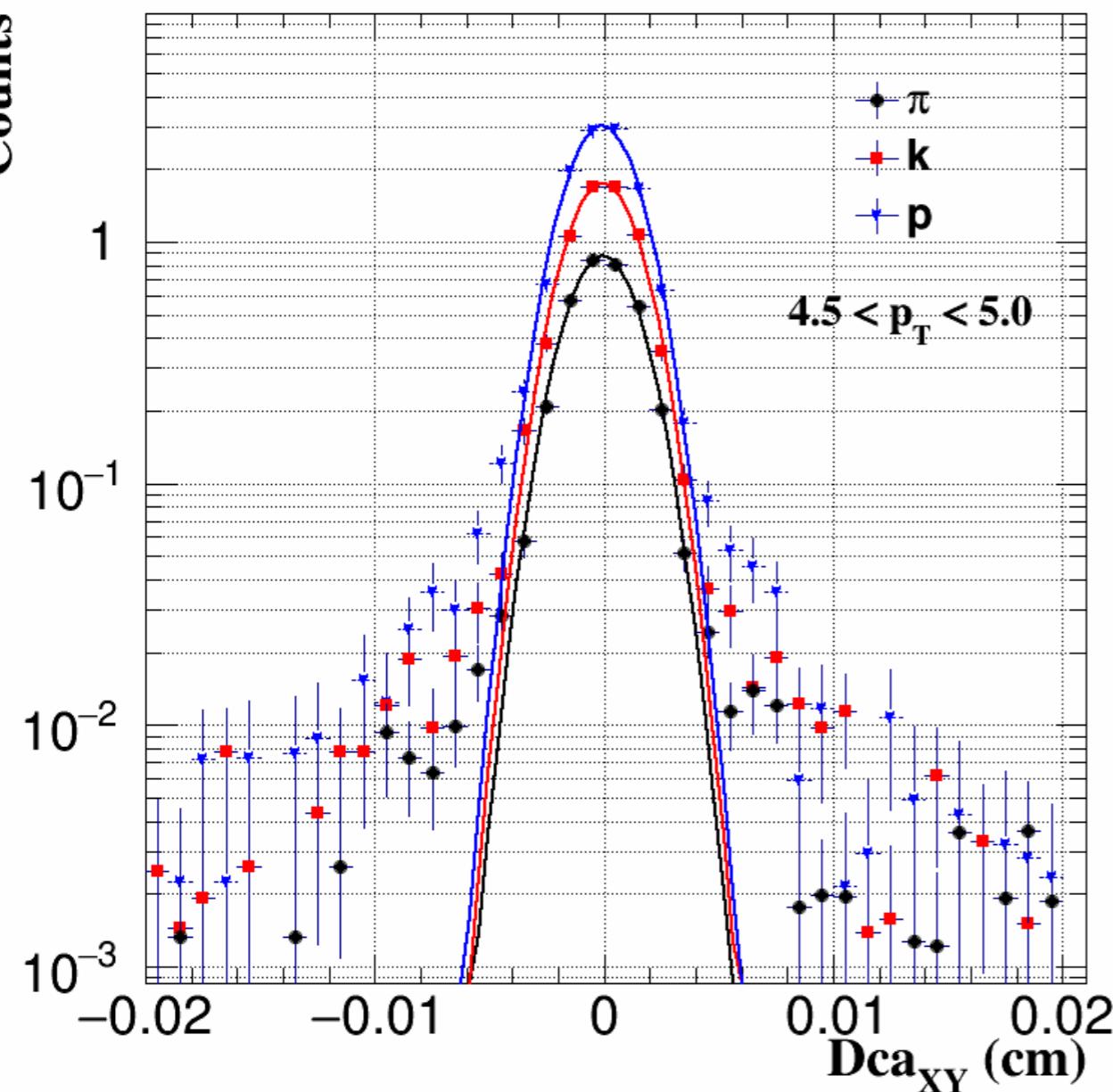
quality < 1.5
At least 2-layer maps

Momentum resolution



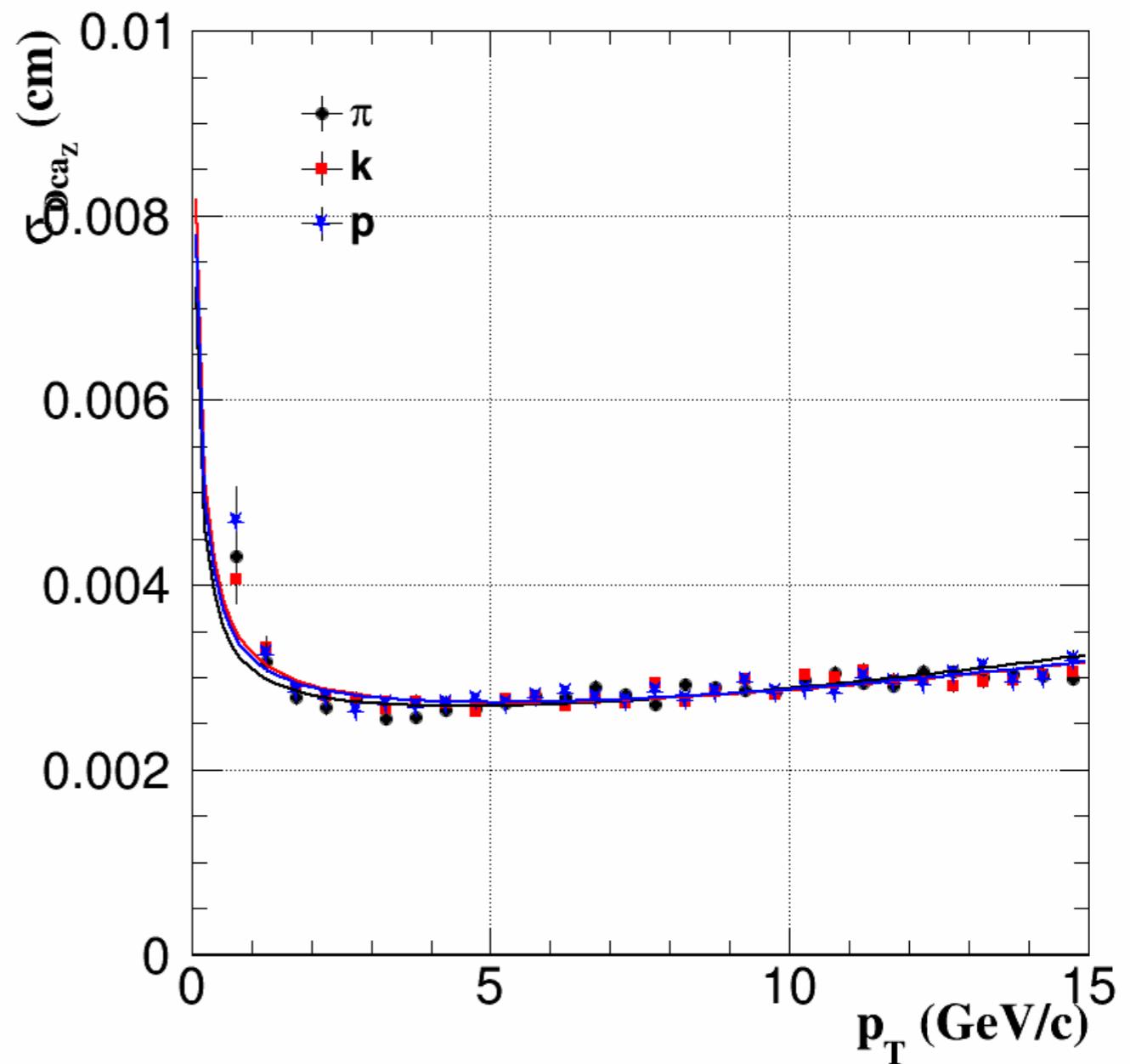
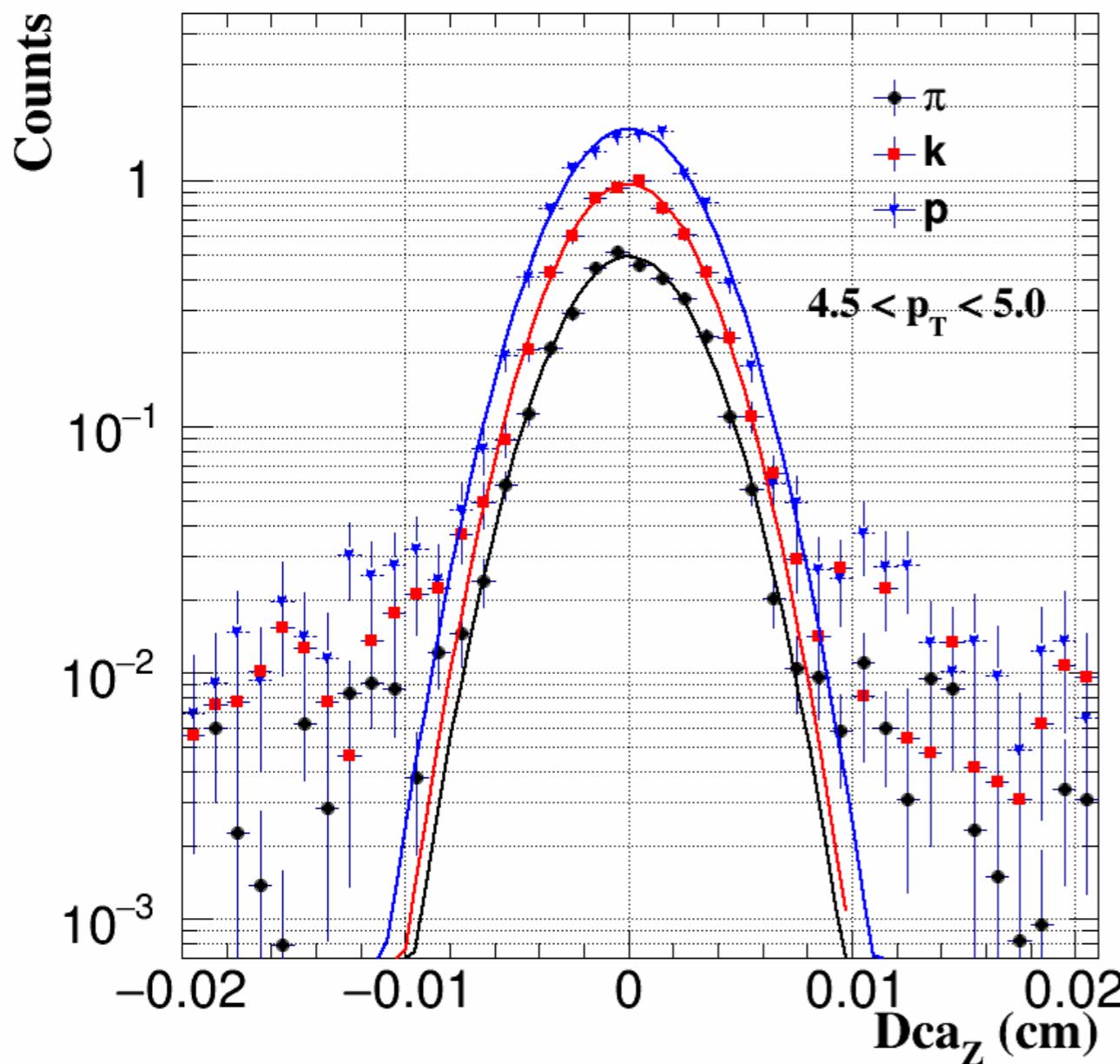
DcaXY resolution

At least 2 maps layer



DcaZ resolution

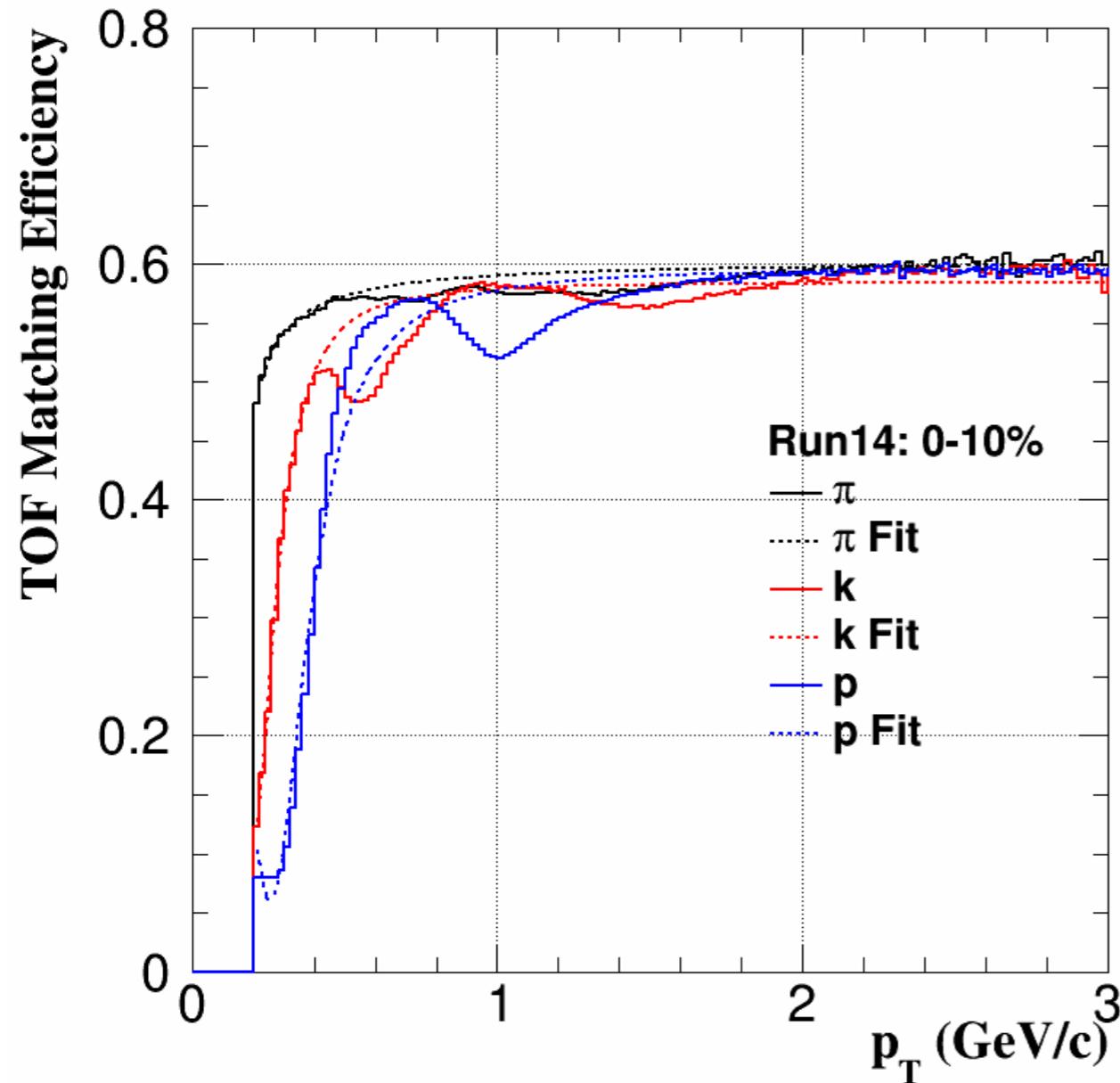
Bad than DcaXY



Signal simulation

- Decay channel
 - Prompt D0: $D^0 \rightarrow k\pi$
 - non-prompt D0: $B^0 \rightarrow D^0 X$
 $B^\pm \rightarrow D^0 X$
- Cross section
 - D^0 total cross section are fixed from AuAu200 data— $46\mu b$
 - B cross section are fixed from fonll (mean)— $0.54\mu b$
- Input particle
 - pT shape is from fonll, eta and phi are flat
- Technology
 - smear Mc k/π initial position (Dca) and momentum
 - consider tpc tracking efficiency, maps matching efficiency, (tof matching),...

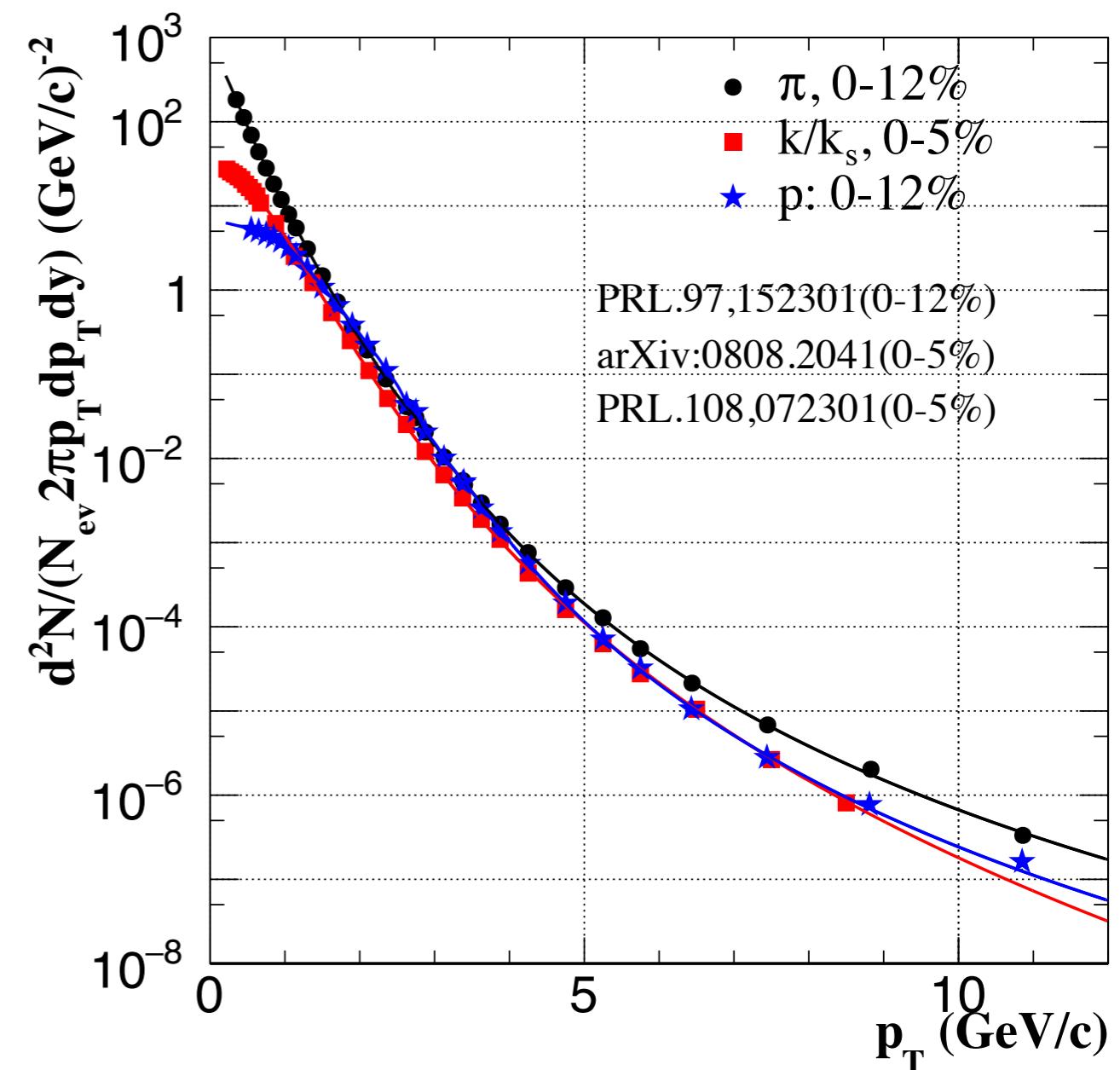
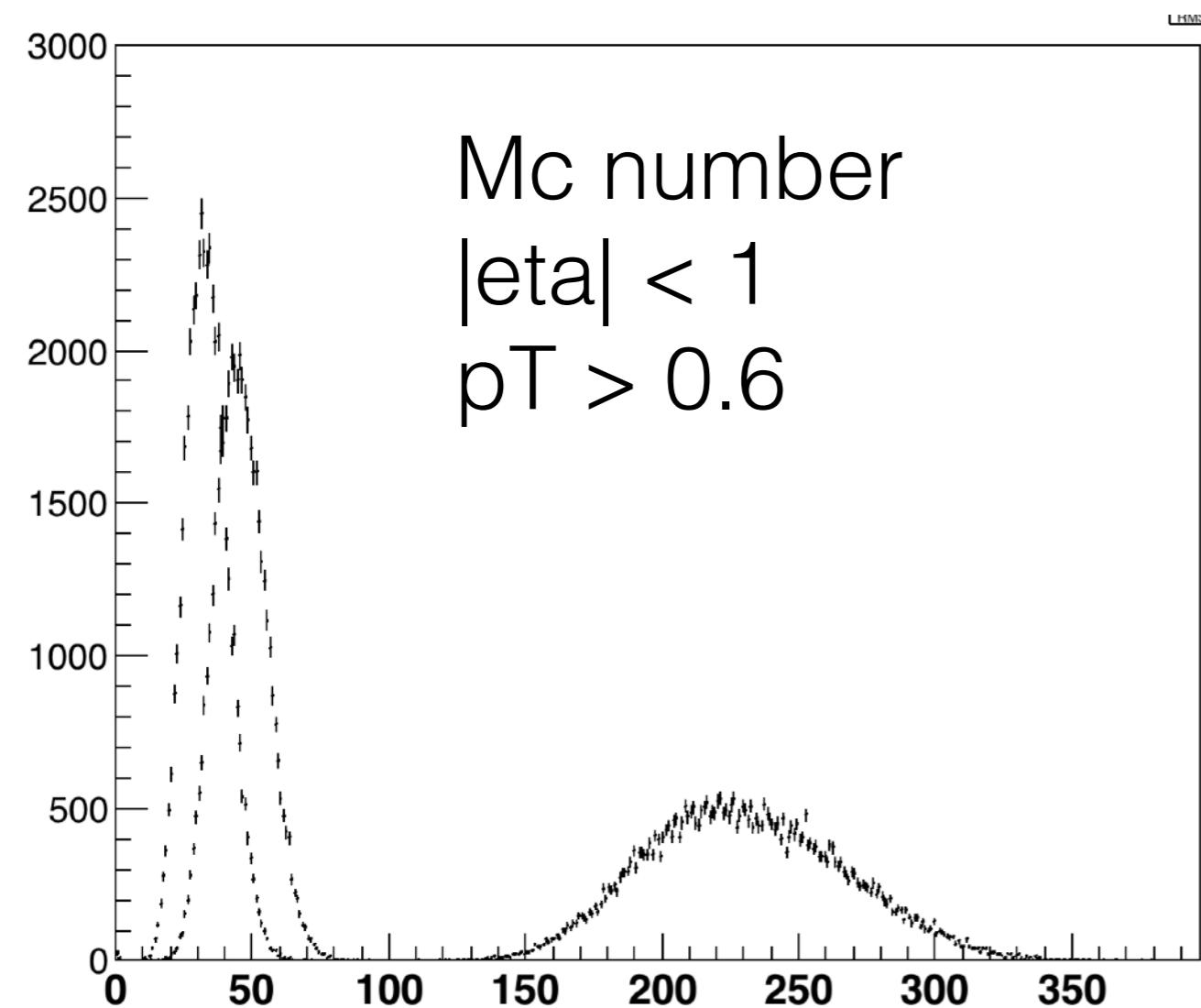
TOF in this fast simulation



Ideal TOF

- shape from left picture
- scale factor
- = $1.0 / \text{fun_pi->Eval}(3.0)$

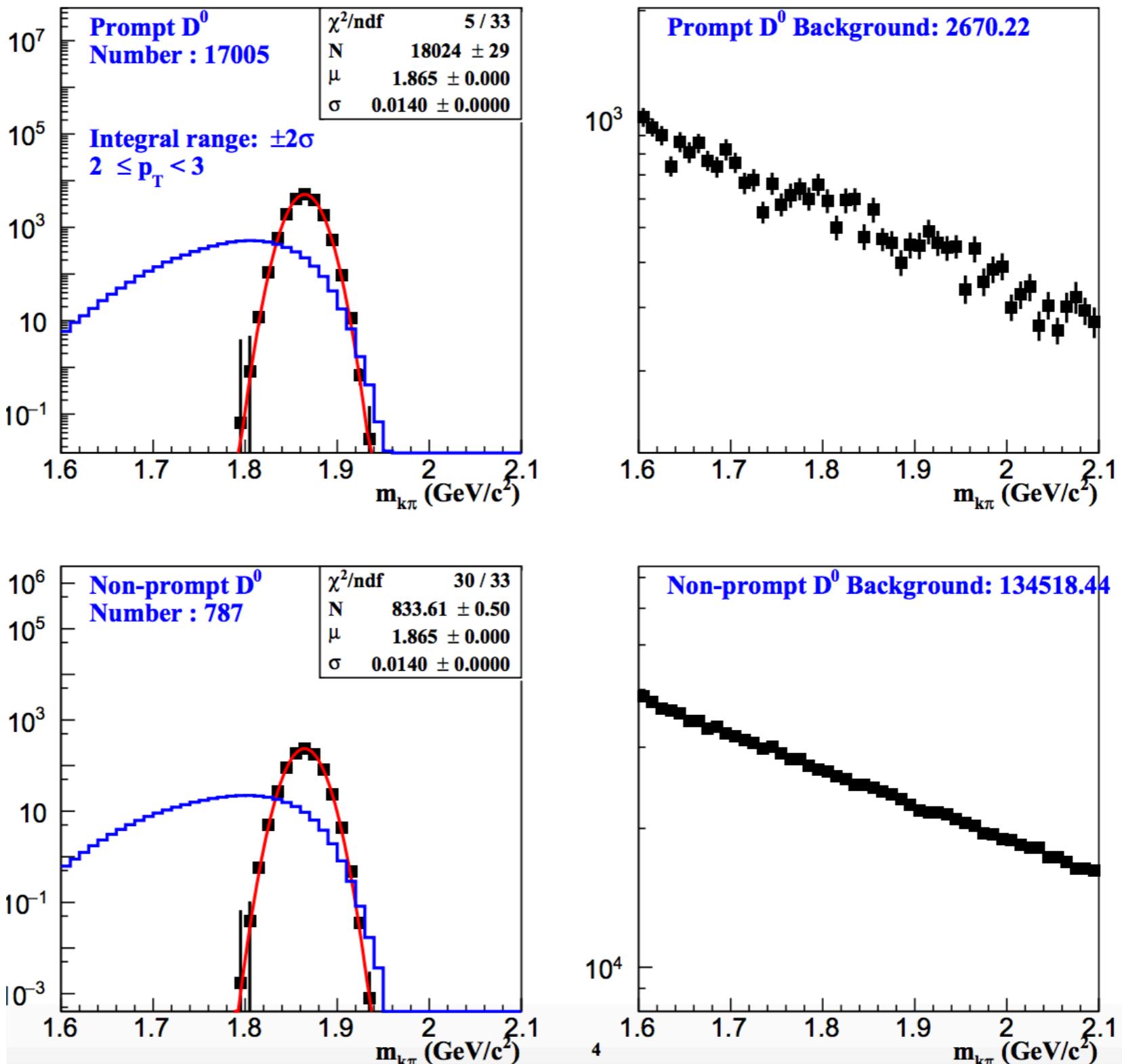
Background simulation



- only consider the combined background now
- only consider primary track now
- input $k/\pi/p$ number sampled from hijing
- p_T spectra use published, eta and phi are flat
- smear $\pi/k/p$ initial position and momentum, apply track efficiency...

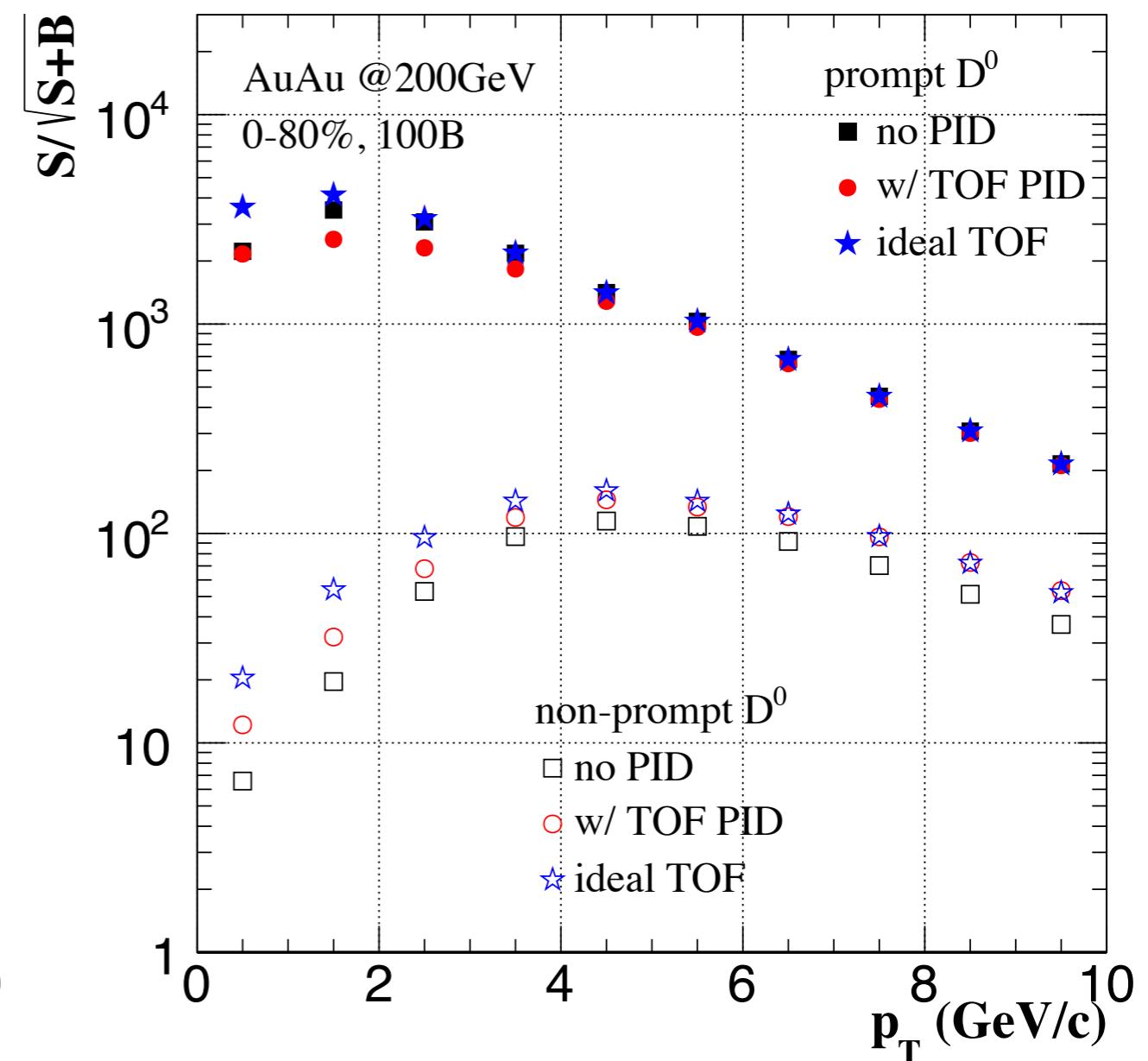
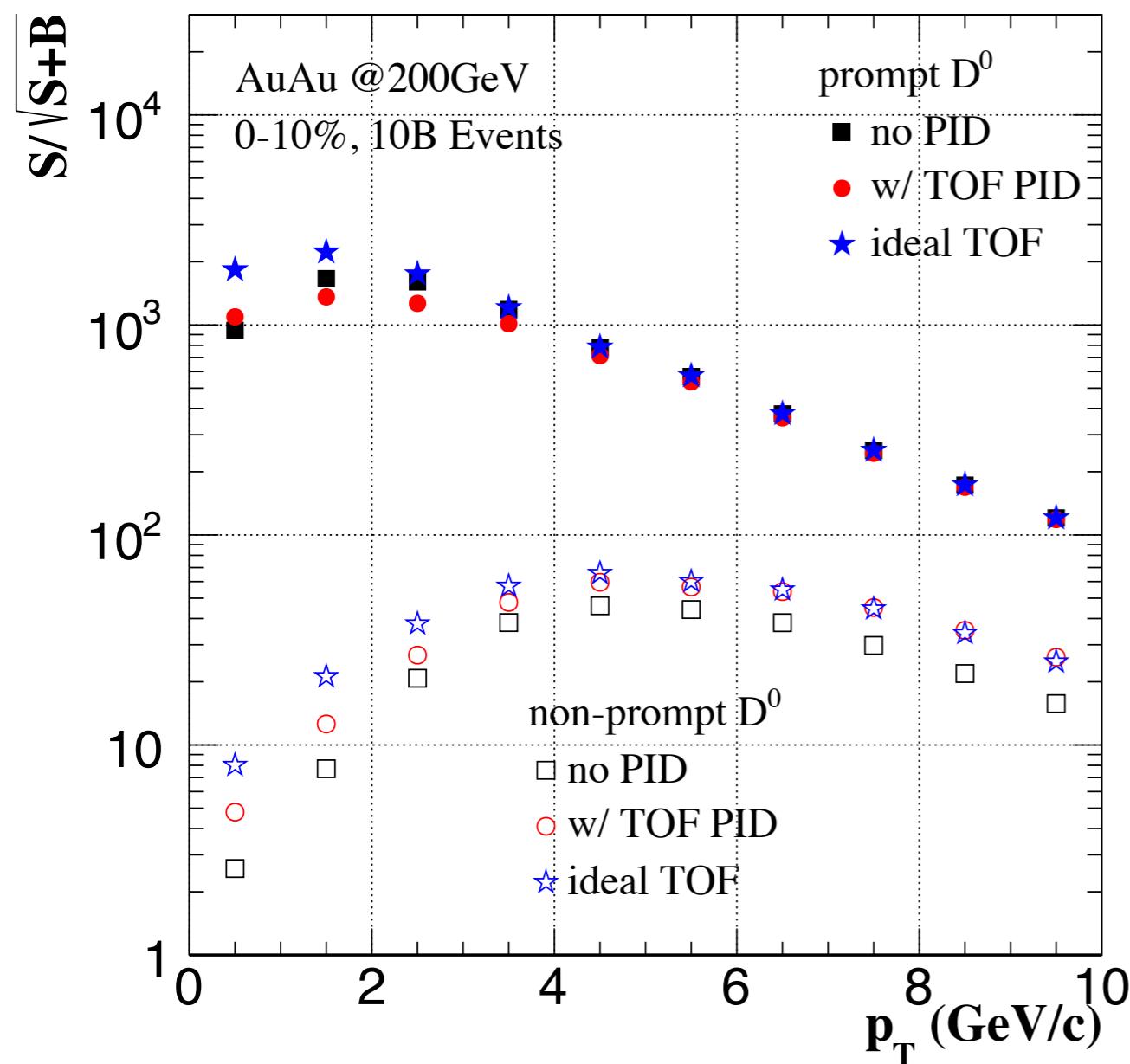
Signal and background example

100M
events



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

Prompt and non-prompt D0 significance

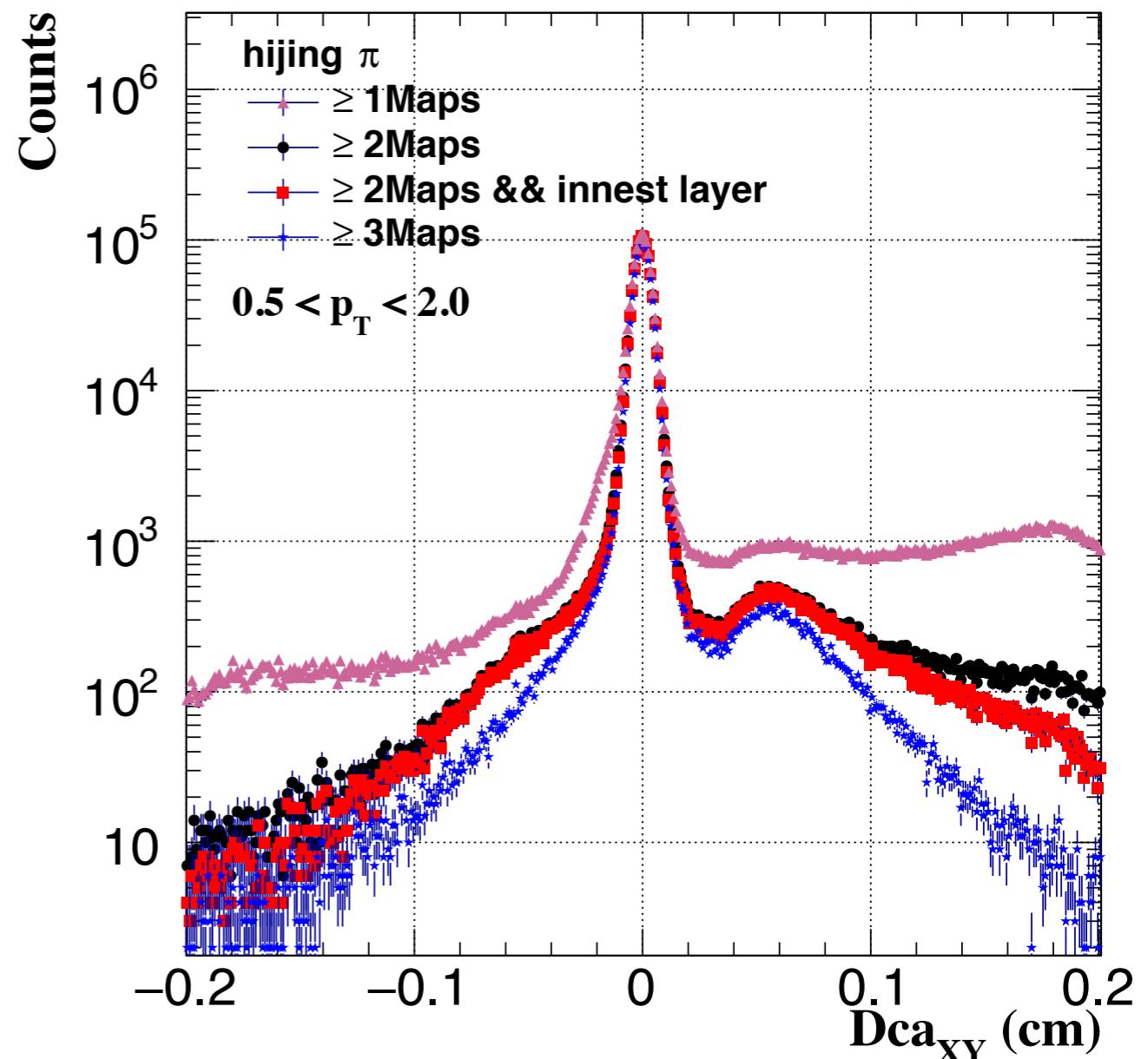
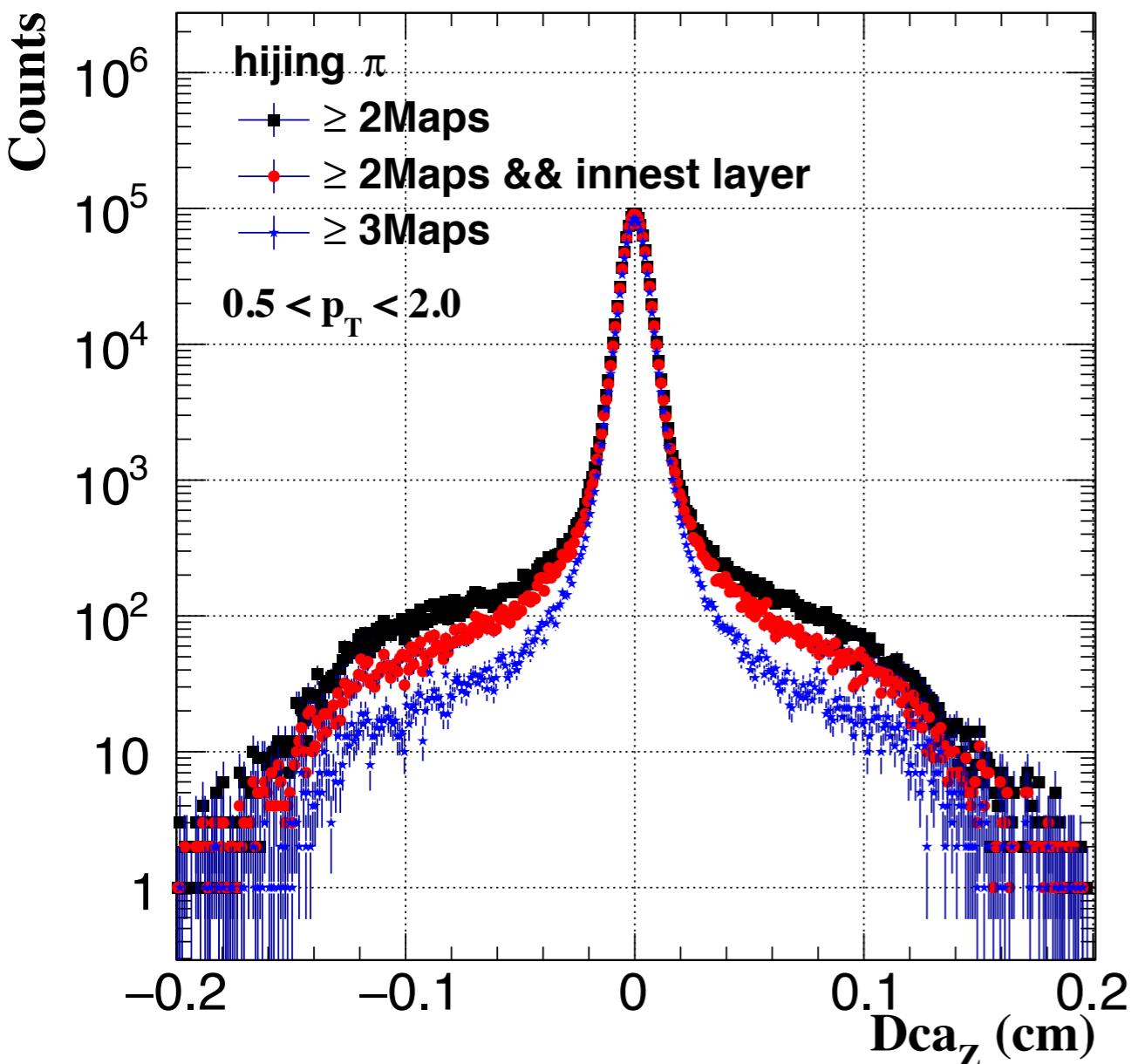


Scale to MB, assume

$$N_{Signal} = const \times N_{bin}$$

$$N_{bg} = const \times N_{part}^2$$

One need be check—strange DcaXY tail

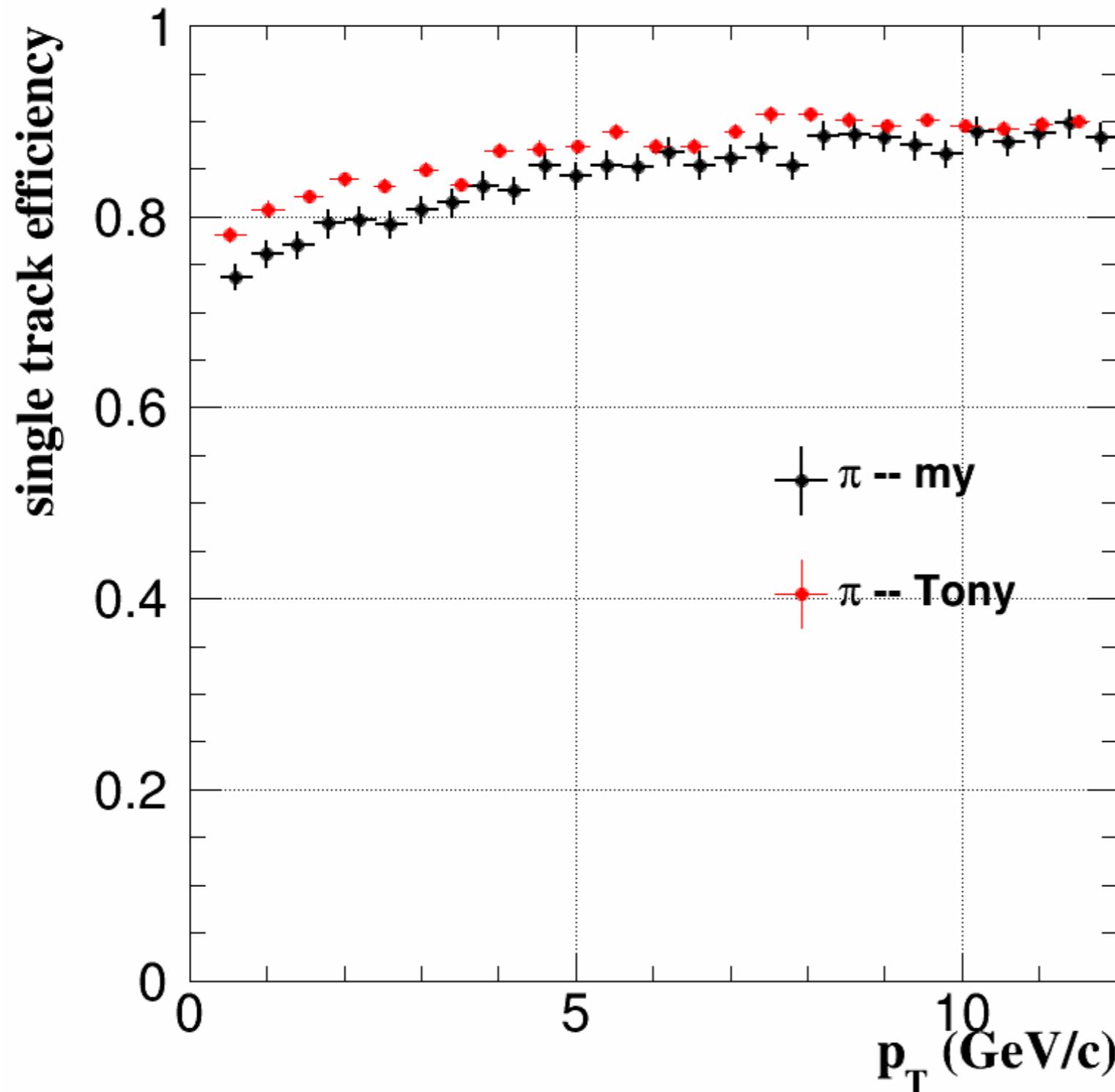


Summary

- Compare to Tony's report (<https://indico.bnl.gov/getFile.py/access?contribId=2&resId=0&materialId=slides&confId=2320>) — see page 14-16
 - eff is a little lower
 - momentum resolution get worse
 - DcaXY resolution get better <2GeV, get worse > 2GeV
- Next:
 - Find the difference

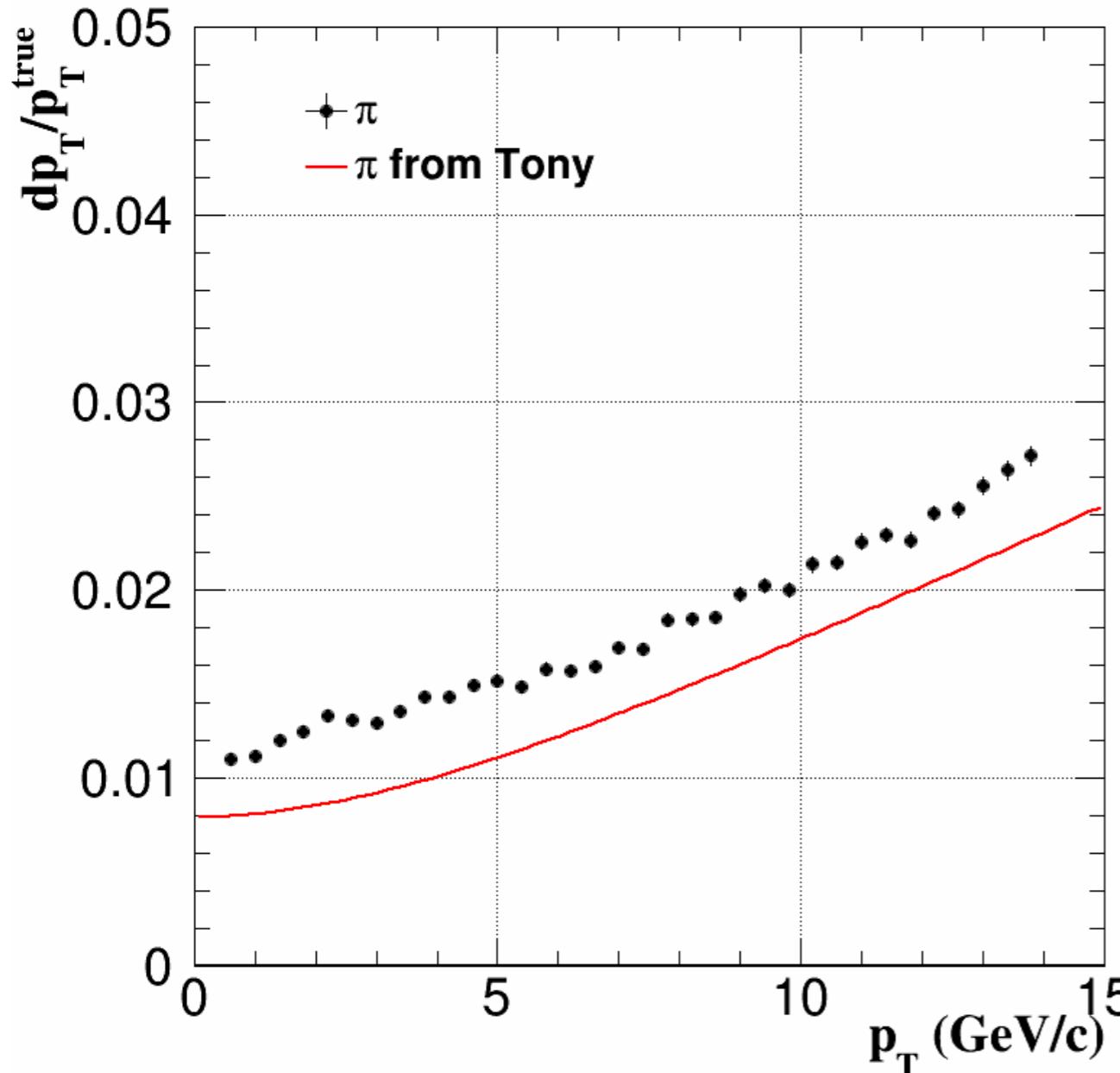
Backup

Single track efficiency

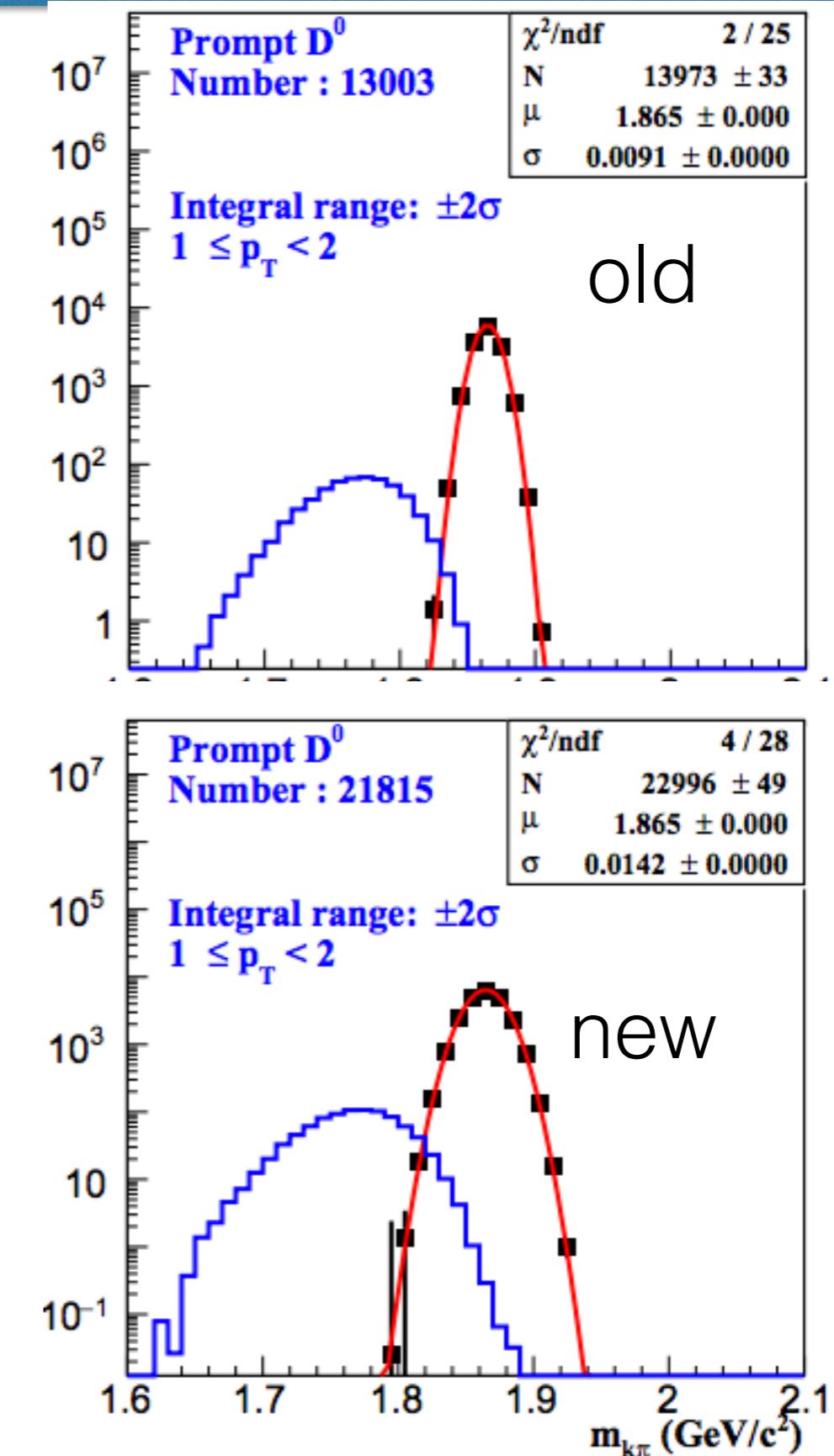


quality < 1.5
 $|DcaXY| < 1\text{mm}$
 $|DcaZ| < 1\text{mm}$

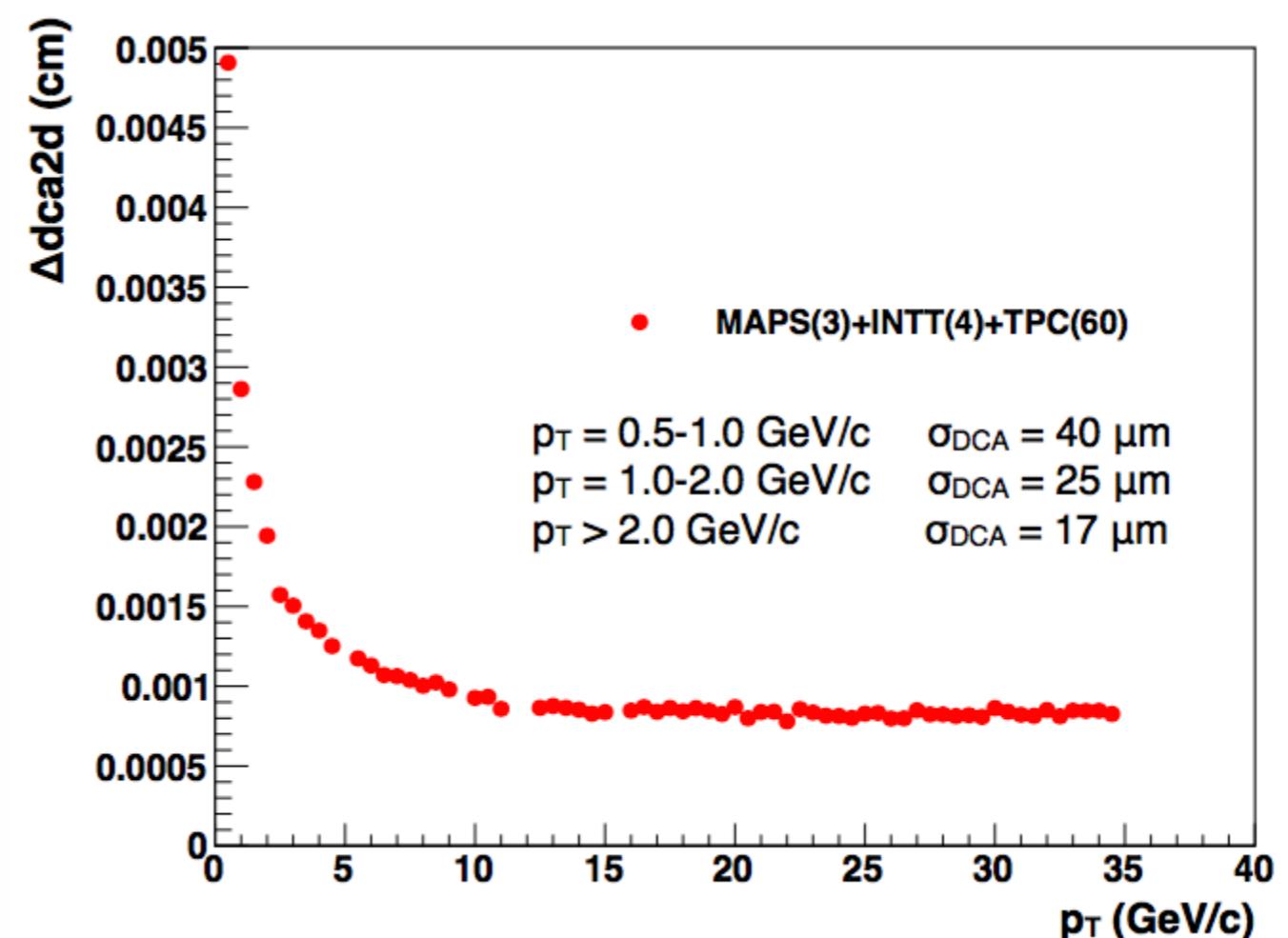
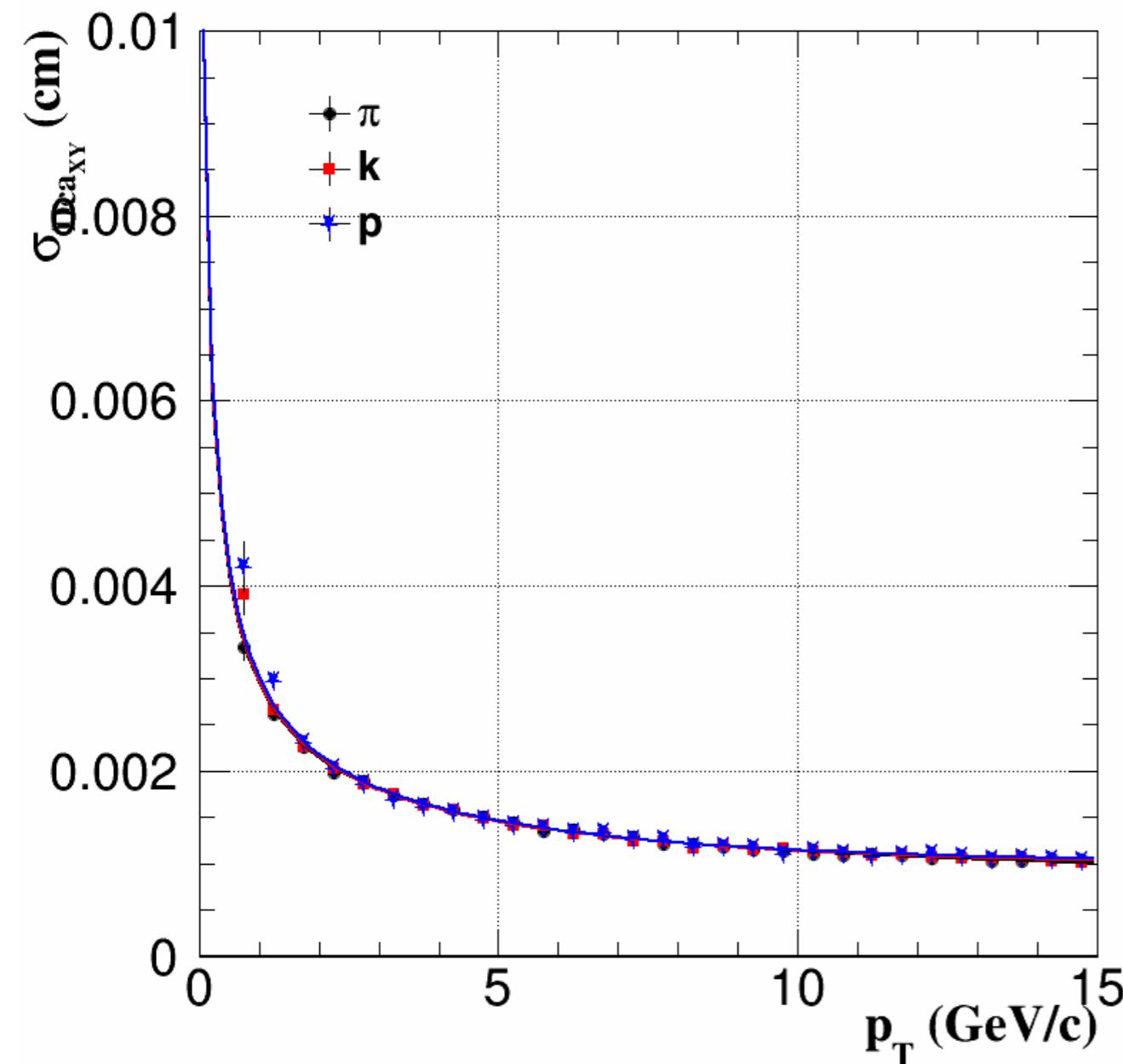
Momentum resolution



p_T resolution get worse
 mass width get wider, influence bg.
 within mass window



DcaXY



DcaXY

DcaZ Distribution Require 3 Maps Hits (use “layers” value) with different central hijing event as input

