2016/07/26 VTX Japan meeting

High-multiplicity BG in Run14 AuAu

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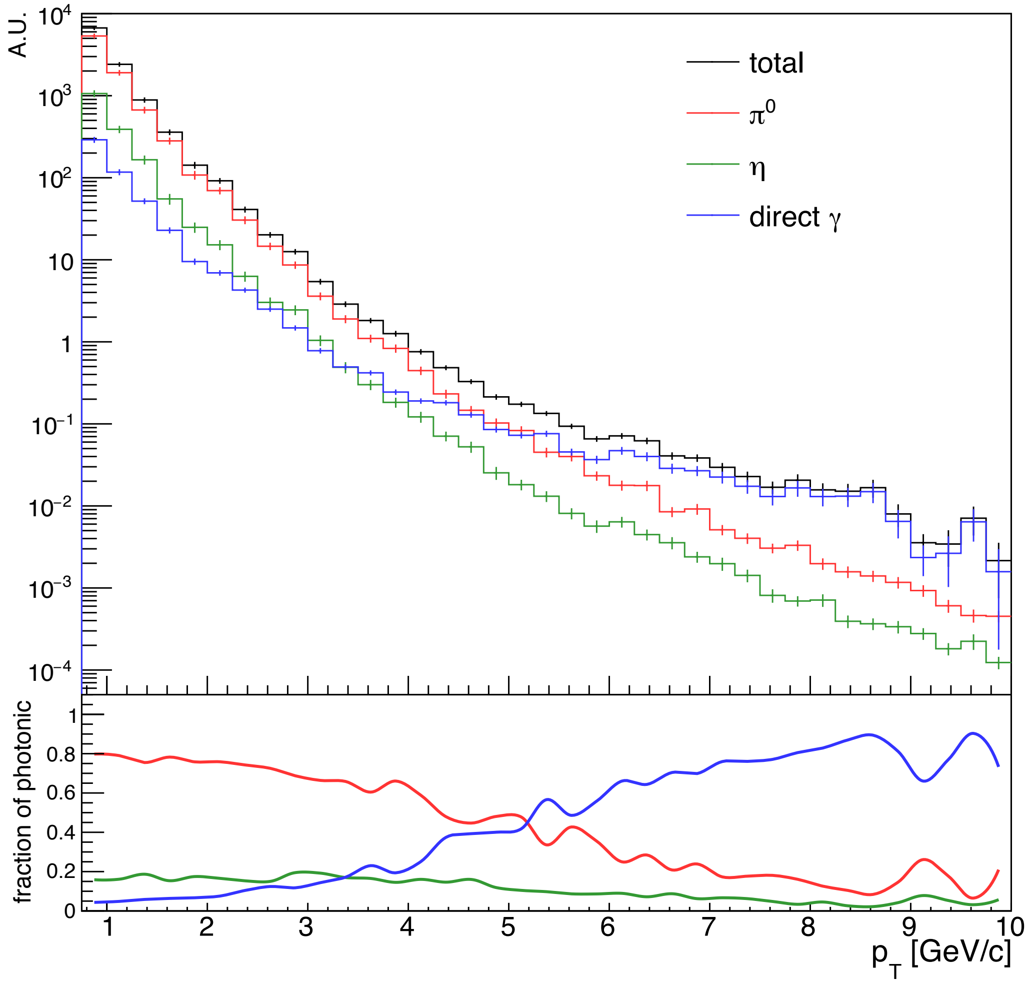
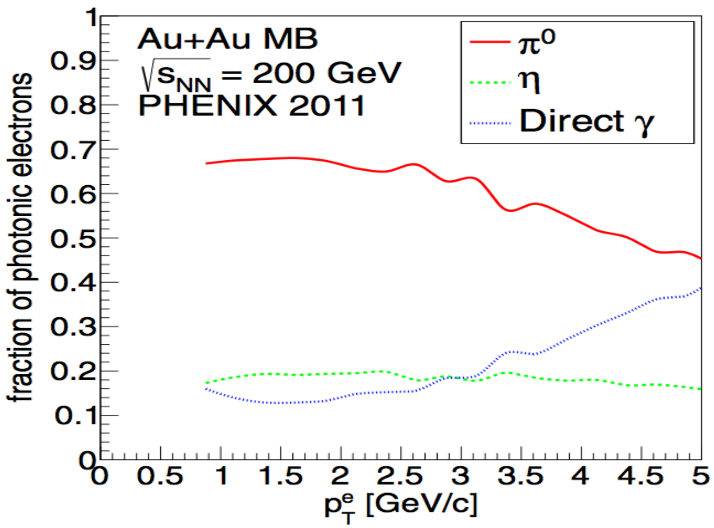
✓ Fraction of photonic electron

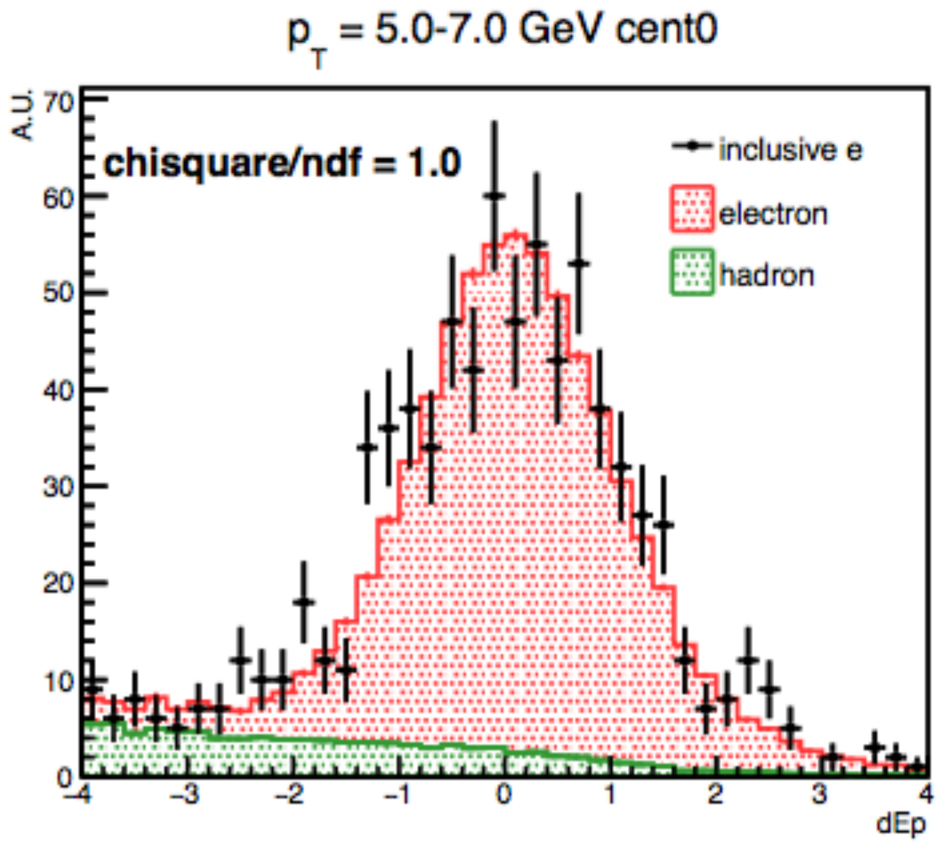


Photonic simulation

- 80M events for each of particles
- applied pT weight function
- applied veto cut
- calculate fraction of photonic e
  > almost same as that PPG182



✓ Dep template fit for high pT mis-ID hadron

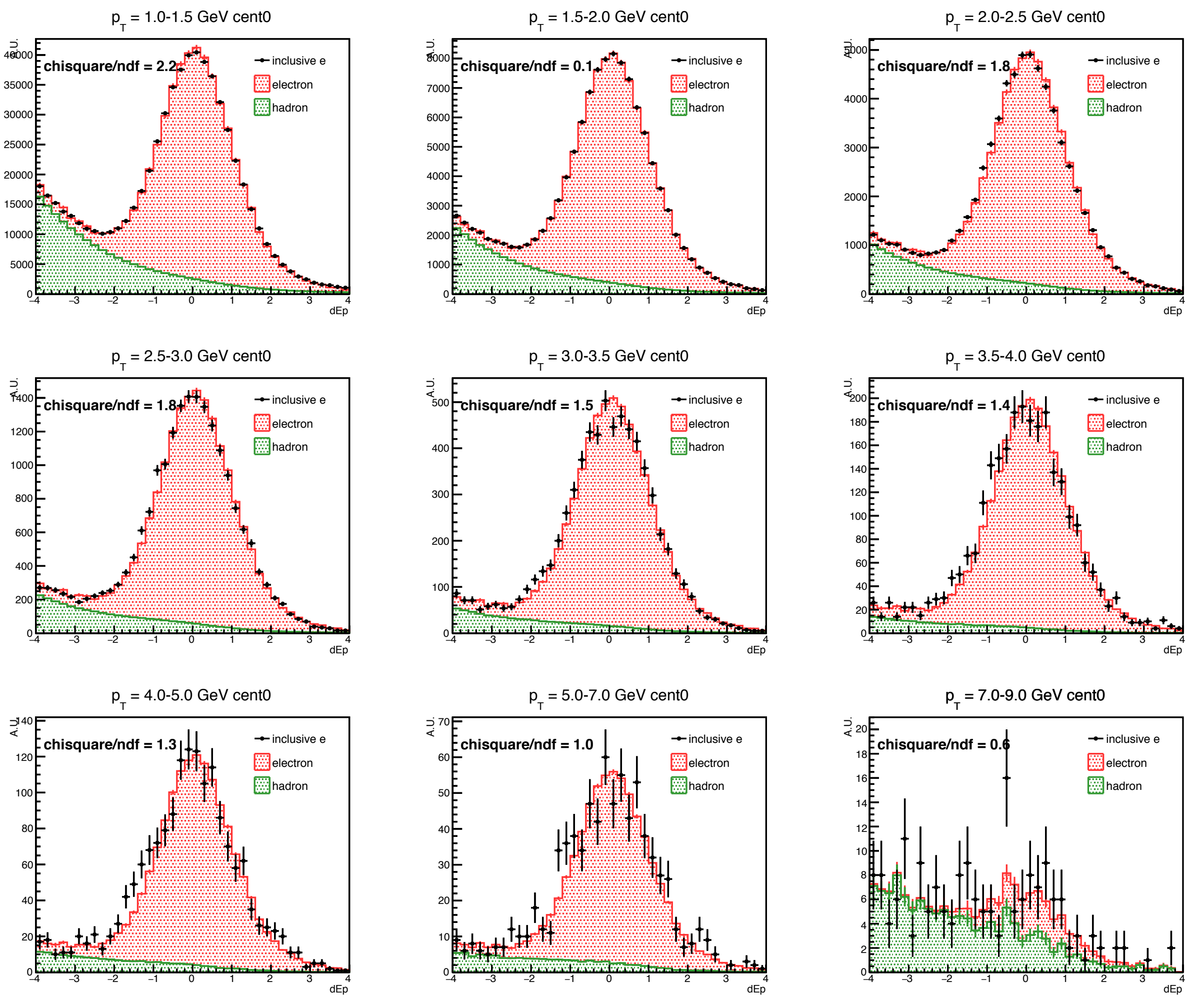


[Template fit]
dep(inc. e) = dep(e) + dep(charged hadron)

dep(electron) after subtracted RICH swap
> low pT dep (fix pt range 1.5-2.0 GeV)
dep(charged hadron)
> same pT range of inc. e

- fit range @ -4 < dep < 4
- fit with chi-square

✓ Dep template fit (MB)

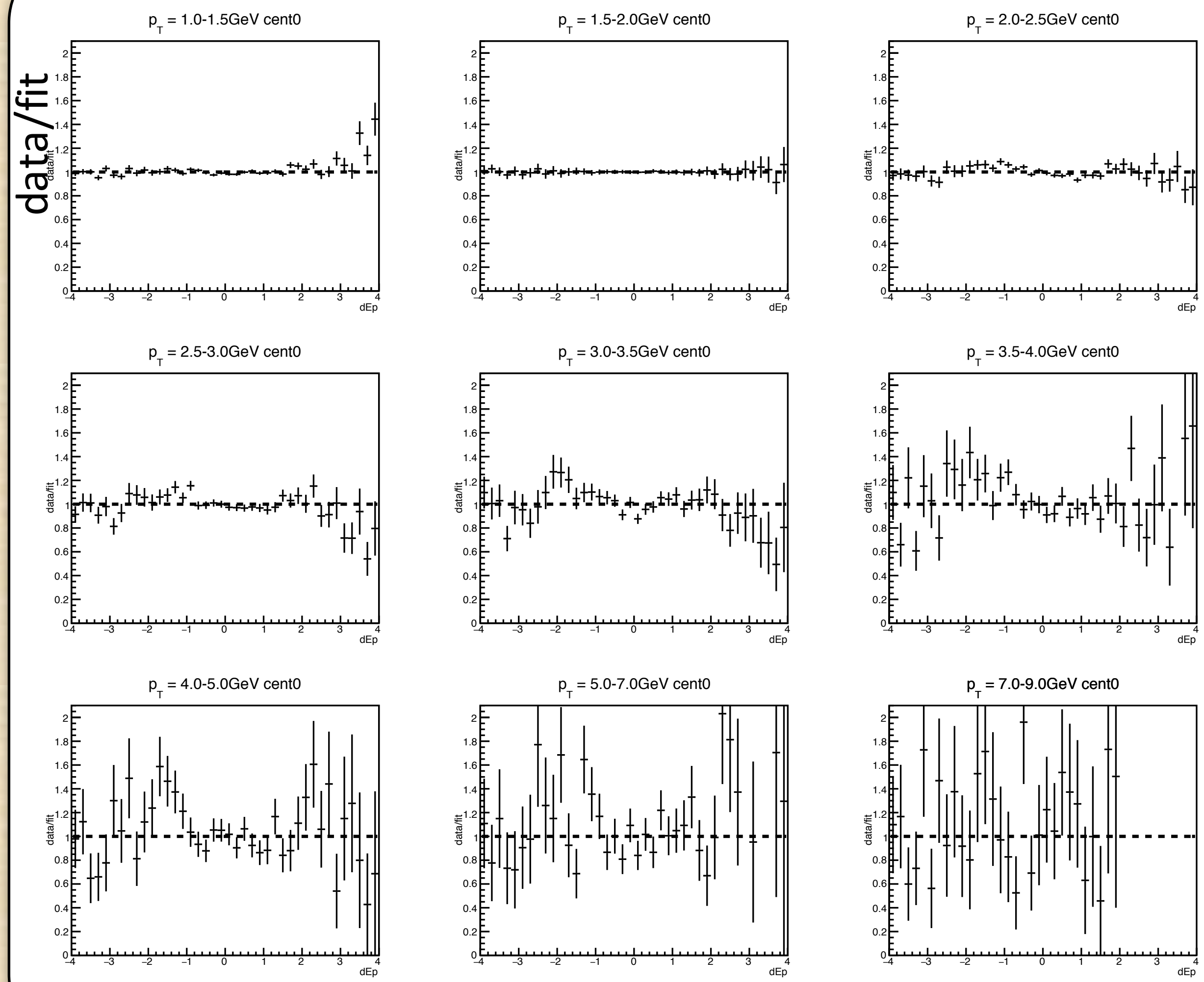


[Template fit]
dep(inc. e) = dep(e) + dep(hadron)

dep(charged hadron)
> same pT range
dep(electron)
> fix pT range (1.5-2.0 GeV)

- template fit works well for all pT range!!
- get hadron contamination at 5.0-7.0GeV, 7.0-9.0GeV

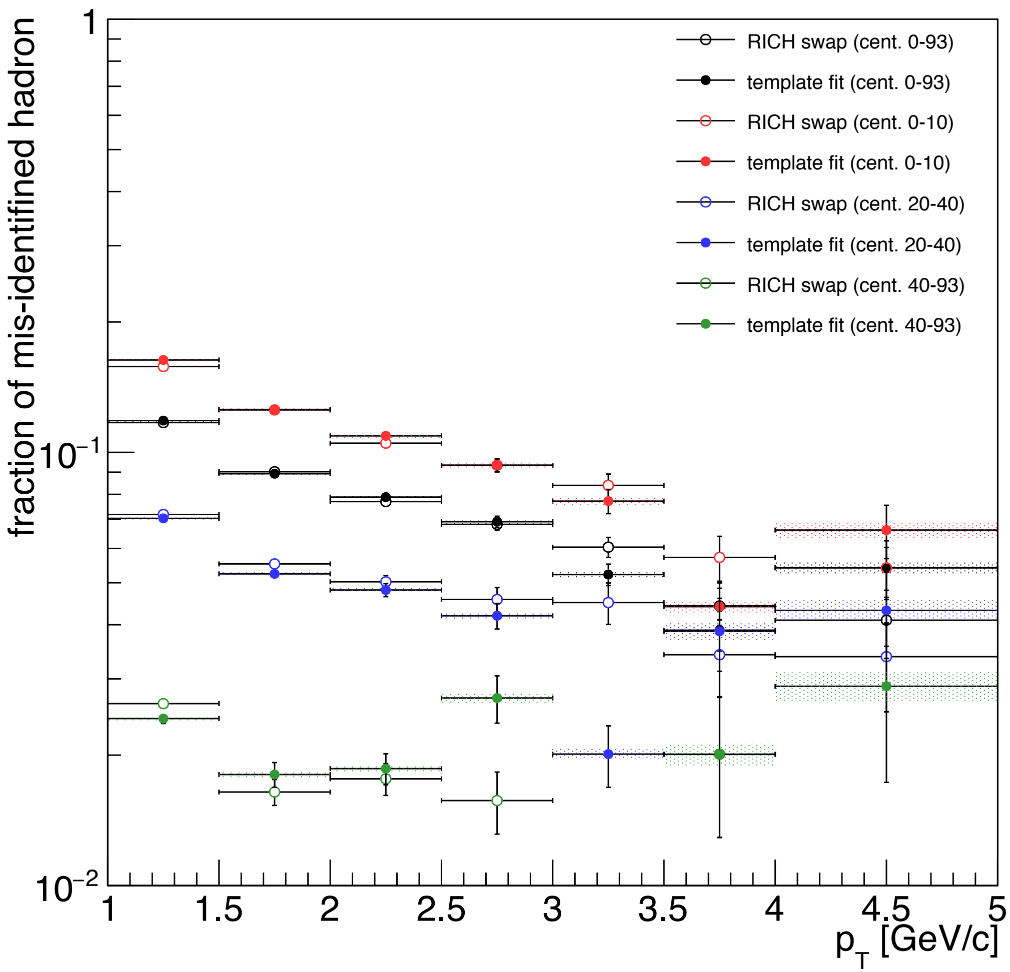
✓ Ratio of data to fit (MB)



[Template fit]
dep(inc. e) = dep(e) + dep(hadron)

Ratio of data to fit is almost 1

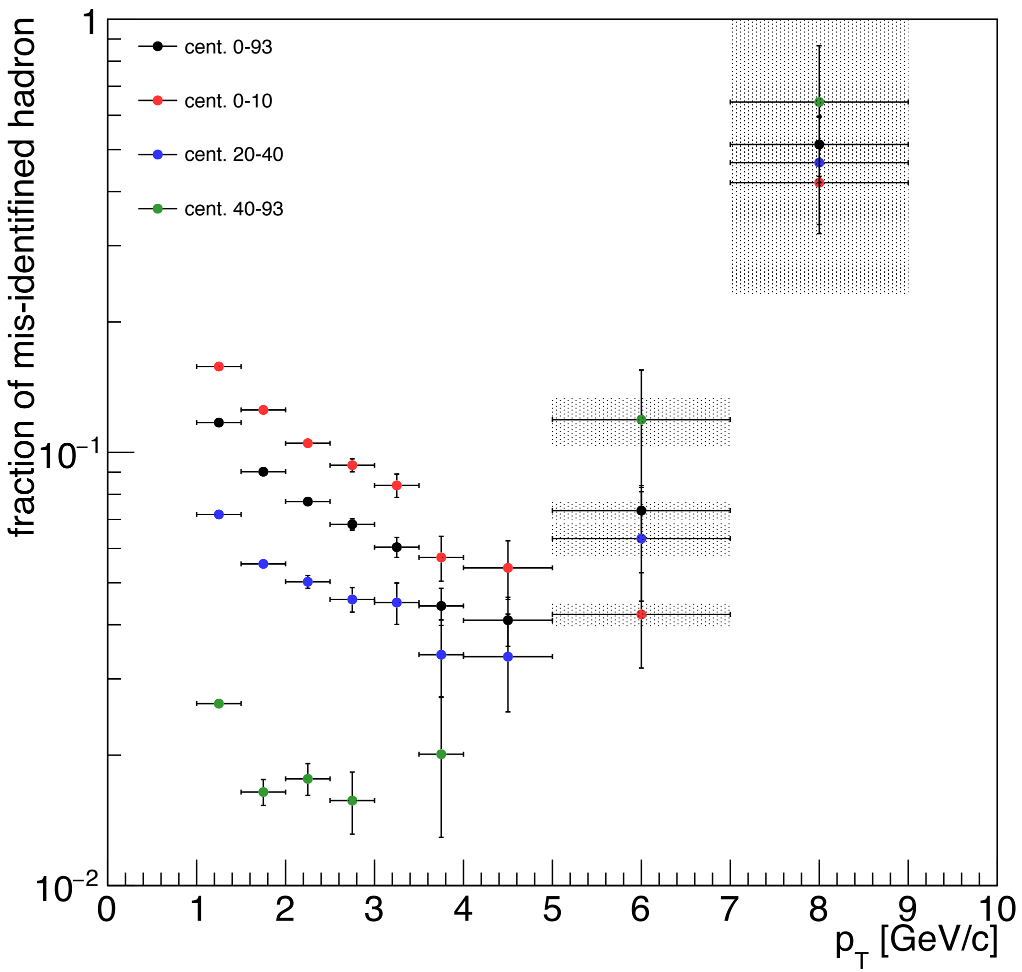
✓ Fraction of mis-identified hadron



- get normalization factor from -2 < dep
- compare fraction of both RICH swap and template fit
- two method are consistent below 5 GeV
  > open marker is RICH swap
  > filled marker is template fit

Template fit agree RICH swap!!
Template fit will be applied for pT > 5GeV

✓ Fraction of mis-identified hadron



[Fraction of mis-identified hadron]
Combine two method
- RICH swap for pT < 5GeV
- template fit for 5GeV < pT

- not good at high pT because of very low statistics
- fit indicator should be change from chi-square to log-likelihood

✓ Background normalization and DCA template

✓ **Expected BG components**

+ **Mis-identified hadron (almost done)**
  - RICH swap for pT < 5GeV
  - dep template fit for 5GeV < pT (new)
+ **Photonic electron (almost done)**
  - residual template fit (new)
    > compare between Run14 and PPG182
+ **High-multiplicity**
  - small angle rotation
  - (embedding study)
+ **J/psi and ke3 (done)**
  - published data in Run4

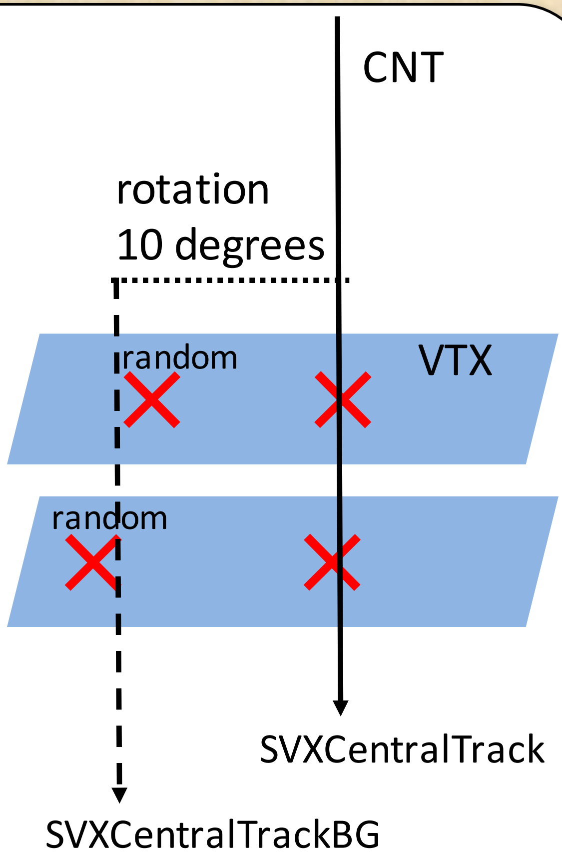
✓ BG: High-multiplicity

✓ **High-multiplicity BG**

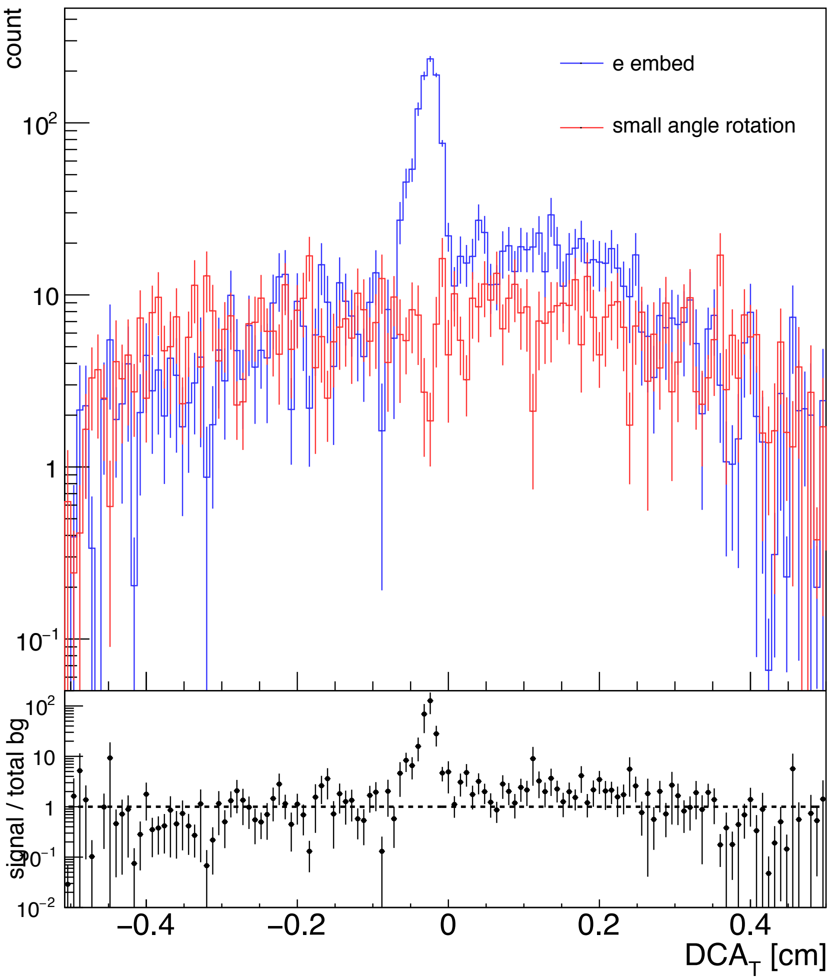
- CNTrack -> true, SVX hit -> fake

✓ **Small angle rotation**

- reconstruct fake track
  for high-multiplicity BG at VTX
- similar method as RICH swap
- CNT track is rotated 10 degrees at VTX
  +ϕ, -ϕ, +θ, -θ, +ϕ.... (track by track)
- SvxCentralTrackBackList (made by Takashi)
  > reconstructed by SvxCentralTrackBG_VarArray



✓ Embedding study for High-mutiplicity BG



+ <u>embedded simulation</u>
  - require VTX hit at B0B1 (2hit)
  - embedding code has bug
    > chi2ndf distribution is odd
    > need more investigation

+ <u>small angle rotation</u>
  - reproduce high-multiplicity BG almost
  - but embedded sim. has asymmetry…

+ <u>To Do</u>
  - modify embedding code
  - apply to real data

✓ To Do

✓ <u>BG normalization</u>

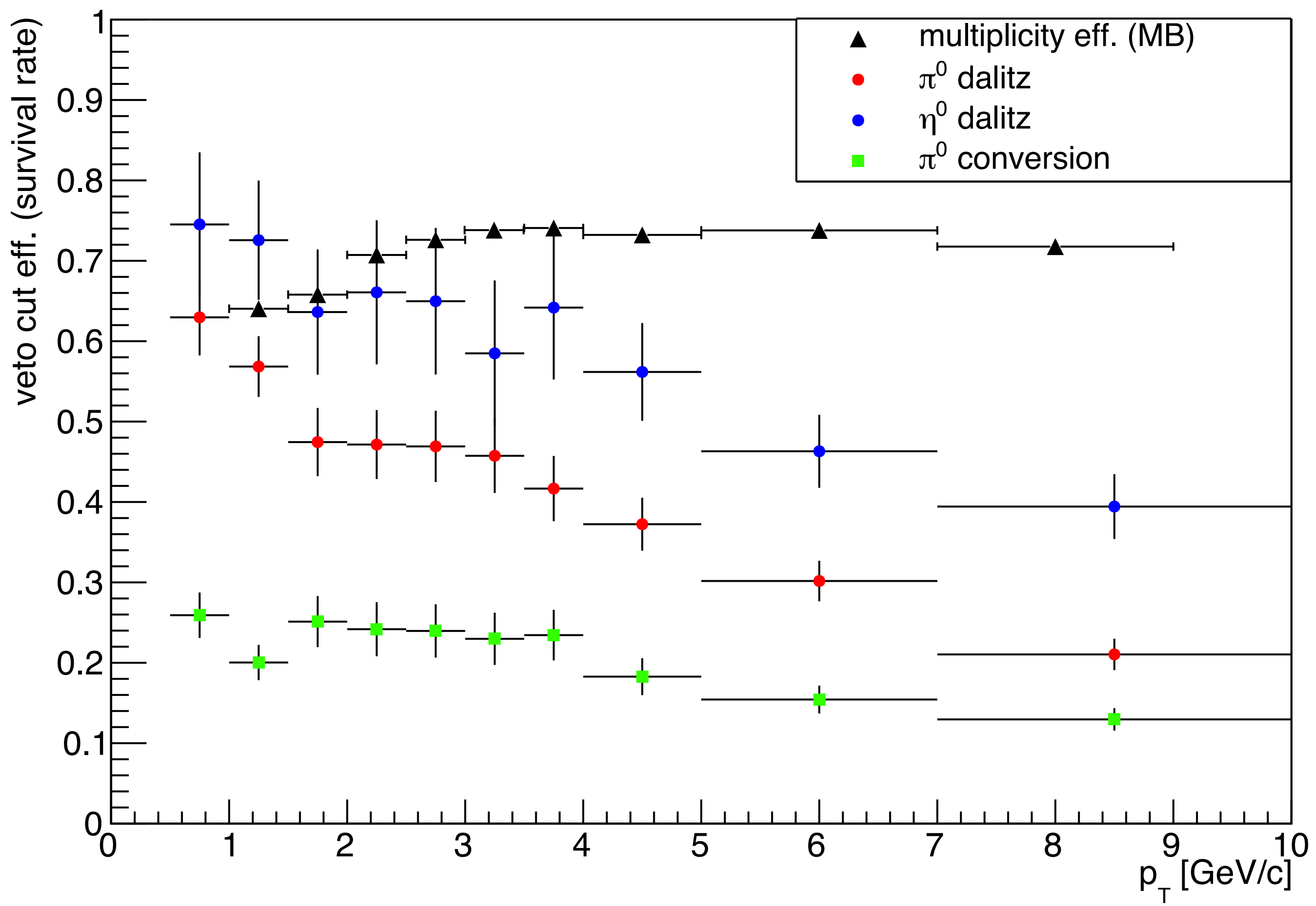
- Mis-ID hadron
  > apply log likelihood fit to template fit
- Photonic
  > increase MC statistics (after new production)
- High-multiplicity
  > check other rotation degrees such as 1 or ….
  > investigating embedding code…
  > apply real data

✓ <u>HFe invariant yield</u>

- estimate by photonic fraction (method1)
- estimate by acc. * reco. efficiency (method2)

✓ backup

✓ Summary of survival rate



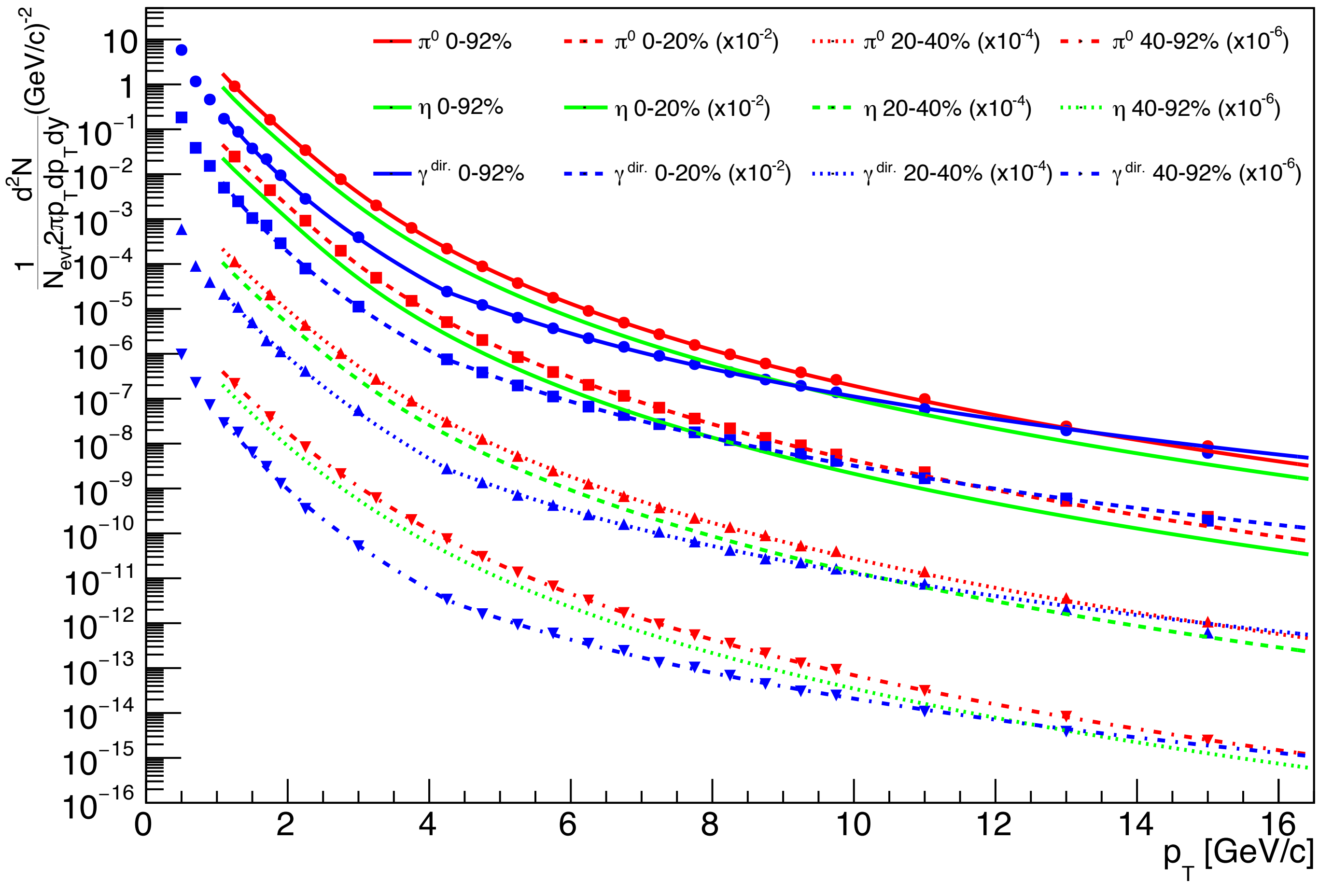
✓ Photonic e simulation file

multi-pi0 simulation (80M)
- 8 pi0 generated in one event
- output at /phenix/analysis/vtx/run14AuAu/mult_piz/pisaToDST

multi-eta simulation (80M)
- 8 eta generated in one event
- output at /phenix/analysis/vtx/run14AuAu/mult_eta/pisaToDST

multi-gamma simulation (80M)
- 8 gamma generated in one event
- output at /phenix/analysis/vtx/run14AuAu/mult_gamma/pisaToDST

✓ Photonic simulation

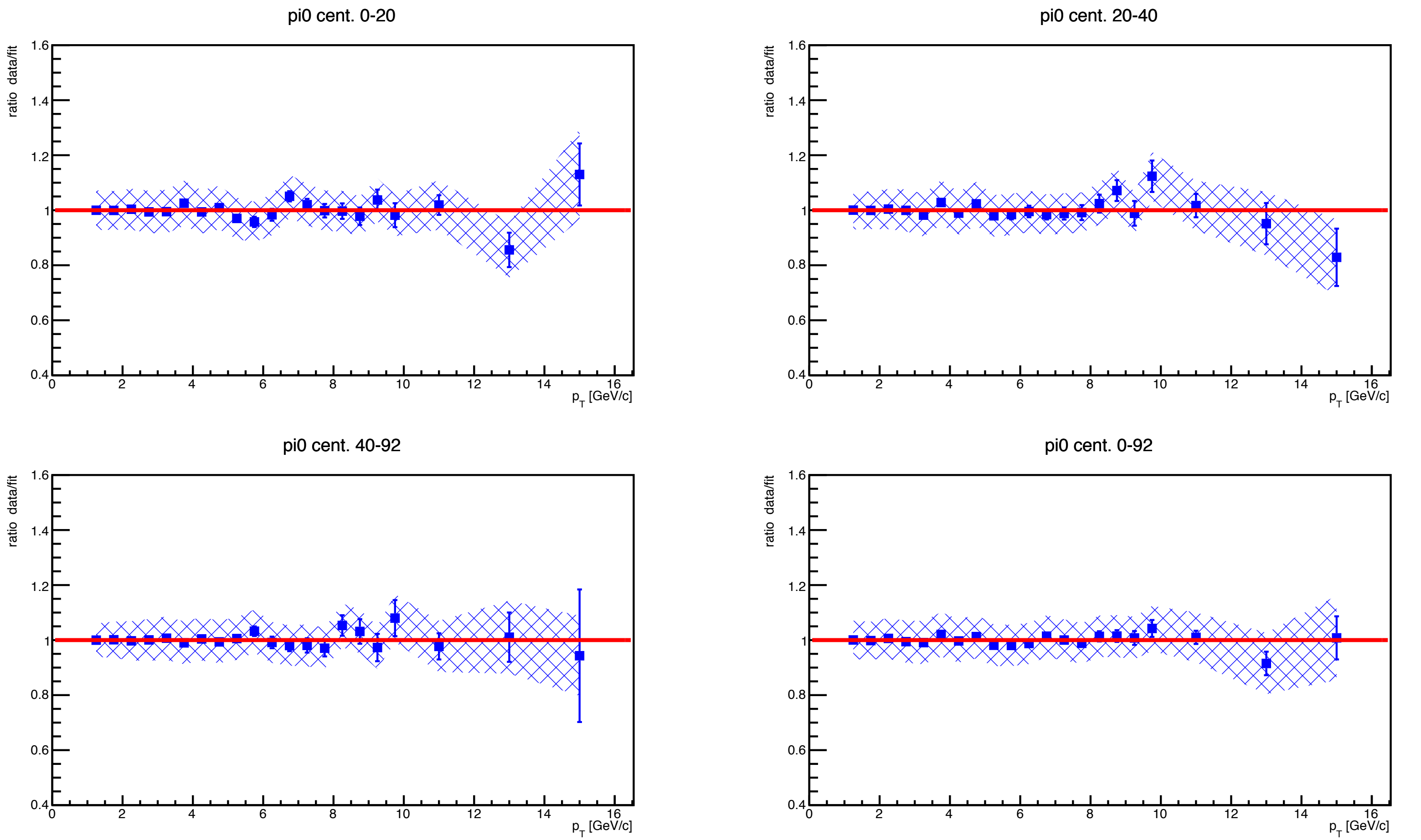


[published data]
π^0 from PPG
η from m_T scaling
γ^{dir} from PPG

[p_T weight function]
- fit mod. hagedorn
  + pow low

> apply p_T weight
  to mc simulation

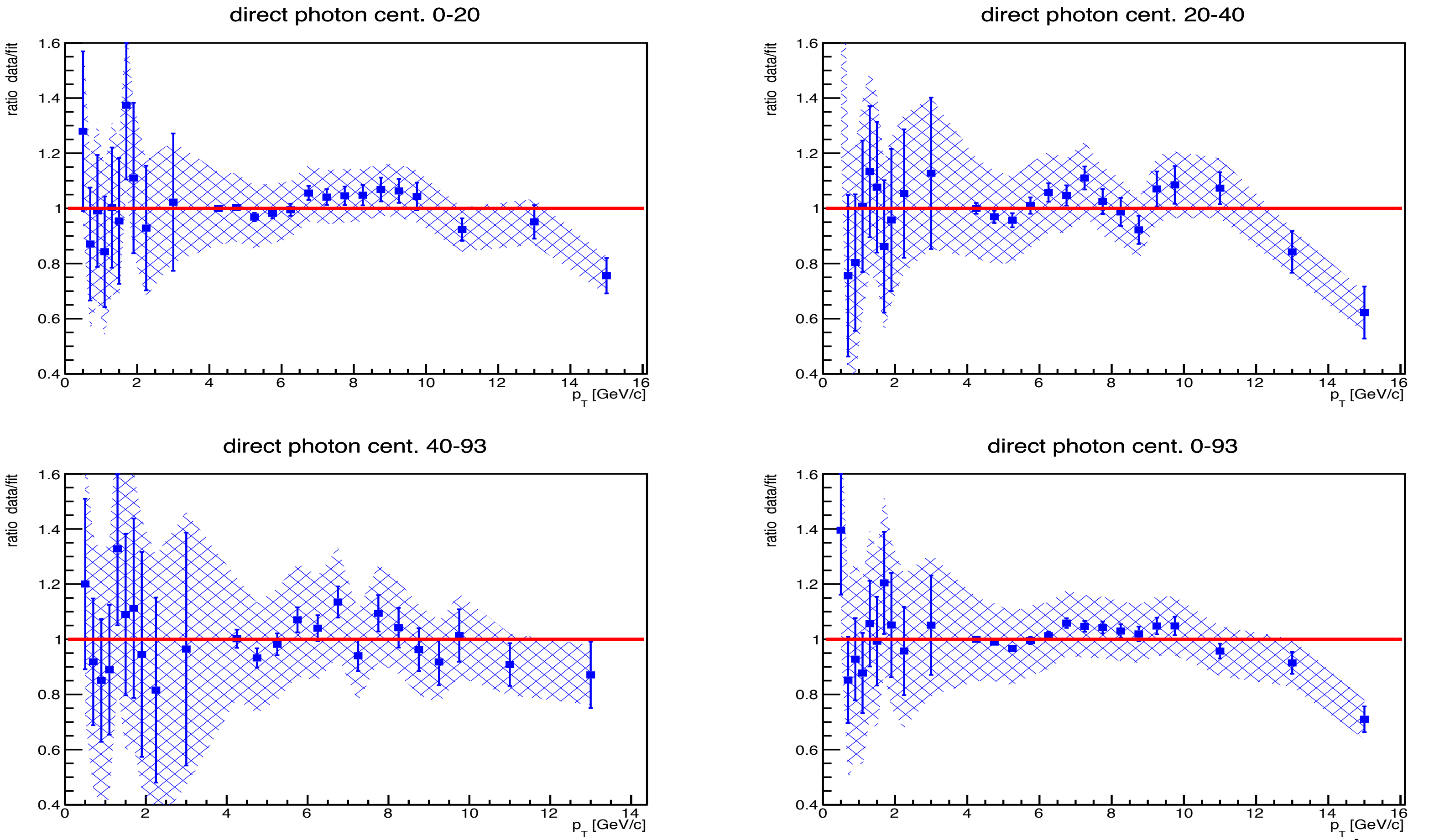
✓ data/fit for π^0 (mod. hagedorn + power low)



- mod. hagedorn + power low agree with data (connected at 9.0 GeV/c)

$$E\frac{d^3N}{d^3p} = \frac{1}{1+\exp((p_T-9.0)/[7])}\frac{[0]}{(\exp(-[1]p_T-[2]p_T^2)+p_T/[3])^{[4]}} + \frac{1}{1+\exp((p_T-9.0)/[7])}[5]p_T^{-[6]}$$

✓ data/fit for direct photon



- mod. hagedorn + power low agree with data (connected at 4.0 GeV/c)

$$E\frac{d^3N}{d^3p} = \frac{1}{1+\exp((p_T-9.0)/[7])}\frac{[0]}{(\exp(-[1]p_T-[2]p_T^2)+p_T/[3])^{[4]}} + \frac{1}{1+\exp((p_T-9.0)/[7])}[5]p_T^{-[6]}$$