2016/08/31 VTX meeting

Invariant yield of HFe in Run14 AuAu

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✓ Invariant Yields of Heavy Flavor e

Calculation of invariant yield of HFe

- dN_e^{HF}/dp_T can be calculated by published photonic yields (π^0, η, γ)

$$\frac{dN_e^{HF}}{dp_T} = \frac{dN_e^{photonic}}{dp_T} \times R_{NP}(p_T) \times (1 - F_{ke3}(p_T) - F_{J/\psi}(p_T))$$

> $\frac{dN_e^{photonic}}{dp_T} = \frac{dN_{\pi^0,\eta,\gamma}^{total}}{dp_T} \times R_{DP}(p_T) \times (1 + R_{CD})$

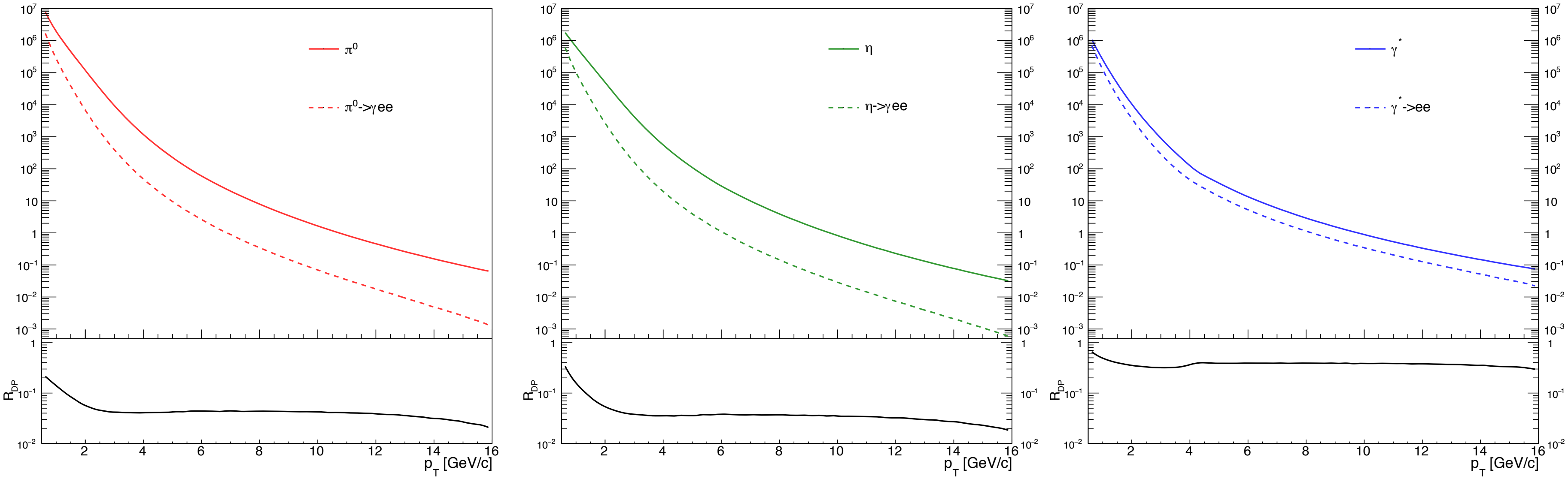
-> $R_{DP}(p_T) = \frac{N_e^{dalitz}}{N_{\pi^0,\eta,\gamma}^{total}}$, $R_{CD} = \frac{N_e^{conv.}}{N_e^{dalitz}}$ calculated by MC method

> $R_{NP}(p_T)$ can be calculated by data driven

> F_{ke3}, $F_{J/\psi}$ are used previous analysis

$$\frac{dN_e^{HF}}{dp_T} = \frac{dN_{photon}^{total}}{dp_T} \times R_{DP}(p_T) \times (1 + R_{CD}) \times R_{NP}(p_T) \times (1 - F_{ke3}(p_T) - F_{J/\psi}(p_T))$$

✓ Ratio of Dalitz decay e to photonic souce



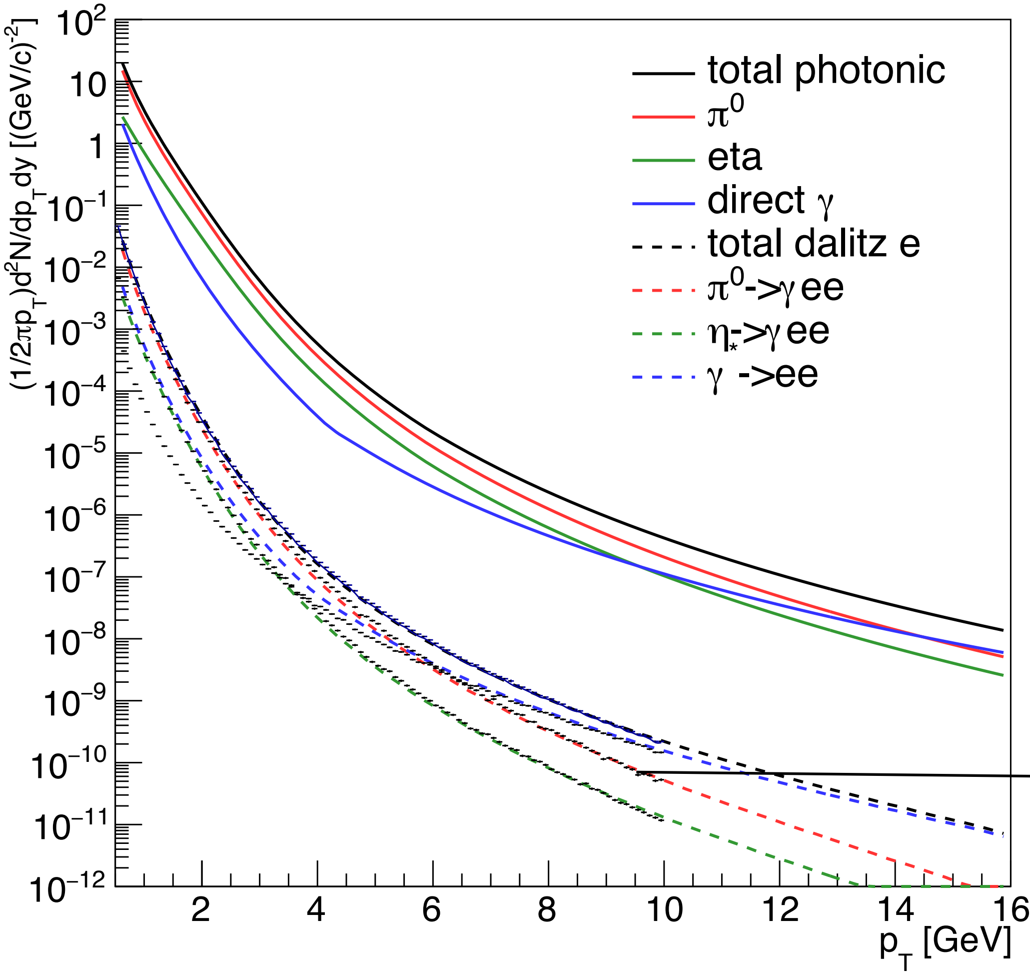
- MC simulation

  single sim. × p_T weight

- Ratio of dalitz e to photonic souce

$R_{DP} = N^{e}_{dalitz}/N_{\pi,\eta,\gamma}$

✓ Invariant yield of dalitz decay e



[Inv. yield of total dalitz e]

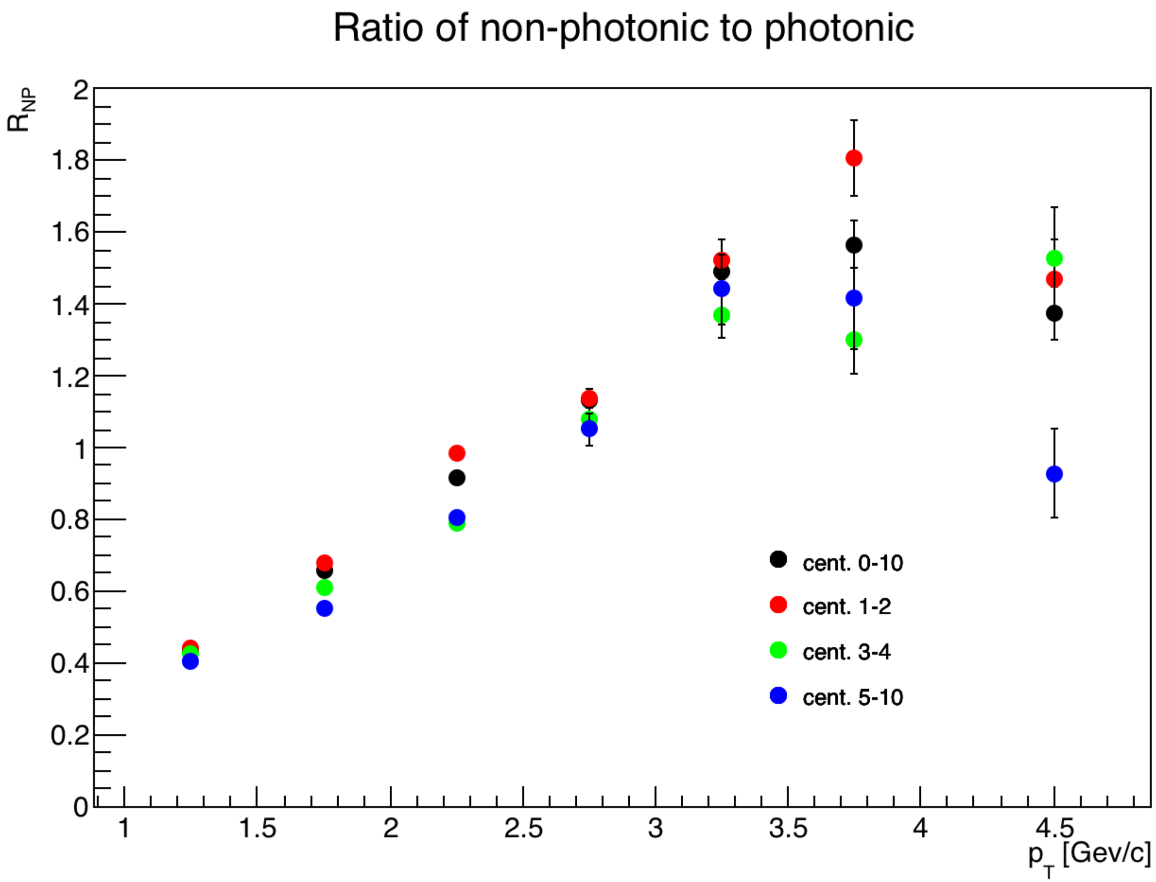
- Invariant yield of dalitz decay e can be estimated by MC sim.

dN_e^{dalitz} / dp_T

$= Yields_{\pi,\eta,\gamma} \times R_{DP} \times$ Branting Ratio

These yield is consistent with Run4 cocktail (black histogram).

✓ Ratio of non-photonic to photonic



$R_{NP} = N_{NP} / N_P$

$N_P = (N_e^{veto} - \varepsilon_R * \varepsilon_V * N_e) / \varepsilon_R * (1-\varepsilon_V)$

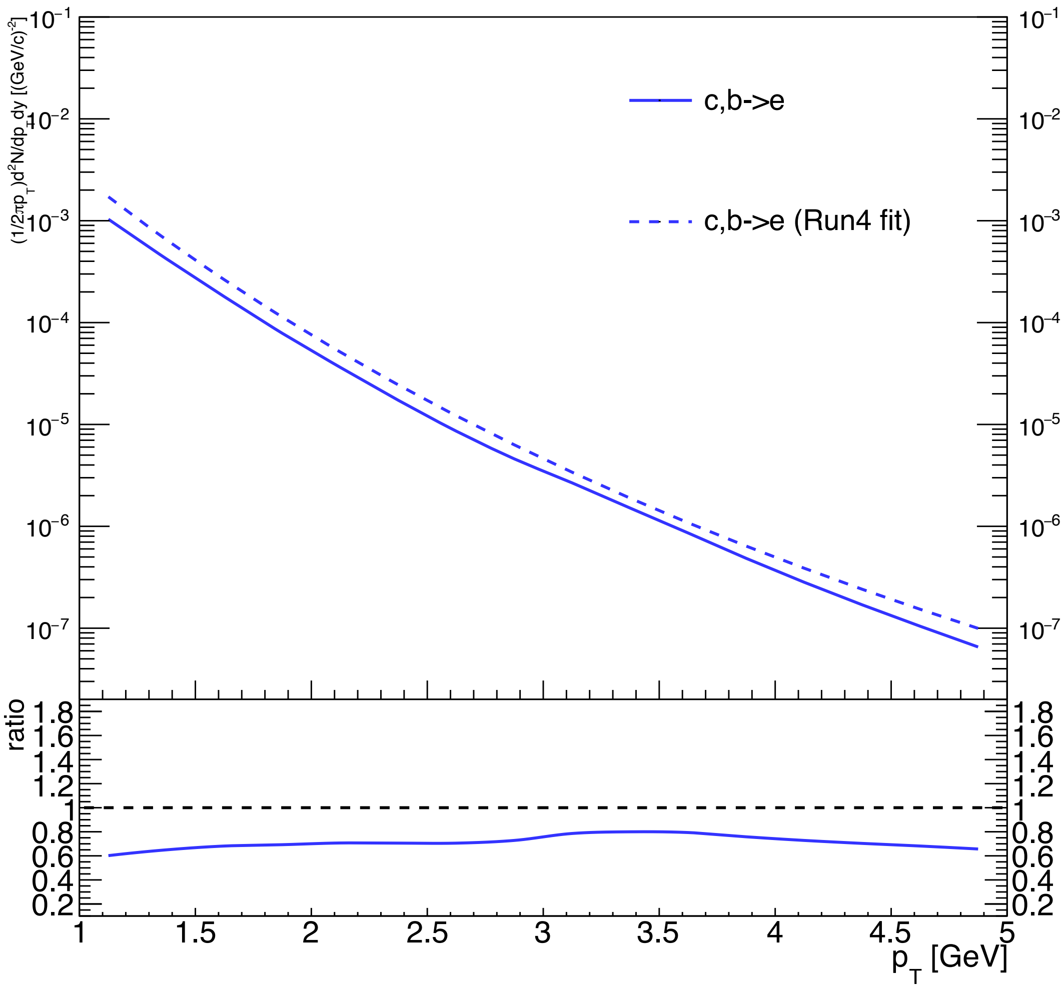
$N_{NP} = (\varepsilon_R * N_e^{veto} - N_e) / \varepsilon_R * (1-\varepsilon_V)$

ε_V = single veto eff.
(calculated by MC method)

ε_R = random veto eff.
(calculated by data driven)

- Invariant Yield of non-photonic e is calculated by R_{NP} and Inv. Yield of dalitz e and R_{CD}

✓ Invariant yield of HF e



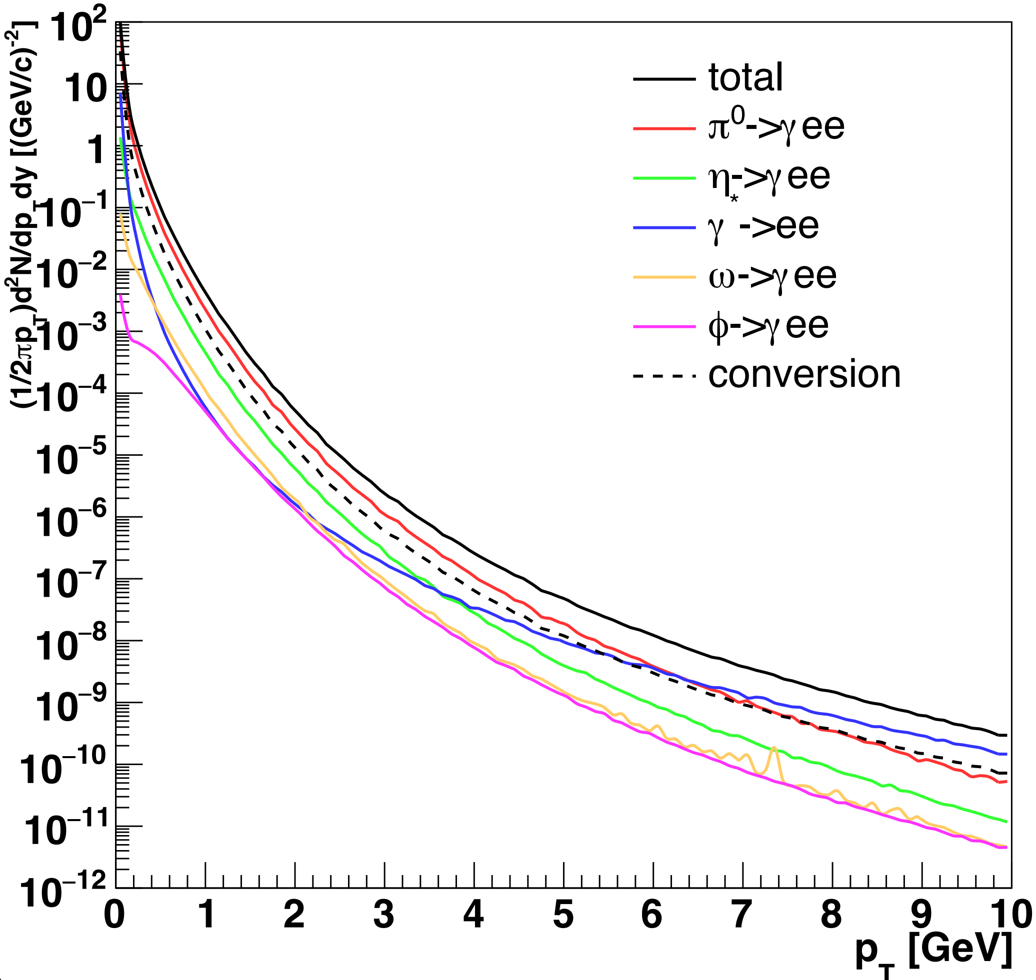
[Invariant yield of HF e]

$dN^{HF}{}_e/dp_T$

$= dN^{dalitz}{}_e/dp_T*(1+R_{CD})*R_{NP}*(1-F_{ke3}-F_{jpsi})$

- Run14 Invariant yield is smaller than Run4 fit by 20~30%.
- have not included ω, ϕ yet
  > expect to increase by ~10%

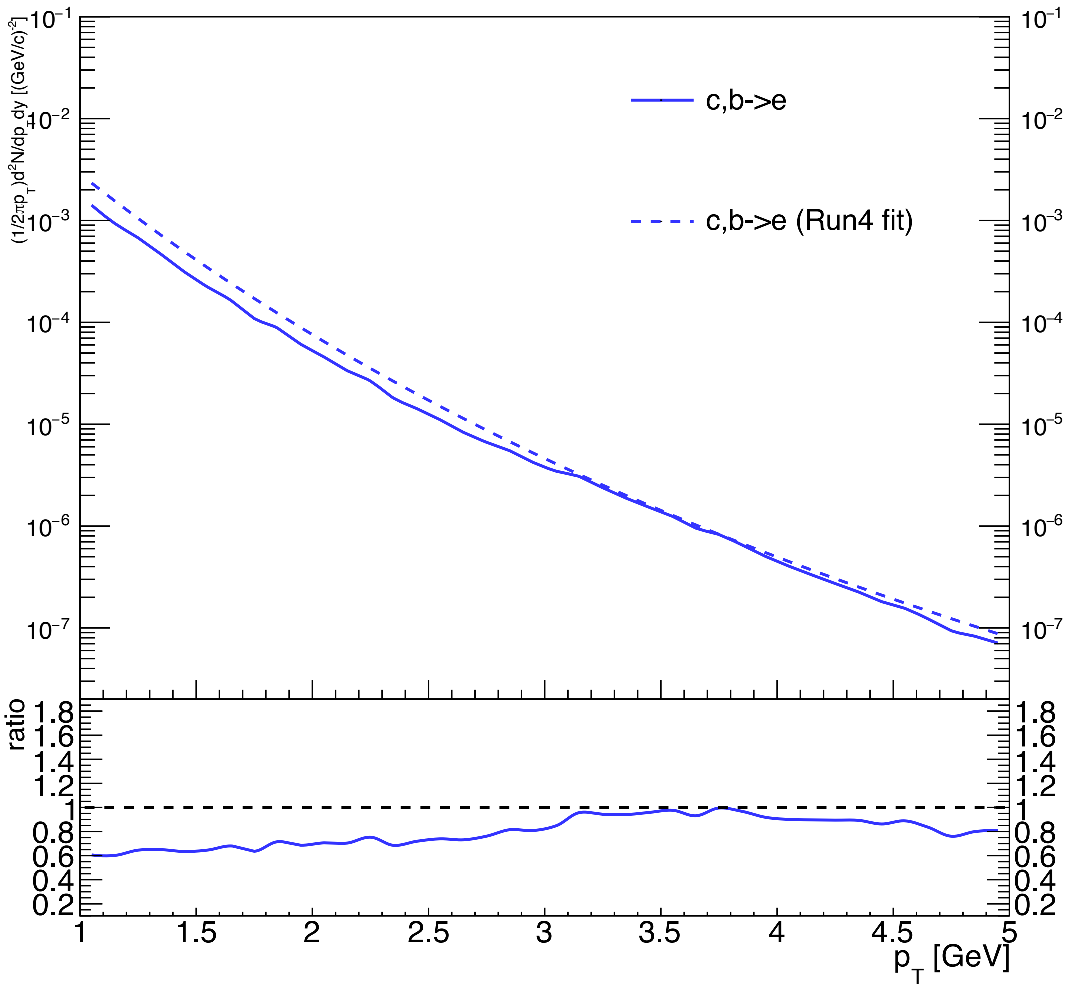
✓ Invariant yield of dalitz e (using Run4 cocktail)



[Run4 cocktail]

- Conversion will be increased by R_{CD} ratio (Run4/Run11)
  > Run14 R_{CD} = 1.027
  > Run11 R_{CD} = 0.404
- conversion × (1.027/0.404)

✓ Invariant yield of HF e (useing Run4 cocktail)



[Invariant yield of HF e]

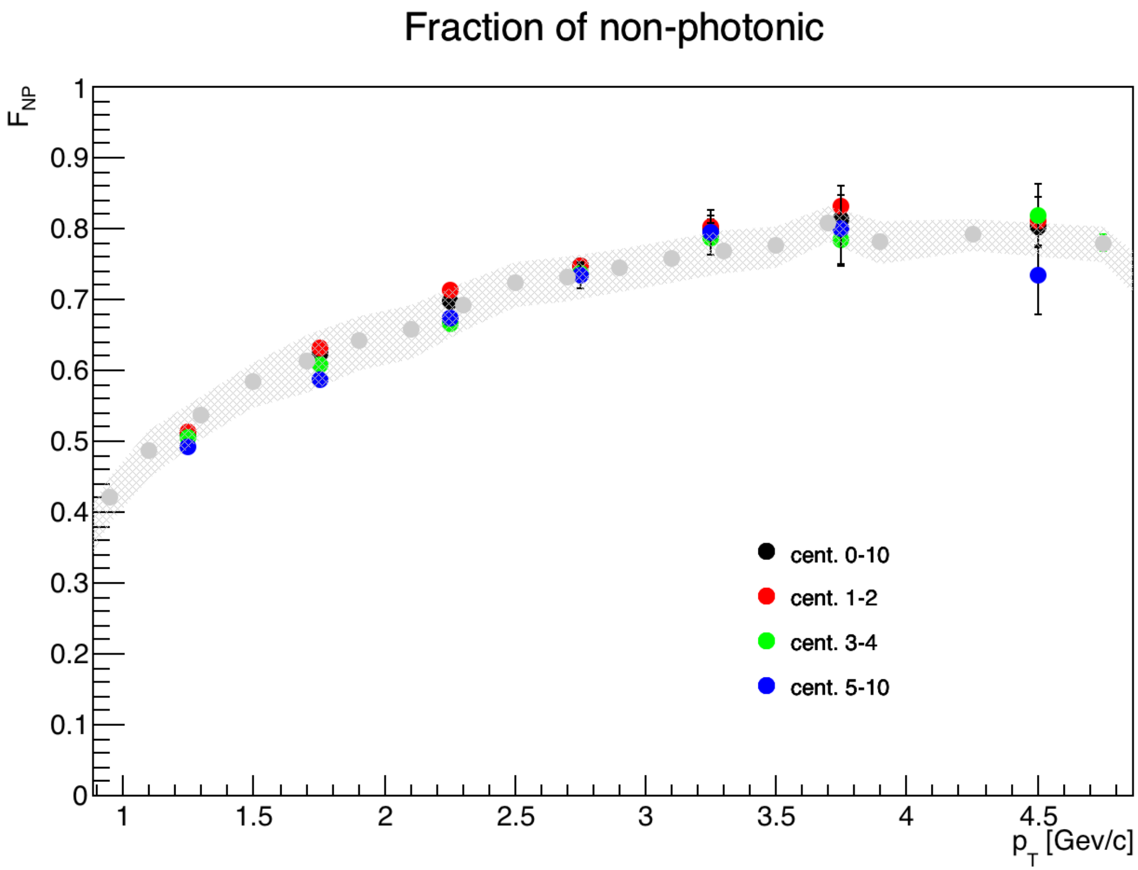
$dN^{HF}{}_{e}/dp_T$

$= dN^{dalitz}{}_{e}/dp_T*(1+R_{CD})*R_{NP}*(1-F_{ke3}-F_{jpsi})$

- Run14 Invariant yield is smaller than Run4 fit by 0~30%.

✓ backup

✓ Fraction of non photonic electron



[Data driven method]

$F_{NP} = N_{NP} / (N_{NP} + N_P)$

$N_P = (N_e^{veto} - \varepsilon_R * \varepsilon_V * N_e) / \varepsilon_R * (1-\varepsilon_V)$

$N_{NP} = (\varepsilon_R * N_e^{veto} - N_e) / \varepsilon_R * (1-\varepsilon_V)$

ε_V = single veto eff.
(calculated by MC method)

ε_R = random veto eff.
(calculated by data driven)

Data driven method agree with bootstrap method!!
Data driven method is better than Residual method (using cdphi dist.)

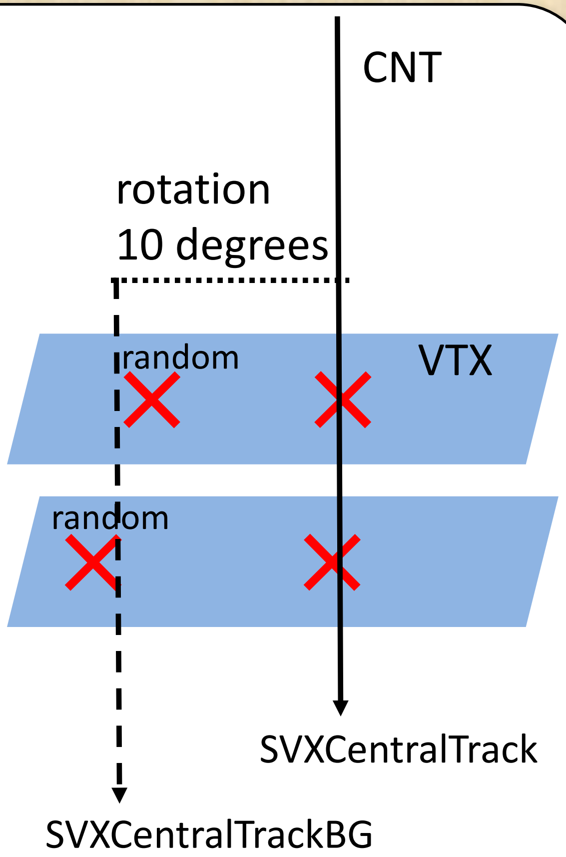
✓ BG: High-multiplicity

✓ **High-multiplicity BG**

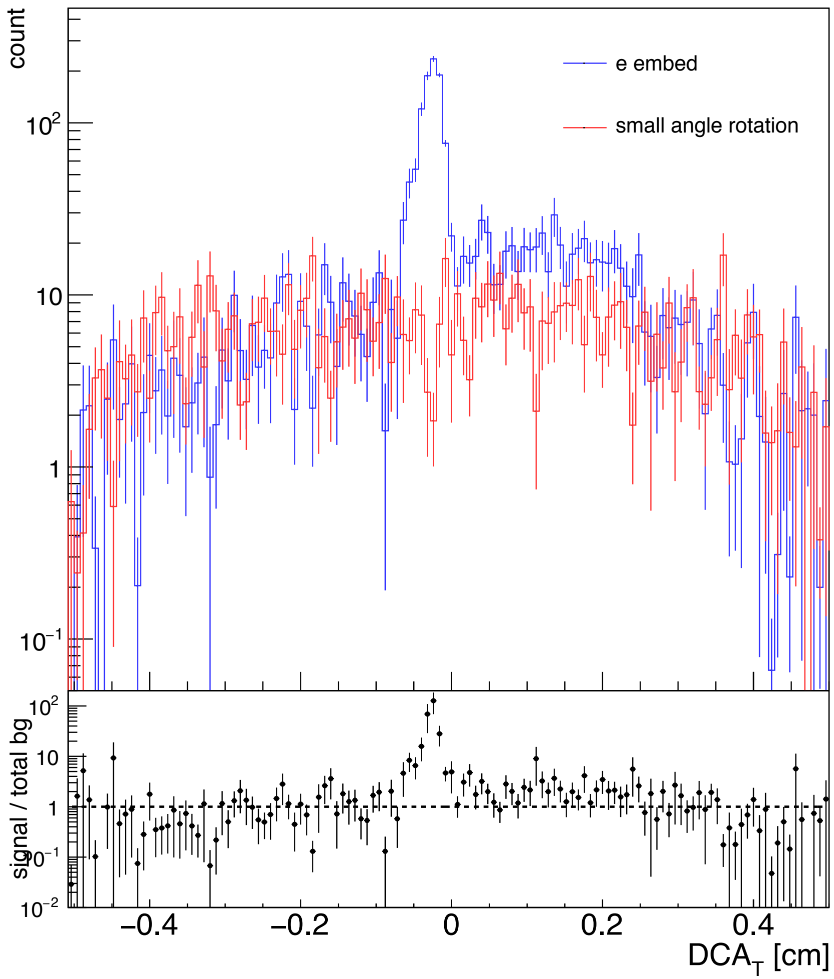
- CNTrack -> true, SVX hit -> fake

✓ **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
  $+\phi, -\phi, +\theta, -\theta, +\phi$.... (track by track)
- SvxCentralTrackBackList (made by Takashi)
  > reconstructed by SvxCentralTrackBG_VarArray



✓ Embedding study for High-mutiplicity BG

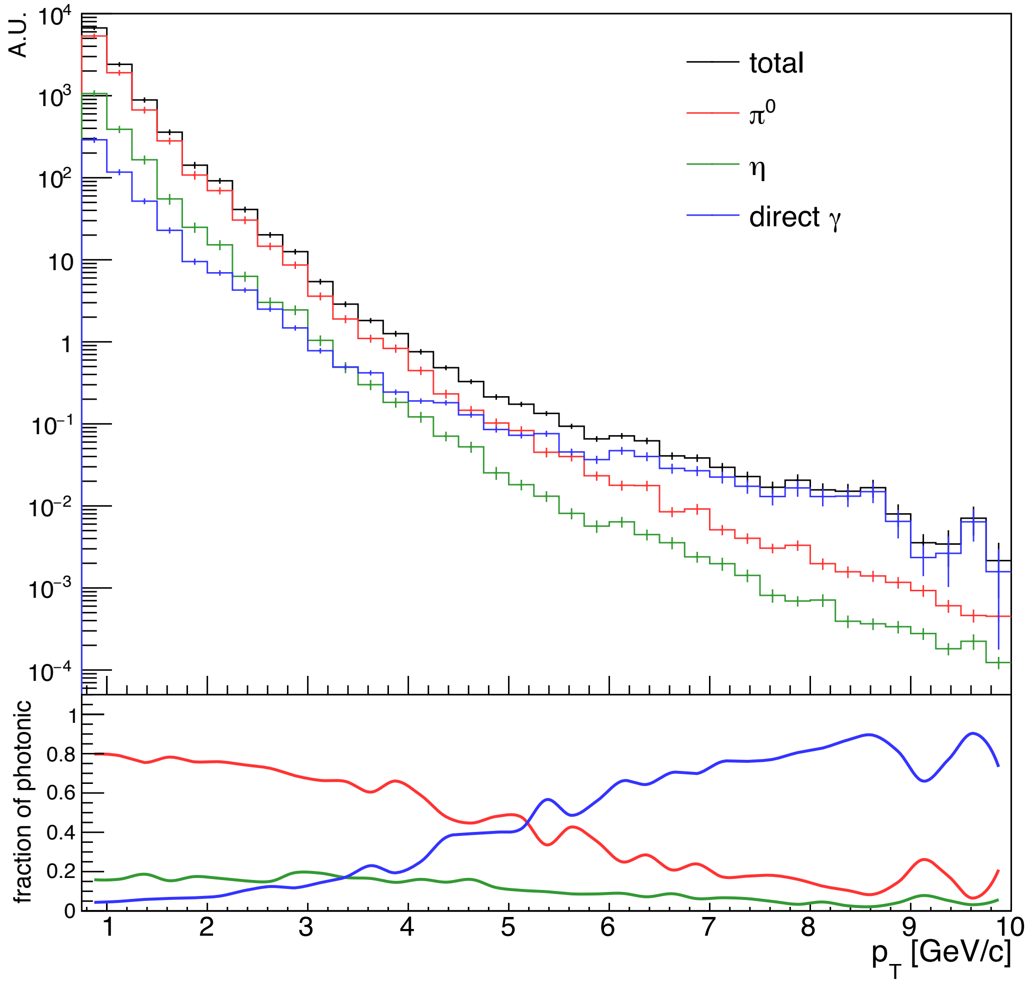


+ embedded simulation
  - require VTX hit at B0B1 (2hit)
  - embedding code has bug
    > chi2ndf distribution is odd
    > need more investigation

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

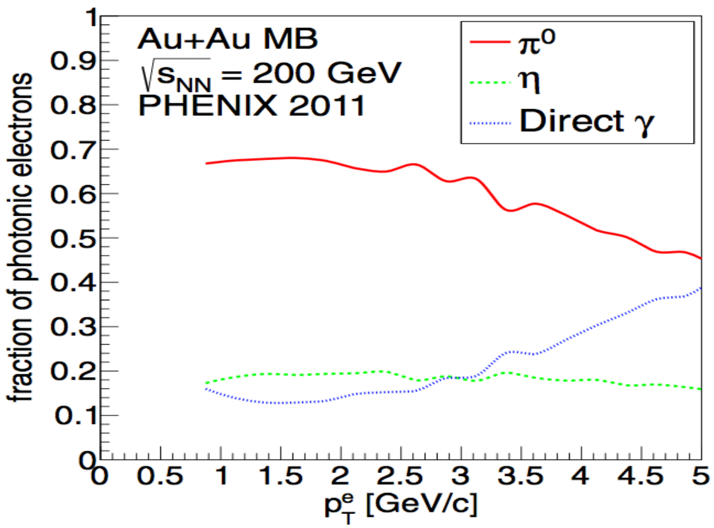
+ To Do
  - modify embedding code
  - apply to real data

✓ Fraction of photonic electron

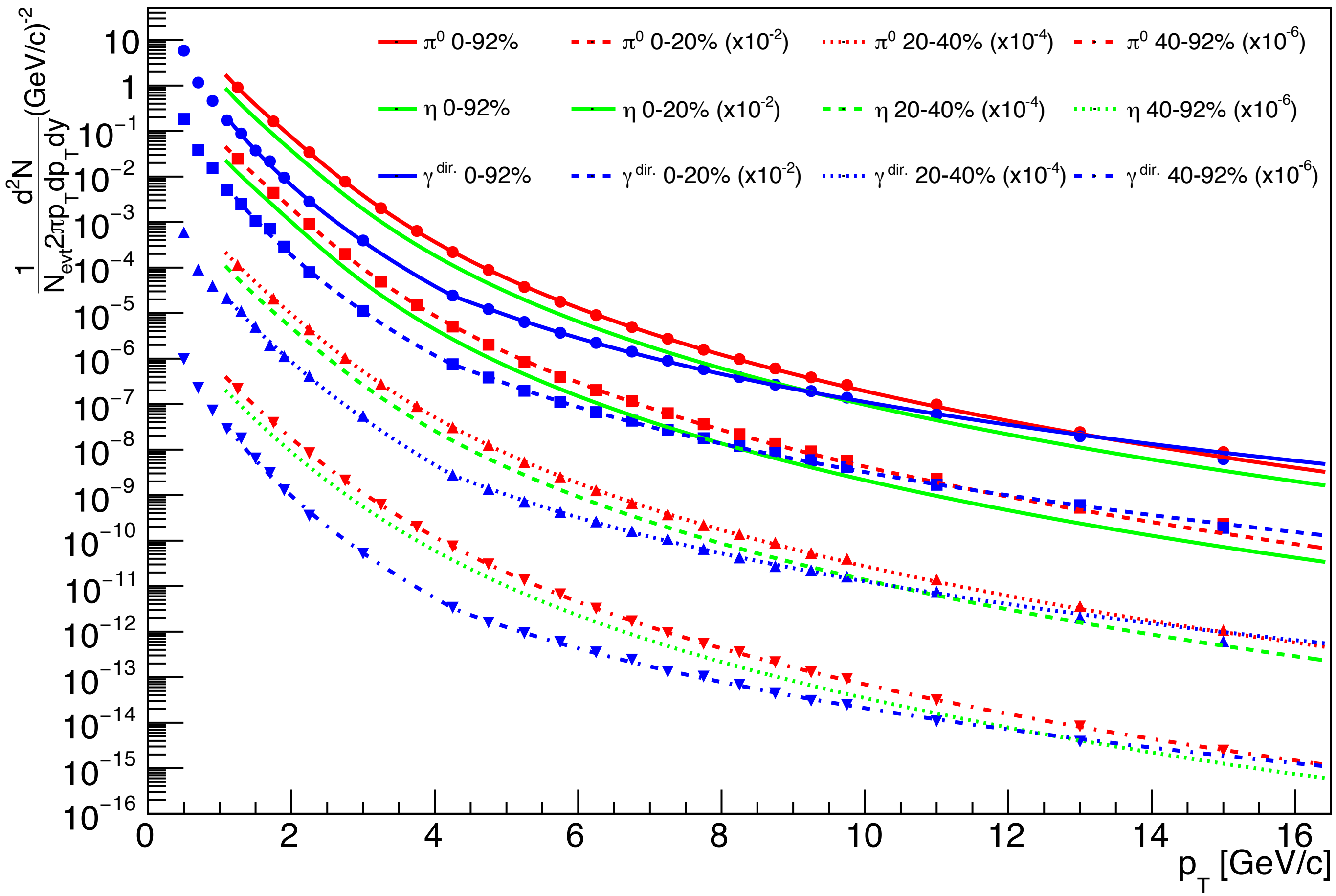


<u>Photonic simulation</u>

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



✓ Photonic simulation



[published data]

π^0 from PPG

η from m_T scaling

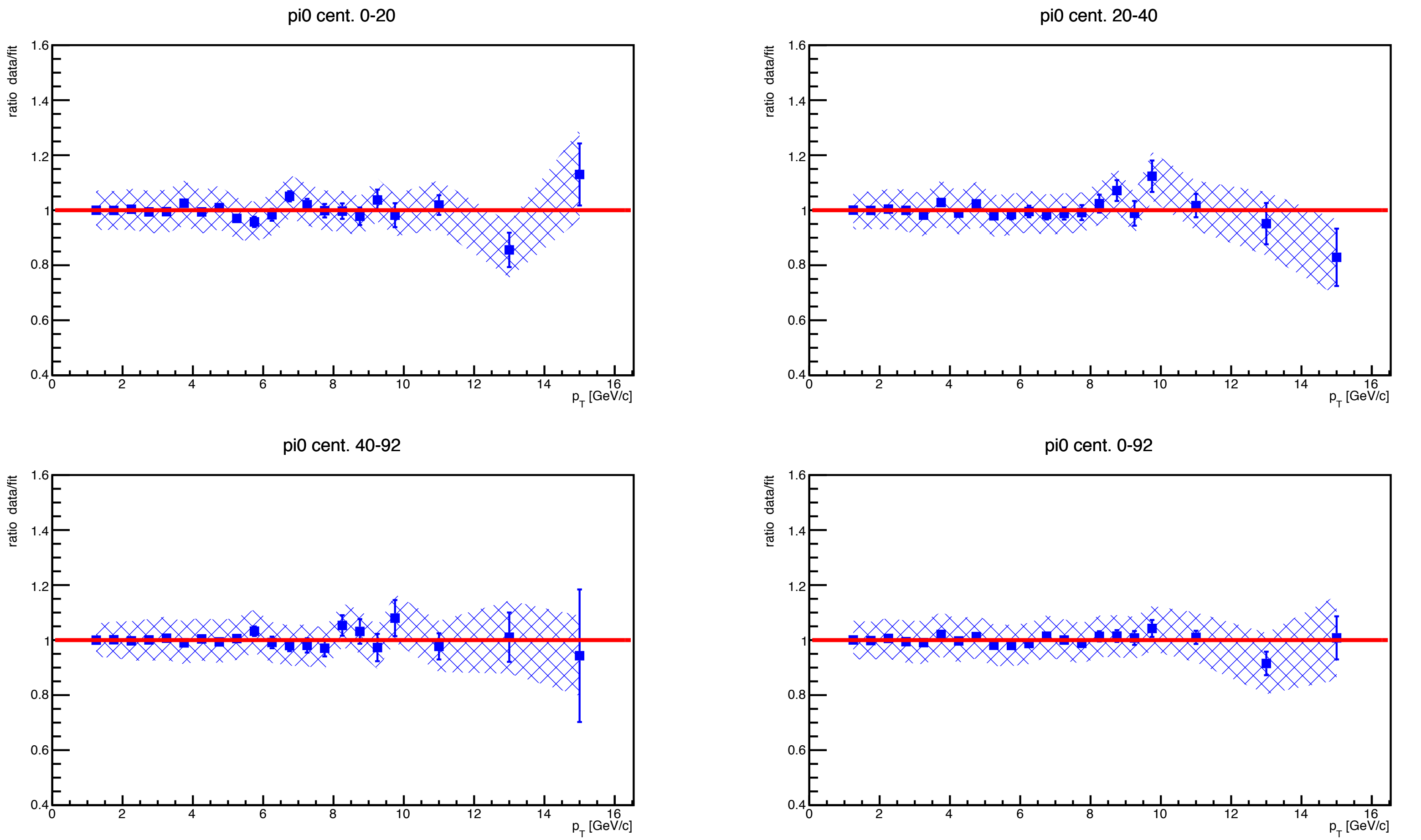
γ^{dir} from PPG

[p_T weight function]

- fit mod. hagedorn
  + pow low

> apply p_T weight
  to mc simulation

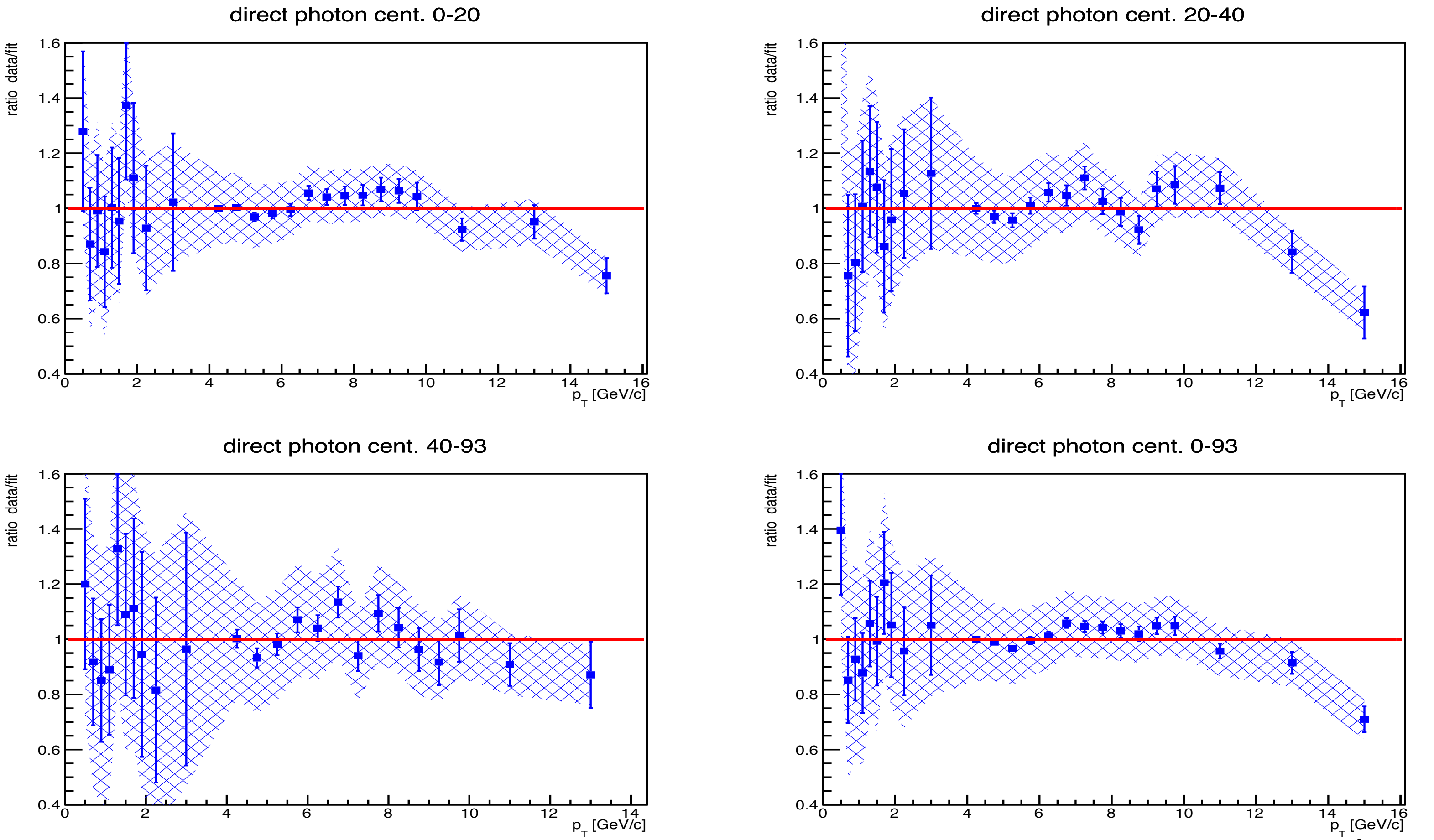
✓ data/fit for π^0 (mod. hagedorn + power low)



- 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)

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