



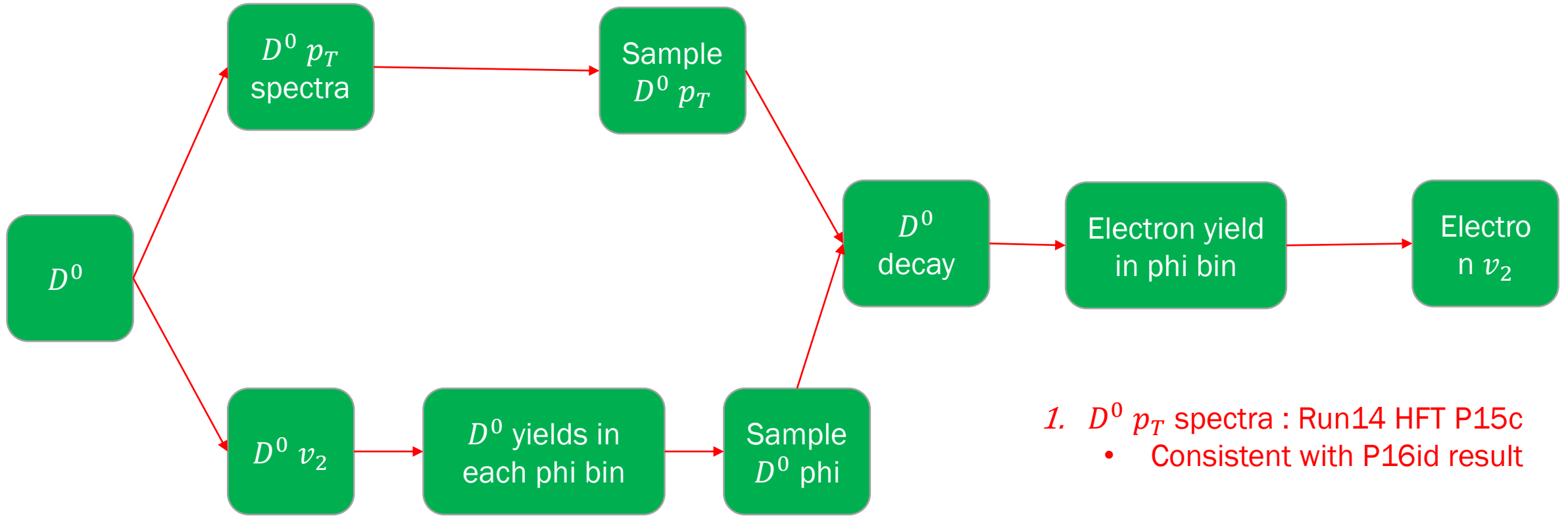
Comparison between D^0 v_2 and NPE v_2 measurement

Long Zhou

Cooperate with : Xin Dong and Yifei Zhang

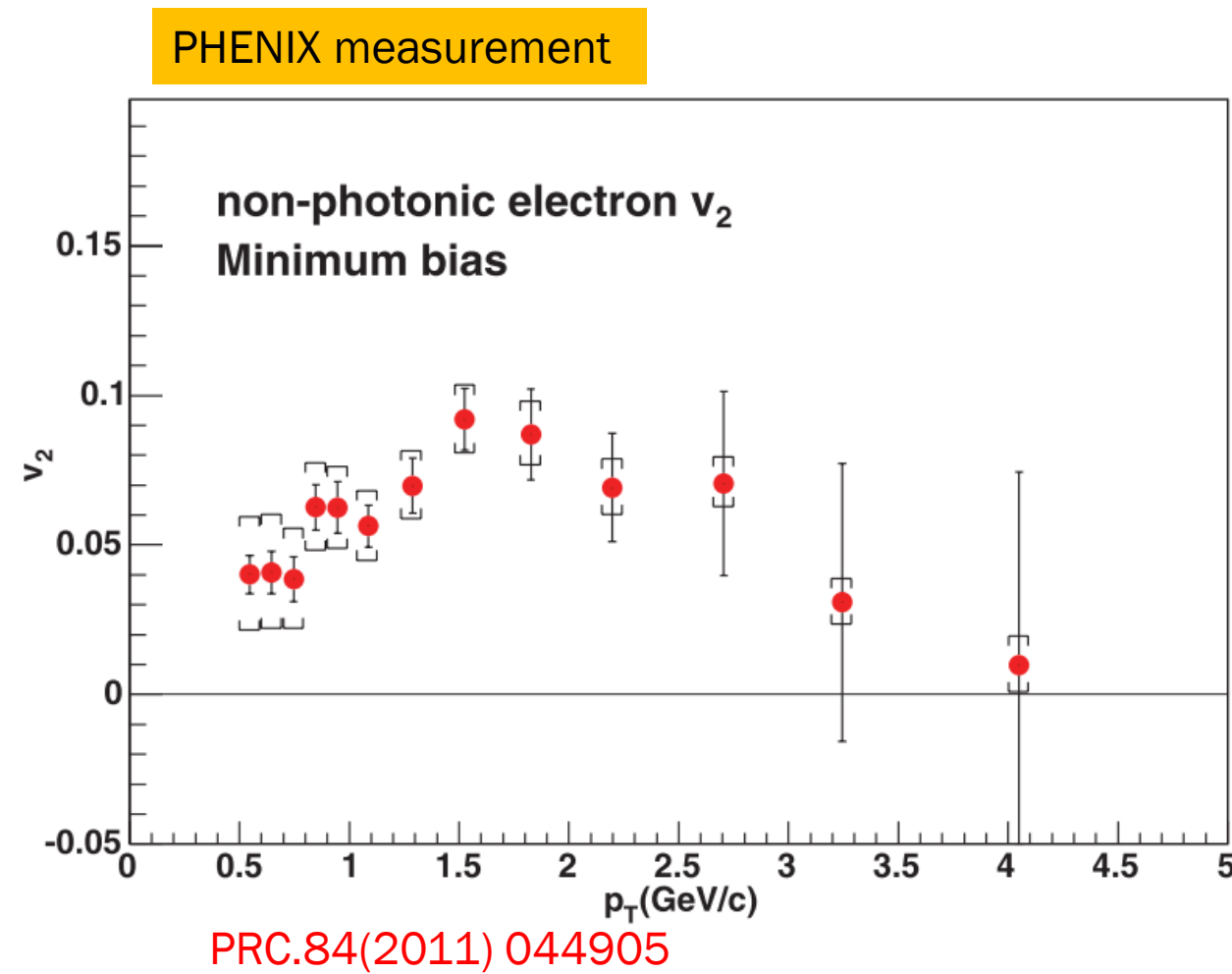
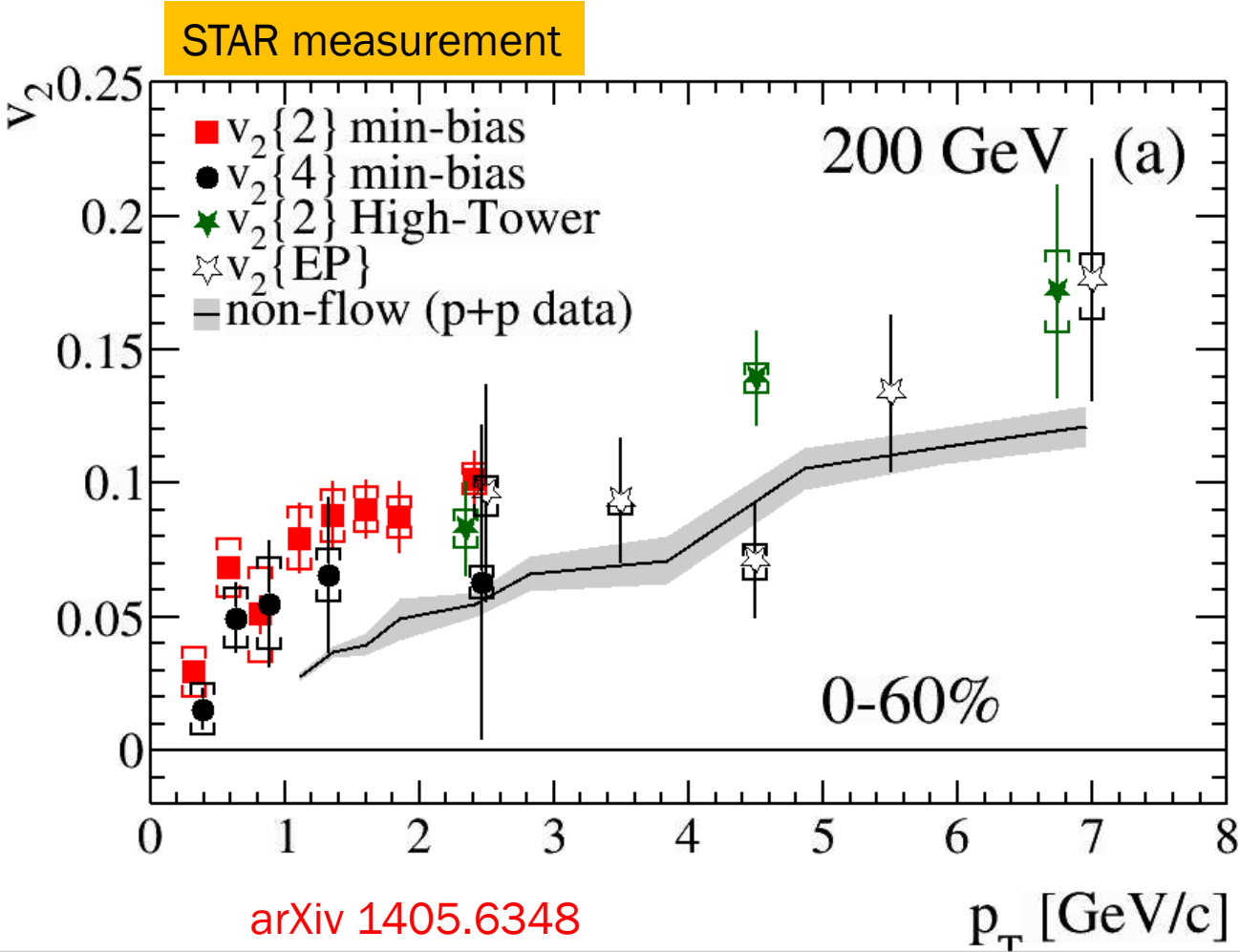
2016/12/21

Introduction



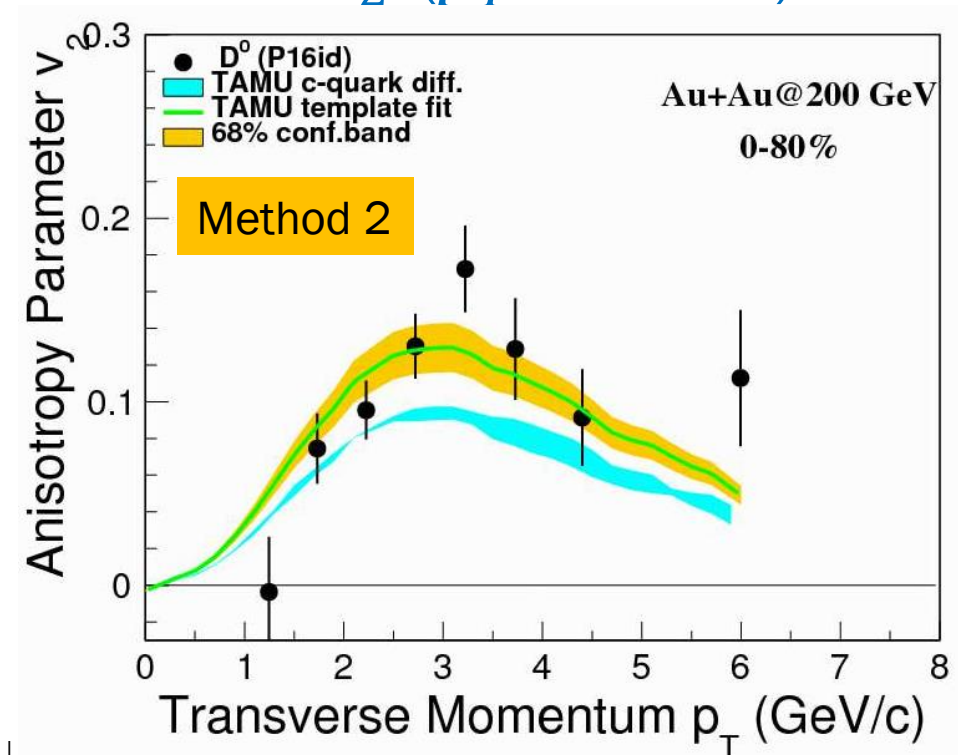
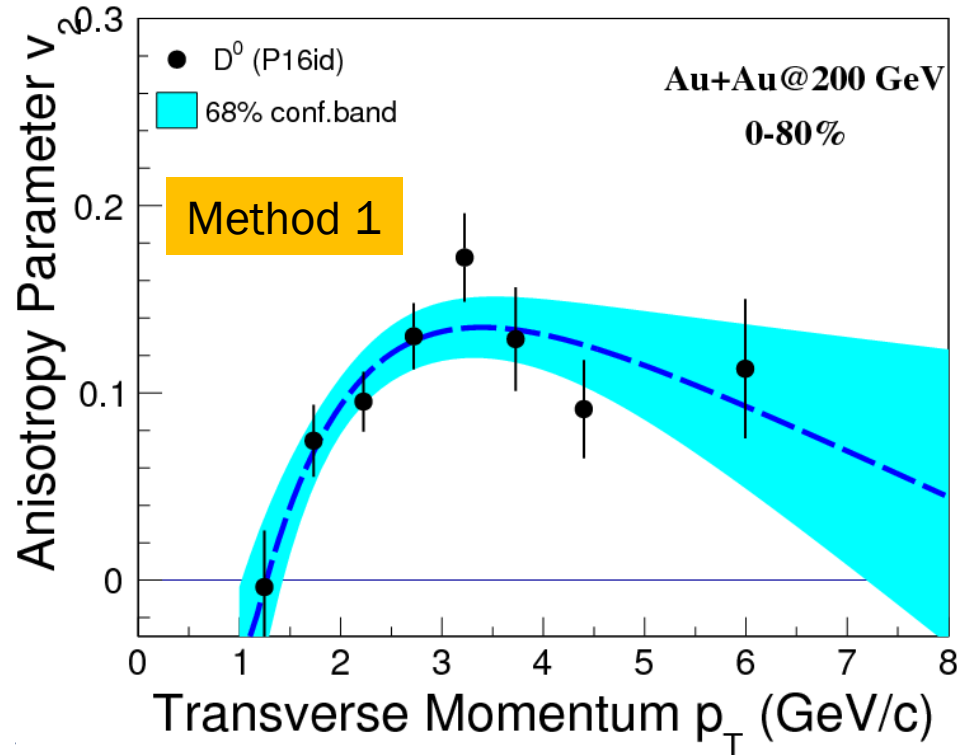
1. $D^0 p_T$ spectra : Run14 HFT P15c
 - Consistent with P16id result
2. $D^0 v_2$: Run14 HFT P16d.

Non-Photonic Electron v_2 measurement



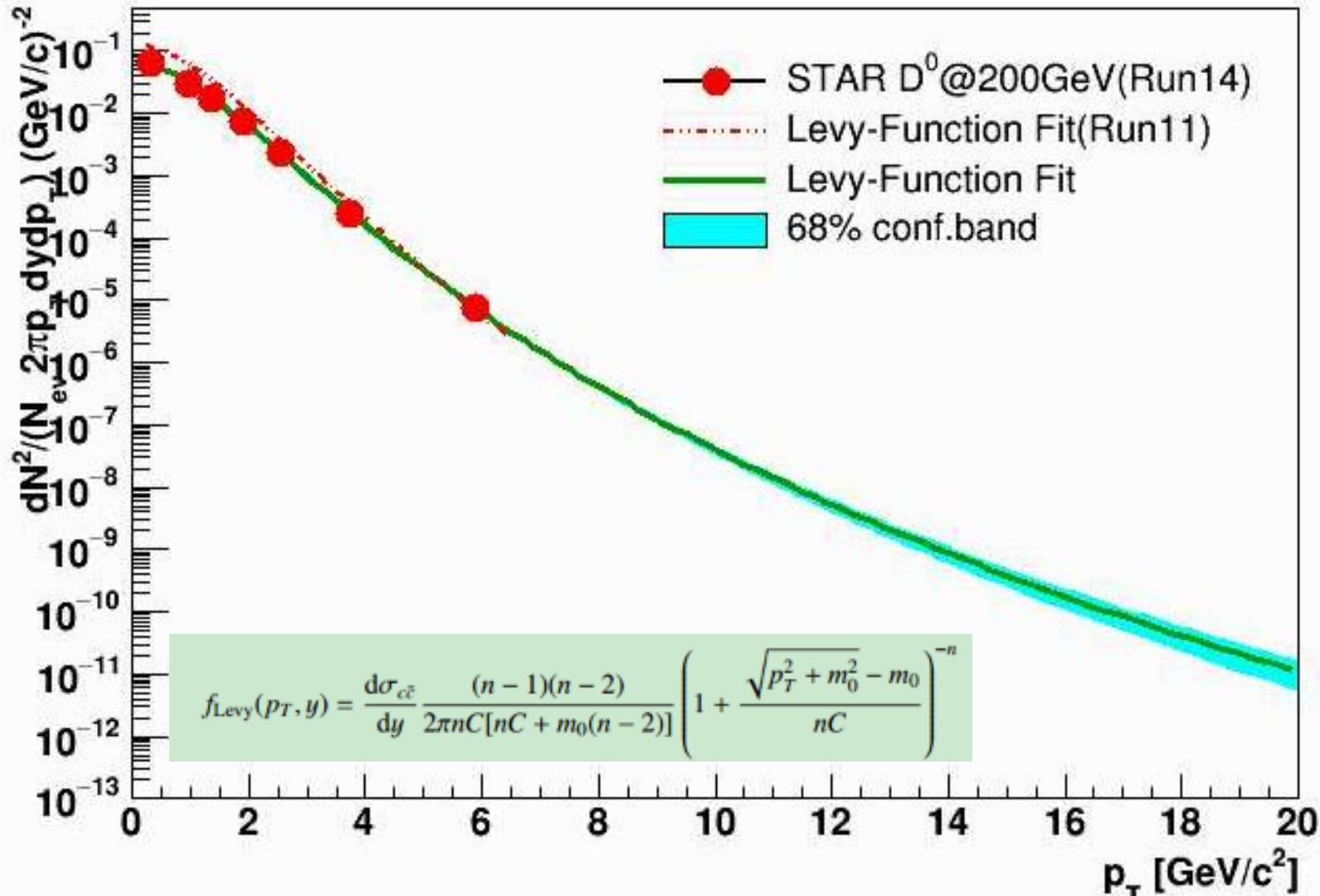
Parametrization of measured D^0 v_2

- Method 1 : Use a function to fit D^0 v_2 ($p_T < 8$ GeV)
 - Add a linear component to control high p_T v_2
 - For low p_T , since there is not measurement results, the v_2 was set to 0, but keep the error as the same as first data point
- Method 2 : Use TAMU p_T shape and fit to D^0 v_2 ($p_T < 6$ GeV)



Input D^0 p_T spectra

P15c, Run14 with HFT



- The D^0 spectra was obtained from Run14 data with HFT(SL15c)

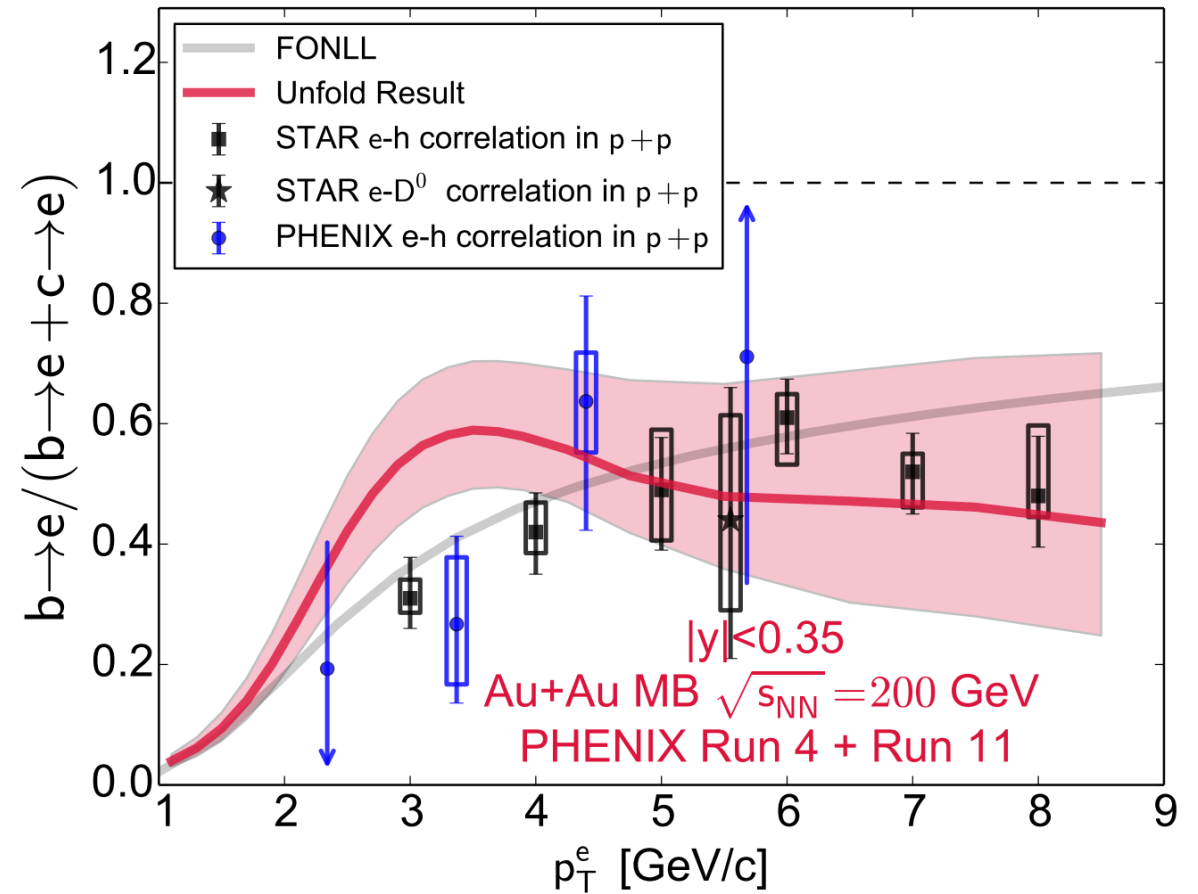
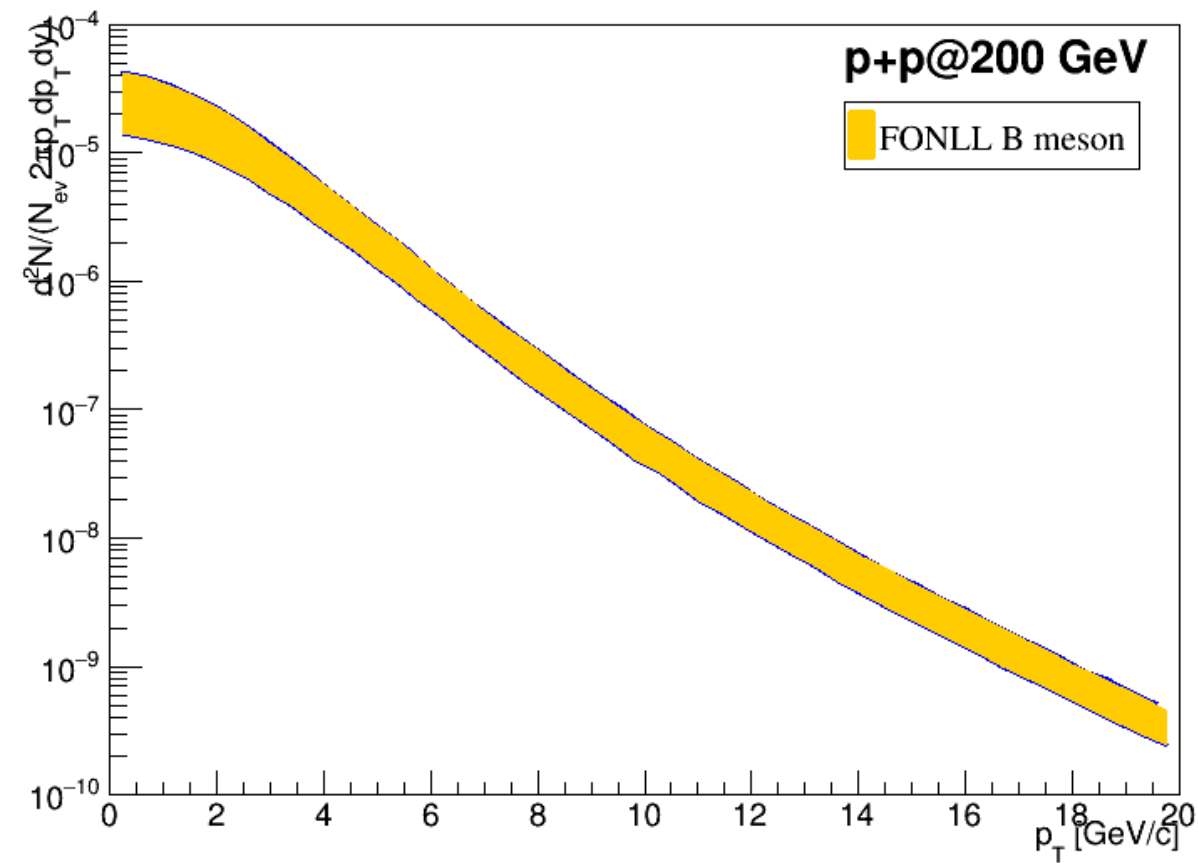
More QA :

https://drupal.star.bnl.gov/STAR/system/files/star_d0_v2_qa.pdf

Bottom contribution

- B meson contribution
 - B meson p_T spectra
 - use FONLL calculation
 - B meson v_2
 - B v_2 follows empirical scaling
 - B $v_2 = 0.5 * \text{empirical scaling}$
 - B $v_2 = 0$
 - Bottom electron fractions
 - FONLL calculation
 - PHENIX measurement

B meson p_T spectra and electron fraction



p_T spectra : From FONLL calculation PRL 95,122001(2005)

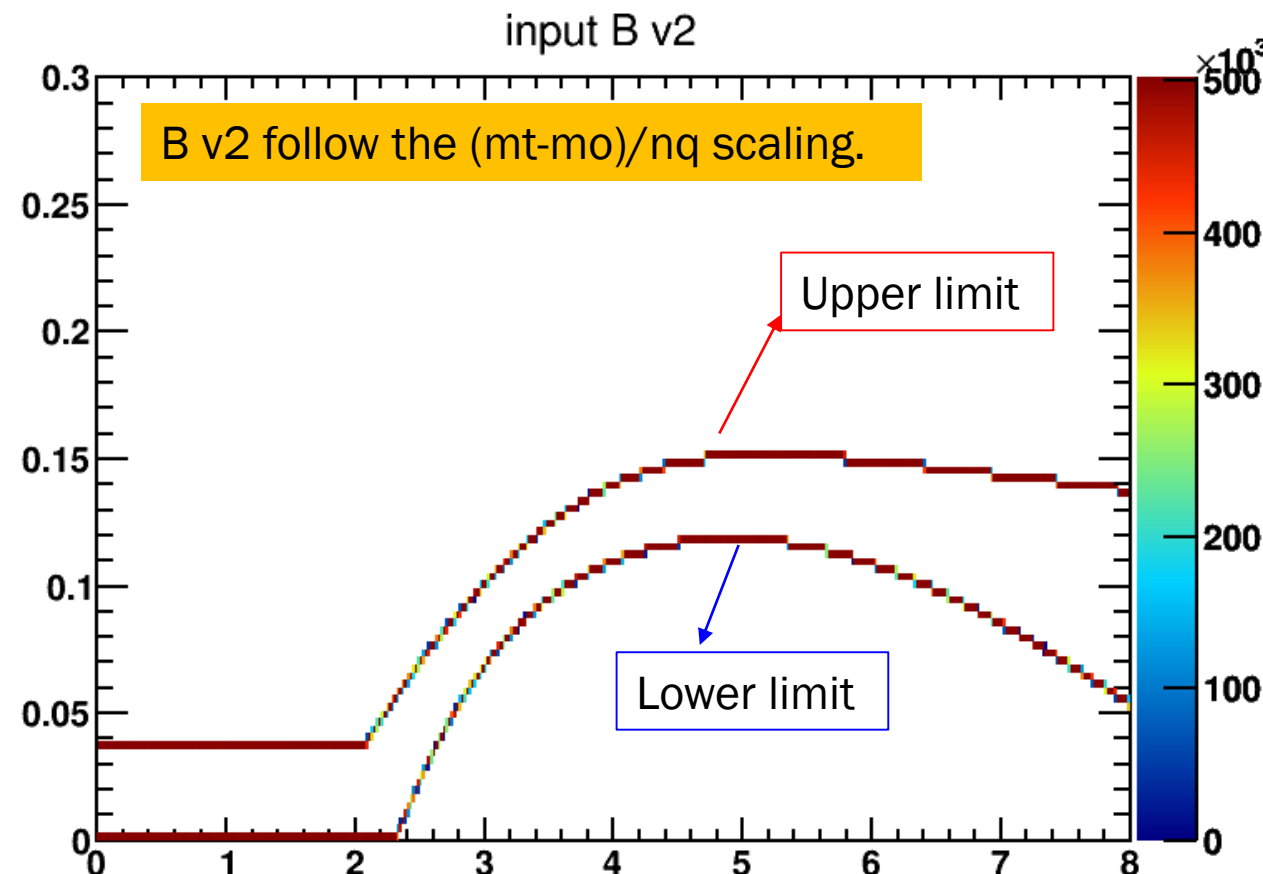
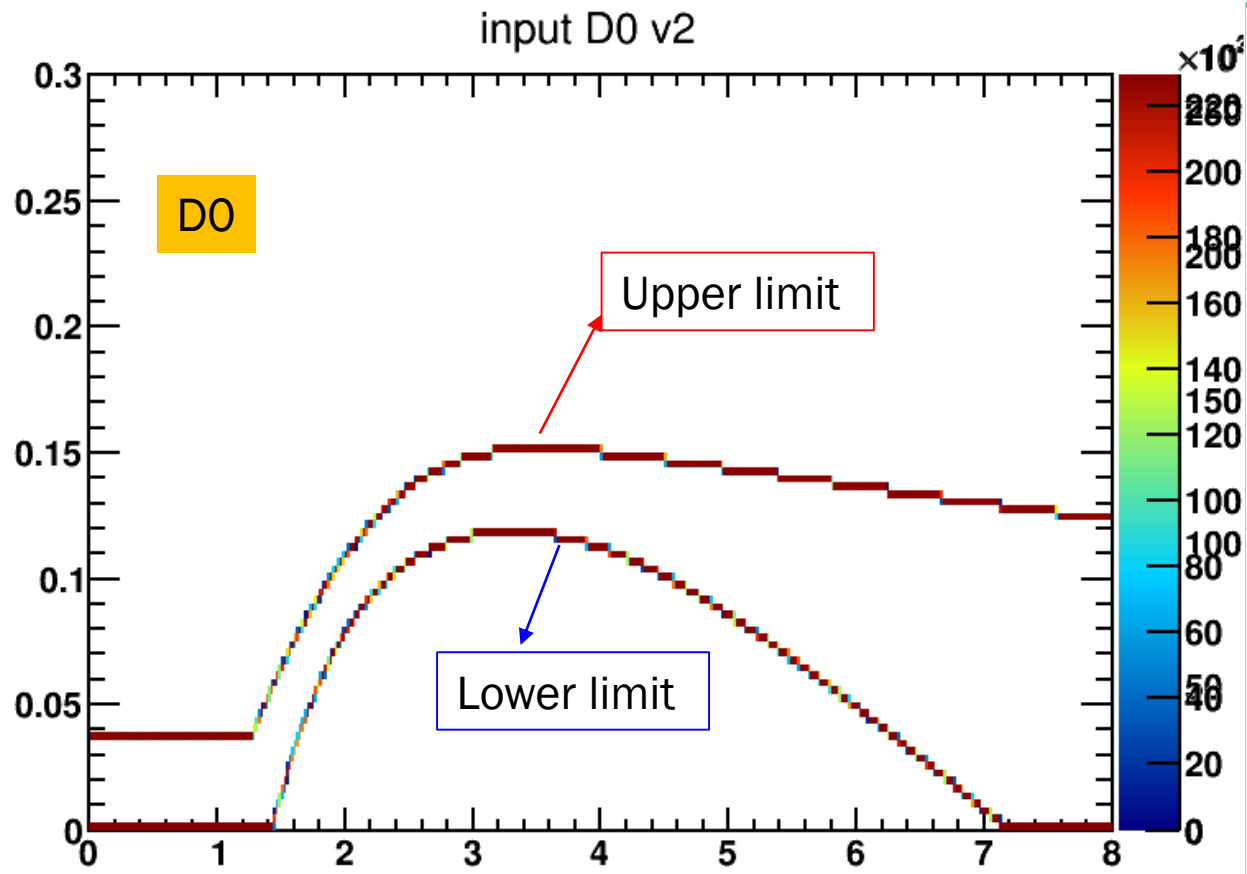
- not considered the R_{AA} modification

B \rightarrow e fraction : From PHENIX and FONLL PRC 93,034904(2011)

Method 1 : Function fit $D^0 v_2$

- c->e from D^0 Only
- b->e

Method 1 : Input D^0 QA

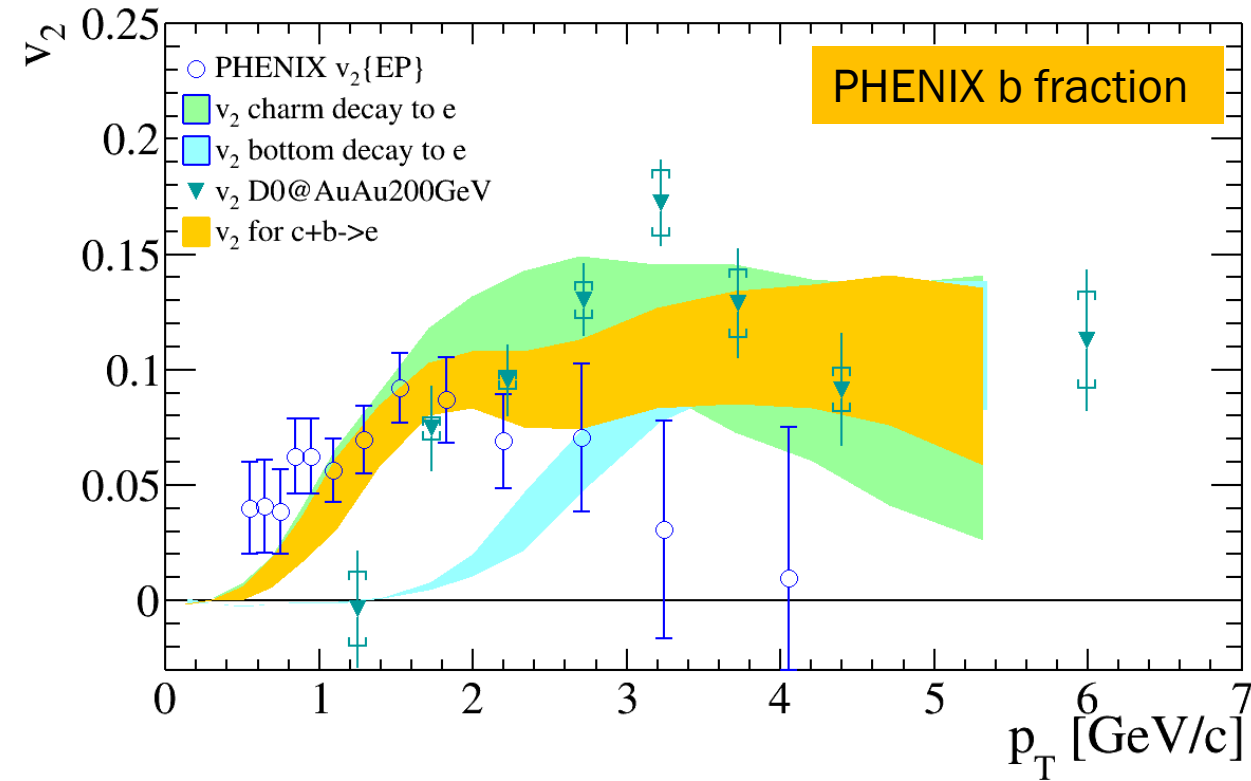
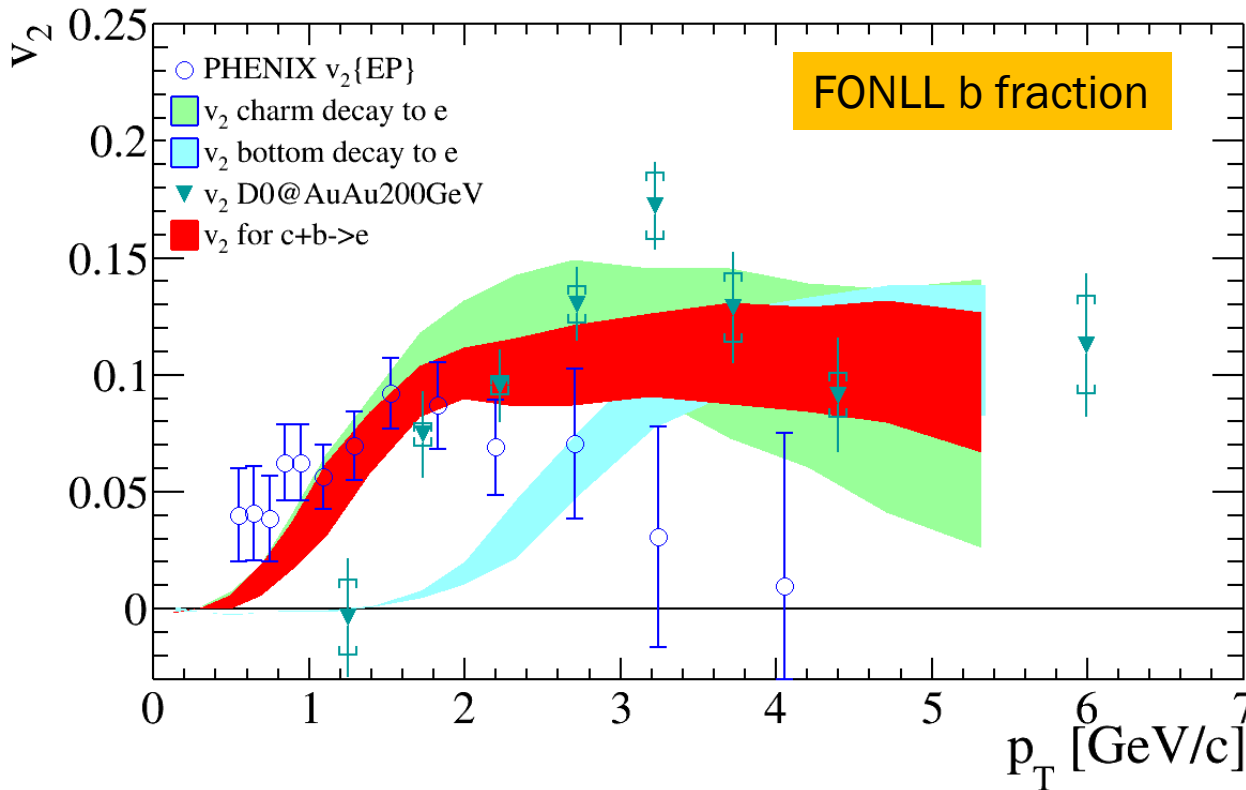


Error estimation for $D \rightarrow e \nu_2$:

- Use $D^0 \nu_2$ upper limit \rightarrow Decay \rightarrow Upper limit for $D \rightarrow e \nu_2$
- Use $D^0 \nu_2$ lower limit \rightarrow Decay \rightarrow Lower limit for $D \rightarrow e \nu_2$

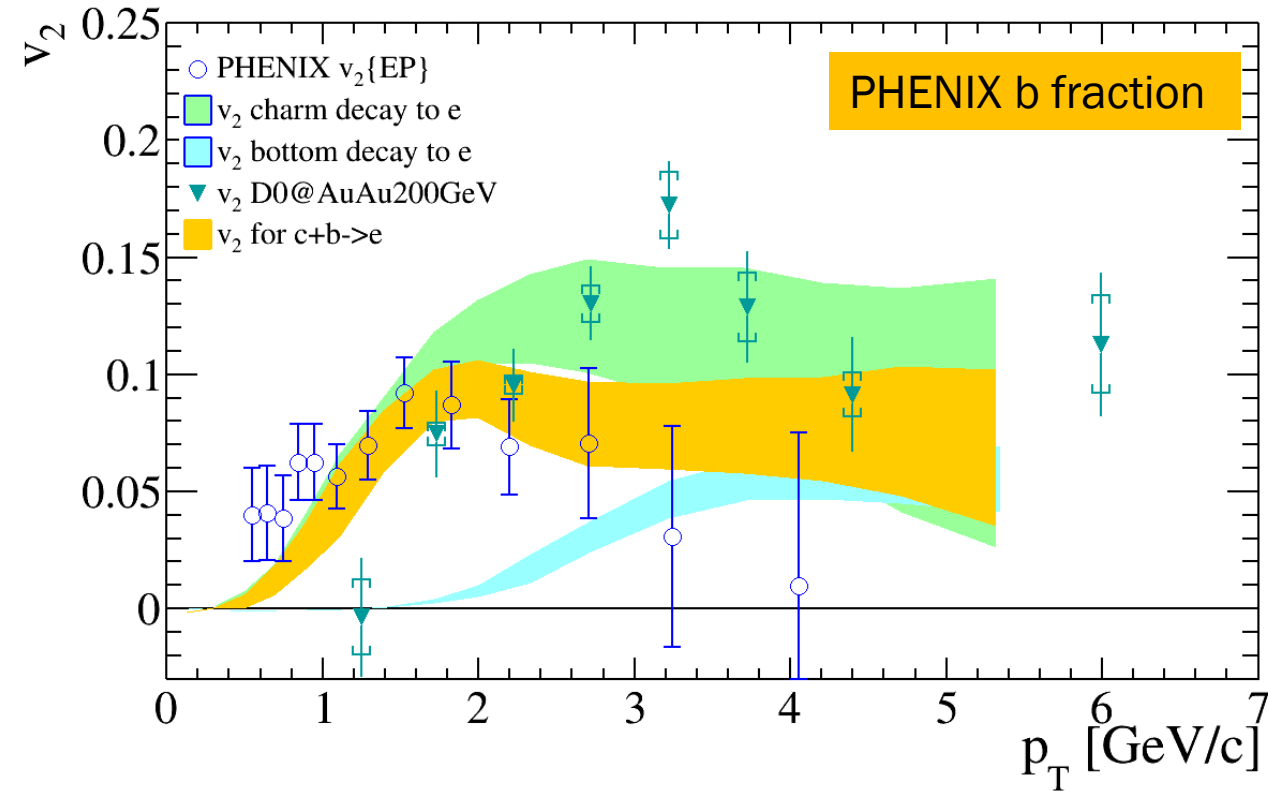
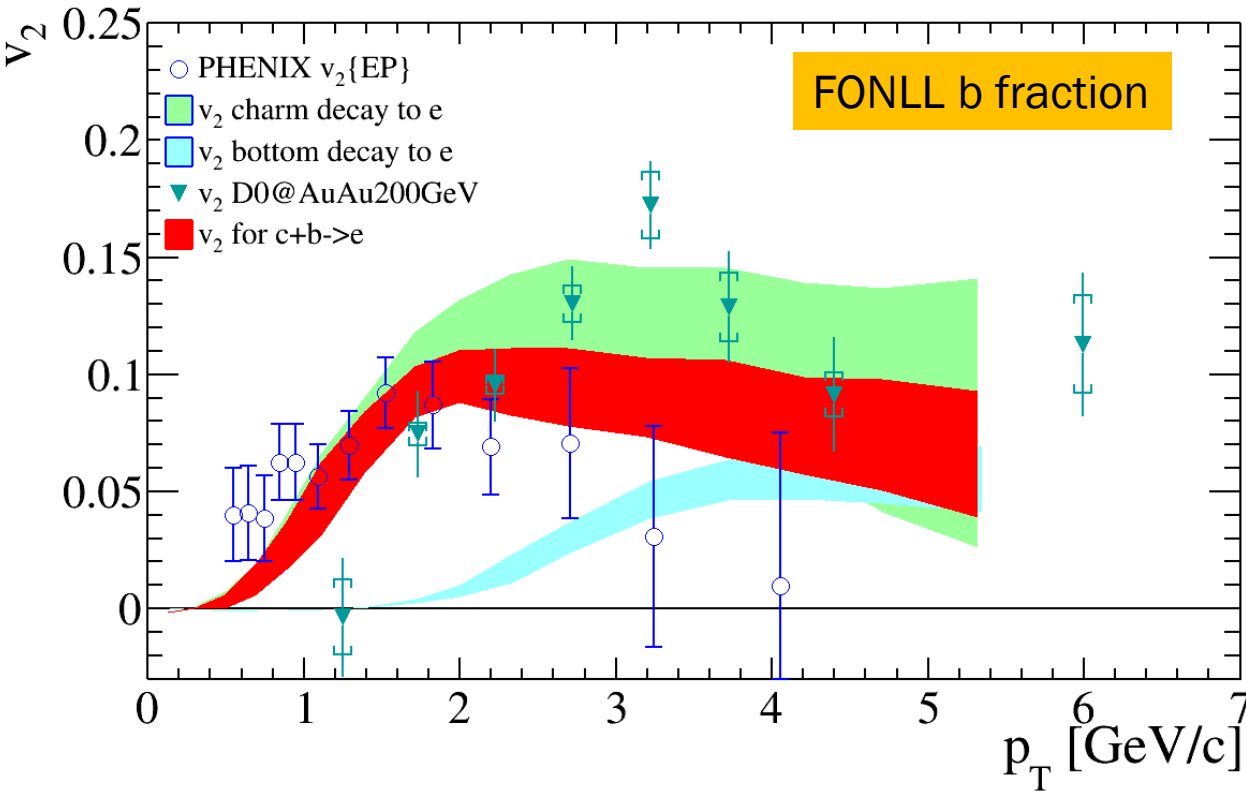
- For B meson ν_2 estimation(three scenario) :
 1. B meson following the (mT-m0)/nq empirical scaling.
 2. B meson $\nu_2 = 0.5 \times (\text{empirical scaling})$;
 3. B meson $\nu_2 = 0$;
- Uncertainty band:propagated from the D0 ν_2 measurement

$$B + D^0 \rightarrow e \nu_2$$



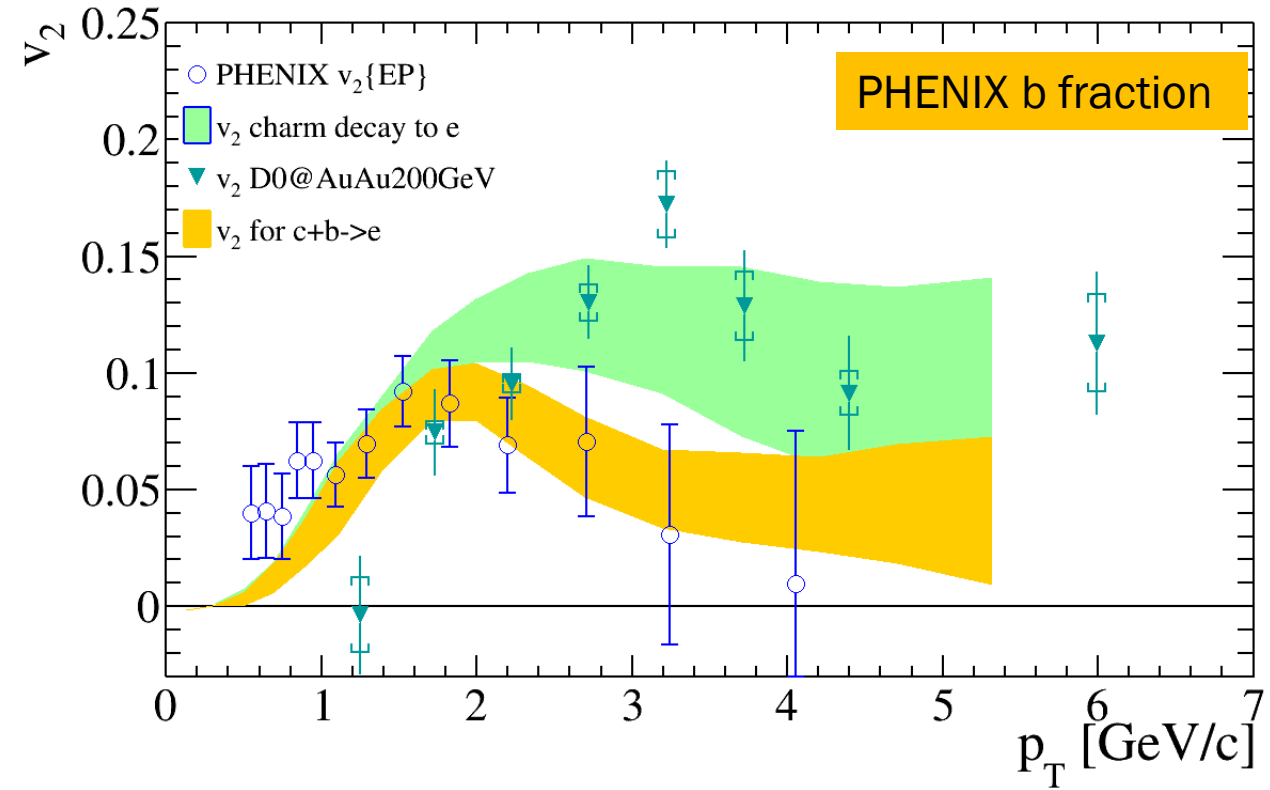
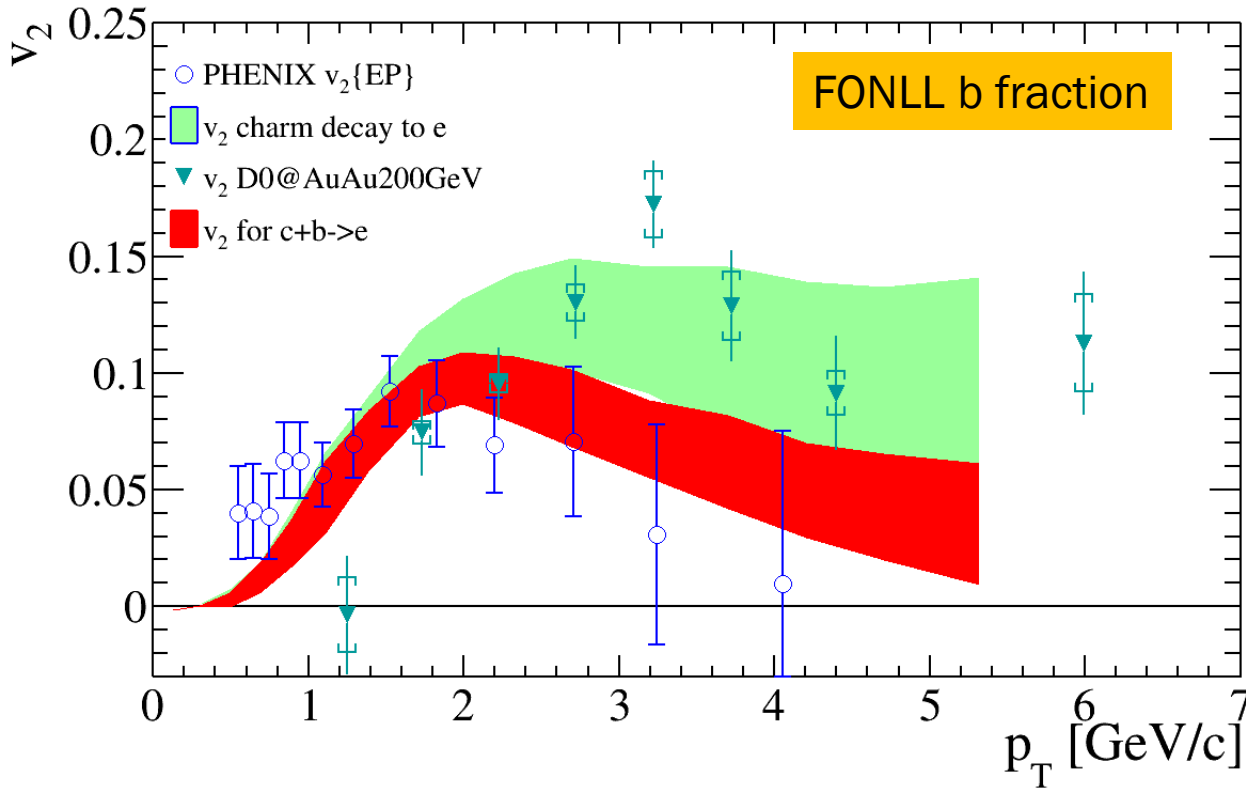
- B meson v_2 : following the $(m_T - m_0)/n_q$ empirical scaling.
- Error for c+b→e v_2
 1. FONLL b fraction : no B fraction error.
 2. PHENIX b fraction : B fraction error included.

$$B + D^0 \rightarrow e \nu_2$$



- B meson v_2 : $v_2 = 0.5 * (\text{empirical scaling})$

$$B + D^0 \rightarrow e \nu_2$$



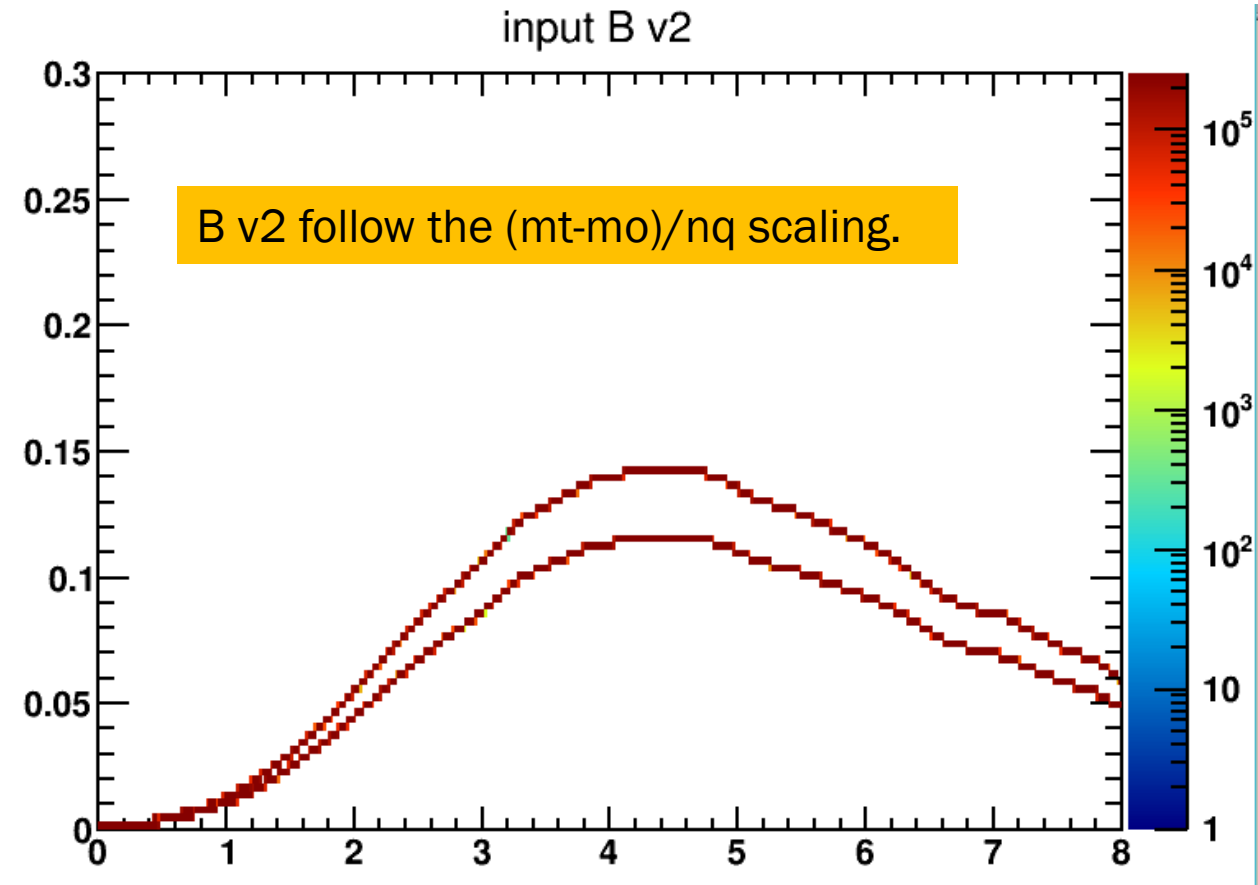
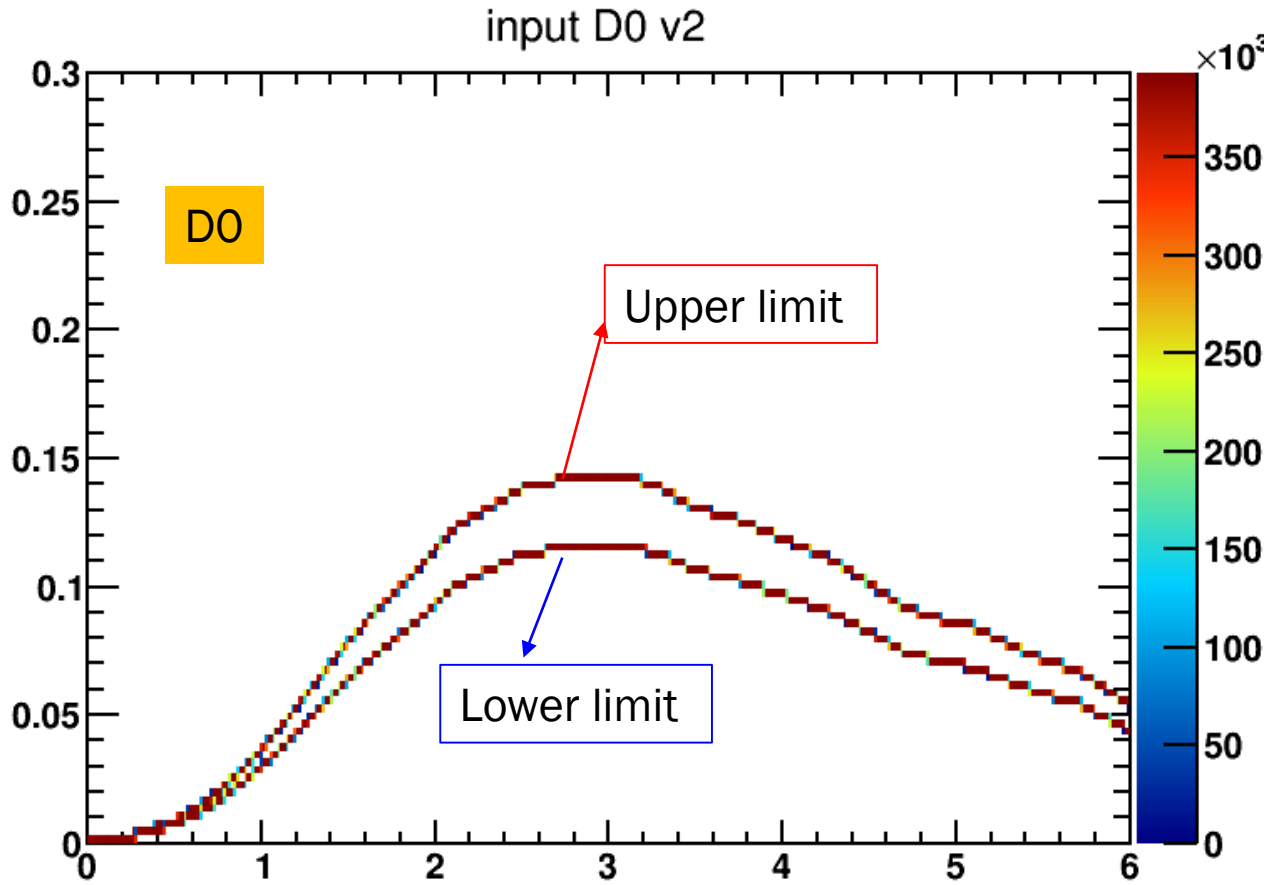
- B meson $v_2 = 0$

Method 2 : TAMU mode fit

$D^0 v_2$

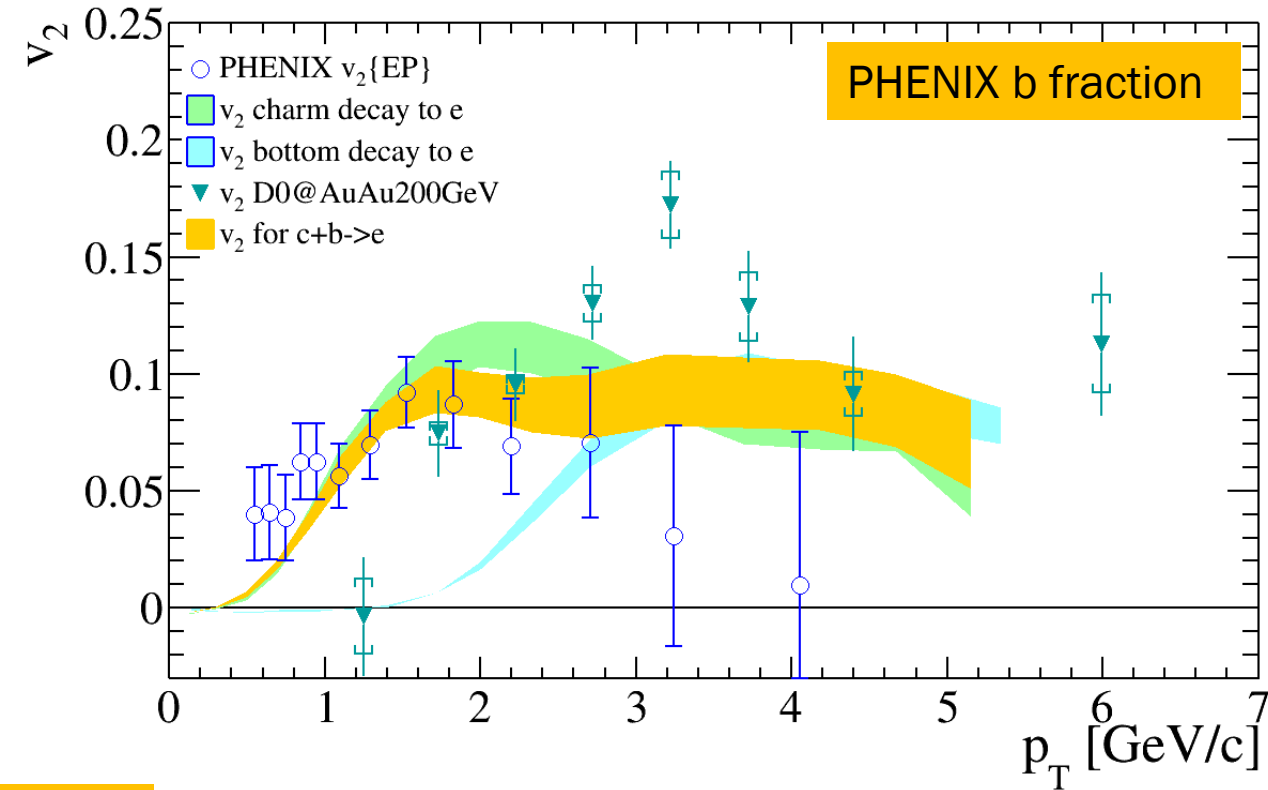
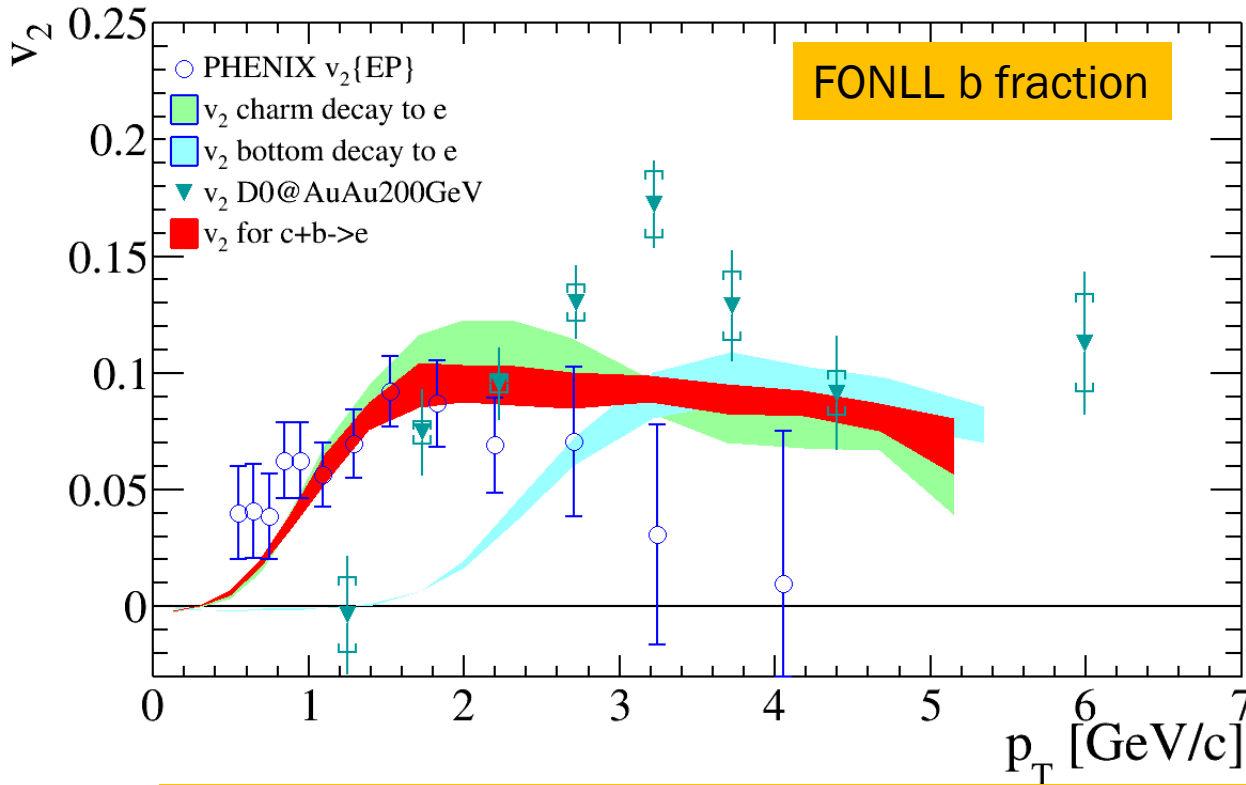
- c->e from D^0 Only
- b->e

Method 2 : Input D^0 QA



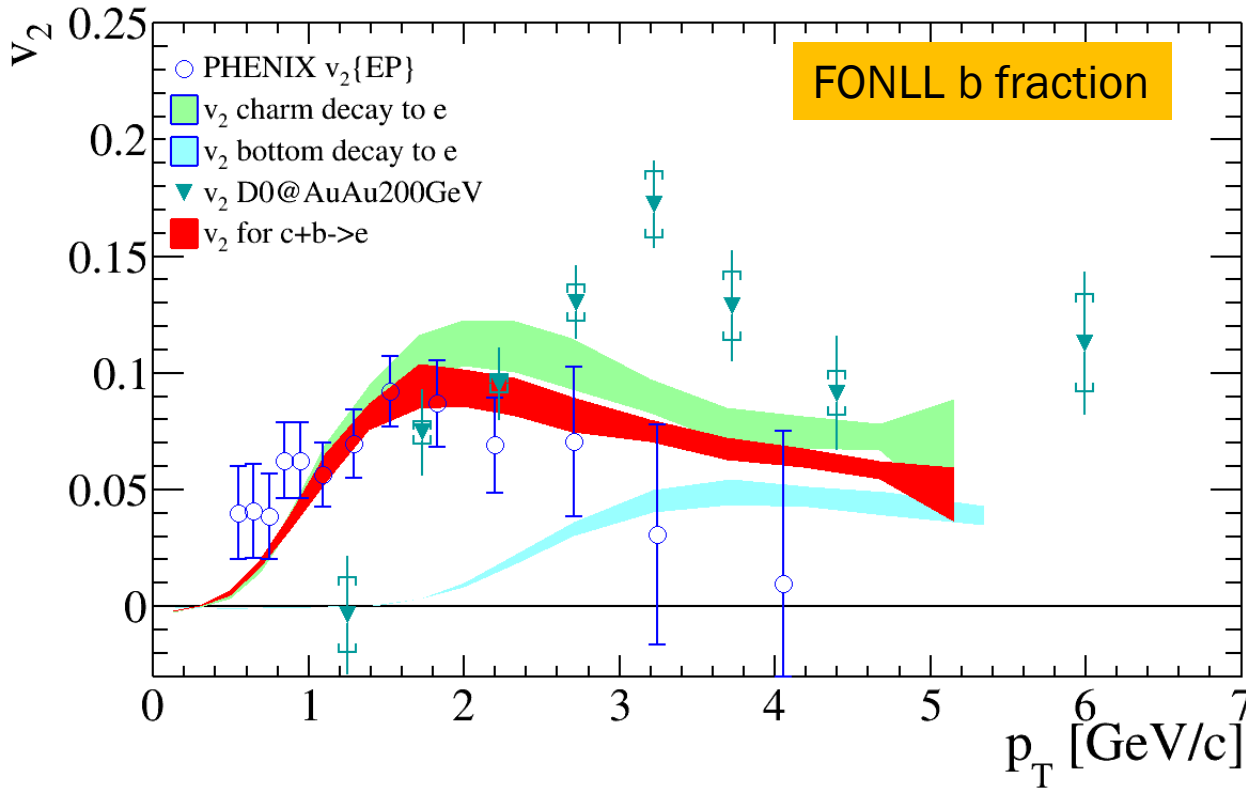
- B meson v2 estimation(three scenario) :
 1. B meson following the (mT-m0)/nq empirical scaling.
 2. B meson v2 = 0.5*(empirical scaling);
 3. B meson v2 = 0;
- Uncertainty band : propagated from the D0 v2 measurement

$$B + D^0 \rightarrow e \nu_2$$

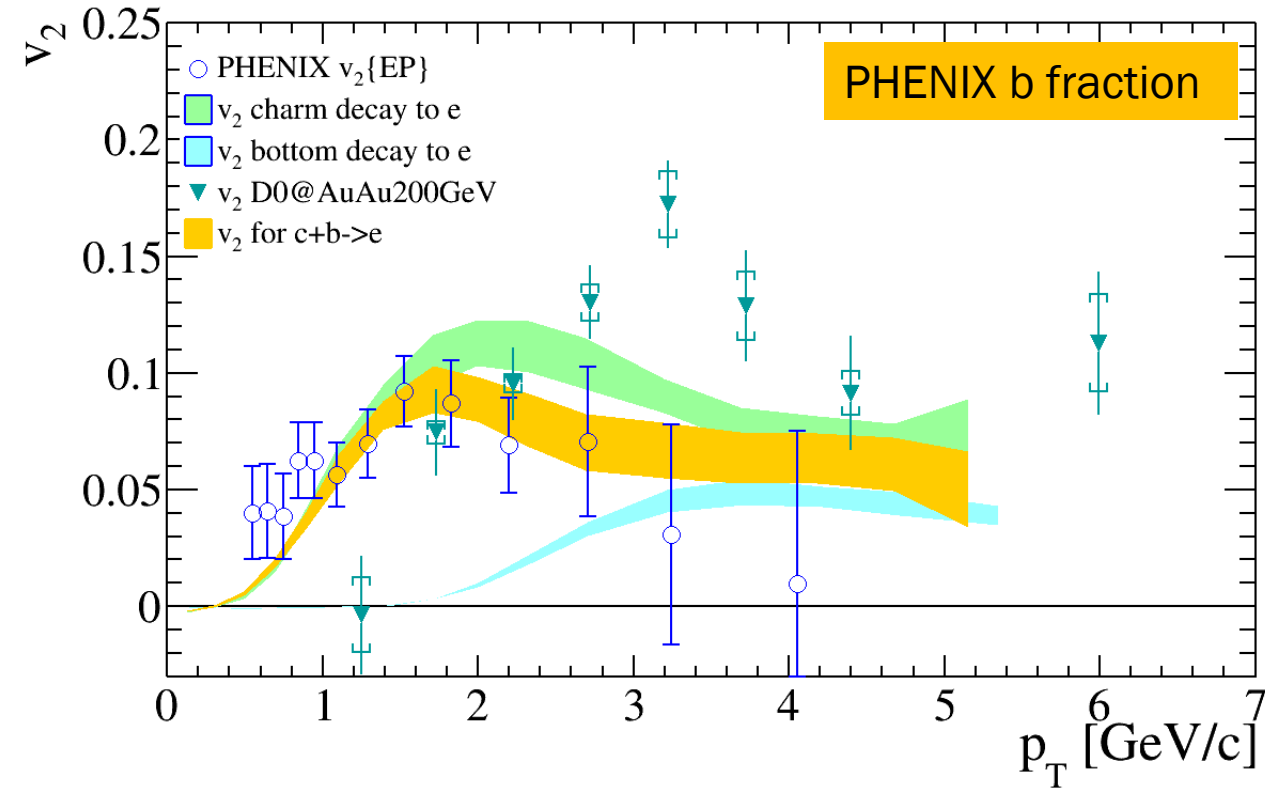


- B meson v_2 : following the $(m_T - m_0)/n_q$ empirical scaling.
- Error for c+b→e v_2
 1. FONLL b fraction : no B fraction error.
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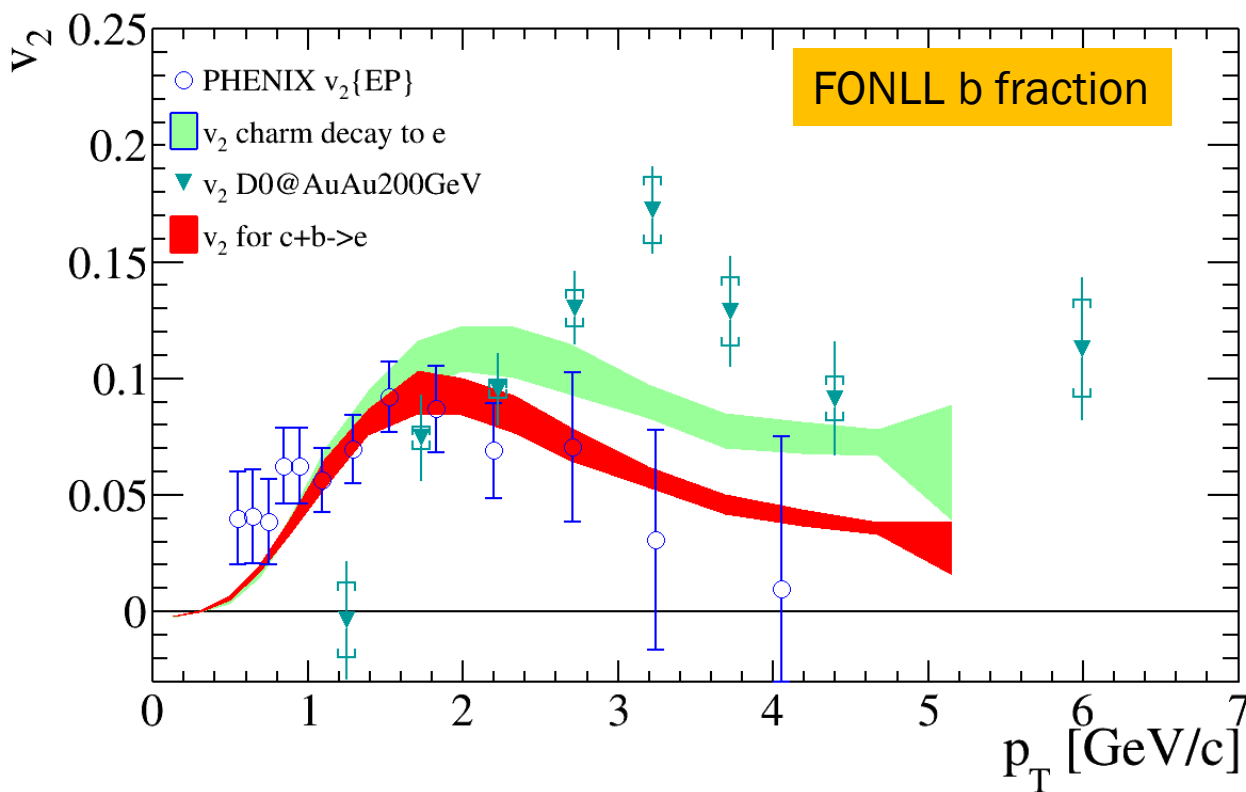
$$B + D^0 \rightarrow e \nu_2$$



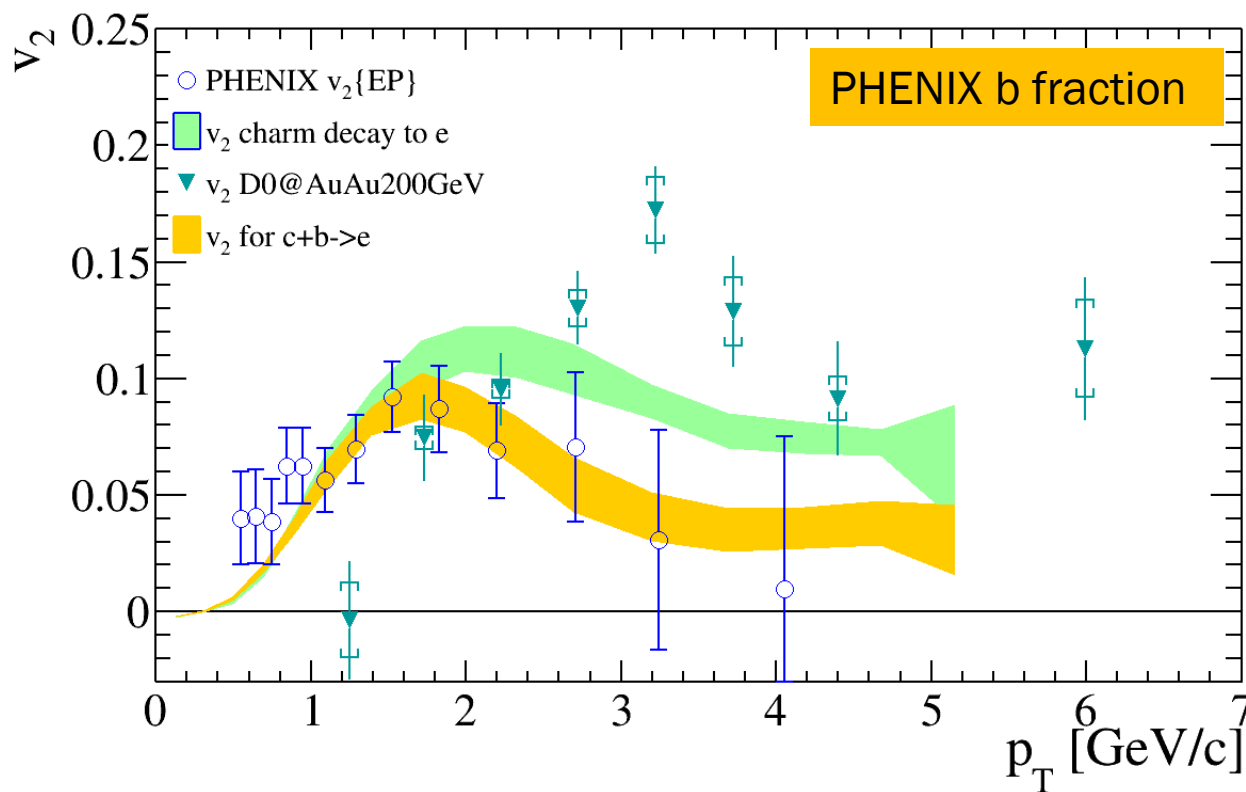
- B meson v_2 : 0.5 * (empirical scaling)



$$B + D^0 \rightarrow e \nu_2$$

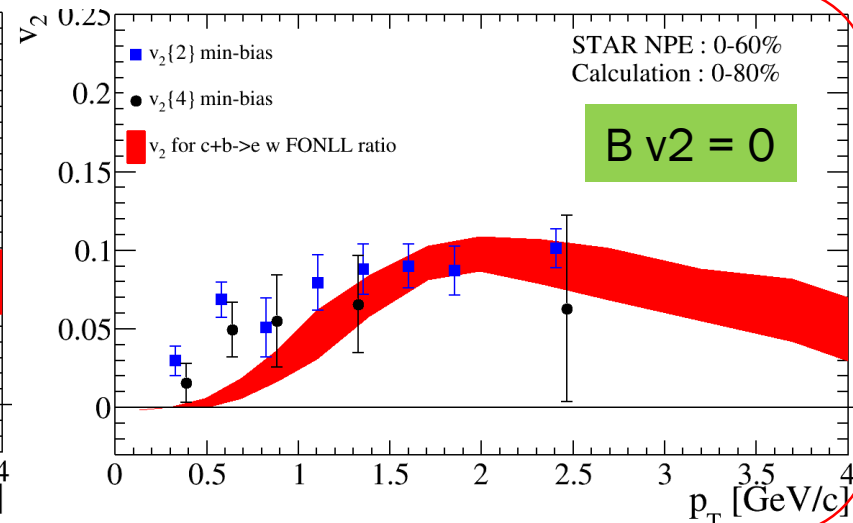
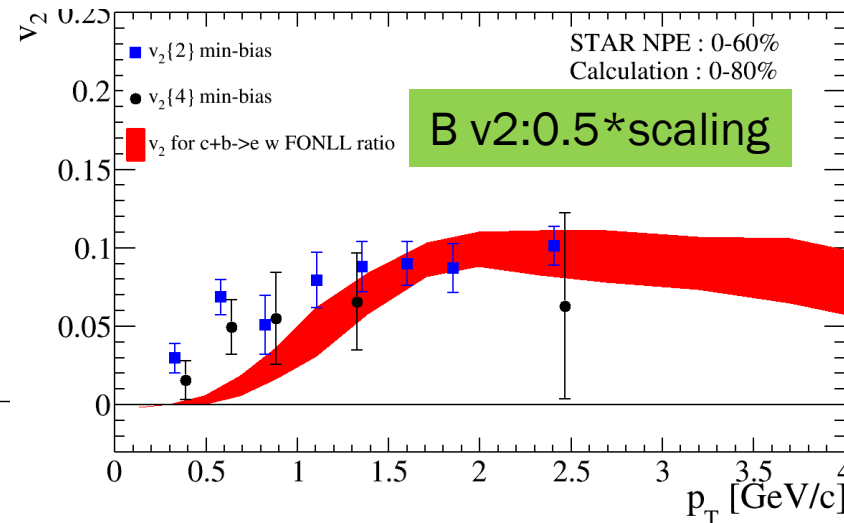
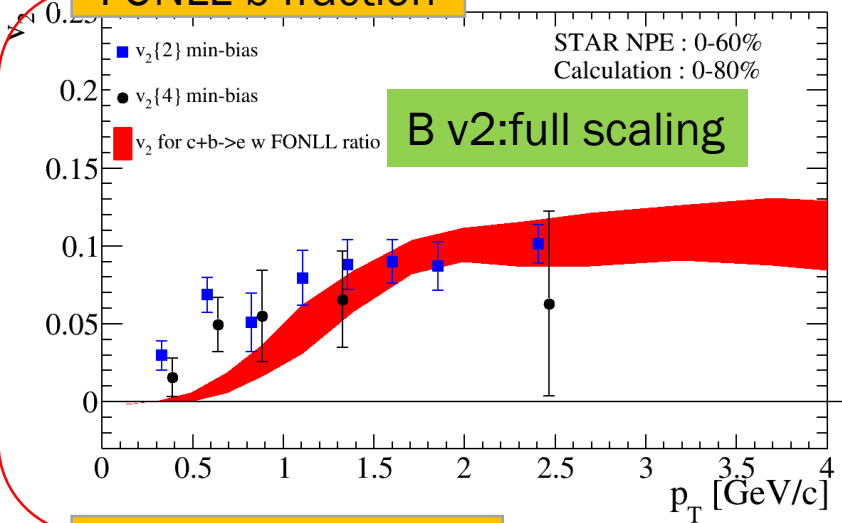


- B meson $v_2 = 0$;

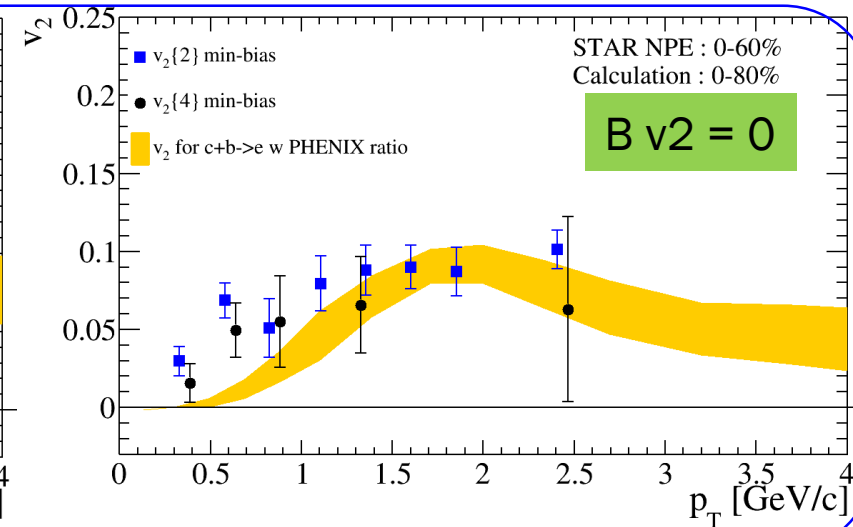
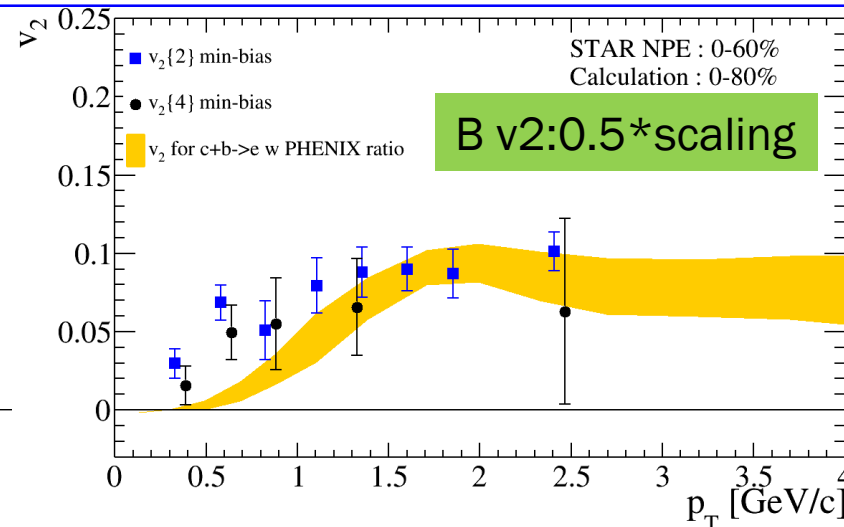
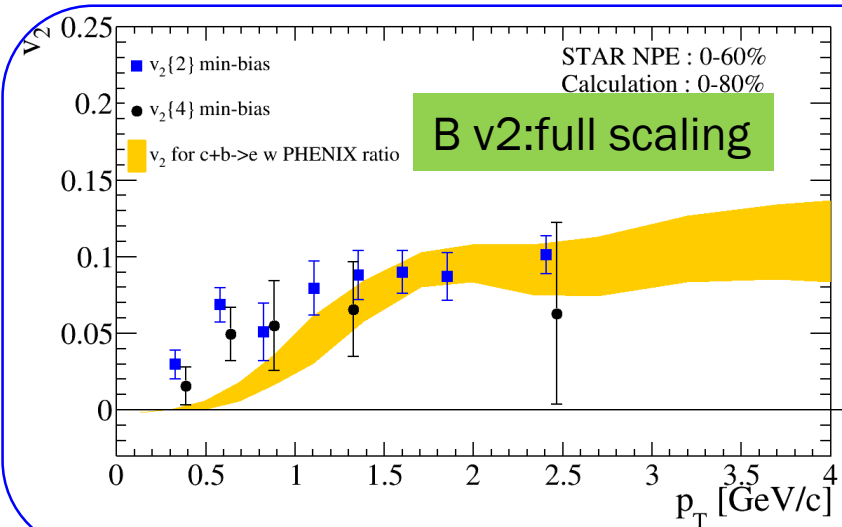


Compare with STAR results(Method 1)

FONLL b fraction

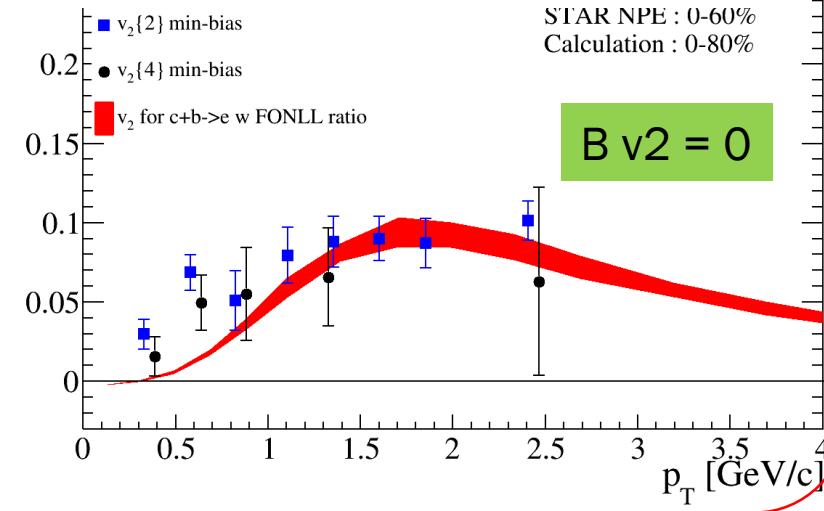
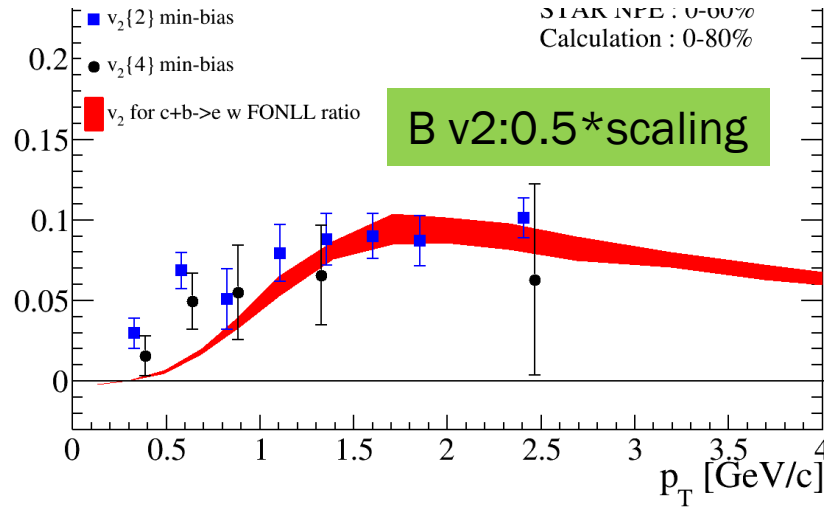
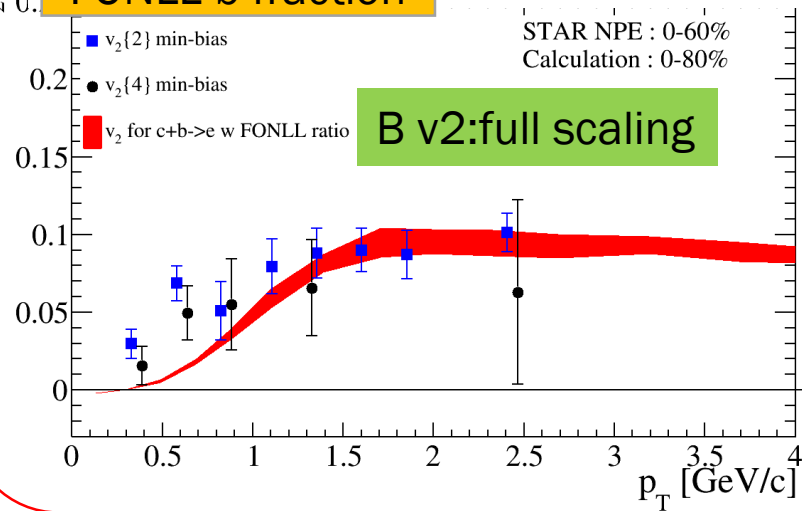


PHENIX b fraction

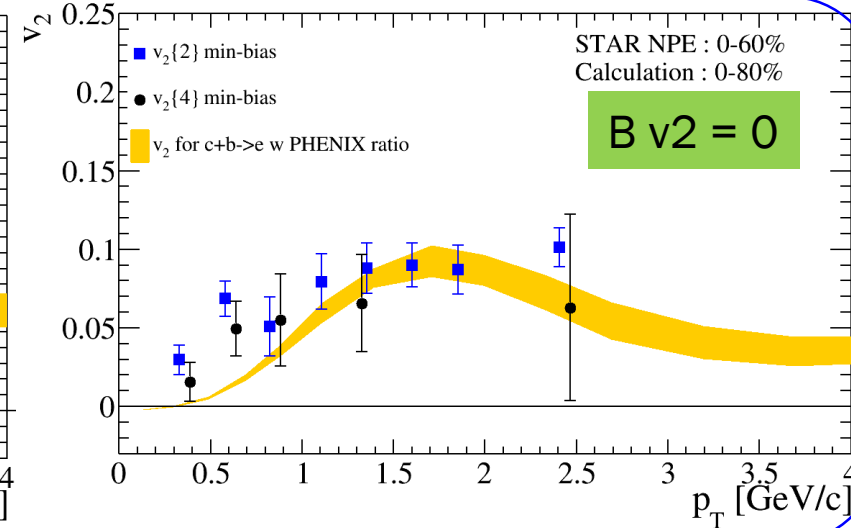
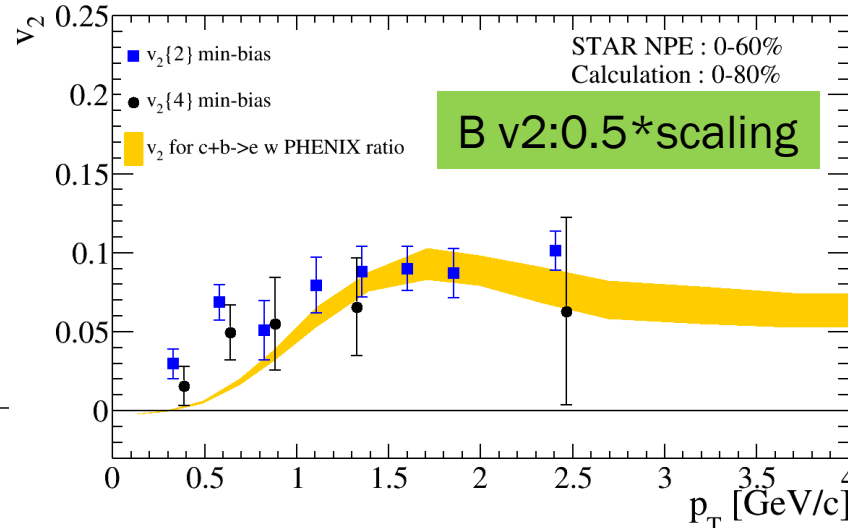
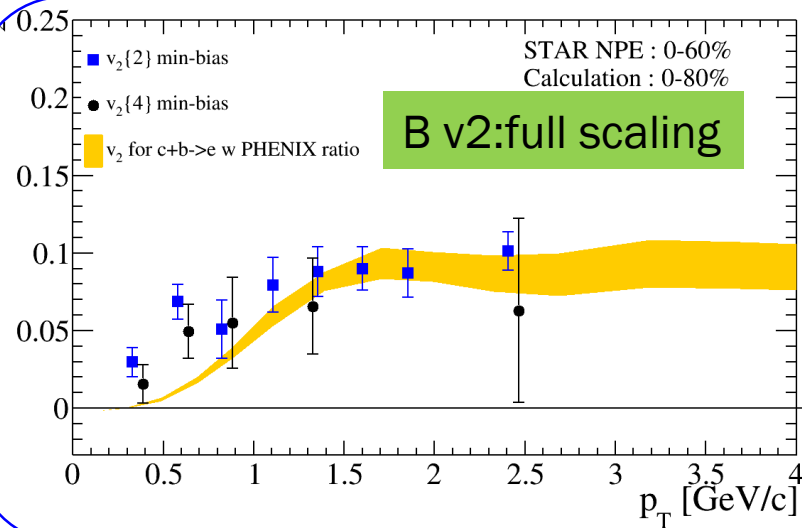


Compare with STAR results(Method 2)

FONLL b fraction



PHENIX b fraction



Summary

- Two methods to approach the NPE v_2 are achieved
- B meson decay to electron have very small contribution to NPE v_2 at low p_T range.
- B meson decay to electron v_2
 - When B meson have small v_2 or event $v_2 = 0$, our calculation will have better description for data.
- At low p_T , our calculation is consistent with data within uncertainties.
 - We do not have data point at low p_T , but two extremely estimations were achieved, and they are consistent within 2σ .

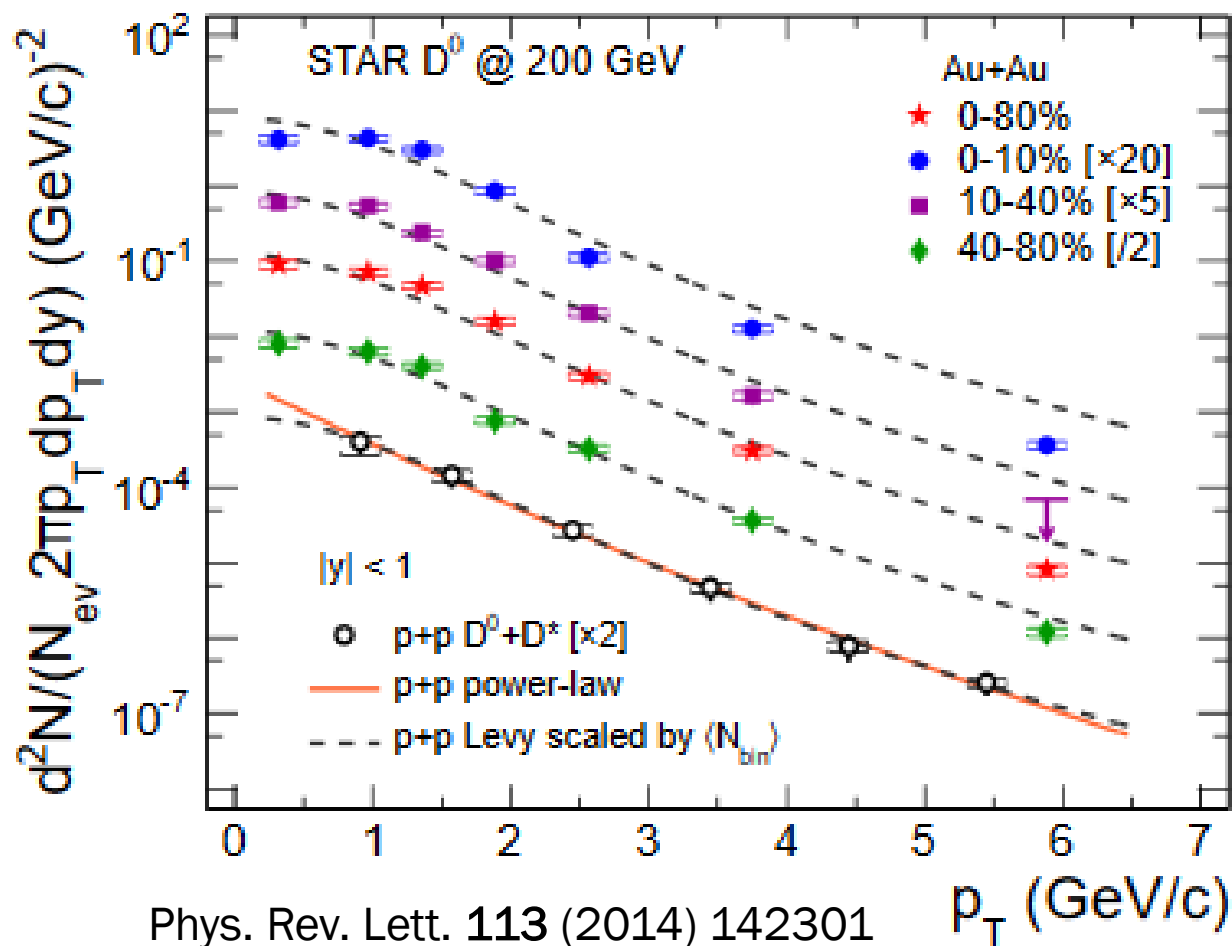
Back up

Updates(compare with Yifei's work)

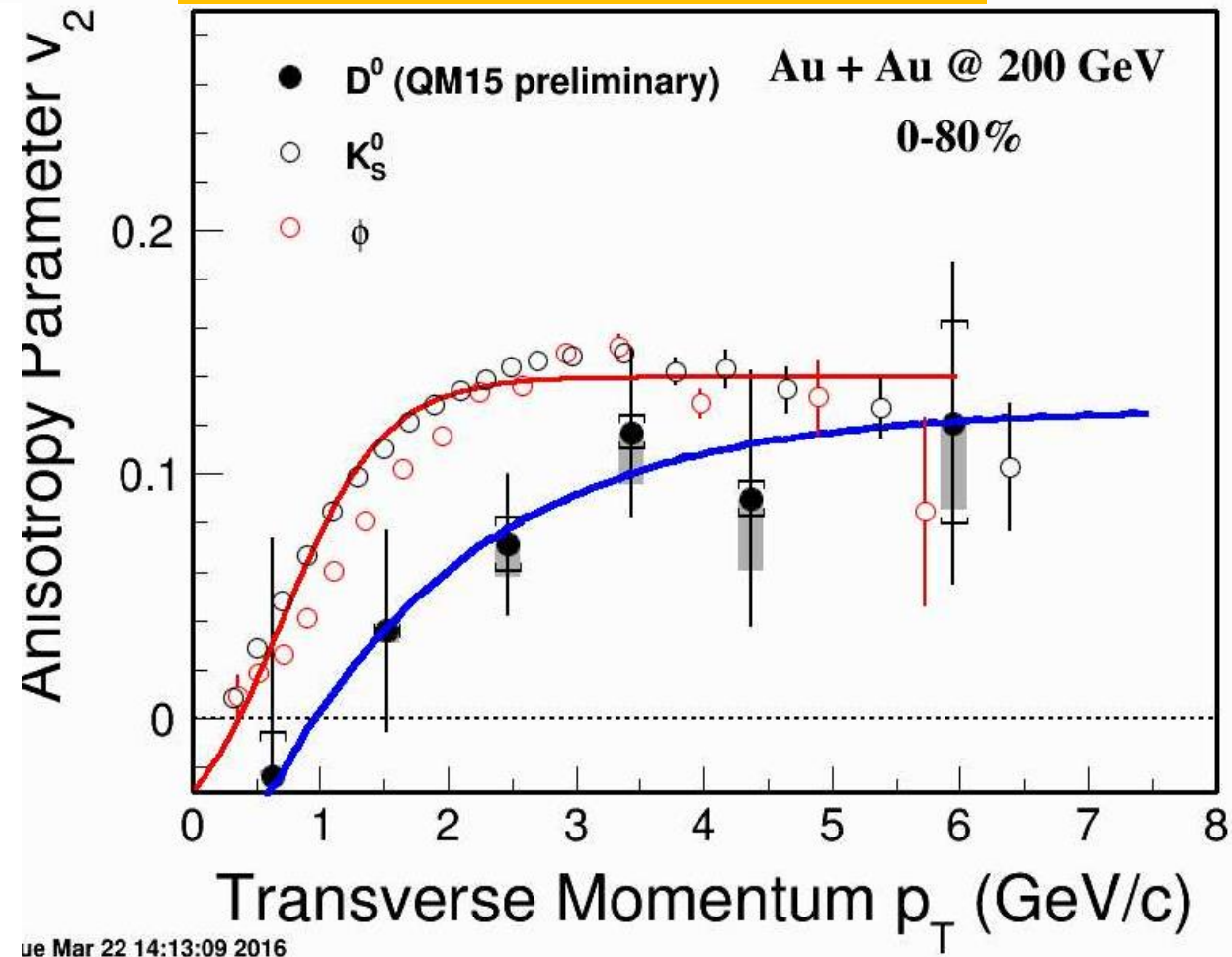
- Update charm quark to charm hadron fragmentation factor
- Update charm hadron decay channel in Pythia 6.4
 - Decay table for Pythia 6.4
- Update charm hadron semi-leptonic decay BR.
 - PDG book 2014
- Update D0 pt spectra
- Update D0 v2 spectra
 - D0v2 @Run14 AuAu 200 GeV
- Flat D0 pt
- ~~• Require D0 pt > 2 GeV~~
- Crosscheck
 - Yife's results
 - Use old pt spectra and old v0 function as input.

Charmed hadron measurement

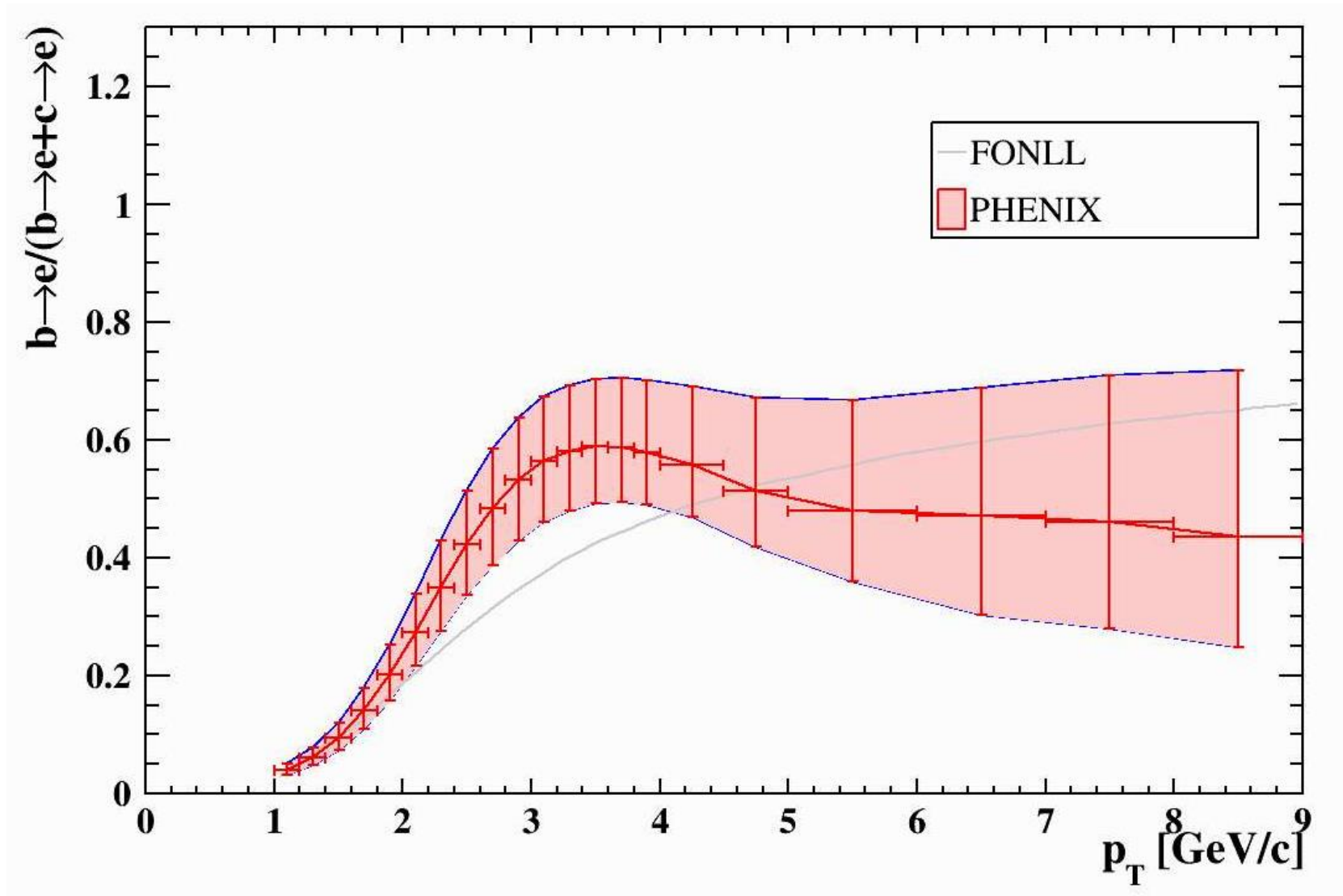
STAR Run11 Au+Au@200 GeV



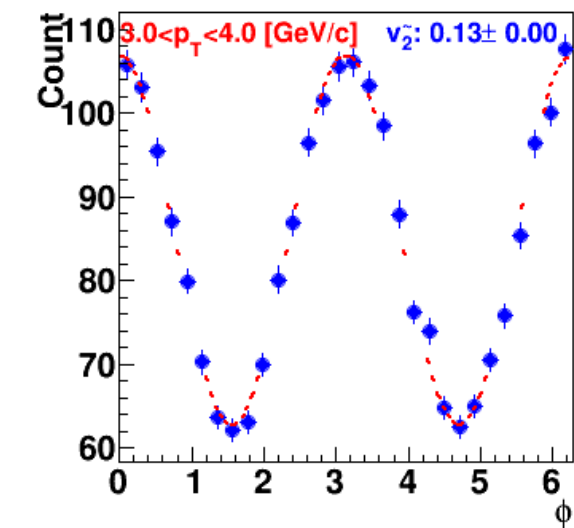
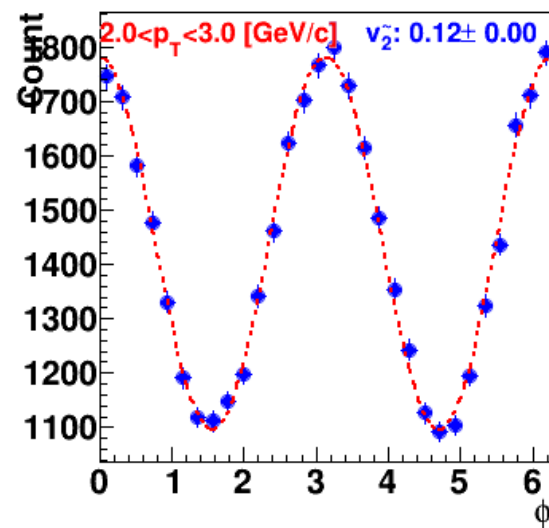
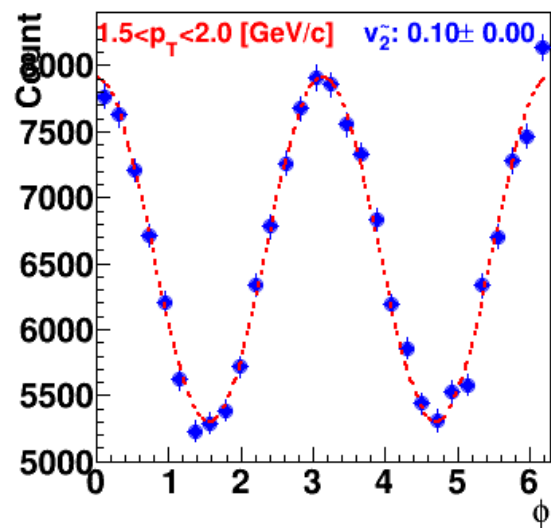
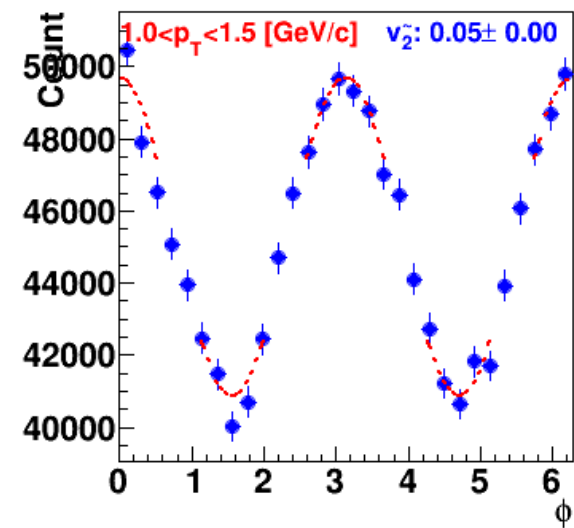
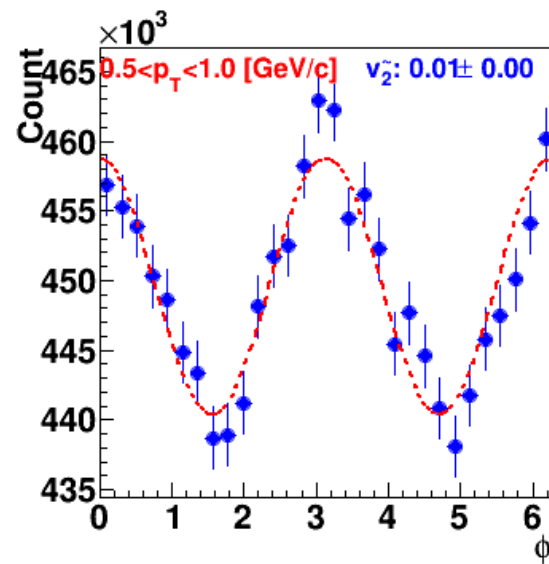
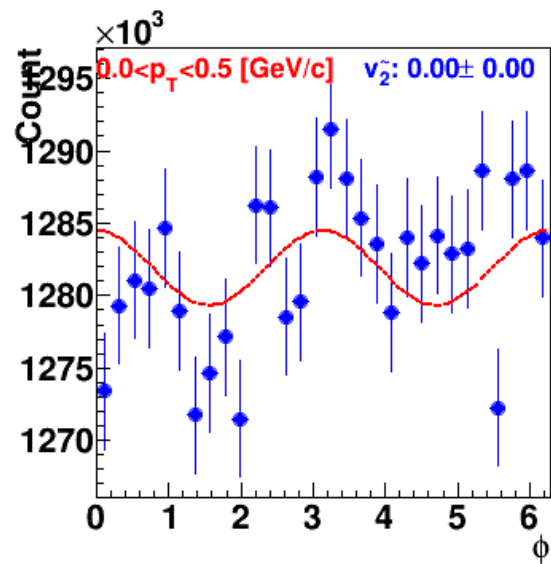
STAR Run14 Au+Au@200 GeV (SL15c)



$B \rightarrow e / (B \rightarrow e + D \rightarrow e)$



Charm hadron decay electron v_2



Charm hadron decay electron v_2

