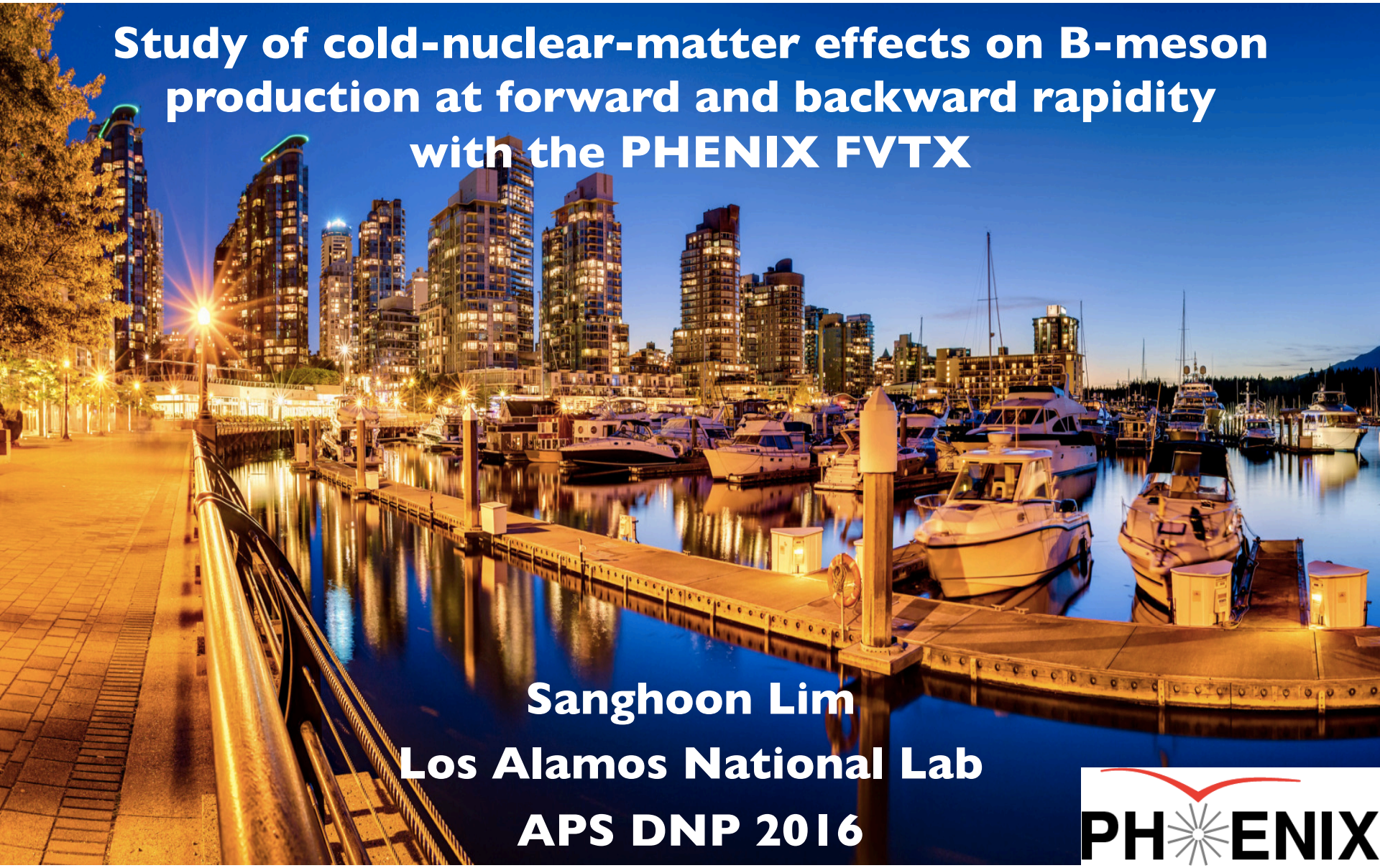

Study of cold-nuclear-matter effects on B-meson production at forward and backward rapidity with the PHENIX FVTX

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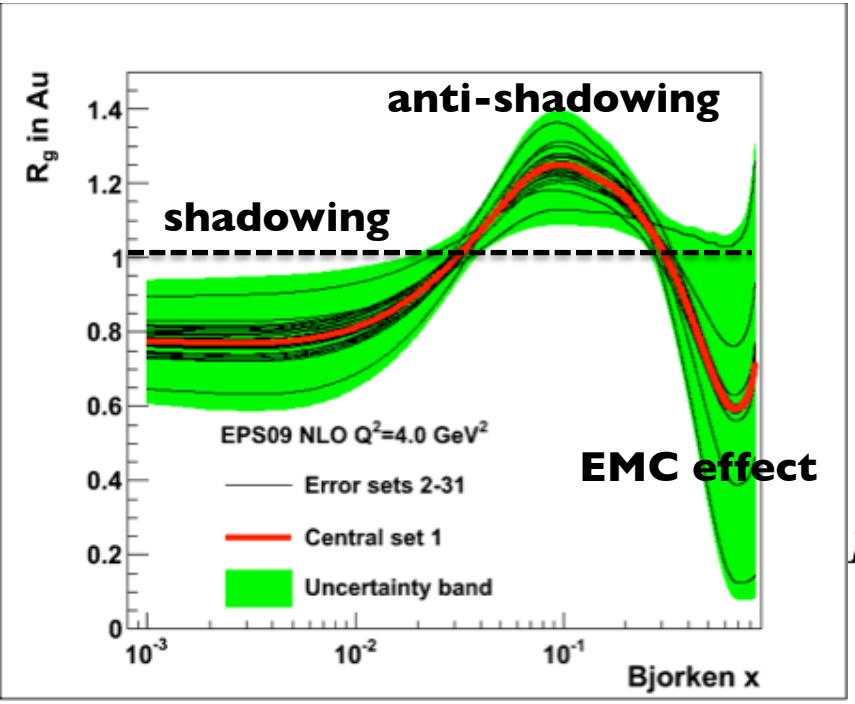
APS DNP 2016

PHENIX

Cold-nuclear-matter effects in heavy quark production



Modification of parton's distribution

Parton distribution functions (PDF) in nucleus are modified from those in nucleon depends on **x (longitudinal momentum fraction)** and **Q^2 (energy scale)**

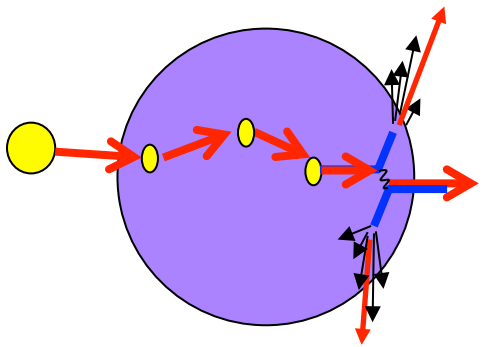
$$R^A(x,Q^2) = \frac{f^A(x,Q^2)}{Af^p(x,Q^2)}$$

EPS09 model for gluon modification

Need various measurements at wide kinematic range!!

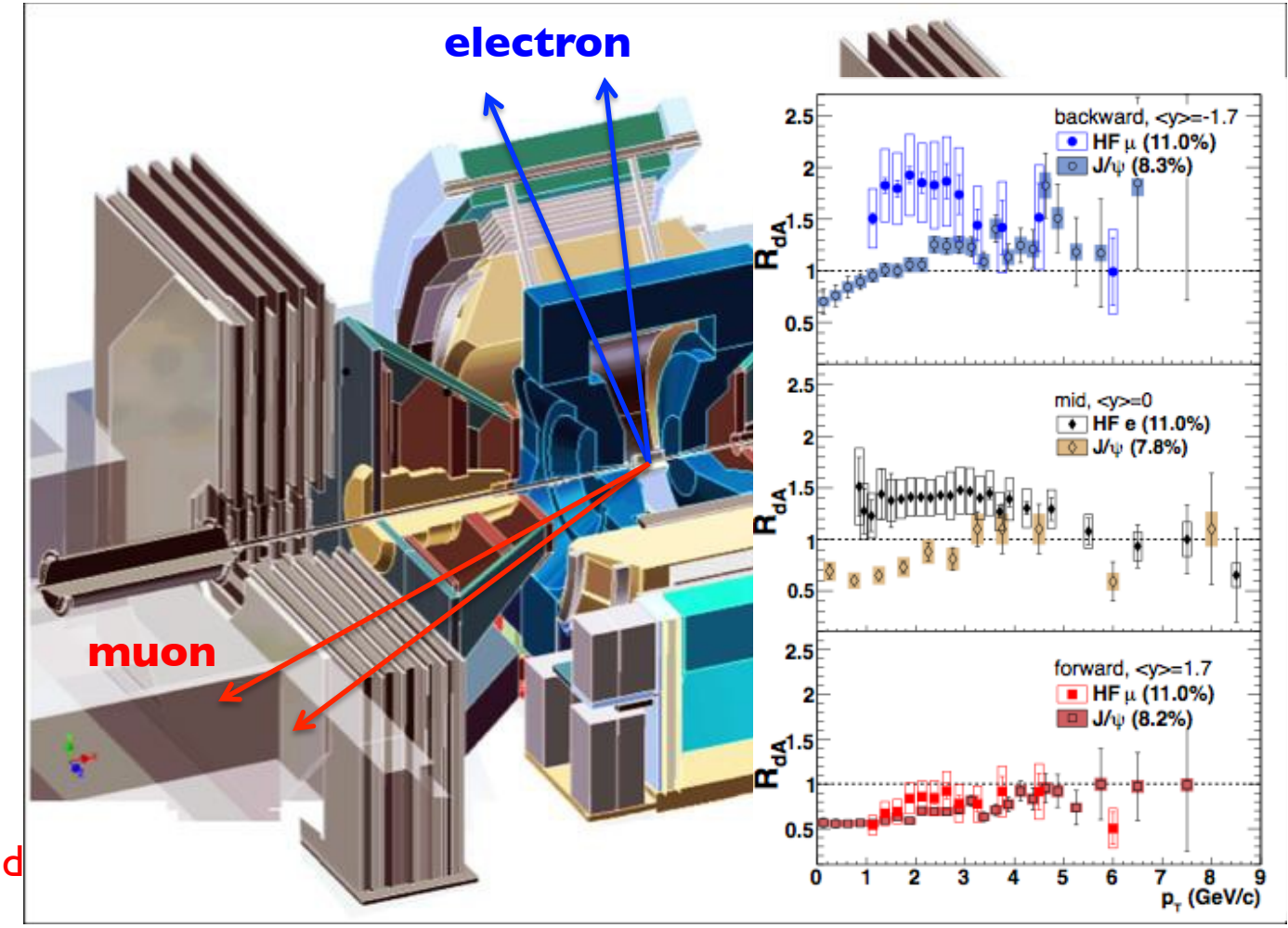
Scattering with nuclear matter

Initial-state (before hard scattering) interaction or final-state (after hard scattering) interaction can cause **energy loss, transverse momentum broadening, and break-up of bound states (Quarkonia)**



Heavy-flavor measurements at PHENIX

- **Central arm**
  - $|\eta|<0.35$
  - $\Delta\phi=\pi$
  - Tracking w/ DC, PC
  - eID w/ RICH, EMcal
- **Muon arm**
  - $1.2<|\eta|<2.2$
  - $\Delta\phi=2\pi$
  - ~10 λ absorber
  - Tracking w/ wire chamber
  - muID w/ 5 layers of steel and larocci tube plane

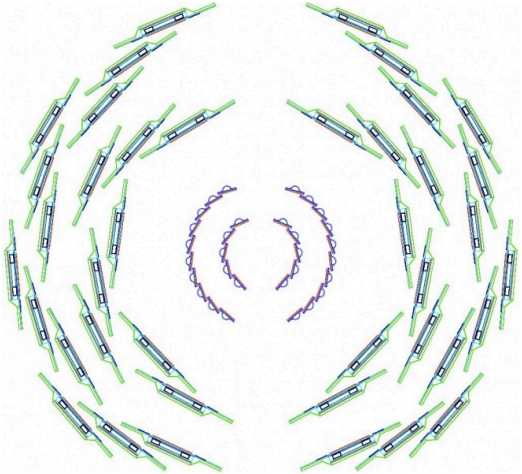


arXiv:1204.0777, arXiv:1208.1293, arXiv:1310.1005

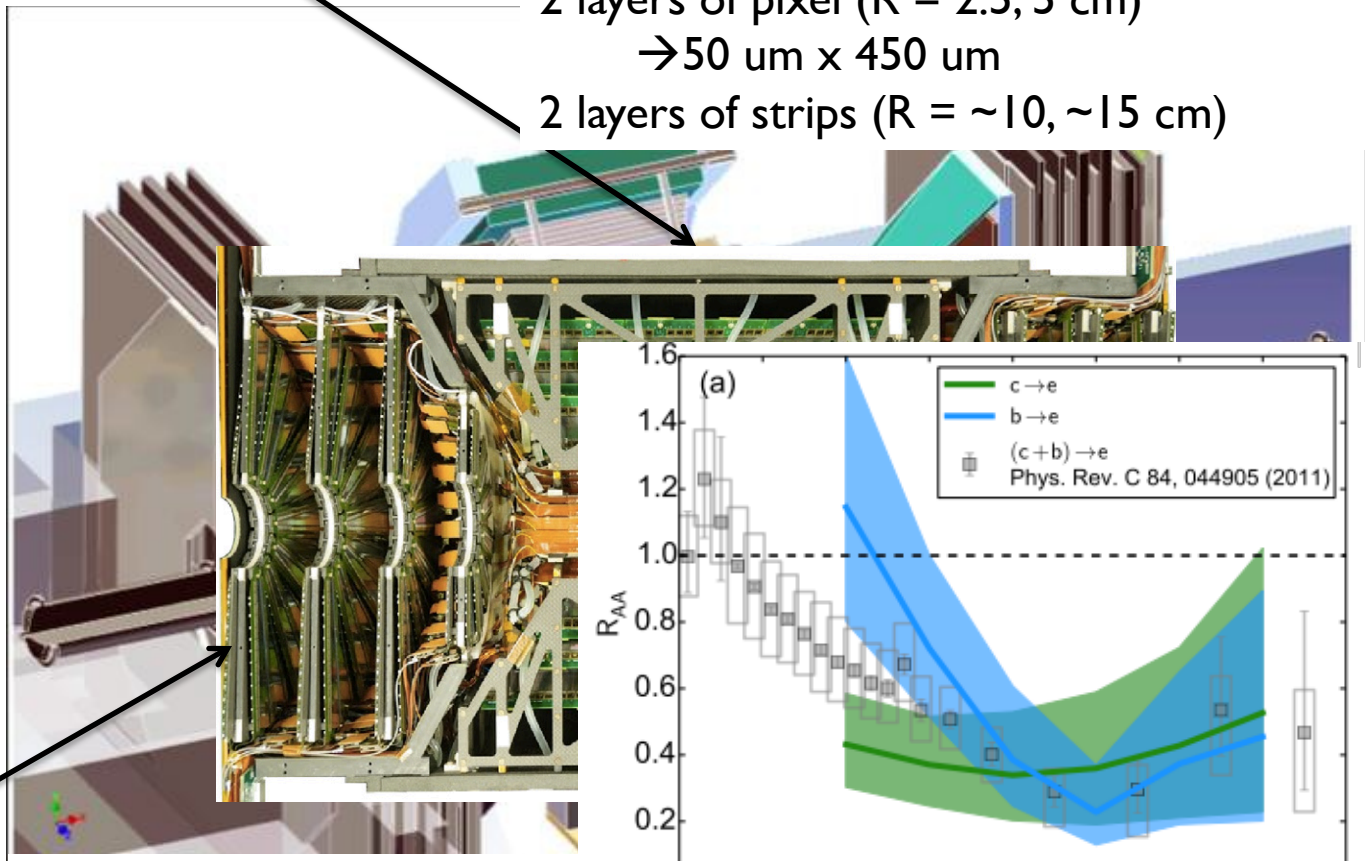
Measuring single & di-leptons from heavy-flavor decay

Silicon Vertex Tracking System

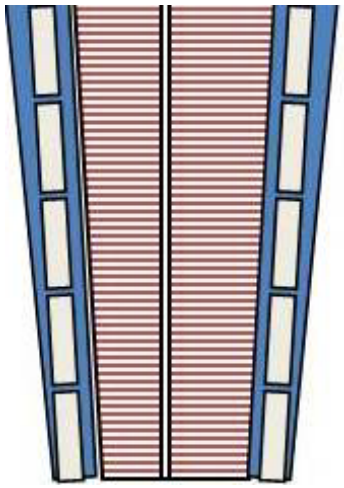
- **VTX at mid-rapidity 2011**



2 layers of pixel (R = 2.5, 5 cm)
→50 um x 450 um
2 layers of strips (R = ~10, ~15 cm)



- **FVTX at forward 2012**



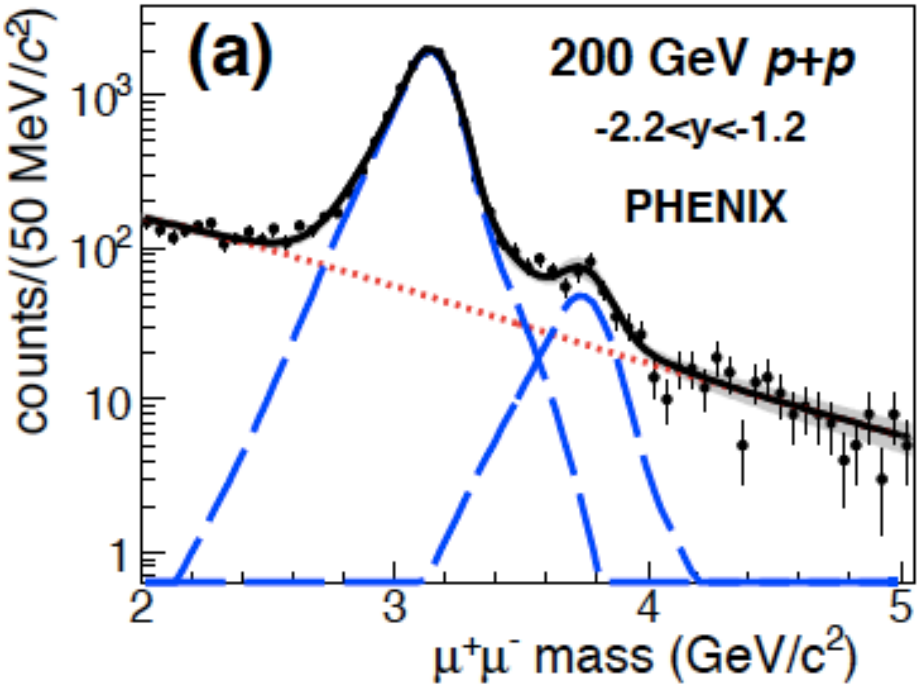
2 columns of strips
75 micron spacing
4 disks per arm (z= ~20, ~25, ~31, ~38 cm)

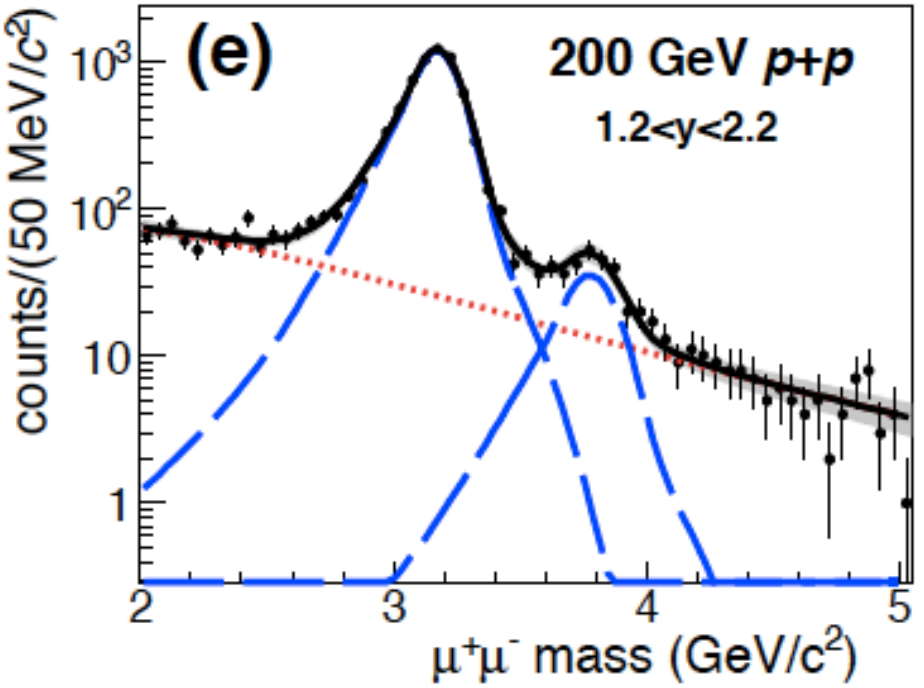
arXiv:1509.04662

Now, we can separate charm & bottom!

J/ψ from B decay

- B production can be studied via both single and dimuon measurements
  - B→J/ψ measurement have a benefit of good Signal/Background with clean identification of J/ψ at the PHENIX Muon arm

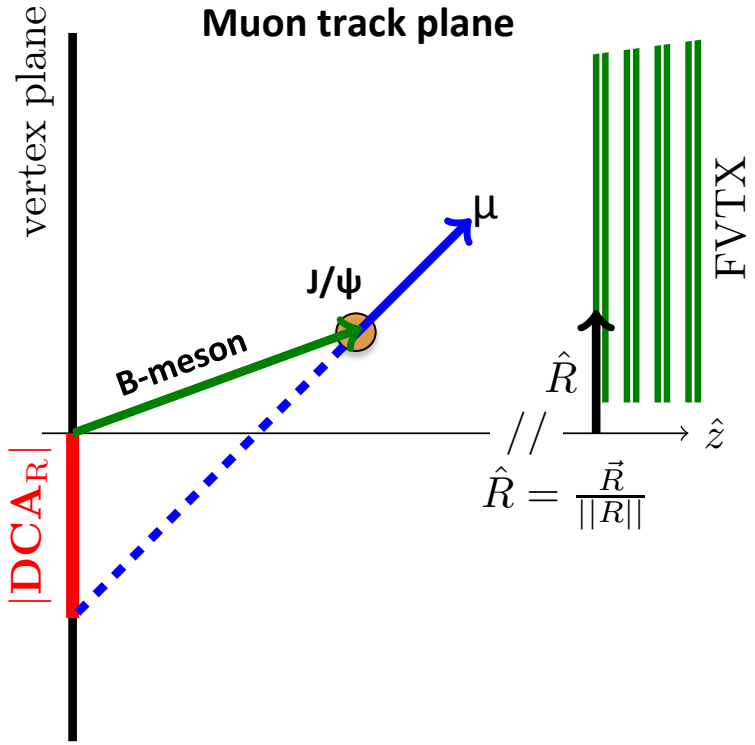


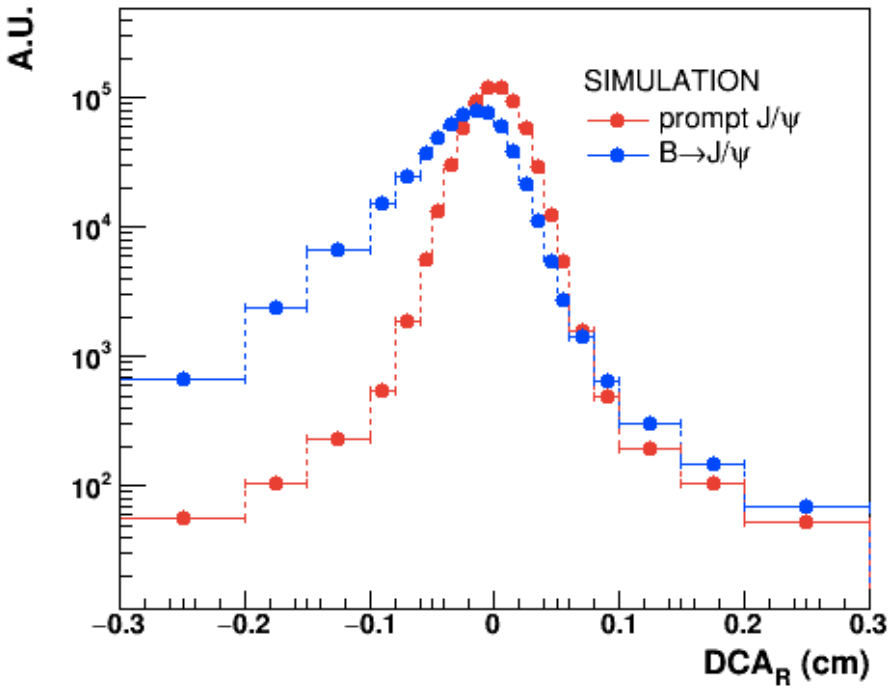


arXiv:1609.06550

J/ψ from B decay

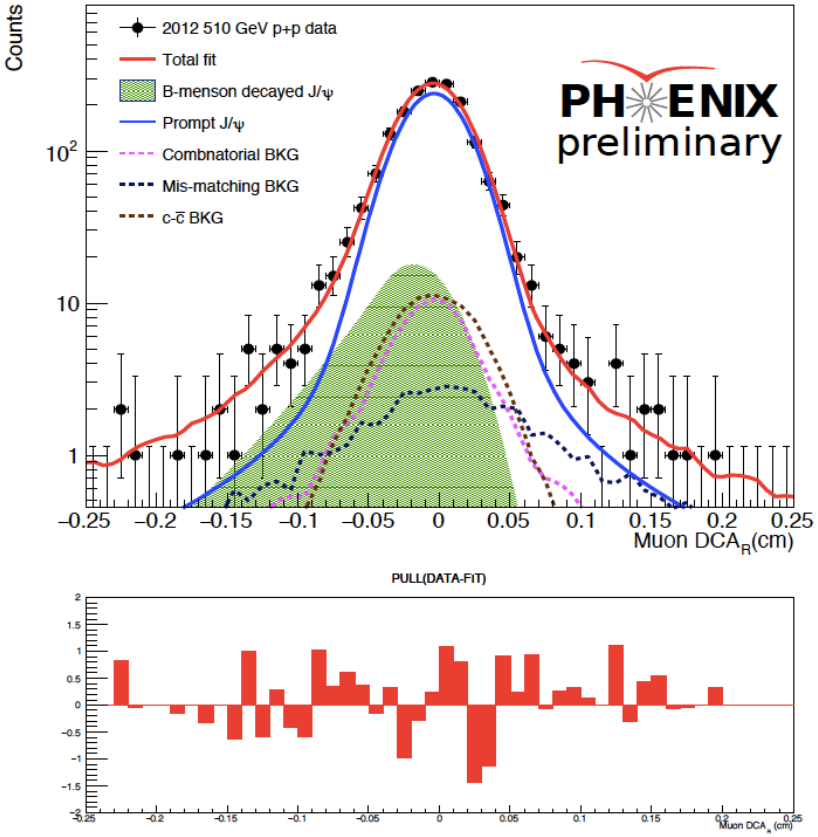
- B production can be studied via both single and dimuon measurements
  - B→J/ψ measurement have a benefit of good Signal/Background with clean identification of J/ψ at the PHENIX Muon arm
  - Clearly different shape of DCA_R between single muons from prompt J/ψ and B→J/ψ because of different decay length

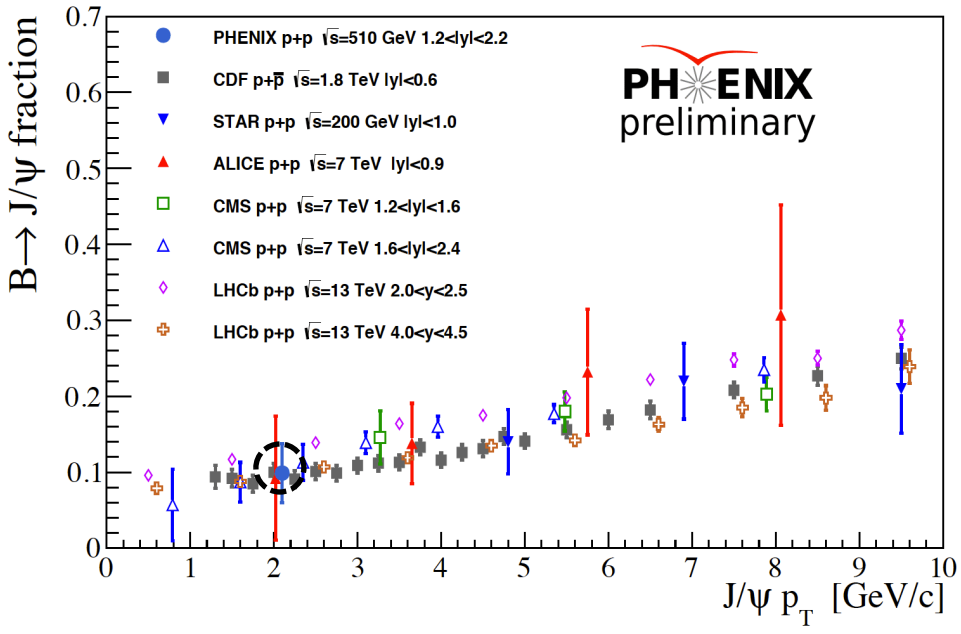




Measurements in p+p (510 GeV) and Cu+Au (200 GeV)

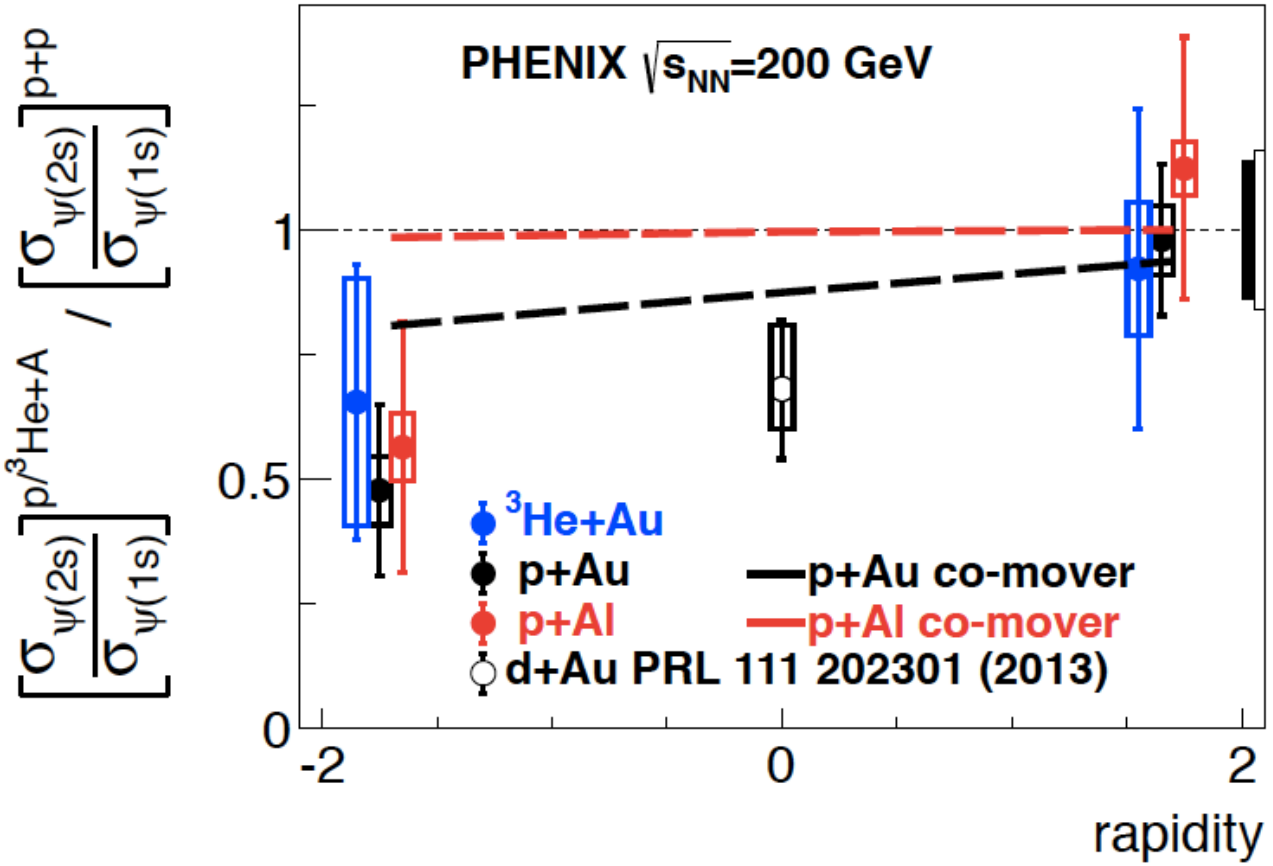
- First B→J/ψ results have been obtained with RHIC Run-12 data
  - ~10% b-fraction in p+p collisions at 510 GeV
    →consistent with results from other experiments
  - ~25% b-fraction in Cu+Au collisions at 200 GeV
    →indicate less suppression of B→J/ψ than prompt J/ψ
    (*more details in Cesar's talk on Friday)





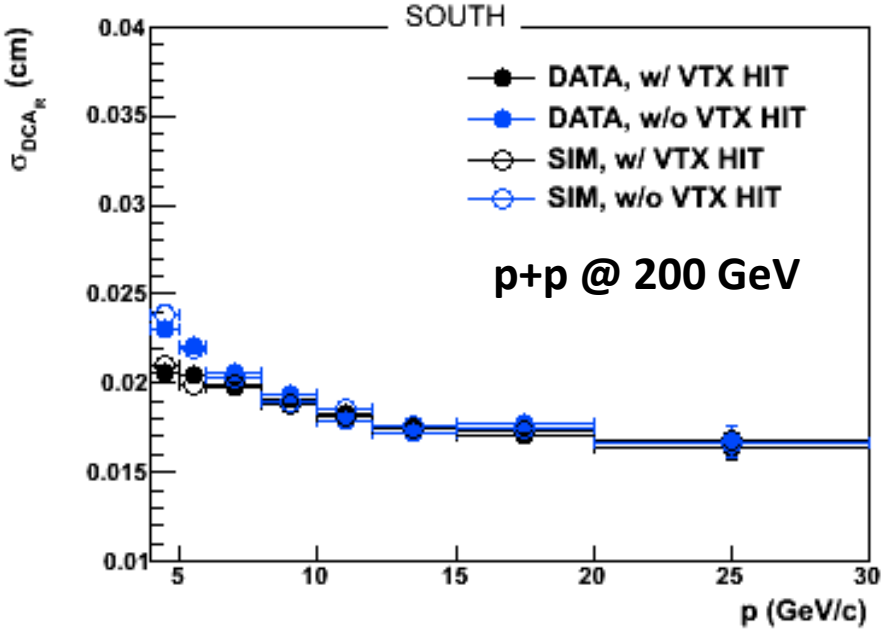
Analysis status of p+p and p+Au @ 200 GeV

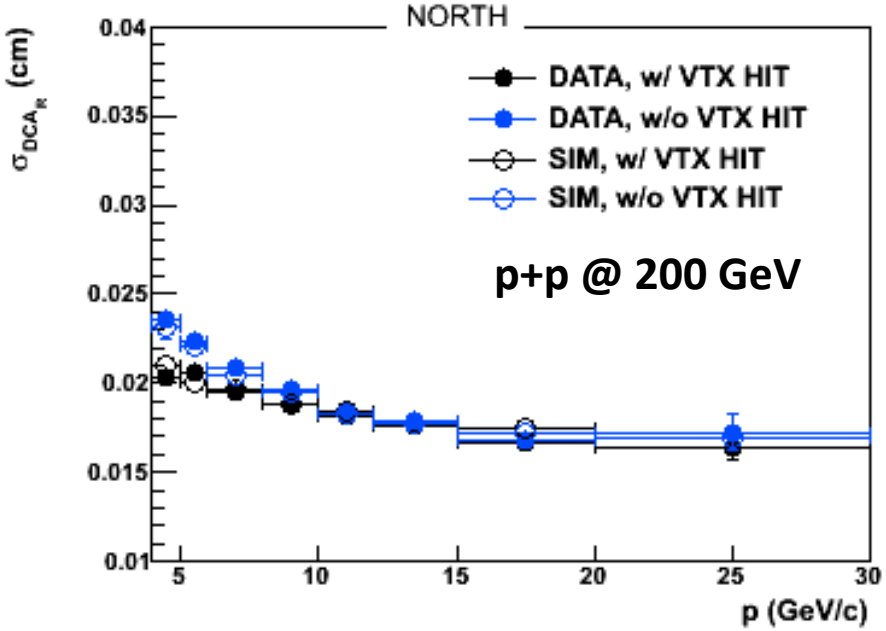
- First results with the FVTX already came out!
  - Ratio between J/ψ and ψ(2S) in p+p, p+Al, p+Au, and ^{3}He+Au collisions ***arXiv:1609.06550***



Analysis status of p+p and p+Au @ 200 GeV

- First results with the FVTX already came out!
  - Ratio between J/ψ and ψ(2S) in p+p, p+Al, p+Au, and ^{3}He+Au collisions ***arXiv:1609.06550***
- Additional data quality check for DCA analysis is on going
  - DCA_R resolution study with stopped hadrons at MuID Gap-2/3





- Analysis method to extract b-fraction has been established in the previous analyses

Summary & Outlook

- B→J/ψ measurements at forward and backward rapidity in p+p and p+Au collisions are important to understand cold-nuclear-matter effects on b production

- Analysis method with the FVTX has been already established
  - Preliminary results in p+p @ 510 GeV and Cu+Au @ 200 GeV
  - Measurement in p+p @ 200 GeV can provide a baseline for the Cu+Au results

- Analysis of p+p and p+Au data is on going
  - DCA_R resolution study with stopped hadrons
  - Comparable DCA_R resolution with simulation
  - Fit and systematic study are on-going
  - Inclusive J/ψ measurement (without FVTX) is also on-going
  - Charm/bottom separated single muon analysis will be following with basic studies of this analysis

BACK UP