Recent PHENIX Results

Larionova Daria
Y. Berdnikov, A. Berdnikov, D. Kotov, Yu. Mitrankov,
M. Mitrankova, E. Bannikov
for the PHENIX collaboration

Overview

Light hadron production in small and large systems

- Identified charged hadron production
- ϕ −meson production in p+Al, p/d/^{3}He+Au collisions
- ϕ −meson production in Cu+Au and U+U collisions
- π^0 −meson production in p+p, p+Al, p/d/^{3}He+Au collisions

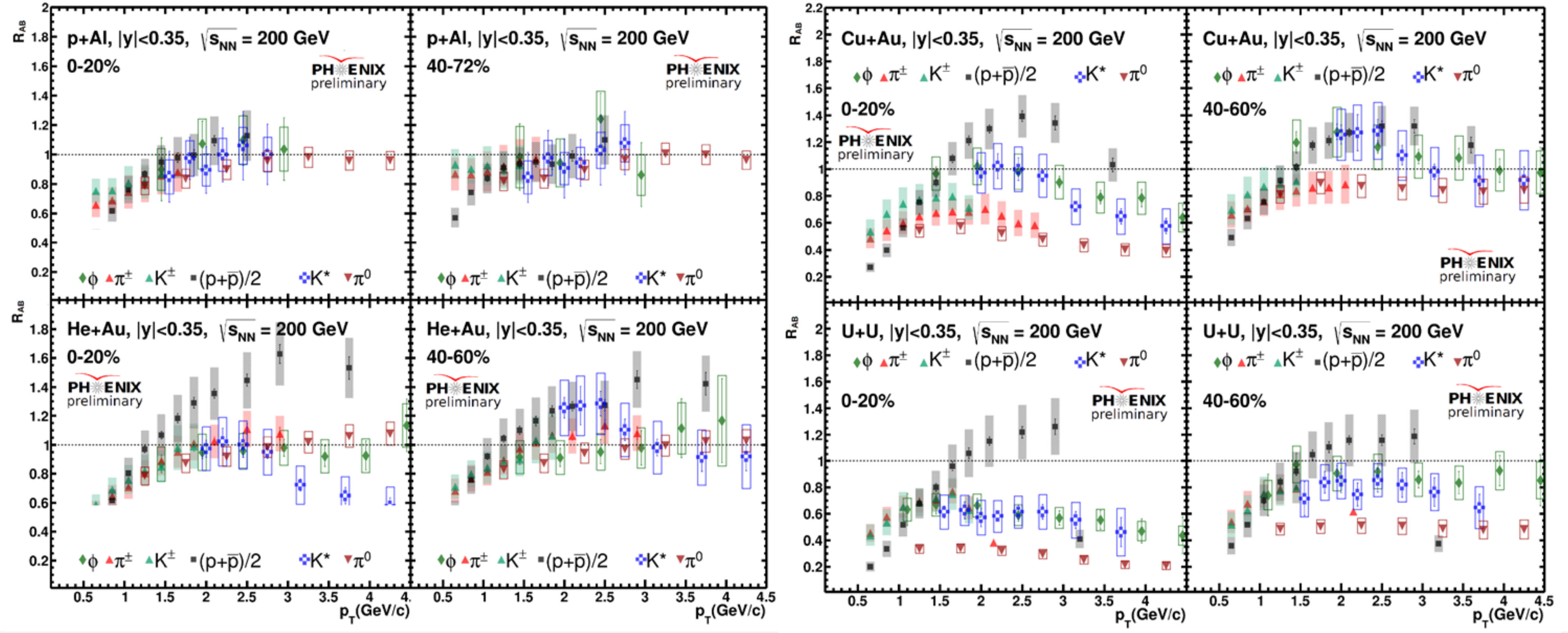
Collectivity in small systems

Direct photon production

Heavy flavor

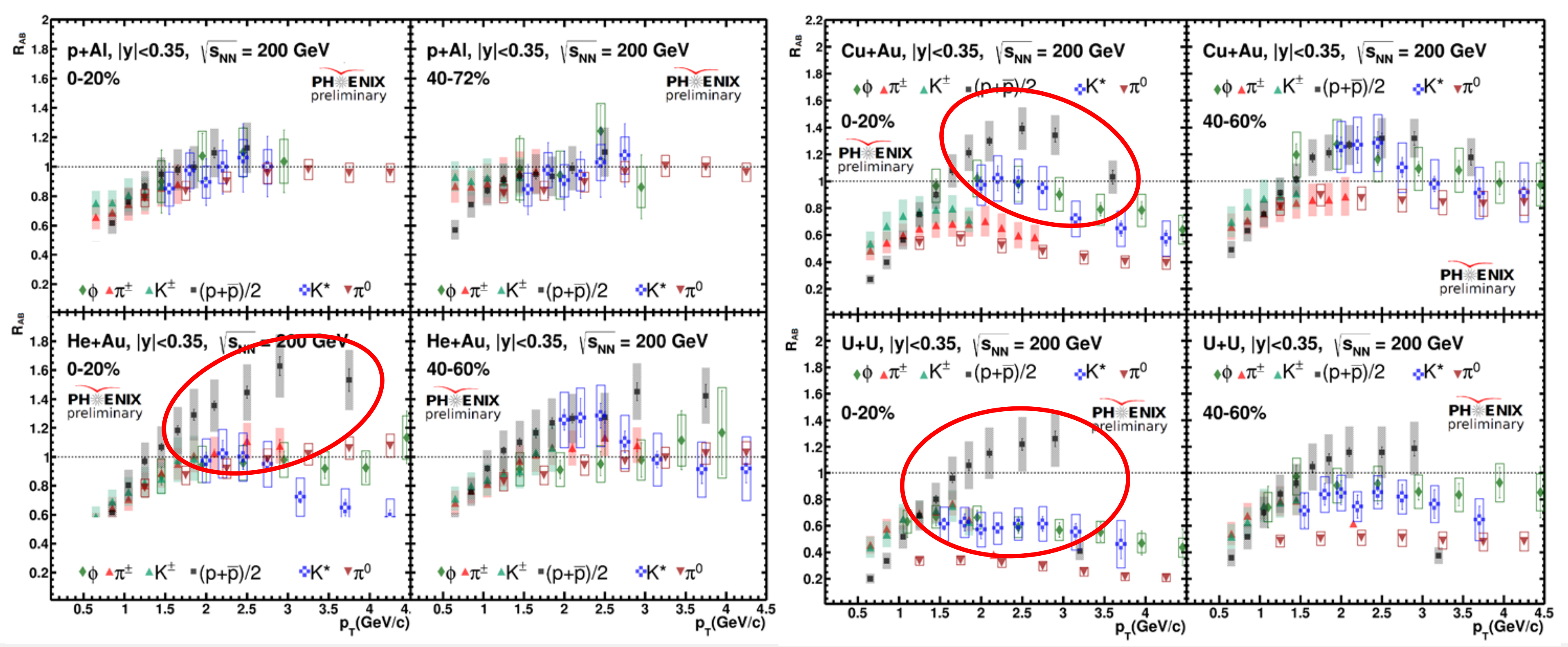
- c and b –quark production in Au+Au collisions
- $\psi(2S)$ nuclear modifcation at backward and forward rapidity in p+p/Al/Au collisions

Light hadron R_{AB} in small and large systems



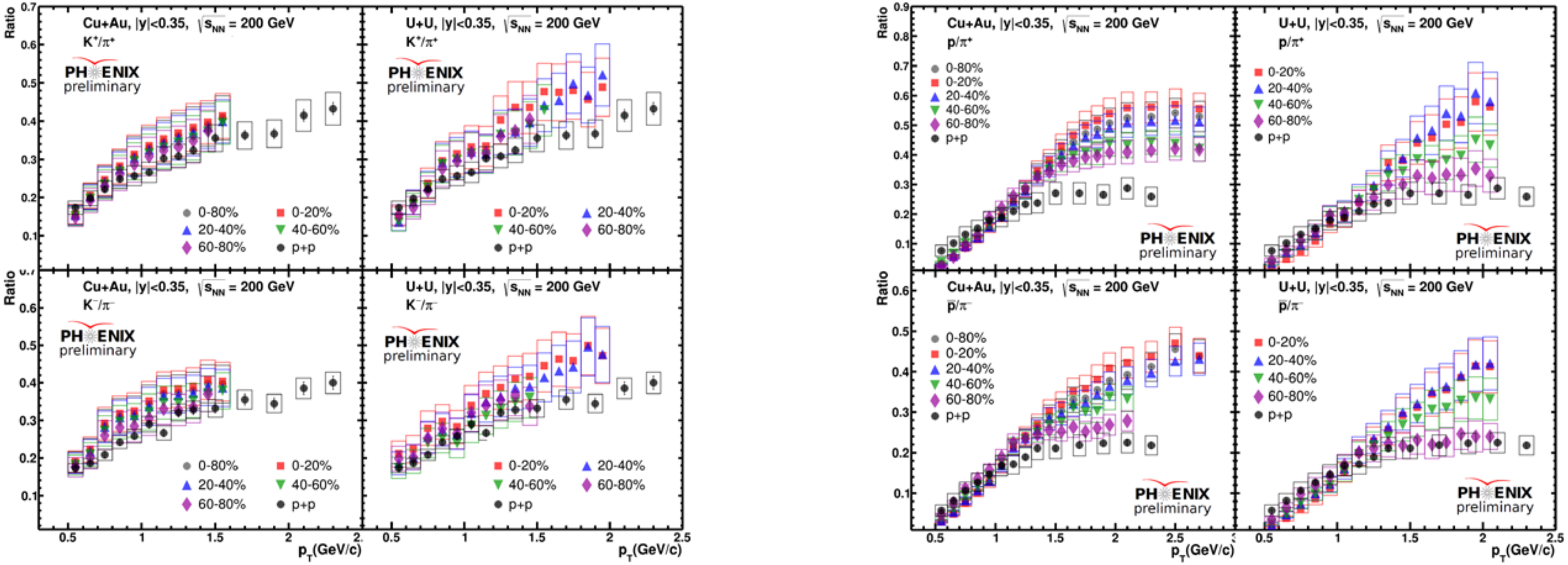
Baryon enhancement

$R_{AB}^{\varphi} < R_{AB}^{p}$, $m_{\varphi} \approx m_p$



Baryon enhancement

The ratios of K/π and p/π



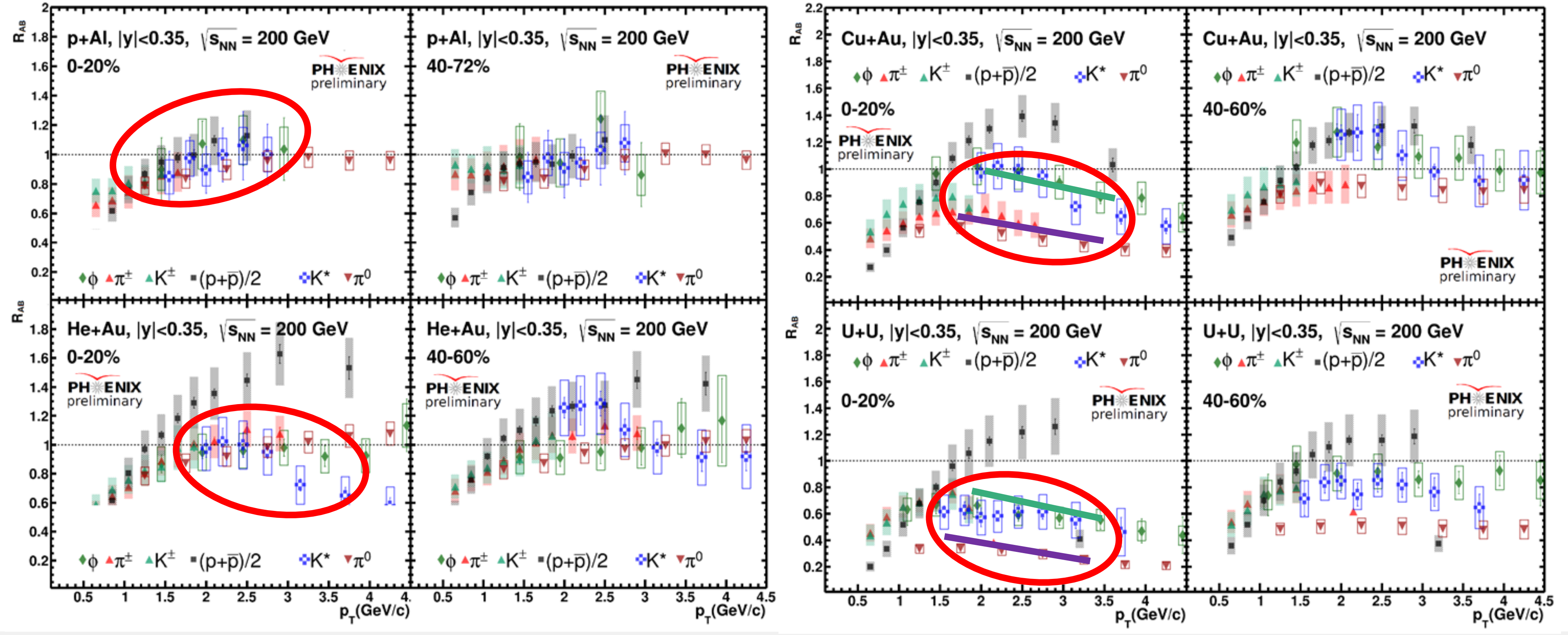
The p/π ratios can be qualitatively described in the frame of coalescence models

Ann. Rev. Nucl. Part. Sci. 2008. V. 58. P. 177-205

Strangeness enhancement

Phys. Rev. C **106**, 014908 (2022)
arXiv: 2203.06087

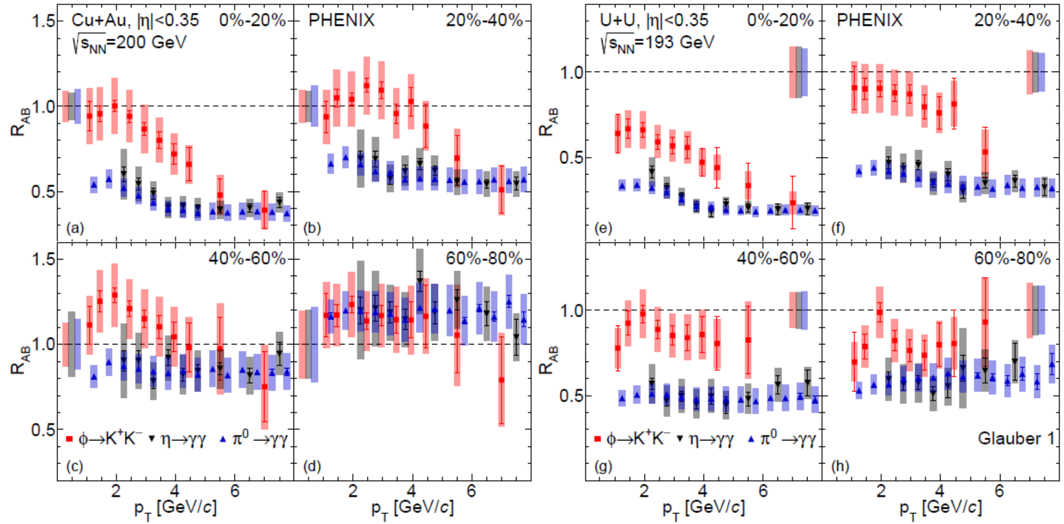
Observed only in large systems?

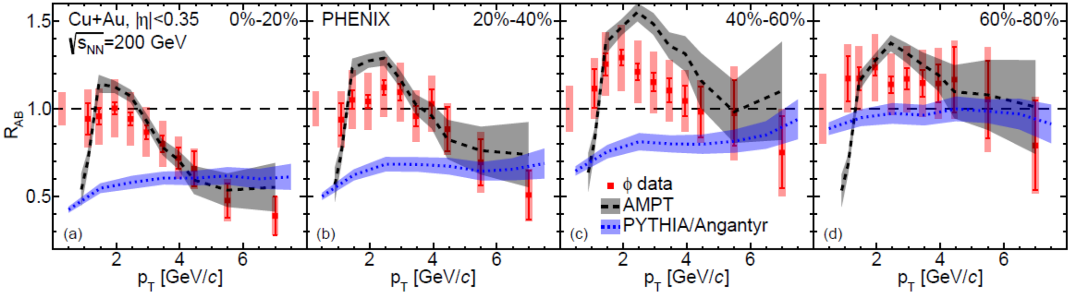


PHENIX

Phys. Rev. C **106**, 014908 (2022)
arXiv: 2207.10745v1

φ in Cu+Au and U+U collisions





ϕ-meson production measured in heavy-ion collisions does not depend on the shape of the nuclear-overlap region.

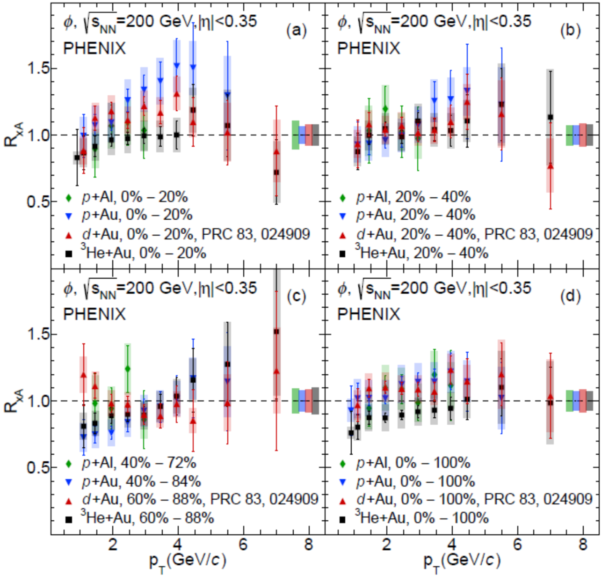
The obtained ϕ −meson $\langle R_{AB} \rangle$ values are consistent across Cu+Cu, Cu+Au, Au+Au, and U+U collisions within uncertainties

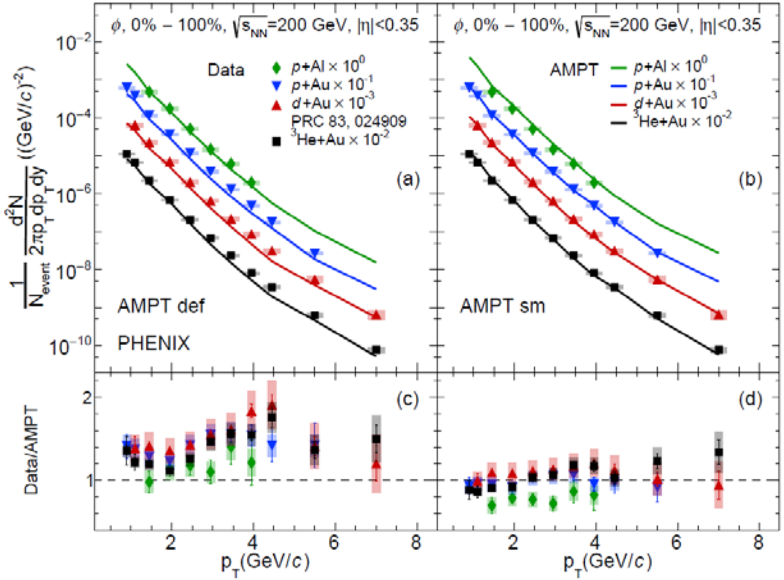
The obtained ϕ-meson R_{AB} values are quantitatively described by the AMPT and iEBE-VISHNU models, which include the coalescence mechanism

PHENIX

φ in p/d/³He+Au collisions

Phys. Rev. C **106**, 014908 (2022)
arXiv: 2203.06087

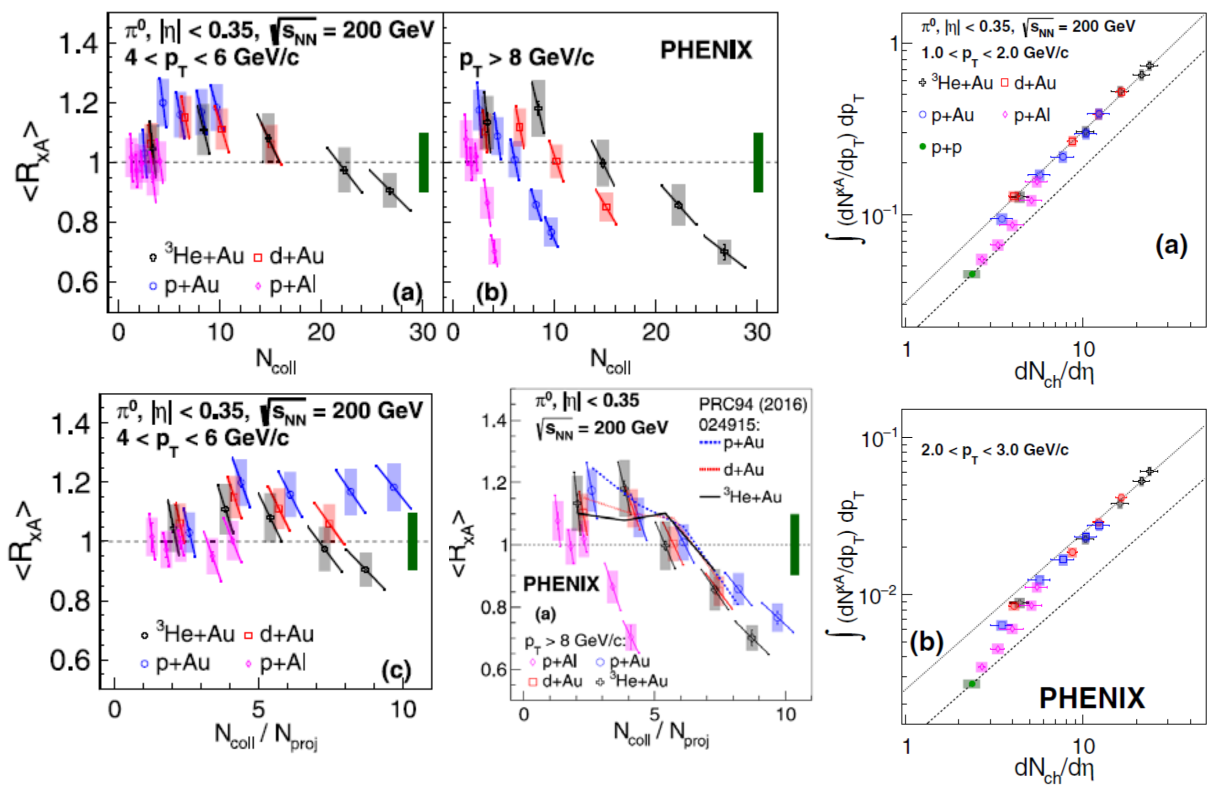




1. Ordering $R_{HeAu} < R_{dAu} < R_{pAu}$
2. ϕ meson R_{xA} in p/d/³He+Au collisions are in good agreement with the string-melting version of AMPT calculations (implements coalescence model of hadronization), whereas the default version of AMPT (fragmentation hadronization model) calculations underpredict the data.

π^0 in small systems

Phys. Rev. C **105**, 024902 (2022)
arXiv: 2111.05756



Different mechanisms might contribute to the nuclear modification at high and low p_T.

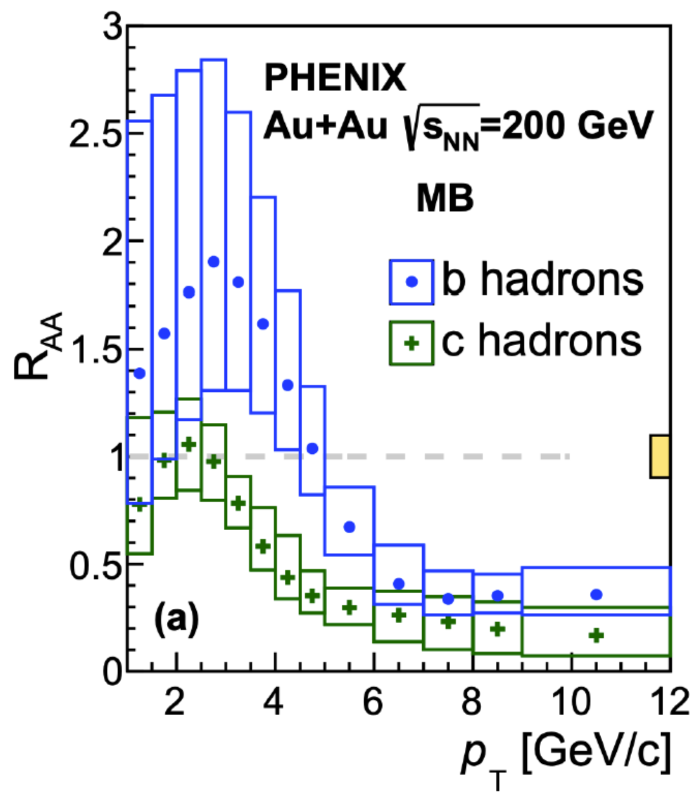
$\langle R_{xA} \rangle, \quad p_T > 8\ GeV/c$

The p/d/^{3}He+Au collision systems follow a common trend. For Al as a target nucleus, a distinctly different trend is observed.

Shift of yield from scaled p+p to scaled ^{3}He+Au starting around $\frac{dN_{ch}}{d\eta} > 4\ to\ 5$

arXiv:2203.17058

Heavy flavor energy loss



Improved precision compared to our previously published results
Extend the p_T coverage down to 1 GeV/c by using the improved p+p baseline.

Unfolded charm and bottom hadron yields indicate the trend

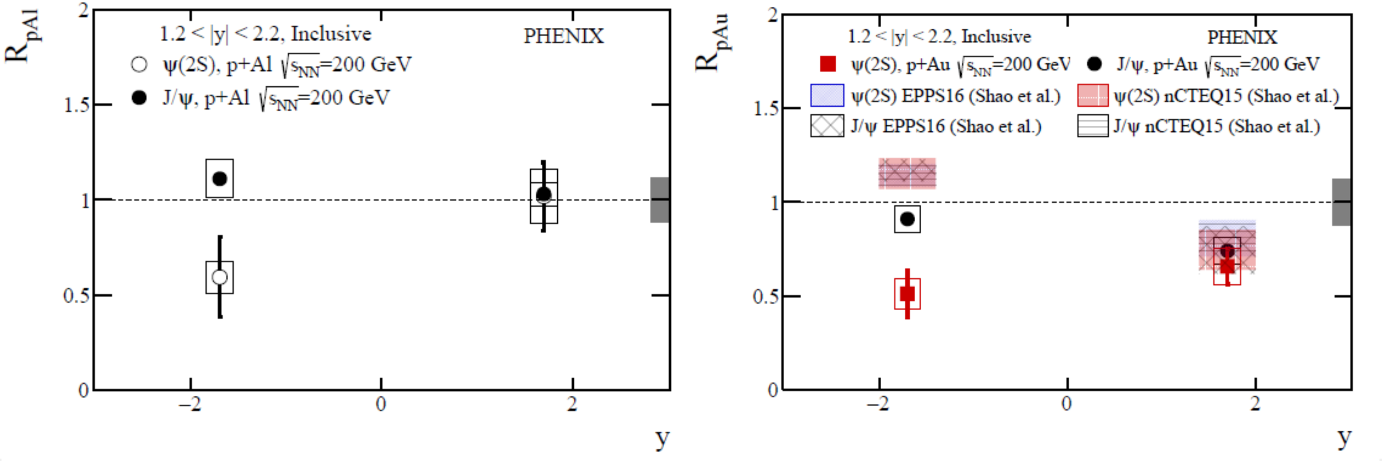
$$E^c_{loss} > E^b_{loss}$$

Result in agreement with the mass dependency of the radiative energy loss

PHENIX

Phys. Rev. C **105**, 6, 064912 (2022)
arXiv: 2202.03863v2

$\psi(2S)$ in small systems

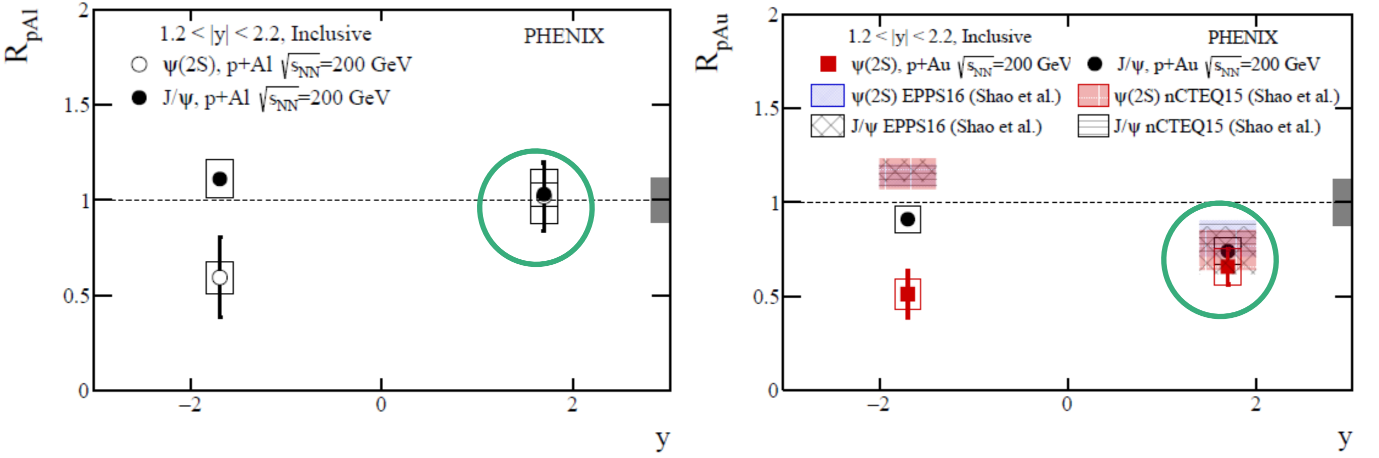


The $\psi(2S)$ and J/ψ nuclear modification are consistent with unity

The $\psi(2S)$ and J/ψ modification in p+Au collisions at forward rapidity is well described by EPPS16 and nCTEQ15 shadowing.

$\psi(2S)$ in small systems

Phys. Rev. C **105**, 6, 064912 (2022)
arXiv: 2202.03863v2

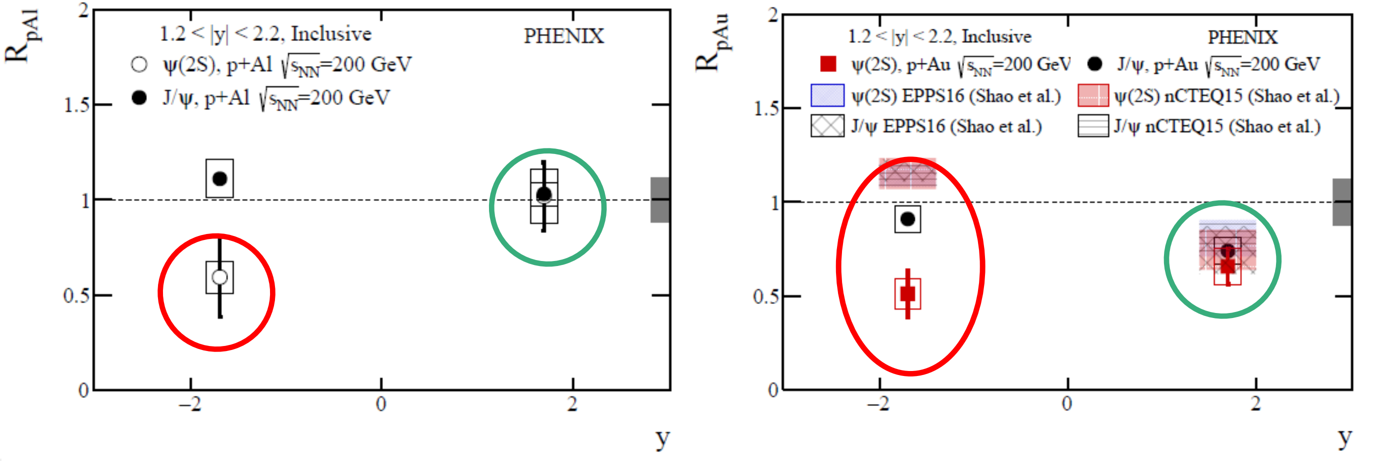


The $\psi(2S)$ and J/ψ nuclear modification are consistent with unity

The $\psi(2S)$ and J/ψ modification in p+Au collisions at forward rapidity is well described by EPPS16 and nCTEQ15 shadowing.

$\psi(2S)$ in small systems

Phys. Rev. C **105**, 6, 064912 (2022)
arXiv: 2202.03863v2

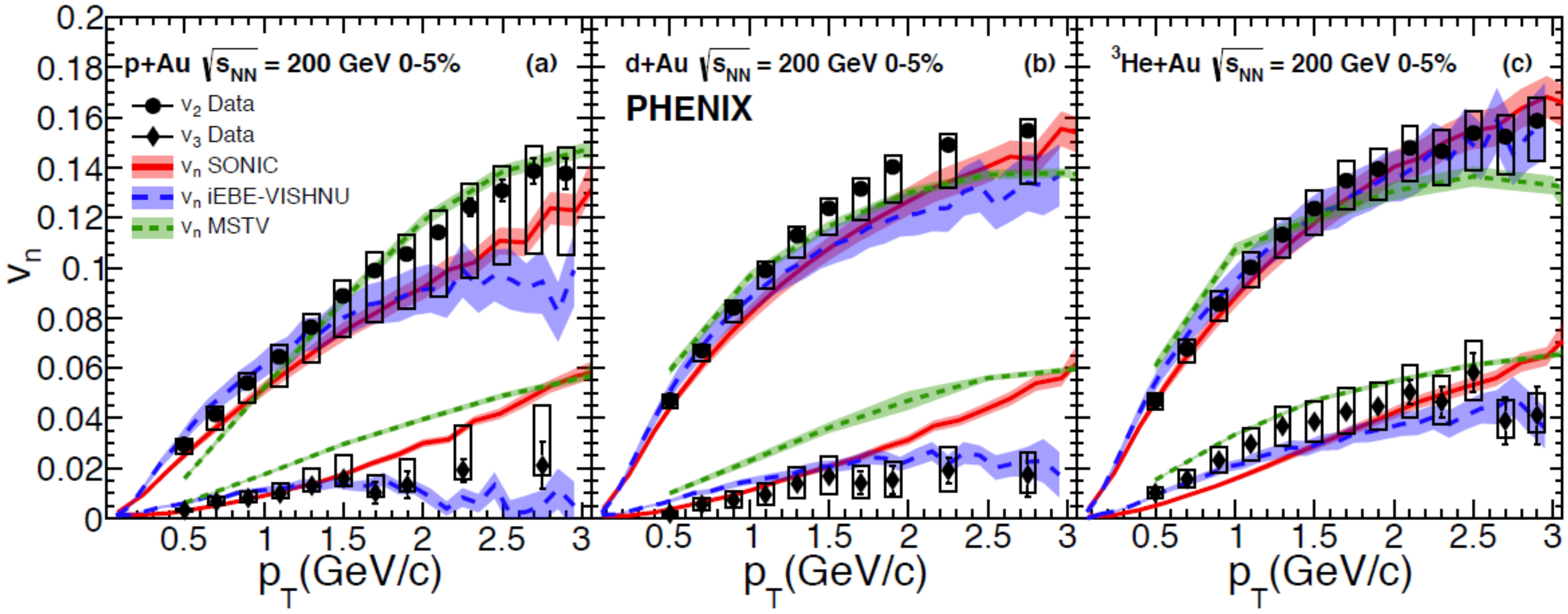


The $\psi(2S)$ nuclear modification results at backward rapidity may indicate final-state effects are present in the p+Al and p+Au system at RHIC energies

Nature phys. 15, 3, 214-220 (2019)

Collectivity in small systems

Anisotropy of charged particle production consistent with hydrodynamic expansion



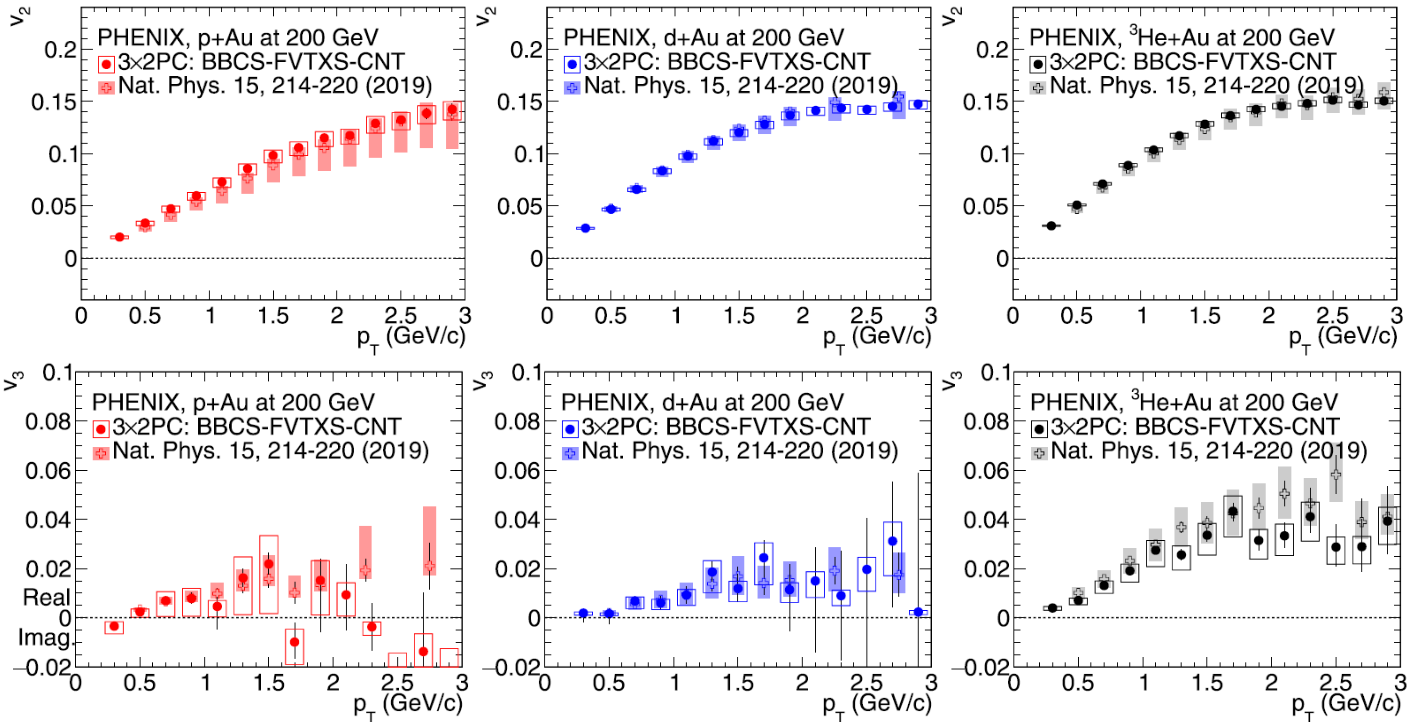
PHENIX

Phys. Rev. C **105**, 6, 024901 (2022)
arXiv: 2107.06634

Collectivity in small systems

3×2PC method - three different two-particle correlations

Consistent results between 2PC and event plane methods.

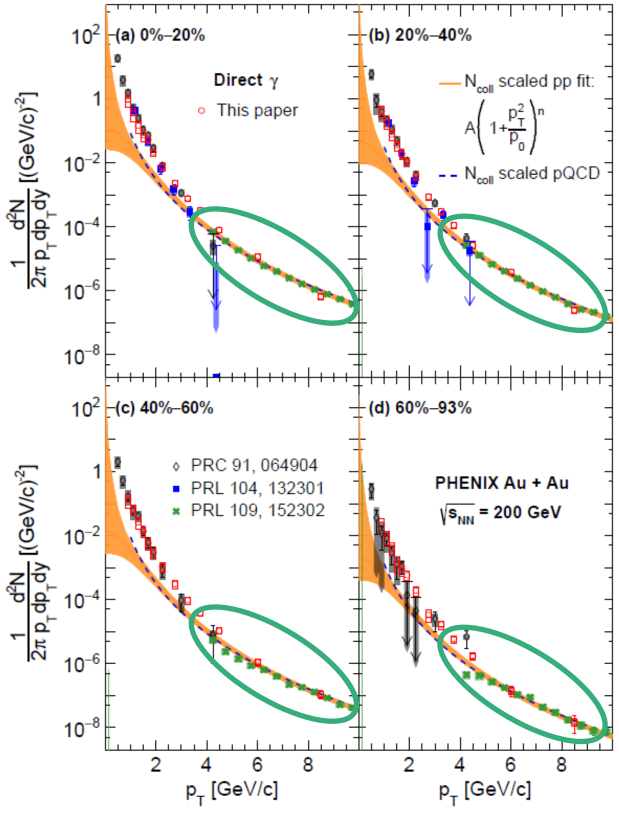


Nonprompt direct-photon production in AuAu collisions

Direct-photon production in Au+Au collisions at $\sqrt{s_{NN}}$ = 200 GeV using photon conversions to $e^+ + e^-$ pairs

- Extension up to 10 GeV/c
- 9 centrality bins

$p_T > 4 - 5$ GeV/c
Well described by Ncoll scaled pp fit and pQCD



PHENIX

arXiv: 2203.17187

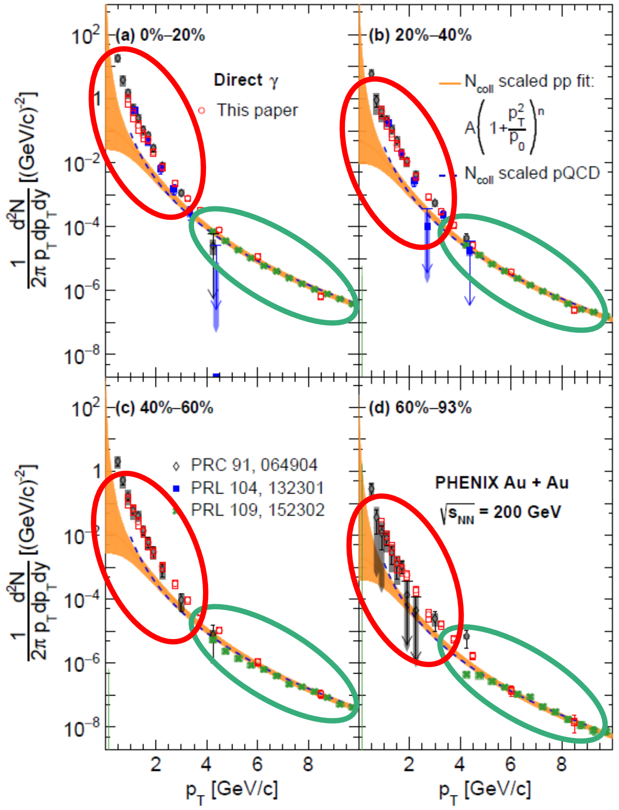
Nonprompt direct-photon production in AuAu collisions

Direct-photon production in Au+Au collisions at $\sqrt{s_{NN}}$ = 200 GeV using photon conversions to $e^{+} + e^{-}$ pairs

- Extension up to 10 GeV/c
- 9 centrality bins

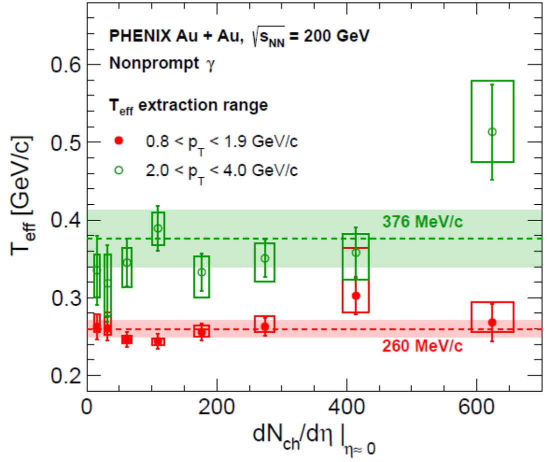
$p_T > 4 - 5$ GeV/c
Well described by Ncoll scaled pp fit and pQCD

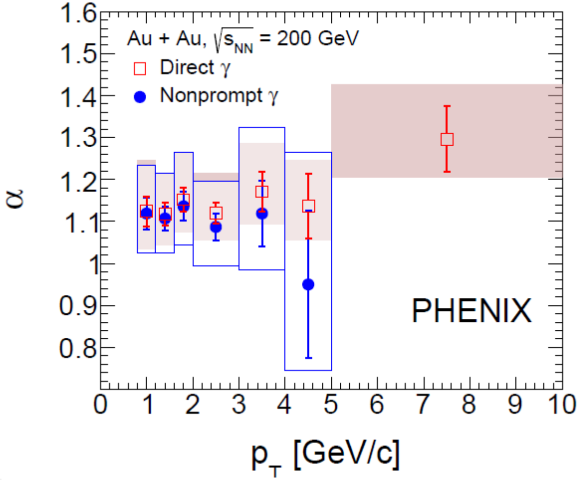
$p_T < 4 - 5$ GeV/c
Direct-photon yields excess



arXiv: 2203.17187

Nonprompt direct-photon production in AuAu collisions





$$\frac{dN_\gamma}{dy} = A \times \left(\frac{dN_{ch}}{d\eta}|_{\eta=0}\right)^\alpha$$

The T_{eff} values are consistent with a constant value, independent of $\frac{dN_{ch}}{d\eta}$

Thank you for attention!