9th International Conference on New Frontiers in Physics 2020

POLYTECH
Peter the Great
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PHENIX

PRODUCTION OF LIGHT FLAVOR HADRONS IN SMALL SYSTEMS MEASURED BY PHENIX AT RHIC

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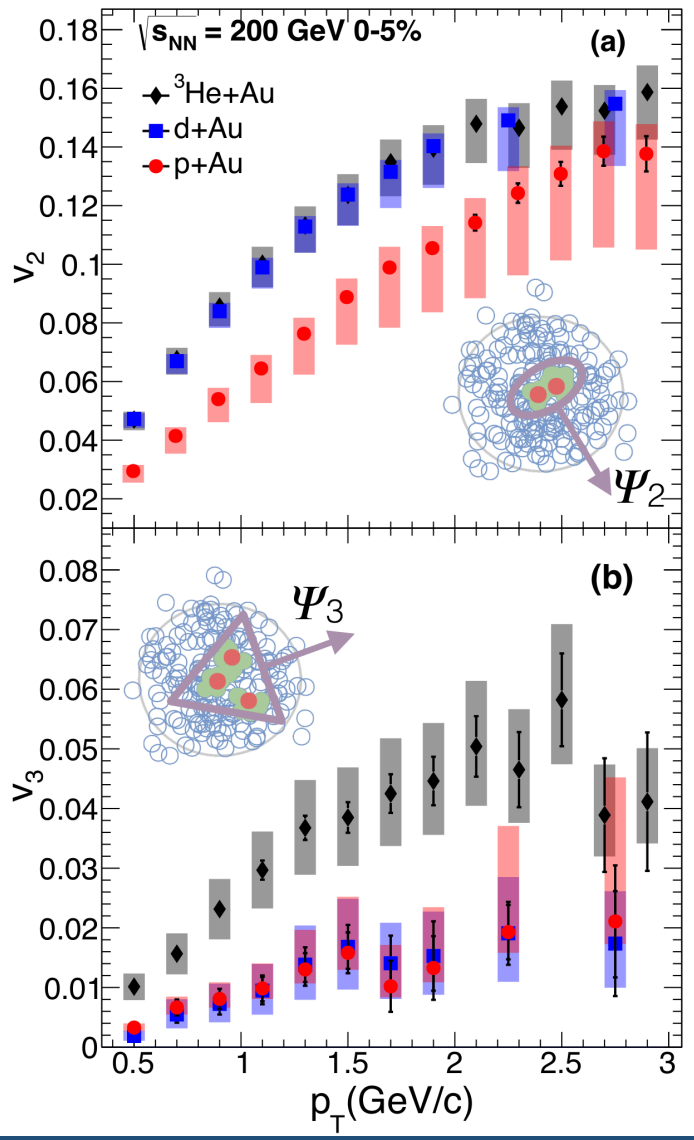
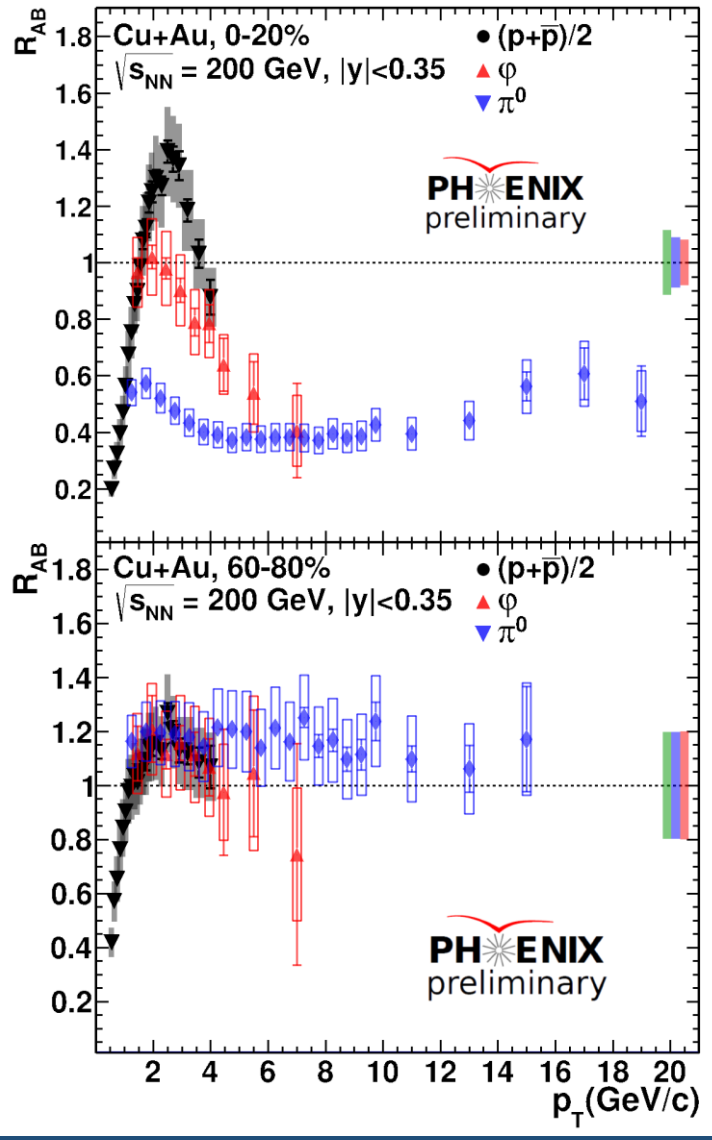
For PHENIX collaboration

Motivation





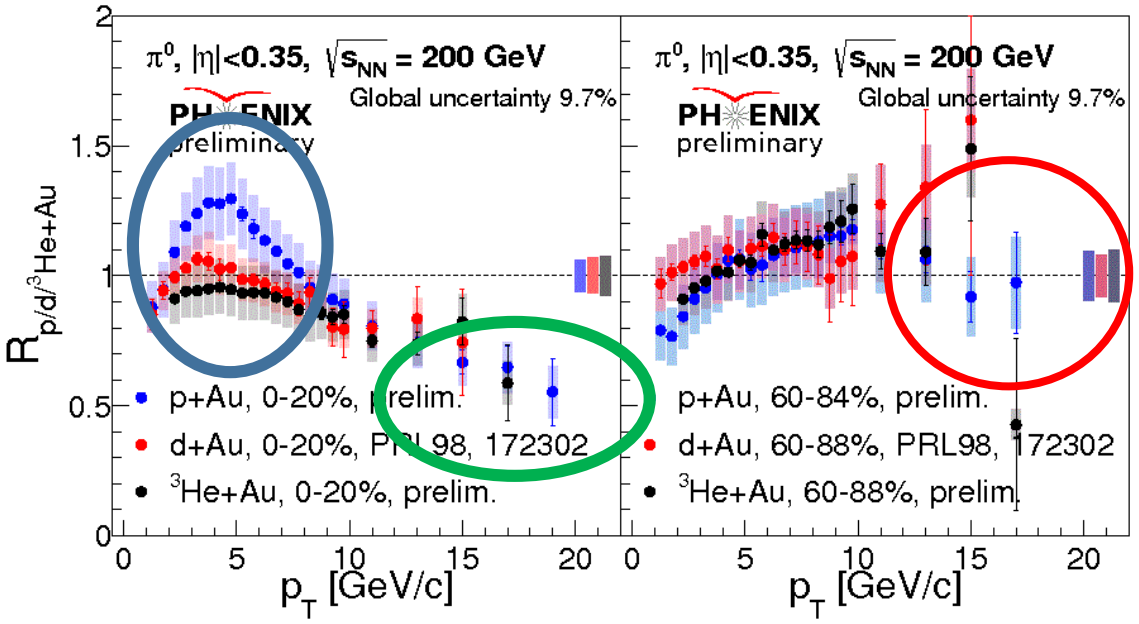
Flow measurements →strong evidence for QGP droplets in small systems

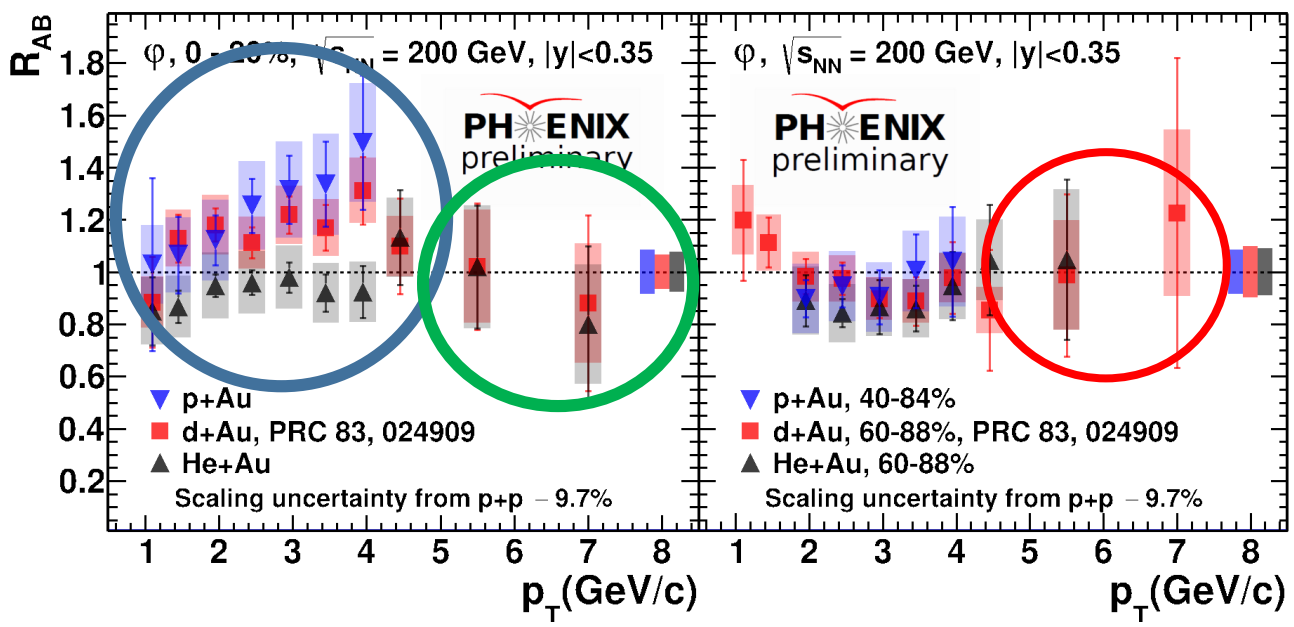
If partons lose energy in the plasma, it would present itself in the hadrons spectra

Cold nuclear matter effects may provide an explanation to the collectivity found in such systems

Interpreting large systems

π^0 and φ R_{AB} in p+Au, d+Au, ^{3}He+Au





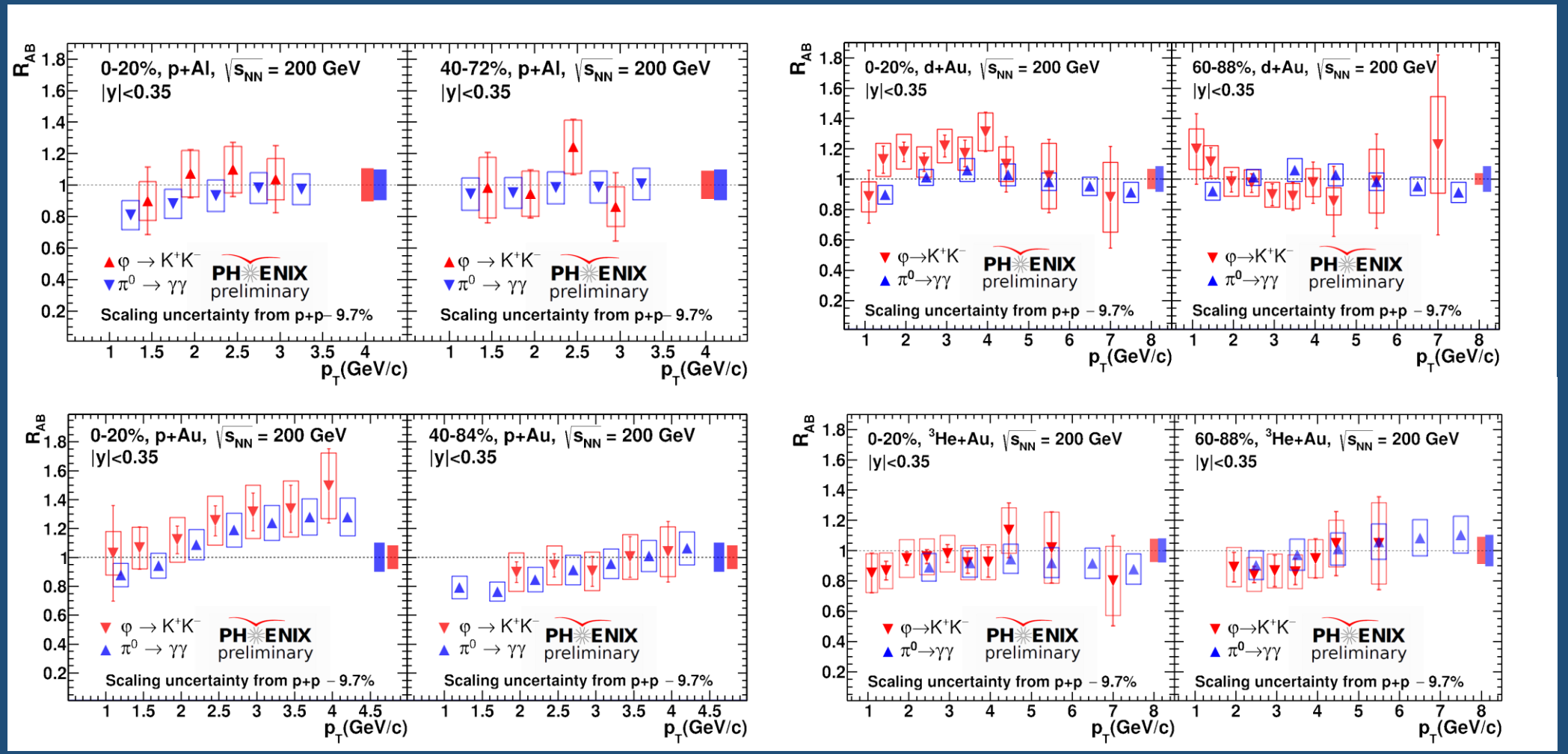
AT INTERMEDIATE p_T RANGE:

- Ordering $R_{pAu} > R_{dAu} > R_{HeAu}$ in 0-20%
- π^0 and φ $R_{pAu} \approx R_{dAu} \approx R_{HeAu}$ in peripheral collisions

AT HIGH-p_T RANGE:

- π^0 R_{AB}'s consistent with each other at high-p_T
- Hint of suppression in central collisions for π^0
- Hint of enhancement in peripheral collisions

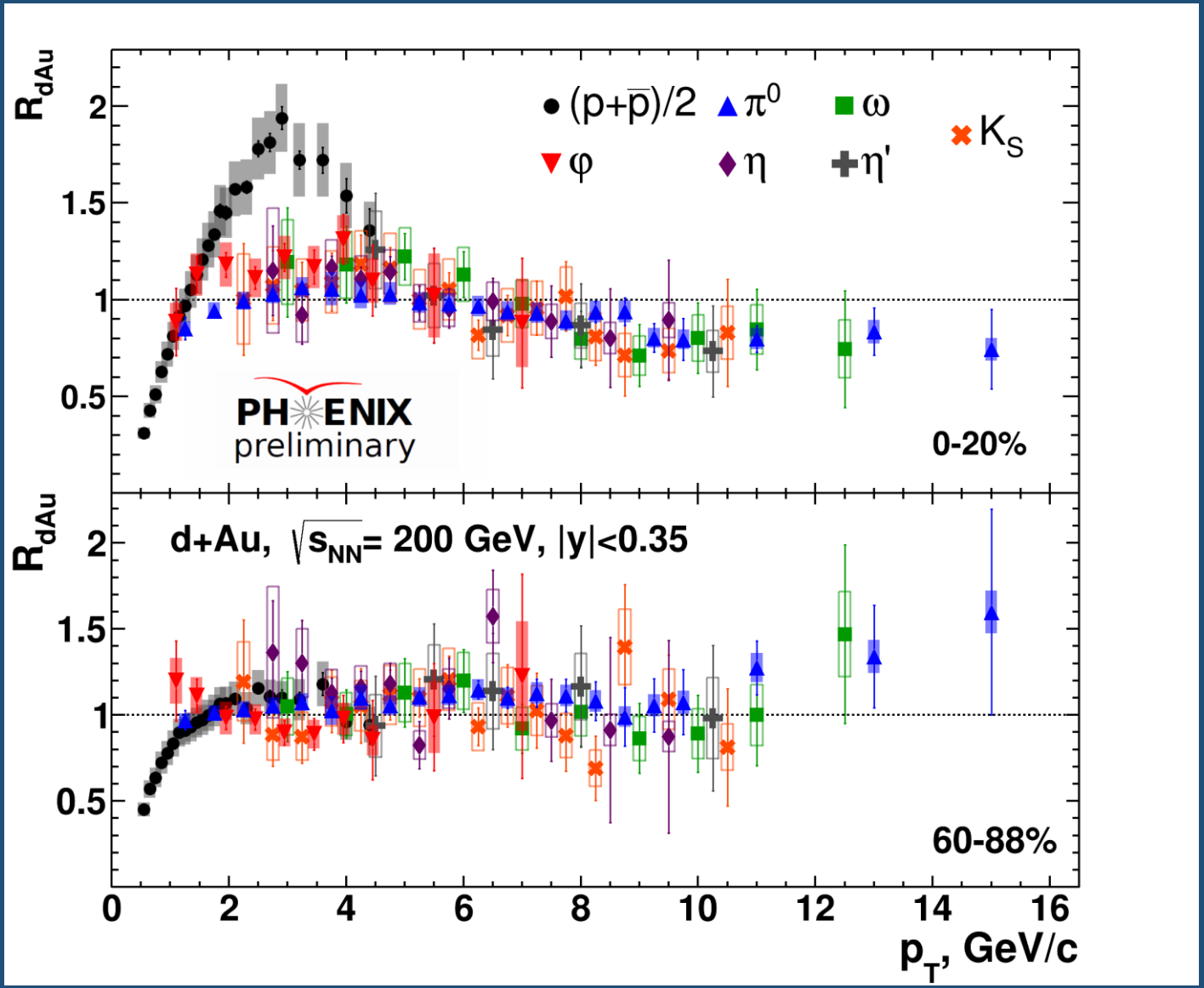
π^0 & φ R_{AB} in p+Al, p+Au, d+Au, ^{3}He+Au



In whole φ p_T range π^0 and φ mesons R_{AB}'s are similar in small systems

Might indicate that CNM effects are not responsible for the differences between φ and π^0 seen in A+A

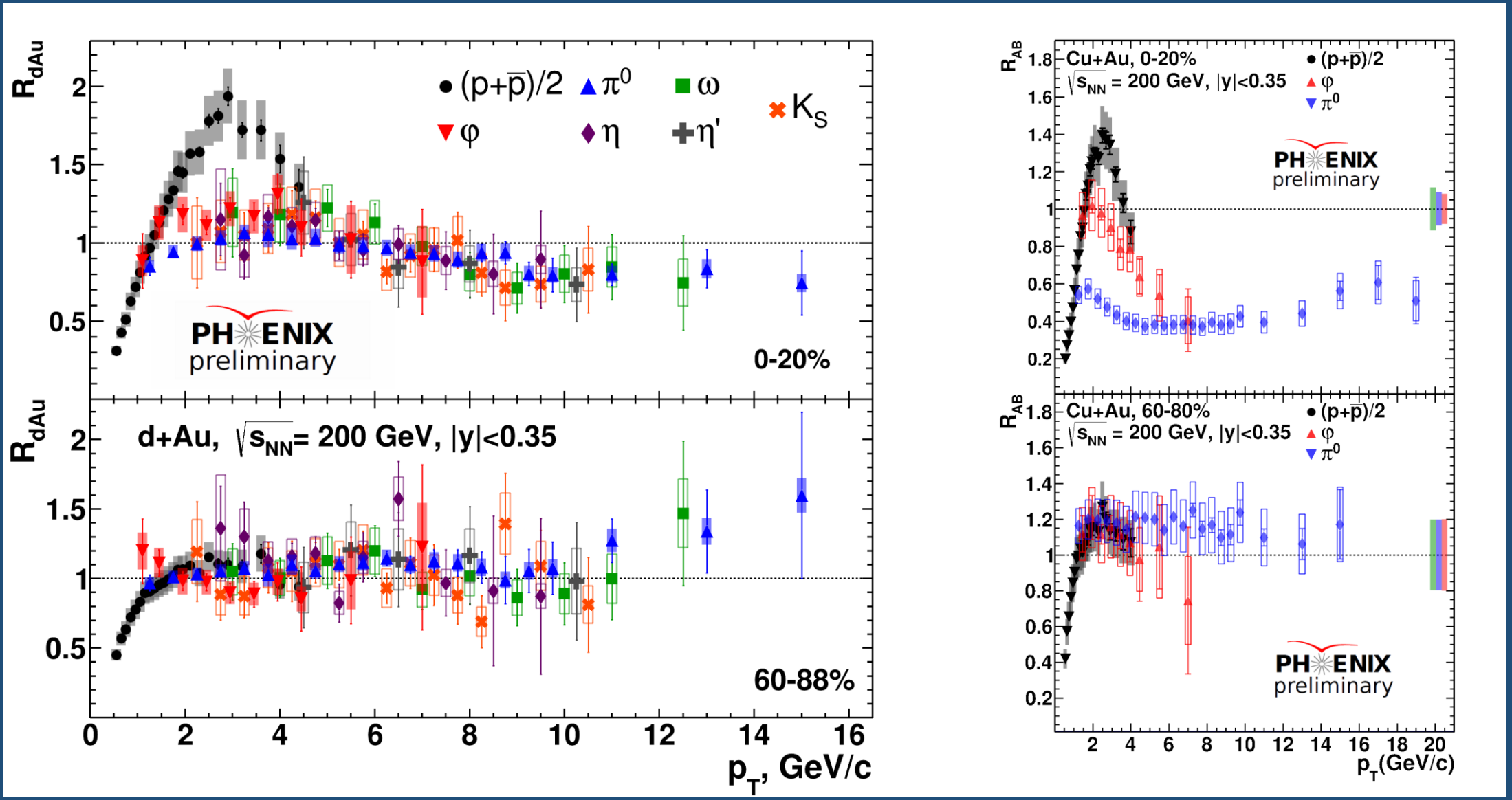
Comparisons to other light hadron's R_{AB} in d+Au collisions



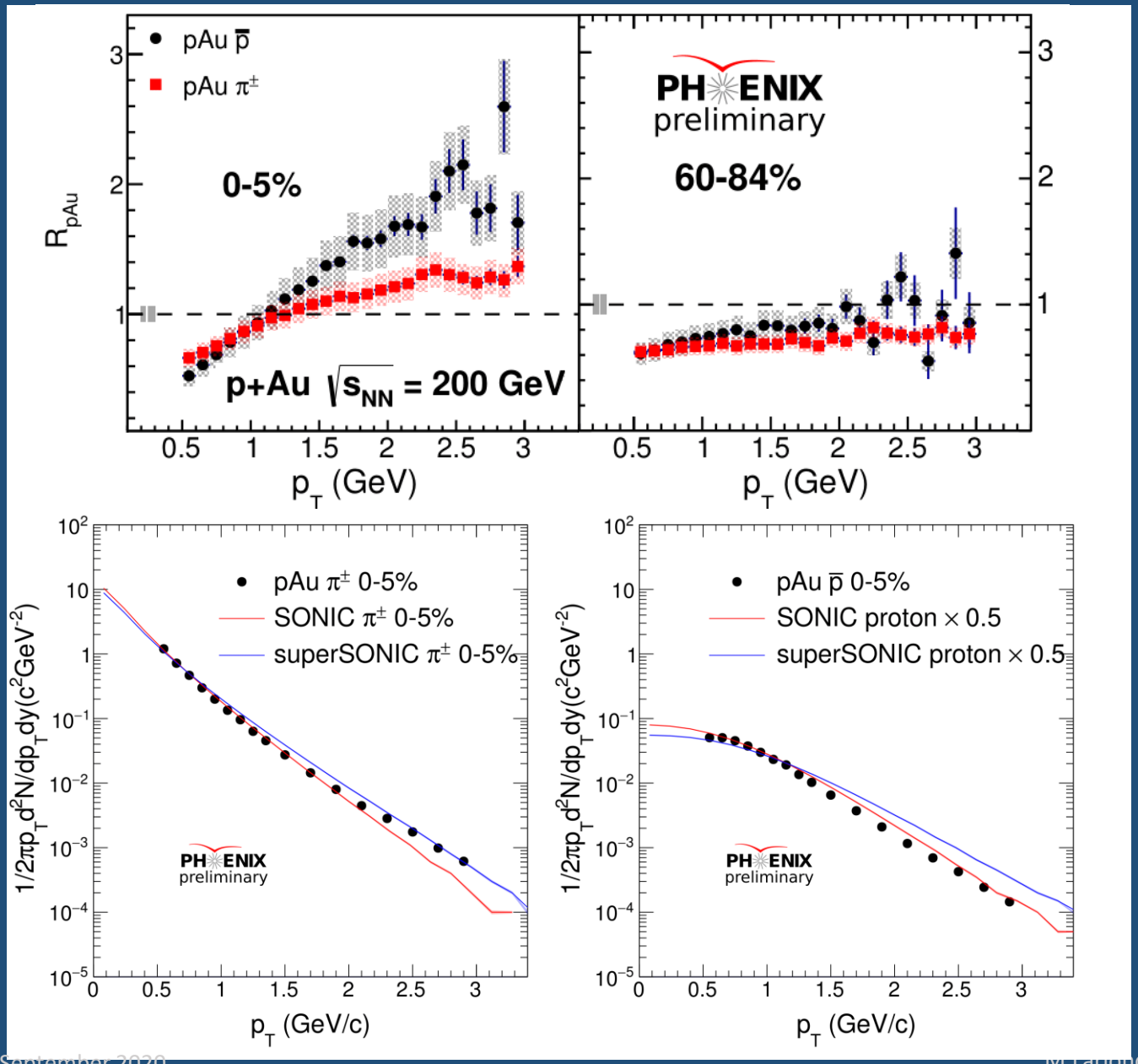
Light mesons R_{AB} exhibit similar shape in contrast to heavy-ion

Protons R_{AB} shows enhancement at moderate p_T as in heavy-ion in the most central collisions

Comparisons to other light hadron's R_{AB} in d+Au collisions



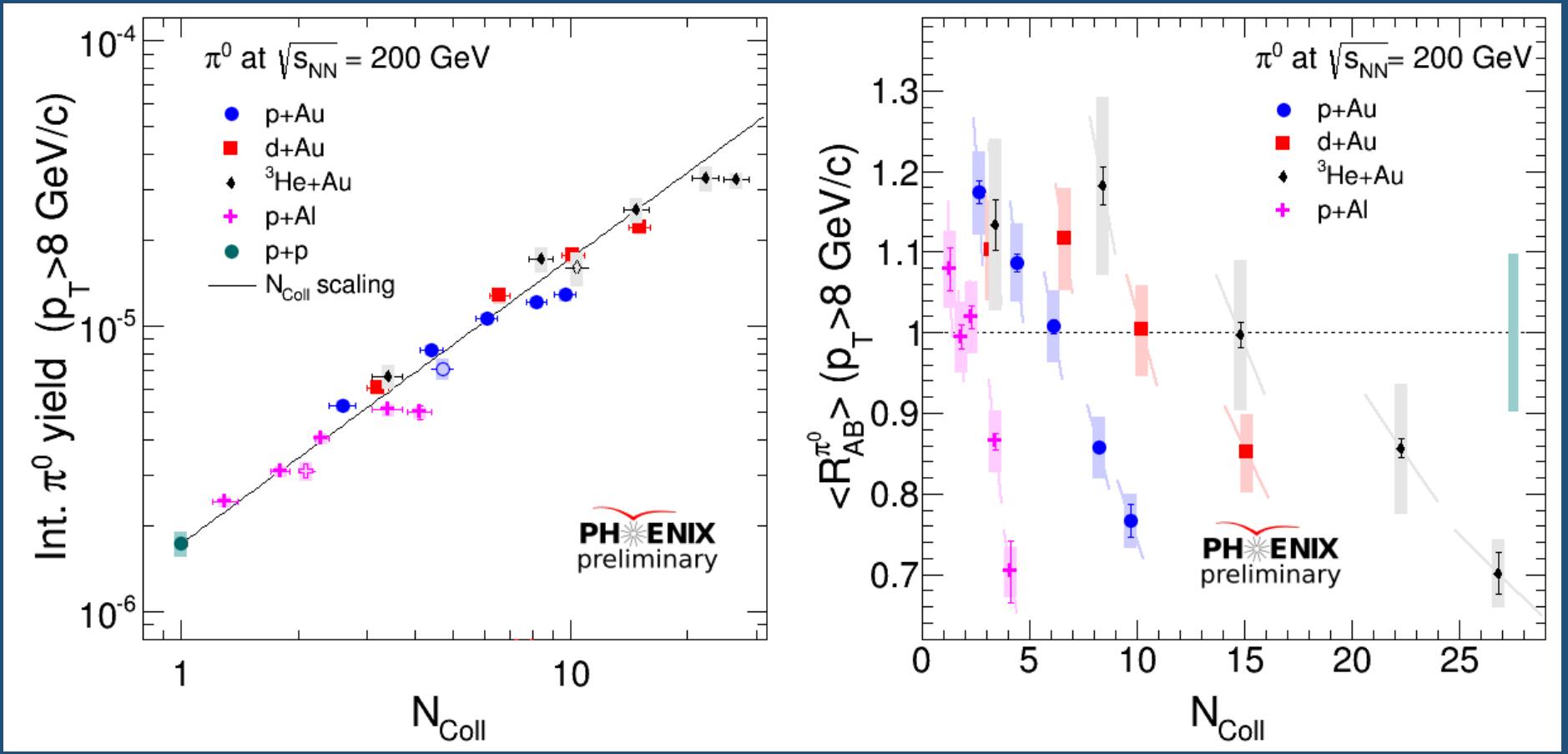
Comparisons to other light hadron's R_{AB} in p+Au collisions

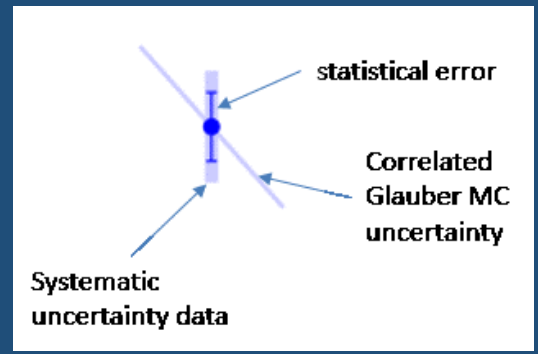


$\pi^{\pm}$ & $\bar{p}$ invariant yield in 0-5% described by SONIC and supersonic

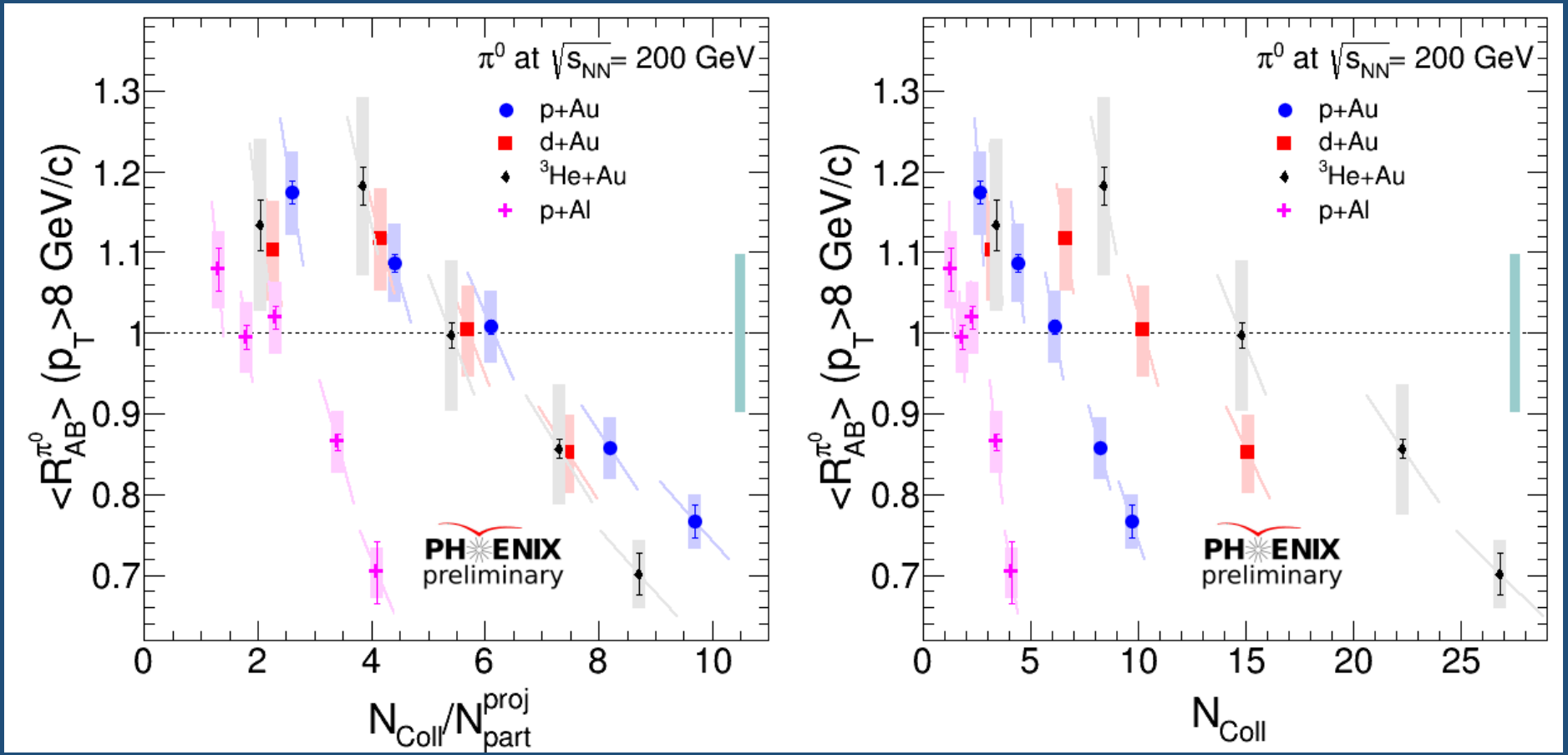
FLOW might be responsible for protons enhancement

π^0 integrated yields & R_{AB} in p+Al, p+Au, d+Au, ^{3}He+Au



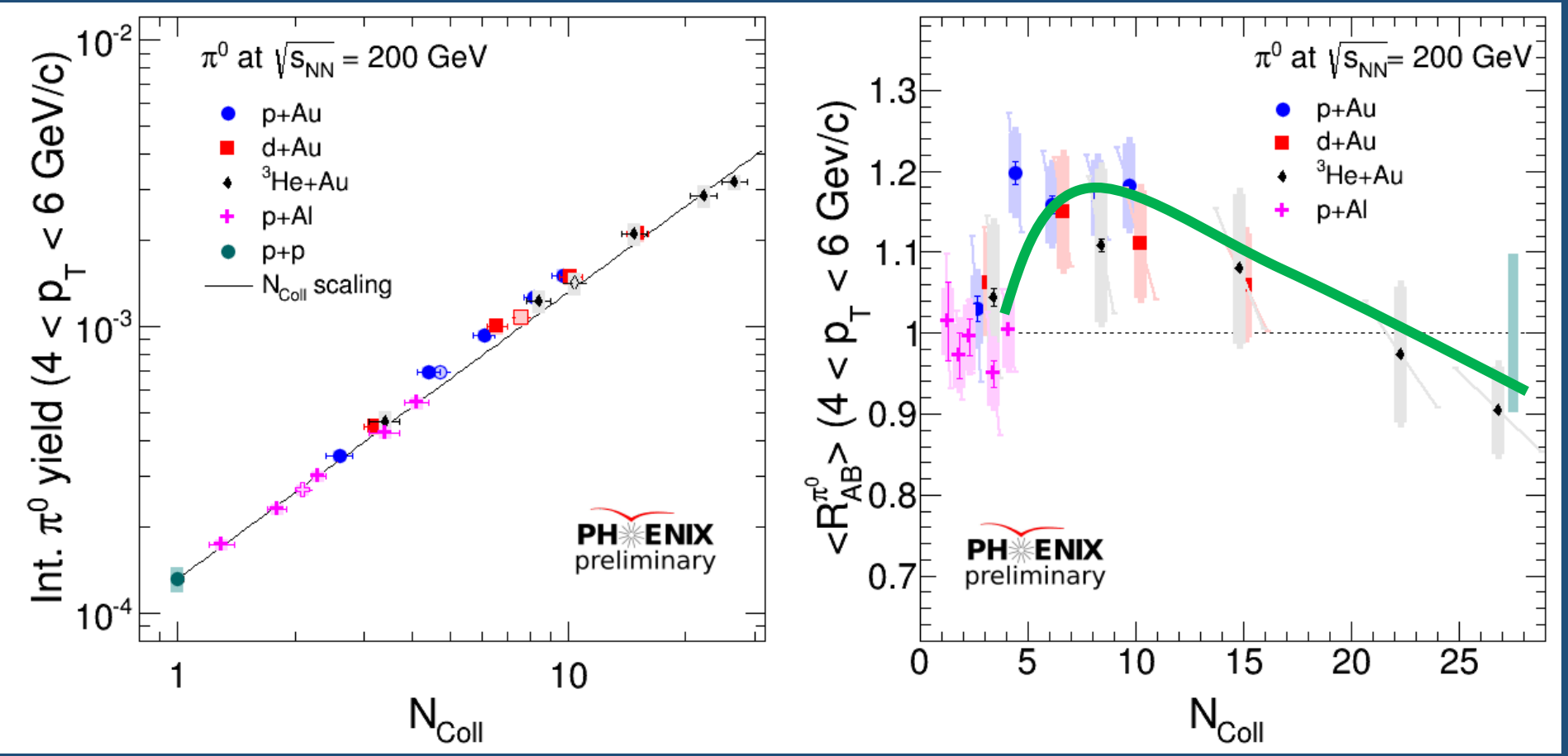


π^0 integrated yields & R_{AB} in p+Al, p+Au, d+Au, ^{3}He+Au



π^0 R_{AB}'s seem to scale with N_{coll}/N_{part}^{proj} for systems with same target at high-p_T

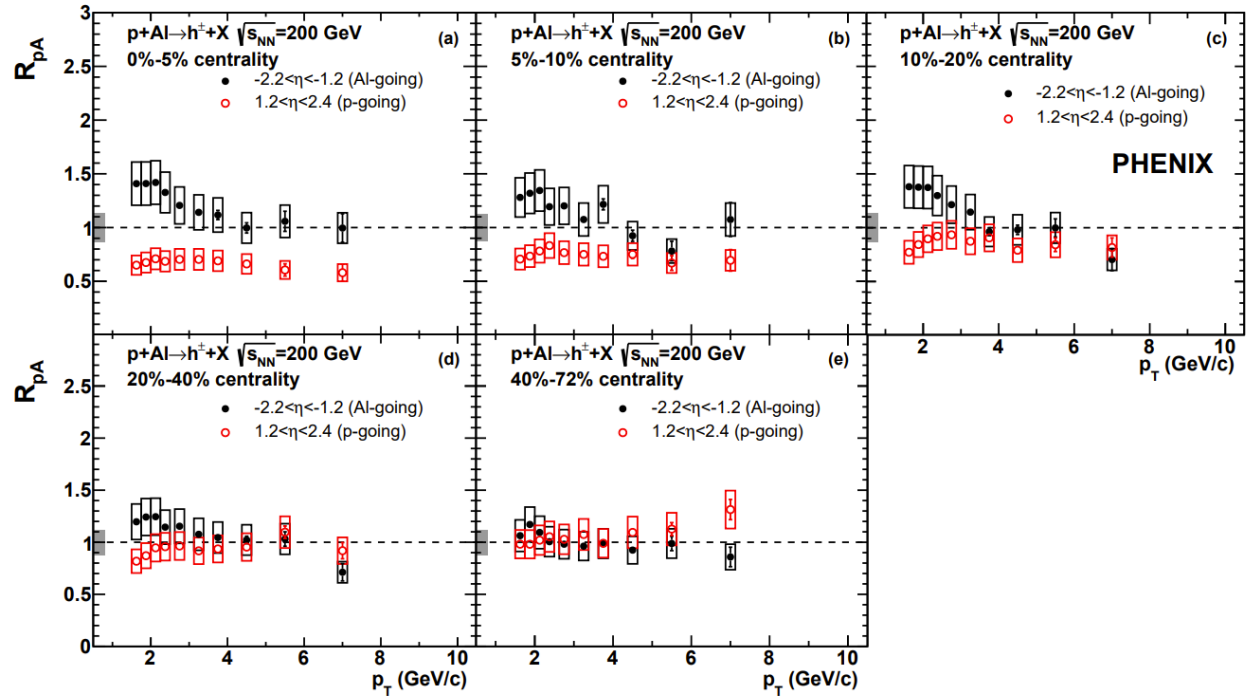
π^0 integrated yields & R_{AB} in p+Al, p+Au, d+Au, ^{3}He+Au

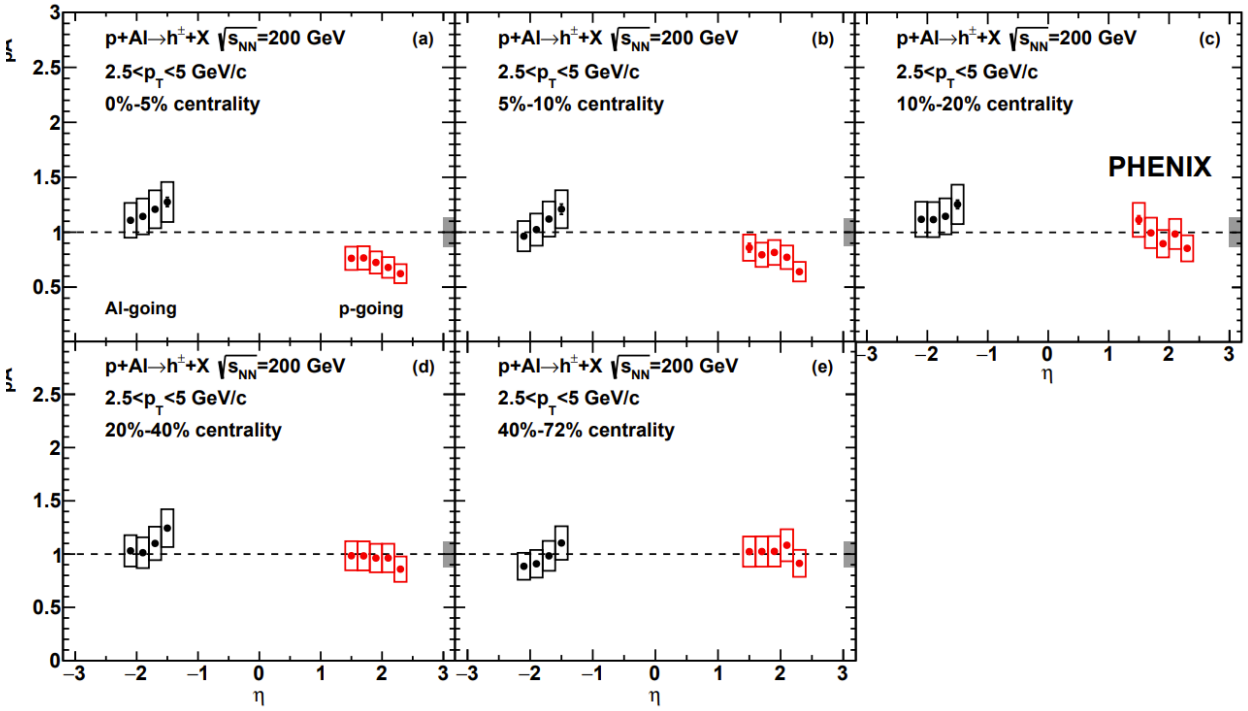


π^0 R_{AB} scales with N_{coll}

$h^{\pm}$ $\langle R_{AB} \rangle$ in p+Al

arXiv:1906.09928v1





In central collisions

- Backward rapidity shows enhancement
- Forward rapidity shows suppression

Centrality dependence

$h^{\pm}$ $\langle R_{AB} \rangle$ in p+Au

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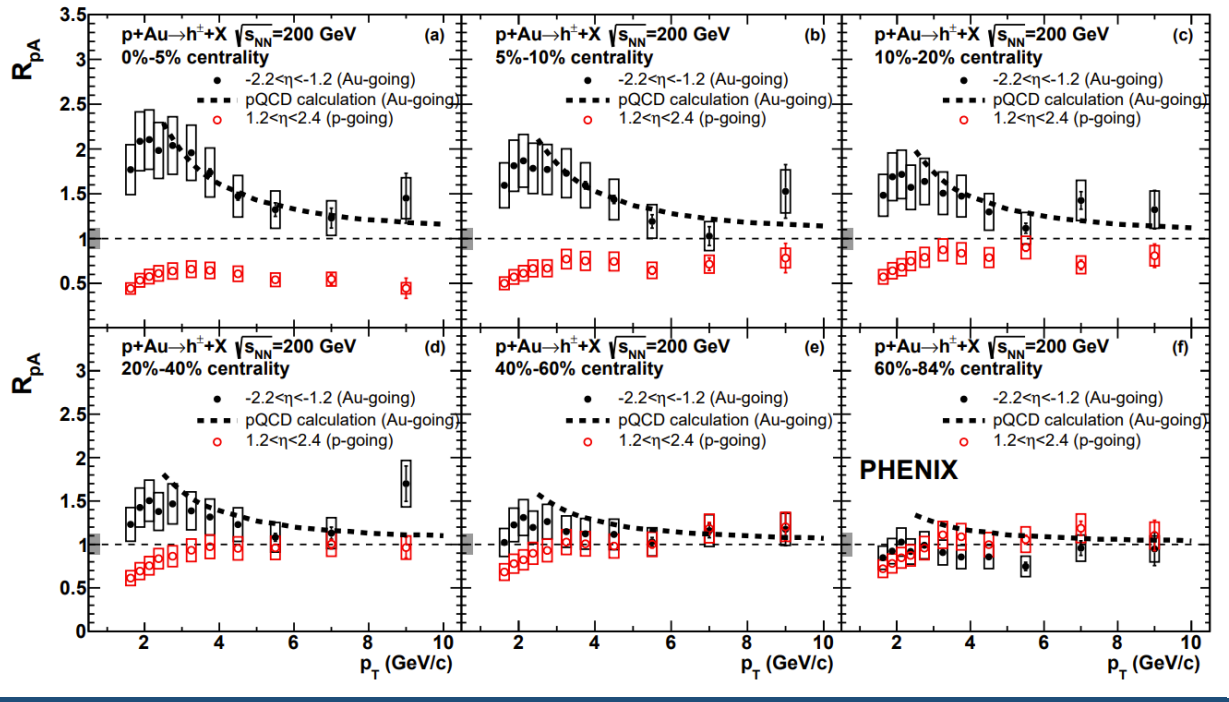
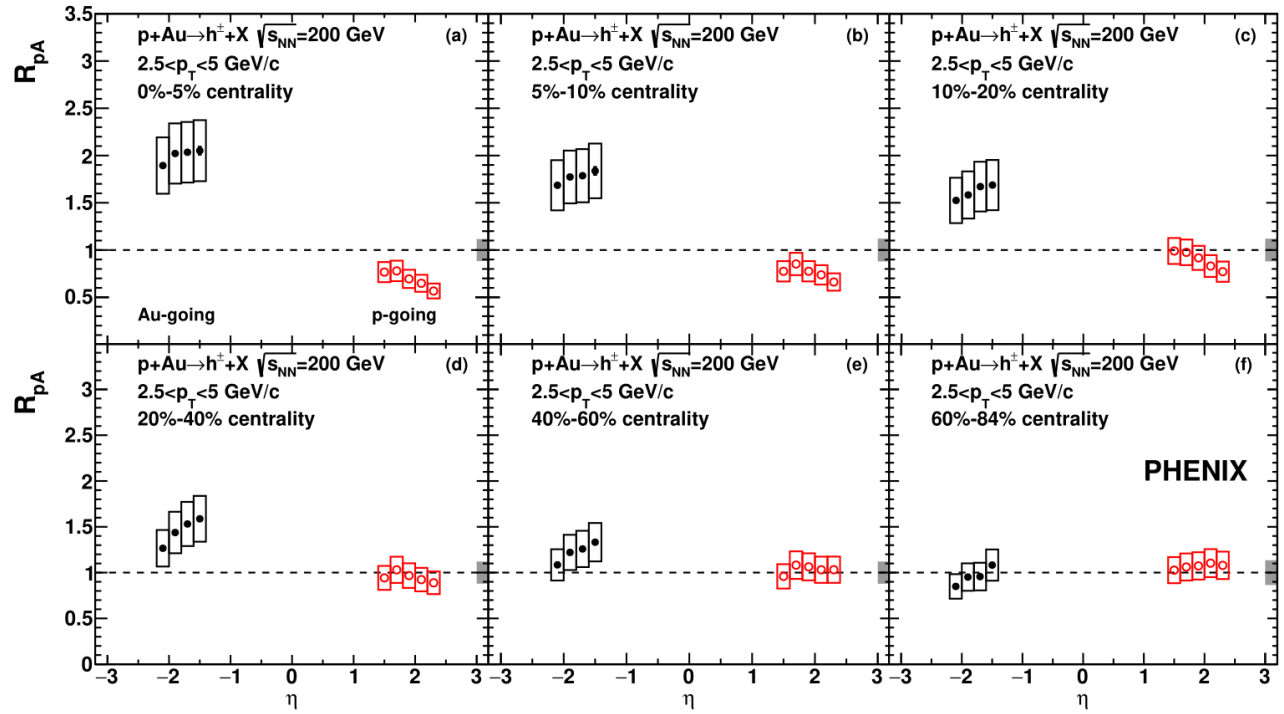




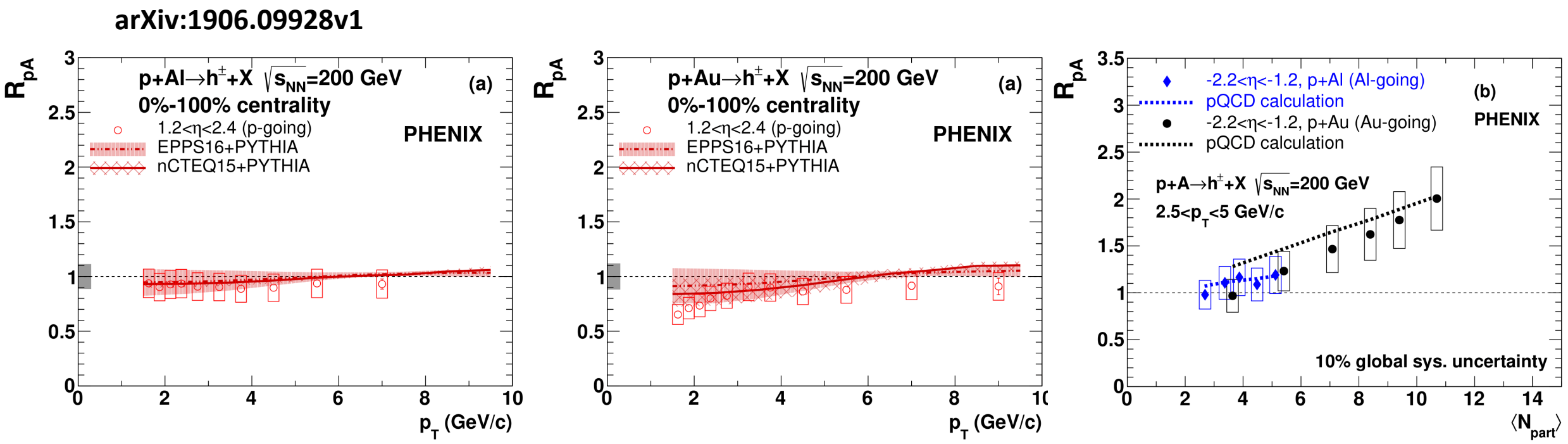
In central collisions

- Backward rapidity shows large enhancement
- Forward rapidity shows suppression
- Consistent with pQCD calculation

Strong centrality dependence

$h^{\pm}$ in p+Al and p+Au

arXiv:1906.09928v1



$h^{\pm}$ R_{AB} in p-going direction is described by EPPS16+PYTHIA and nCTEQ15+PYTHIA

$\langle R_{AB} \rangle$ vs. N_{part} in A-going direction is described by pQCD multiscattering calculations

Summary

Integrated π^0 R_{AB} seem to:

- ✓ scale with N_{coll} at moderate p_T
- ✓ scale with N_{coll}/N_{part}^{proj} for same target at high-p_T

φ & π^0 mesons R_{AB}'s are consistent in all centralities, while protons R_{AB}'s show enhancement in central collisions, $\pi^{\pm}$ and $\bar{p}$ are described by SONIC

Hint of suppression for π^0 at high-p_T in central collisions

Strong rapidity and centrality dependence of charged hadrons production in small systems, which is well described by CNM effects

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THANK YOU FOR YOUR ATTENTION!