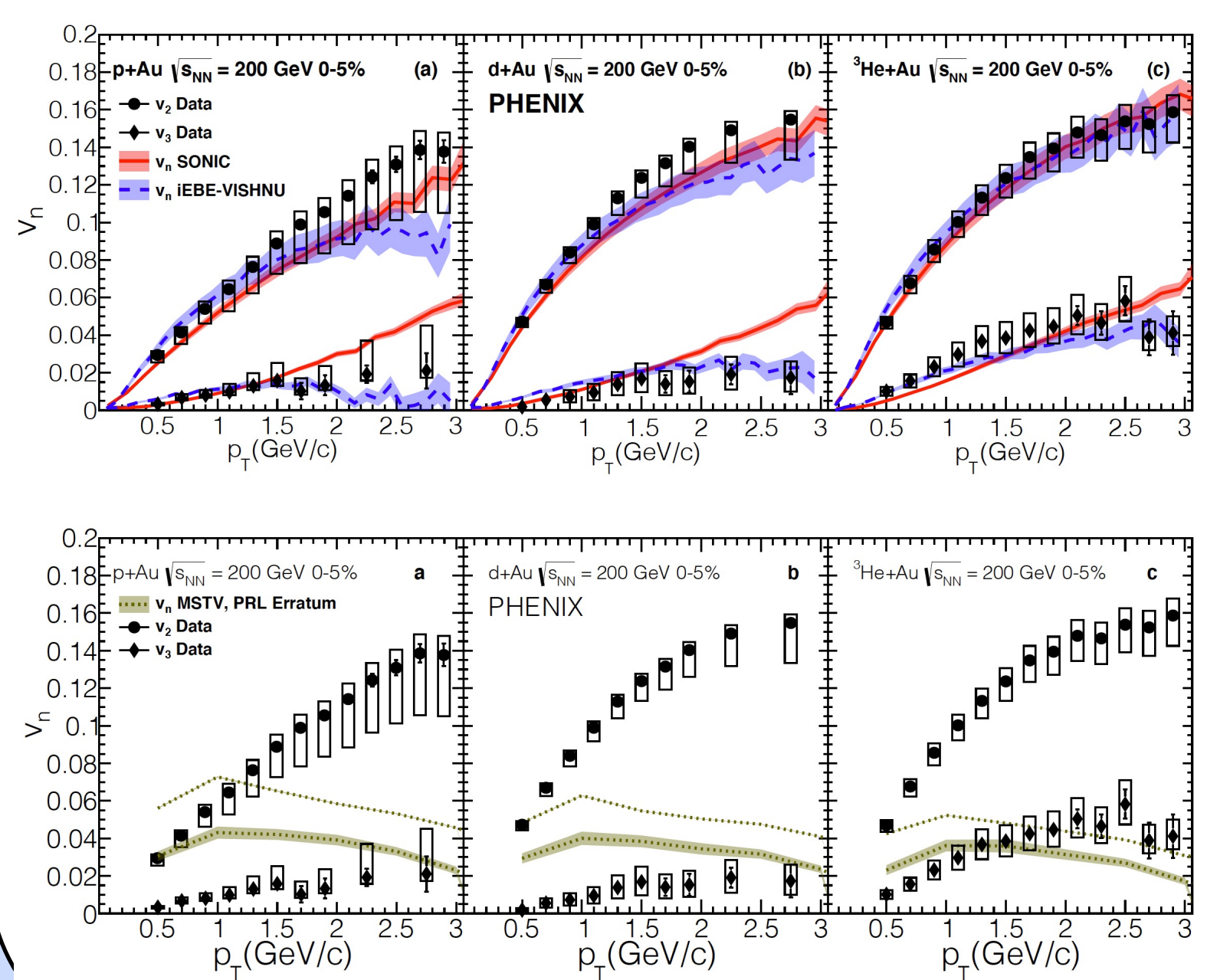
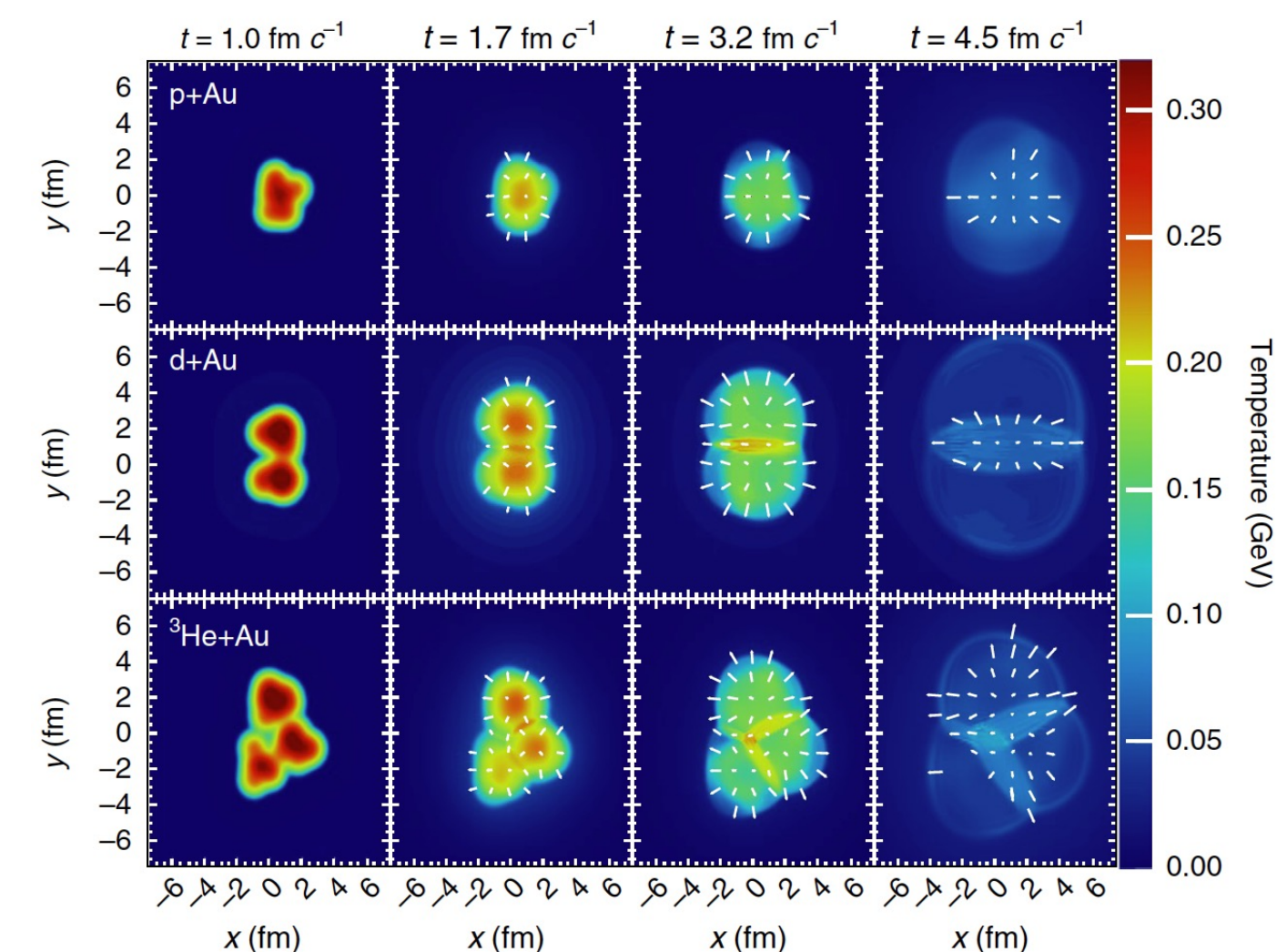
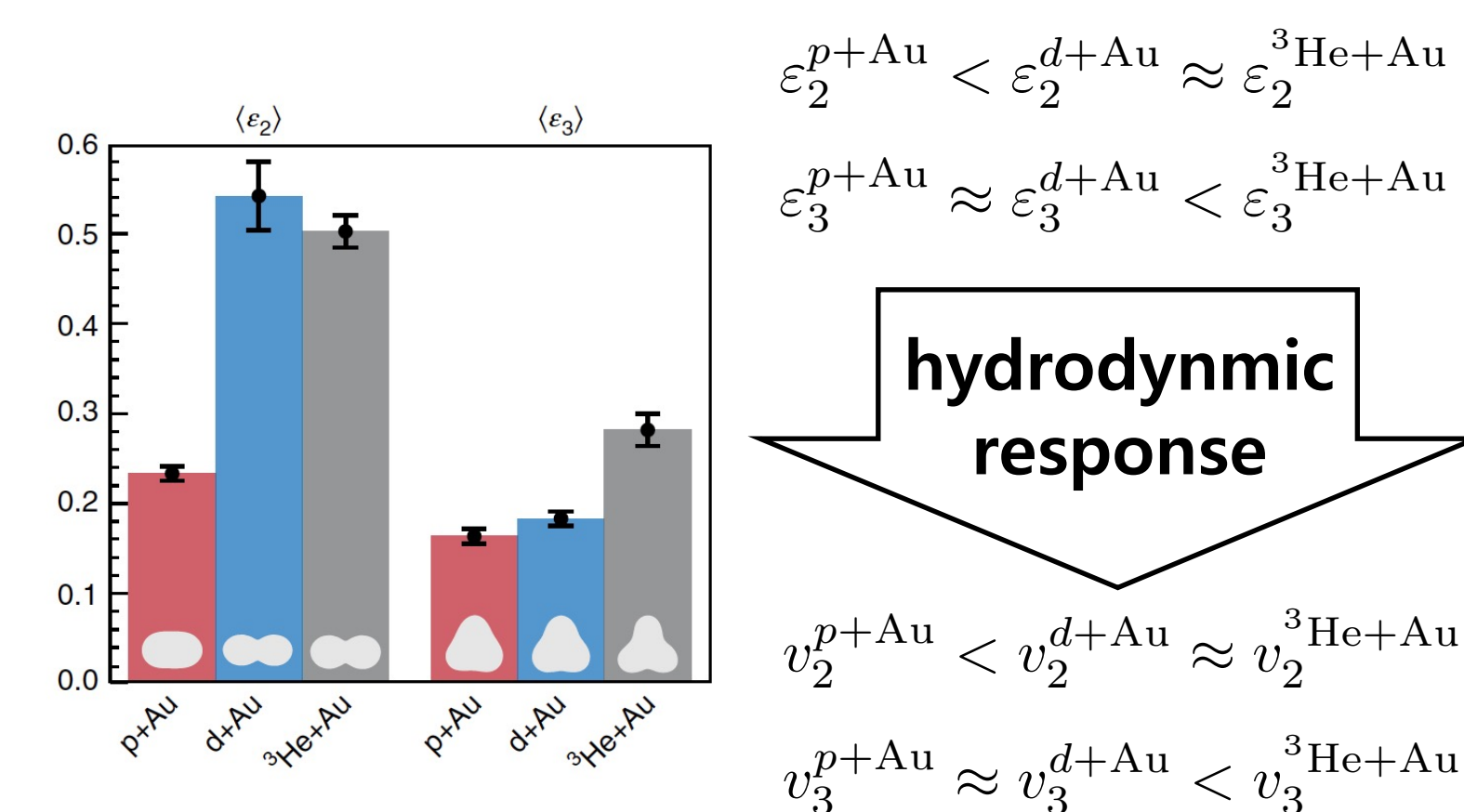


Collectivity in small collision systems at RHIC

- PHENIX published elliptic and triangular flow of charged particles in asymmetric collisions of different projectiles (p , d , ${}^3\text{He}$) at 200 GeV

Nature Phys. 15 (2019) 3, 214



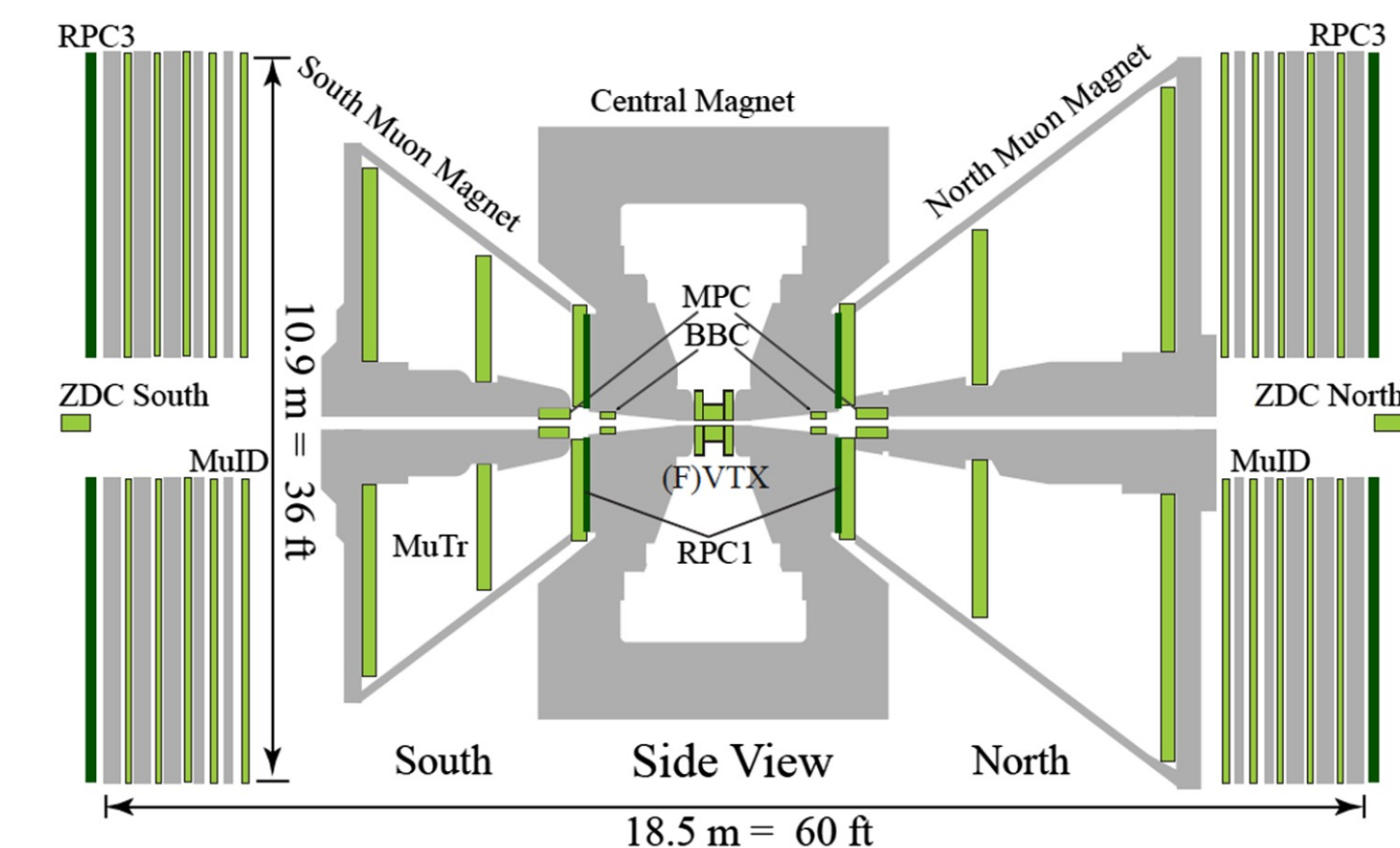
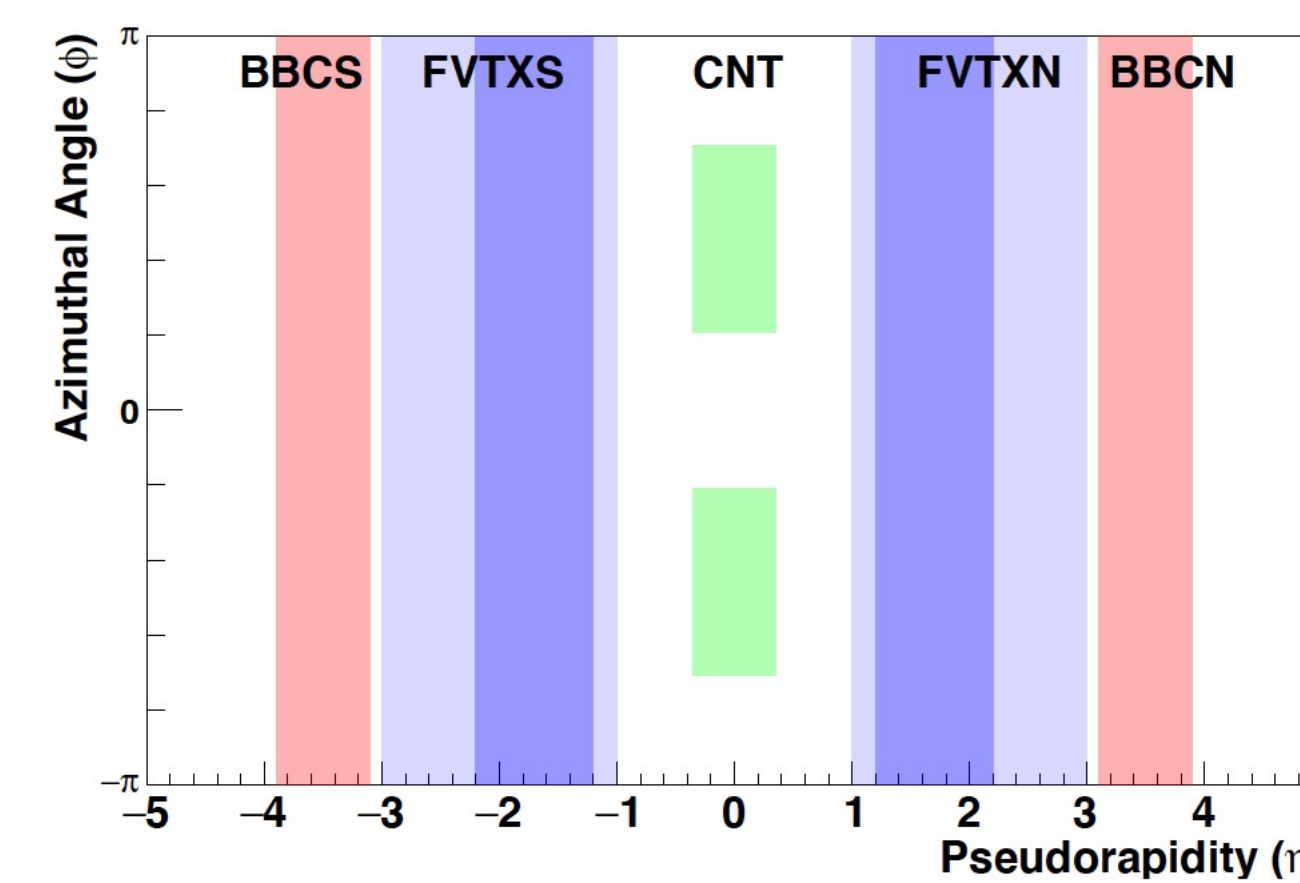
- $v_2(p_T)$ and $v_3(p_T)$ in three systems are well described by hydrodynamics

Phys. Rev. Lett. 113, 112301 (2014)
Phys. Rev. C 95, 014906 (2017)

- Model of initial-state correlation does not describe the data: flow magnitude/system dependence

Phys. Rev. Lett. 113, 112301 (2014)

Flow measurement at PHENIX



- Flow of charged particles at mid-rapidity (CNT, $|\eta| < 0.35$)
- Event plane (EP) method (published in Nature Physics)**
 - EP is measured with BBCS or FVTXS (Au-going direction)
 - EP resolution is determined with the three-subevent method (CNT-FVTXS-BBCS)
 - Non-flow contribution is estimated with CNT-BBCS correlation in p+p collisions scaled with the ratio of multiplicity at BBCS

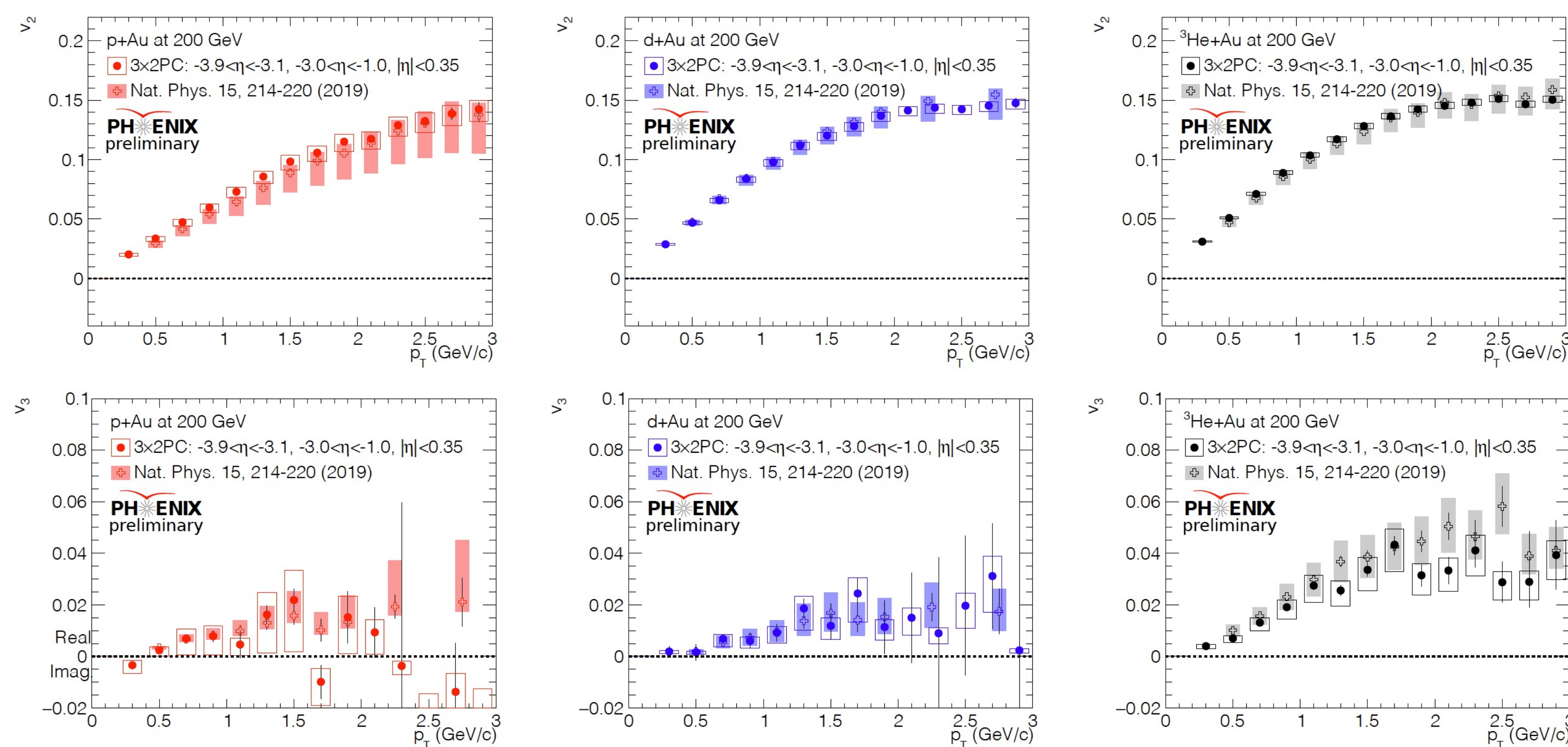
- Two-particle correlation (2PC) method (new results)**
 - Three sets of 2PC are used

$$v_n^{\text{CNT}}(p_T) = \sqrt{\frac{c_n^{\text{CNT-A}}(p_T) c_n^{\text{CNT-B}}(p_T)}{c_n^{\text{AB}}}}$$

- FVTXS/BBCS and FVTXS/FVTXN combinations are used for A/B
- Non-flow subtraction is not applied
- Possibility of non-closure of non-flow subtraction methods at RHIC energy
Phys. Rev. C 100, 024908 (2019)

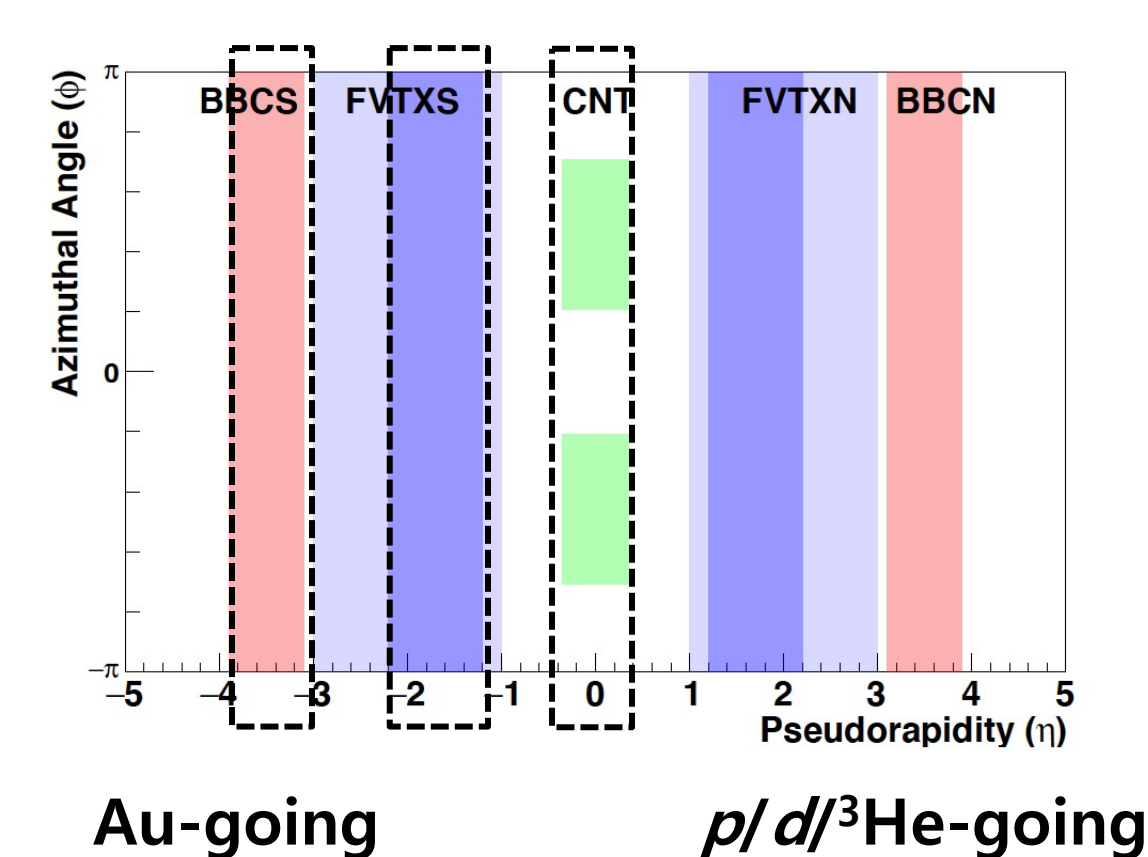
Results with the two-particle correlation method

CNT-FVTXS-BBCS combination

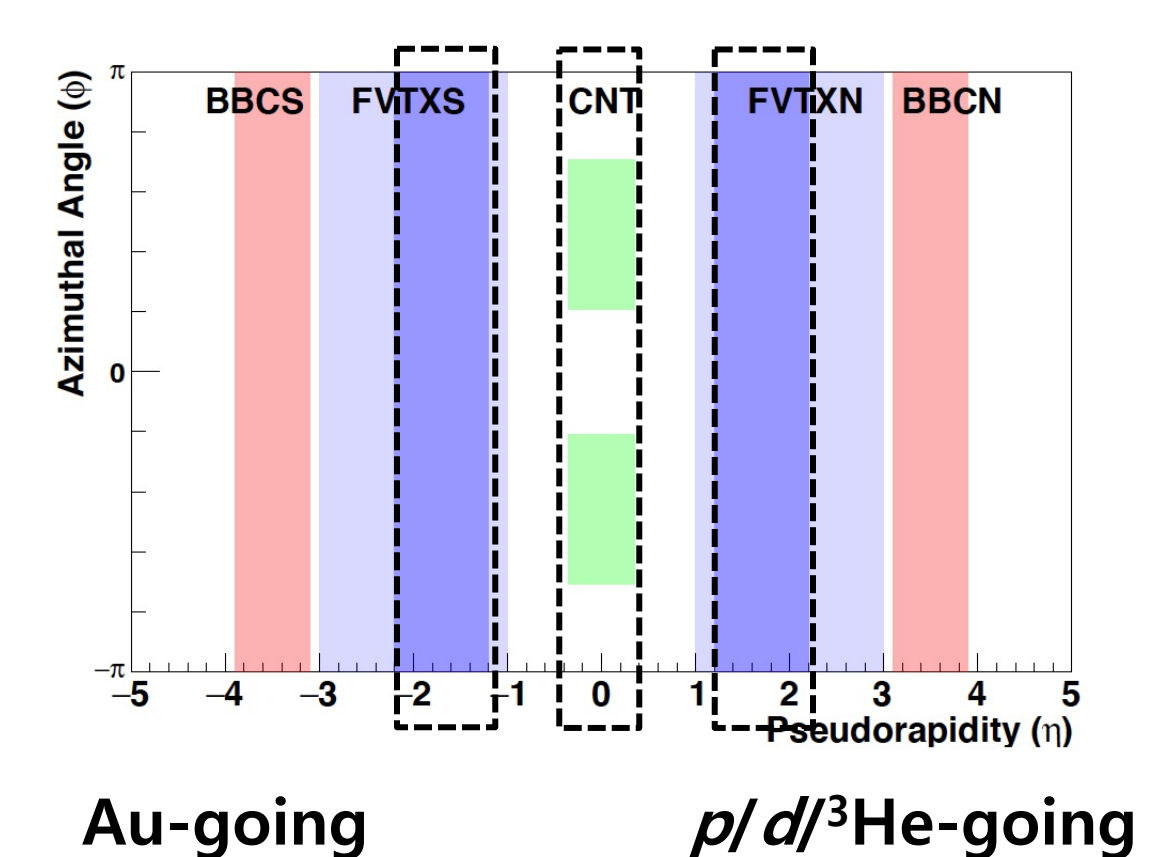


- Independent analysis with 3x2PC method
- Different sensitivity to beam conditions (angle and offset) and detector alignment
- Consistent v_2 and v_3 results in all three collision systems between two different methods (EP and 3X2PC)
- Verify the published results!

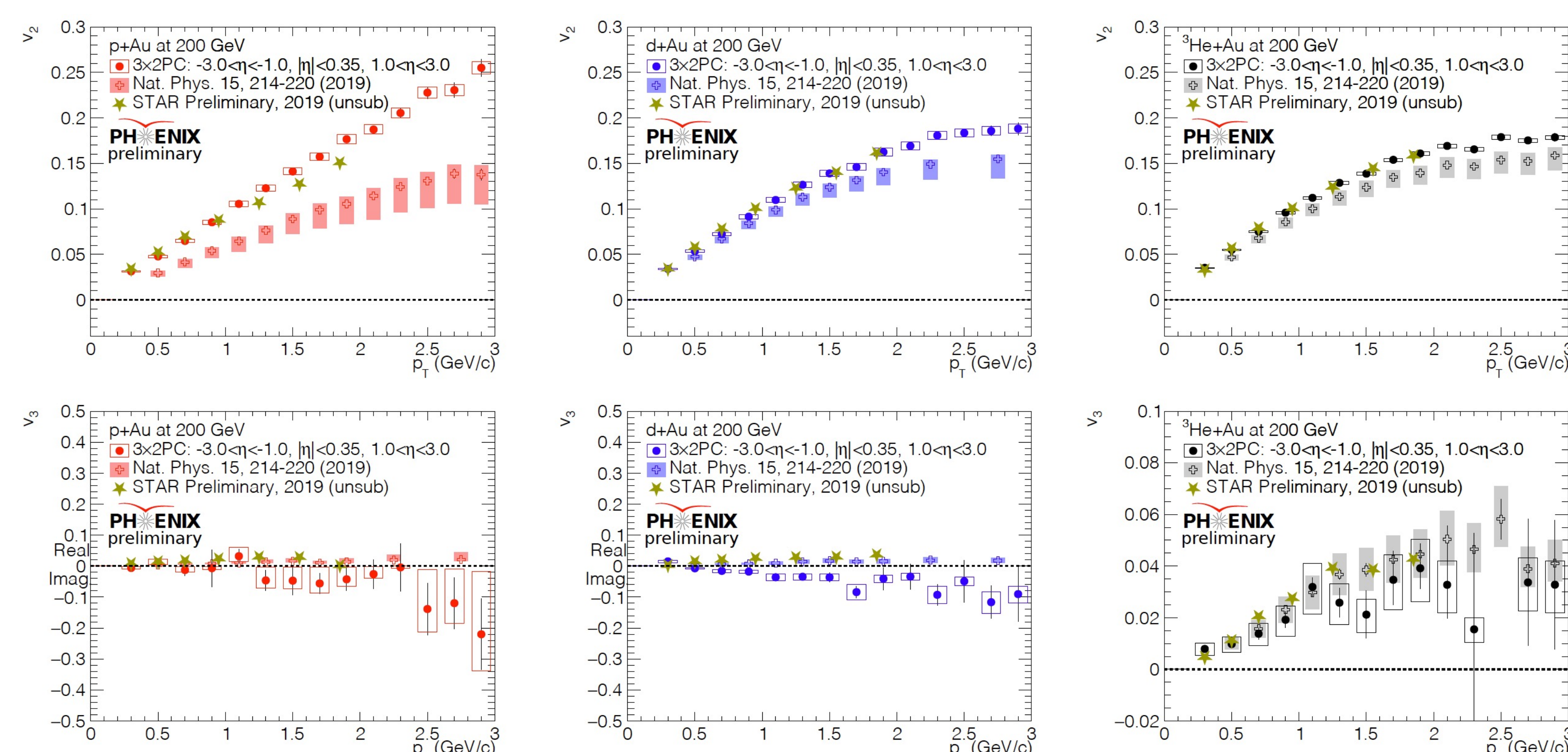
3X2PC combination 1



3X2PC combination 2



Comparison with different kinematic ranges



- CNT-FVTXS-FVTXN combination
- Expect stronger non-flow effects due to smaller flow in p/d/3He-going direction
- Higher v_2 than results with the CNT-FVTXS-BBCS combination
- Larger difference in higher p_T and smaller collision system
- Stronger non-flow effects
- Similar v_2 with the STAR preliminary results (no non-flow subtraction)
- Imaginary v_3 values in p/d+Au from negative c_3 coefficient where real v_3 is small
- Consistent v_3 in ${}^3\text{He}+\text{Au}$ between two combinations
- PHENIX paper with these new results will be submitted in this week!