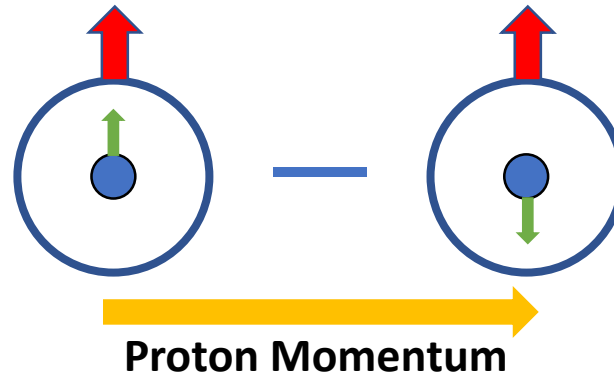


Azimuthal Transverse Single-Spin
Asymmetries of Charged Pions
Within Jets from Polarized pp
Collisions at $\sqrt{s} = 200$ GeV

Ting Lin, for STAR
Collaboration

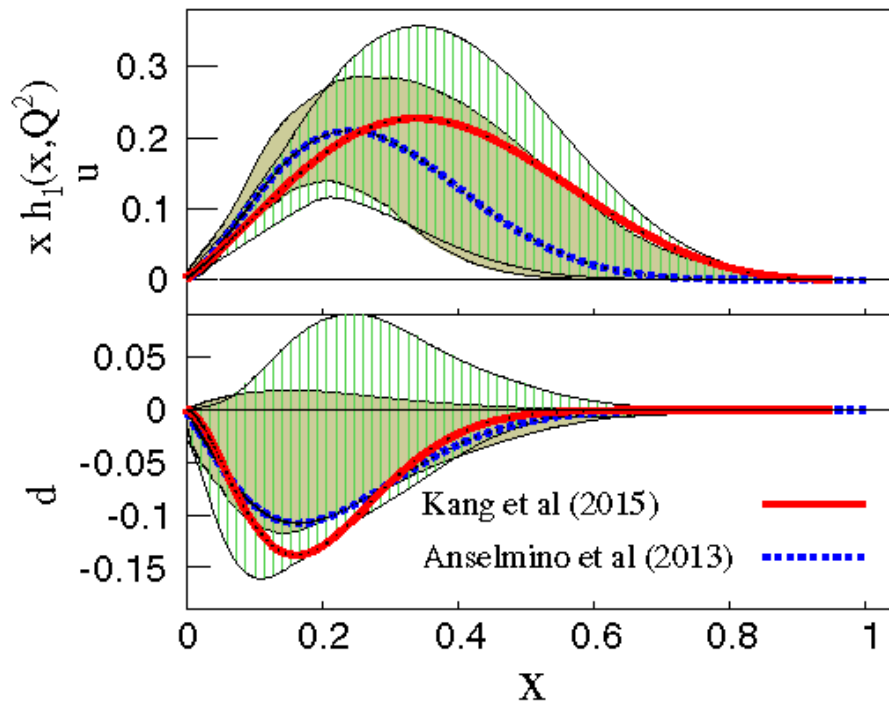
Texas A&M University

Transversity

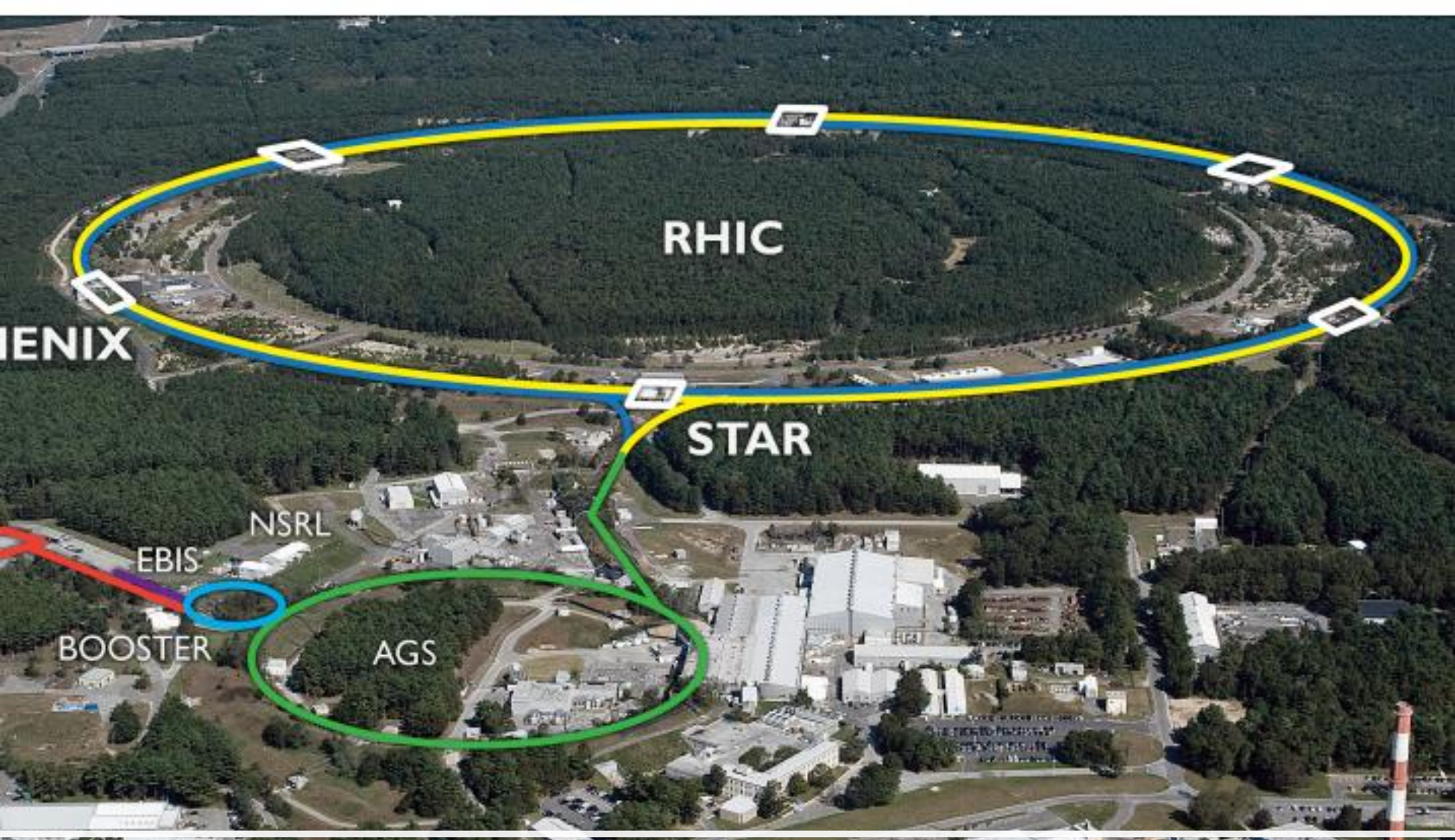


- Transversity is very important for complete understanding of the nucleon spin structure
- Quark polarization along spin of a transversely polarized proton
 - Chiral odd
- Requires another chiral odd distribution
 - Collins FF: correlates initial state quark spin to final state hadron within the jets;
 - Interference fragmentation function (IFF): correlates quark polarization to azimuthal distribution of final state hadron pairs.

Transversity



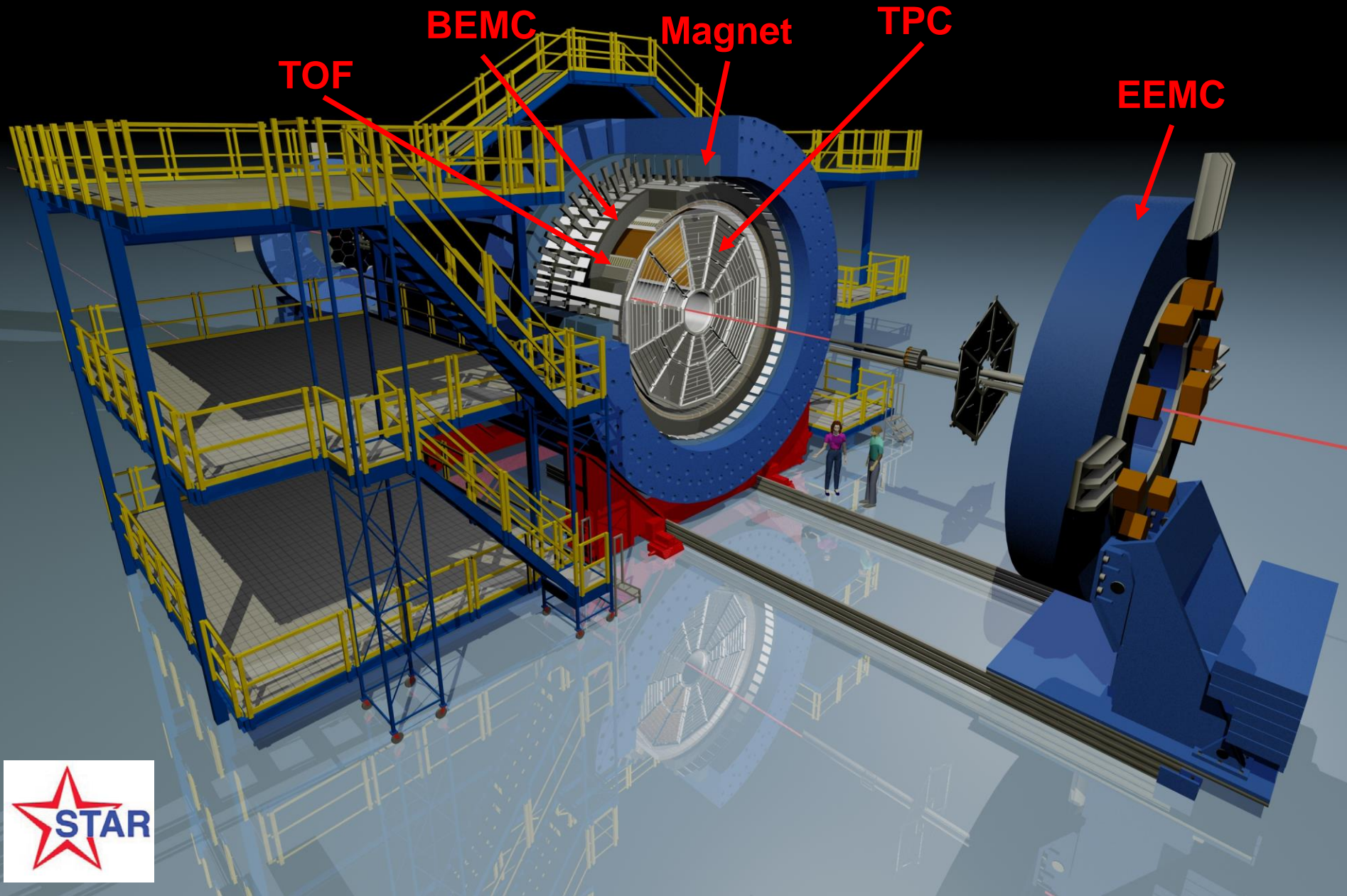
- Before **STAR**, only observed in SIDIS combined with e^+e^-
- Several recent global analyses including:
 - Collins effect input:
 - PRD 93, 014009
 - PRD 92, 114023
 - IFF input:
 - PRD 94, 034012
 - All show large uncertainties



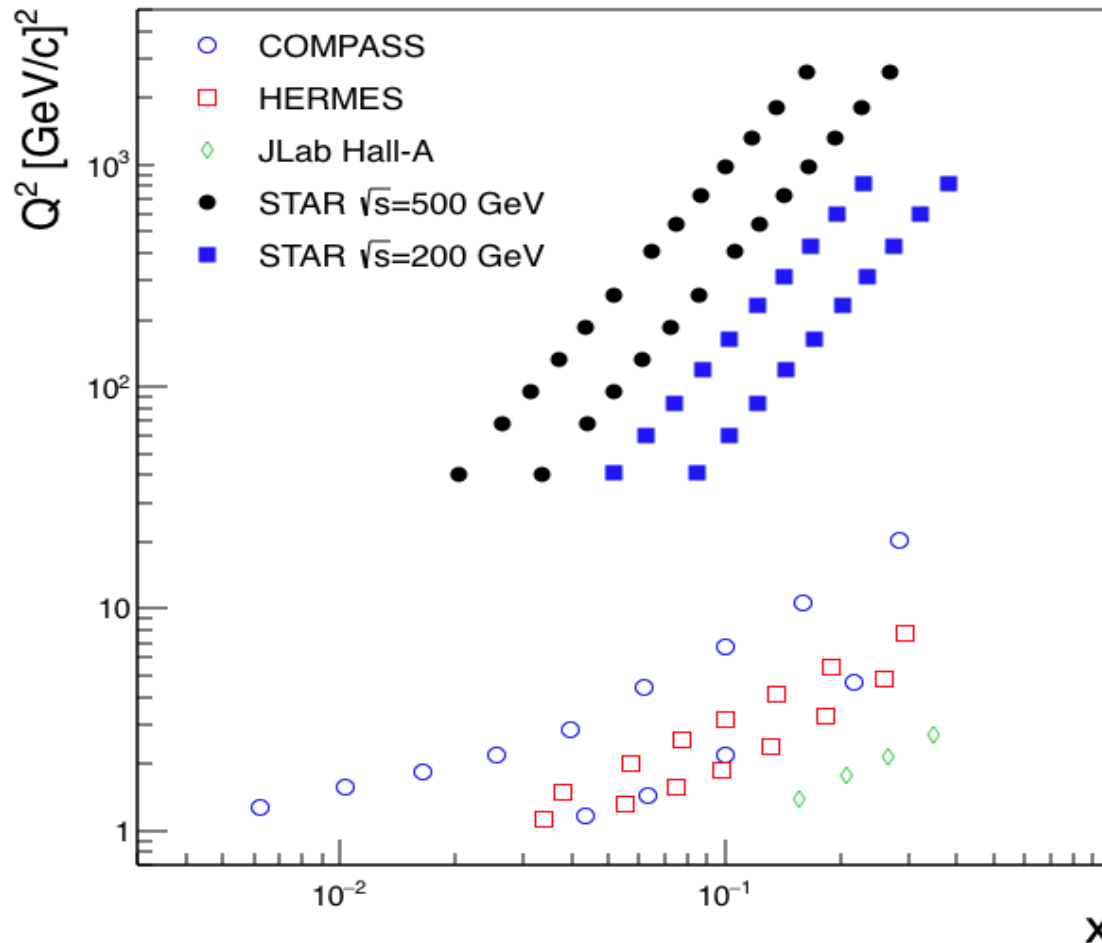
Relativistic Heavy Ion Collider



The Solenoidal Tracker At RHIC (STAR)



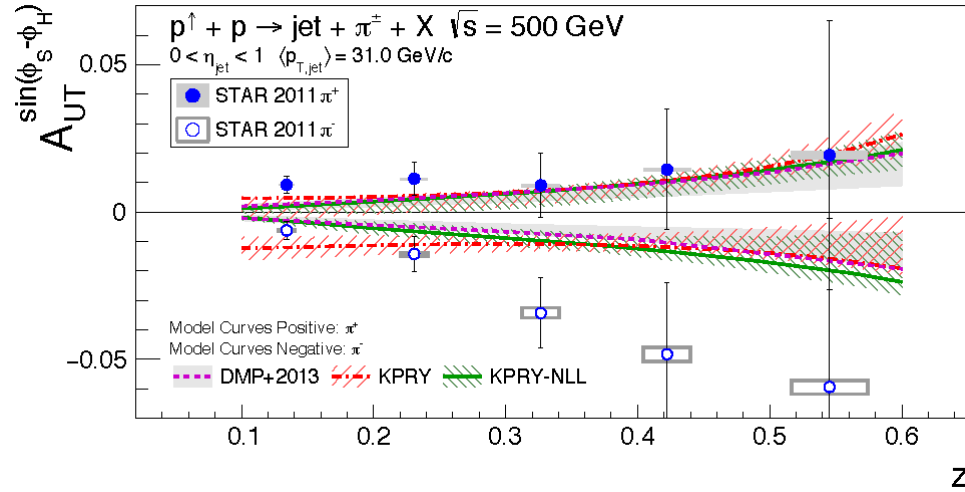
Kinematic Coverage



- STAR covers a similar range in x to that of SIDIS results
- Much higher in Q^2

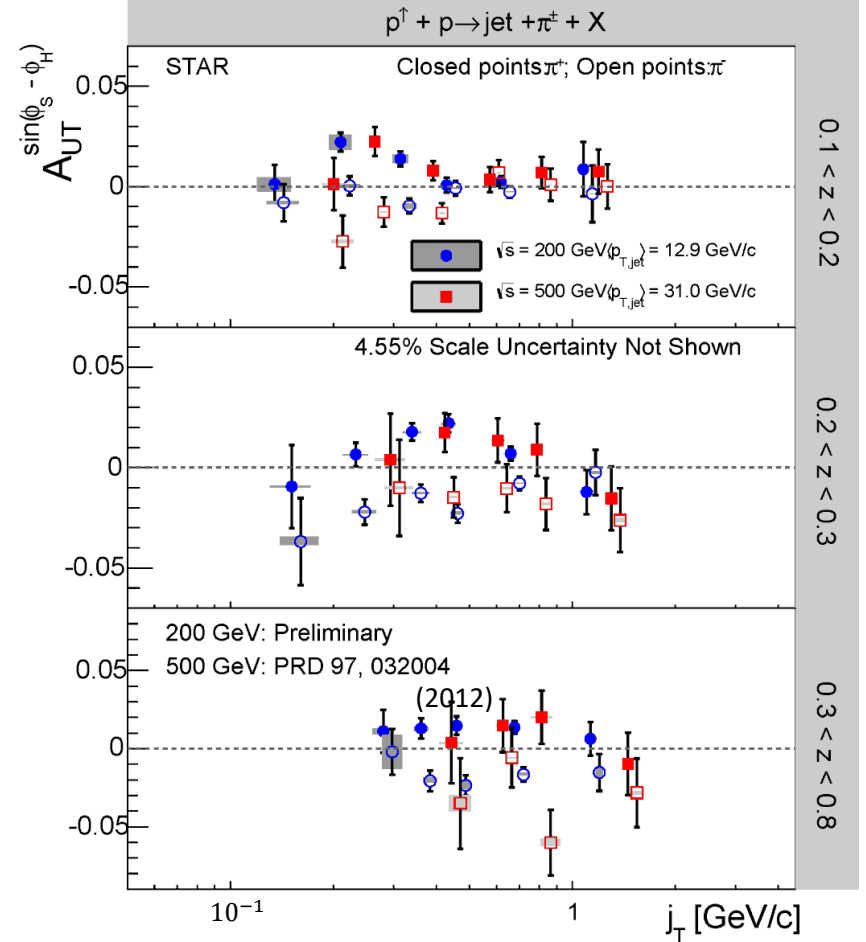
Collins Asymmetry from STAR

500 GeV: PRD 97, 032004 (2018)



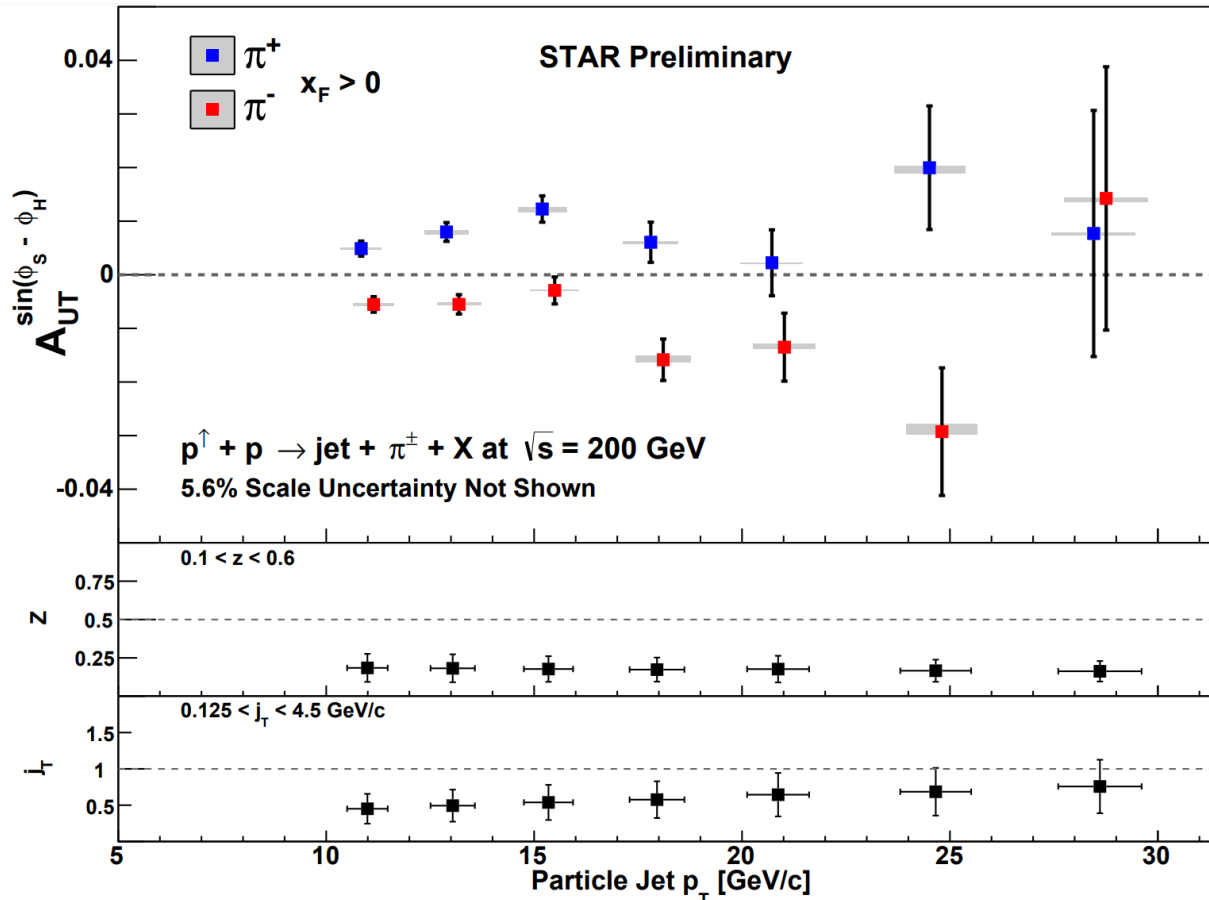
- First Collins effect measurements in pp collisions are reasonably described by two recent calculations that convolute the transversity distribution from SIDIS with the Collins FF from e^+e^- collisions
- Both 200 and 500 GeV pp results hint that the asymmetry peak shifts to higher j_T as z increases

Spin2018: 2012 pp200GeV
2011 pp500GeV



Collins Asymmetry from STAR

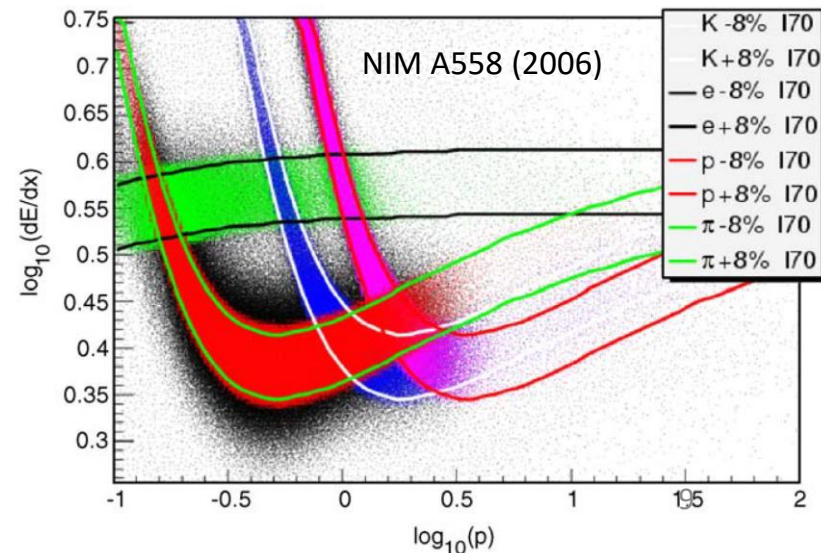
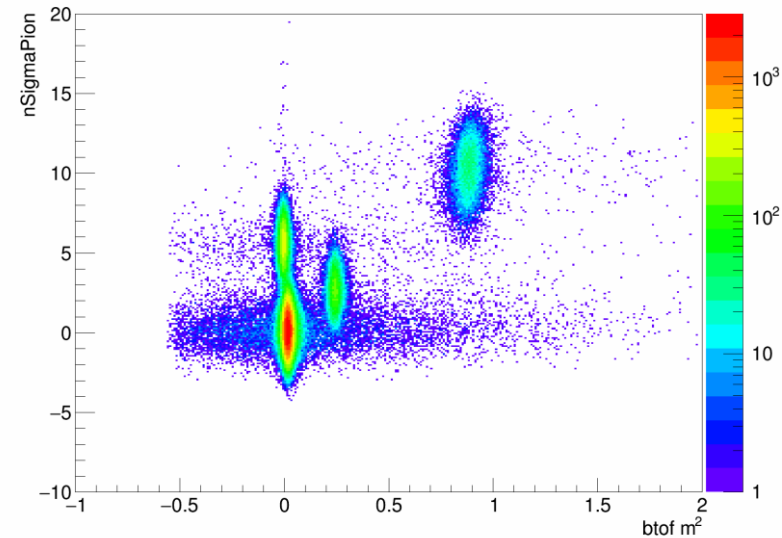
2012 pp200 GeV: Spin2014



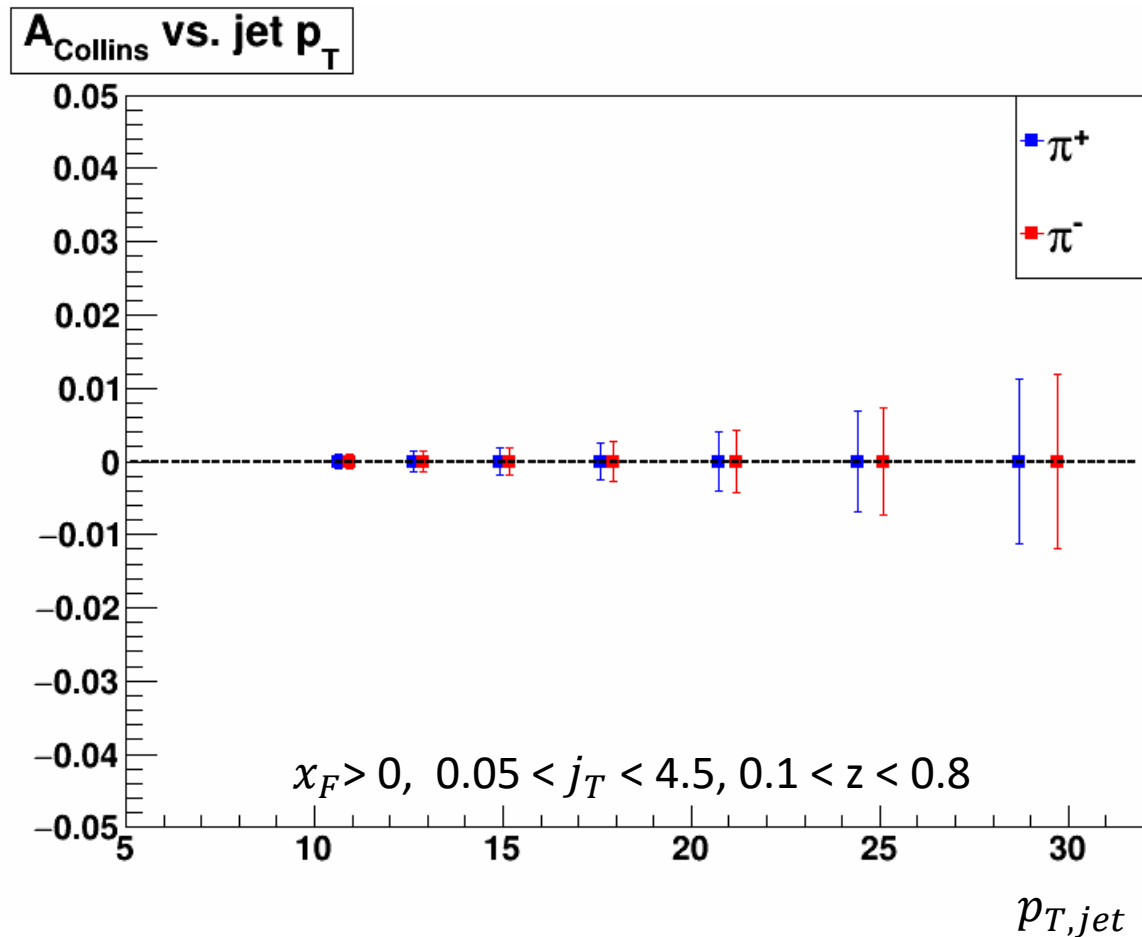
2015 Collins Analysis at STAR

- $52 pb^{-1}$ transverse polarized p+p data at $\sqrt{s} = 200$ GeV, twice as 2012;
- 57% averaged beam polarization;
- Particle identification from TPC and TOF;
- Underlying event contamination will be considered;
- Increased statistics will enable more multi-dimensional binning of the asymmetries

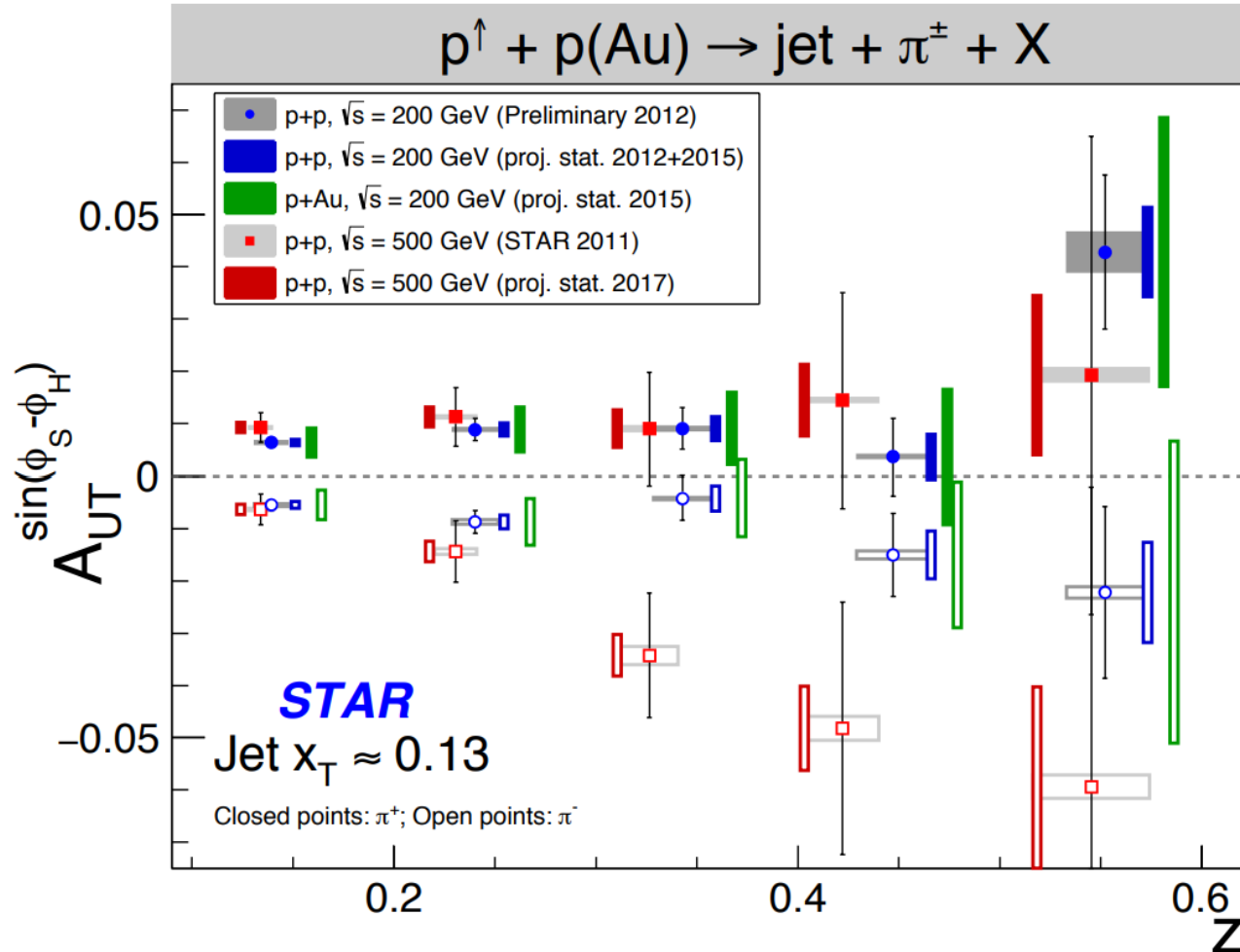
Track btof m2 vs nSigmaPion: track P = 0.70 - 0.75, Charge = +1



Projected 2015 Statistical Uncertainties



Projected Statistical Uncertainties



- Data under analysis from 200 GeV p+Au and 510 GeV pp

Conclusion

- RHIC is the world's only polarized collider, with unique opportunities for transverse-spin physics;
- STAR has recently released some exciting results and has a huge amount of spin data under analysis;
- 2015 transverse analysis is ongoing and will provide the most precise measurements of transversity and the Collins effect in 200 GeV pp collisions.