Jets and Jet Quenching
- Collimated hadrons created by parton fragmentation at early stages of collision
- Jet modification through QGP probe of the medium
- Modification factor $R_{pAu}/R_{pPb} = V_{partons}/V_{pPb}$

QGP in Small System
- Flow-like signals detected in small systems (p+Au, p+Pb, d+Au) at RHIC and the LHC
- Overall minimum bias $R_{p+Au}$ for jet modification signals found to be consistent with unity\(^{(3,4)}\)
- Event Activity (EA) binned ratios show suppression/enhancement in high/low EA

Inclusive Jet Analysis in p+Au
- Per-trigger analysis (D. Stewart’s talk @QM2019\(^{(1)}\)) provides relative comparison without Glauber\(^{(2)}\)
- Although applicability to p+Au collisions being questionable, Glauber scaling and inclusive jet measurements provide direct comparison to p+p collisions

The Solenoid Tracker at RHIC (STAR)

Time Projection Chamber\(^{(2)}\)
- Full $\phi$ coverage for $|y|<1$
- $p_T$ resolution as good as 2% at $p_T<1$ GeV/c
- Primary detector for charged jet analysis

Barrel Electro-Magnetic Calorimeter\(^{(3)}\)
- 4800 towers recording energy hits from charged and neutral particles
- Angular resolution $\Delta y = \Delta p_T / 0.05$ full $\phi$ coverage at $|y|<1$
- Energy resolution $\sigma_E/E \sim 14\% / \sqrt{E (\text{GeV})}$ + 1.5% required for full (charge+neutral) jet analysis

Beam Beam Counter\(^{(4)}\)
- Hexagonal plastic scintillators arranged into inner & outer ring
- Full $\phi$ coverage at rapidity range 2.2$<|y|$$<5.0$
- Minimum bias trigger for p+Au analysis

Dataset
- p+Au $S_{NN} = 200$ GeV: 2015
- 0(10$^3$) events after quality cuts
- Track level cuts:
  - $0.2 \text{GeV/c} < p_T < 30 \text{GeV/c}$
  - $|y| < 1$

Jet Clustering
- FastJet\(^{(5)}\) (Anti-$k_T$, R=0.4 jets)
- Charged tracks from TPC
- Full jets; EMC hits after performance study, hadronic correction applied
- Small uncorrelated background to be handled in the unfolding procedure

Event Activity Category
- Standard STAR analyses use the mid-rapidity charged-particle multiplicity for Event Activity definition, but has auto-correlation with jet yield
- Au-going BBC signal can serve as indicator of EA (Fig. 6) while avoiding auto-correlation
- Group events into EA bins based on BBC activity, record per-event yield for each bin and compare with each other

Two-step Glauber Mapping
- $N_{coll}$ distribution calculated through standard Glauber simulation software\(^{(3)}\)
- Fold to model $N_{coll}$ and Negative Binomial Distribution (NBD) to fit with data multiplicity, obtain $N_{coll}$ for each multiplicity value (Fig. 7)
- Calculate average ($N_{coll}$) for each EA bin (as in Fig. 6) according to multiplicity distribution in the category
- Divide EA-categorized jet yield by ($N_{coll}$) in each bin and obtain Glauber-scaled $R_{cp}$ and nuclear modification factor $R_{pAu}$

Summary
- Utilized backward (Au-going) BBC signal as an event activity indicator
- Measured inclusive particle & jet spectrum
- Developed a method to obtain $<N_{coll}>$ for each centrality class

Outlook
- Further validate the BBC-$$N_{coll}$$ mapping method
- Measure jet $R_{pAu}$ and compare with previous results
- Study EA dependence of fully corrected p+Au jet spectra and modification via $R_{pAu}$

References
\(^{(5)}\) D. Stewart for the STAR collaboration, QM 2018. https://na61.web.cern.ch/analytical/si/si2562076871/967320243
\(^{(8)}\) J.-C. Band, for the S. collaboration, STAR Results from Polarized Proton Collisions at RHIC, arXiv/1004.0431v2.
\(^{(12)}\) C. Leslie [LPC/1004.0431v4], https://indico.cern.ch/event/1622372/session/13/contribution/3237/