Measurement of Two-Point Energy Correlations within Jets in p+p $\sqrt{s}$ = 200GeV at STAR – Update aiming for Quark Matter

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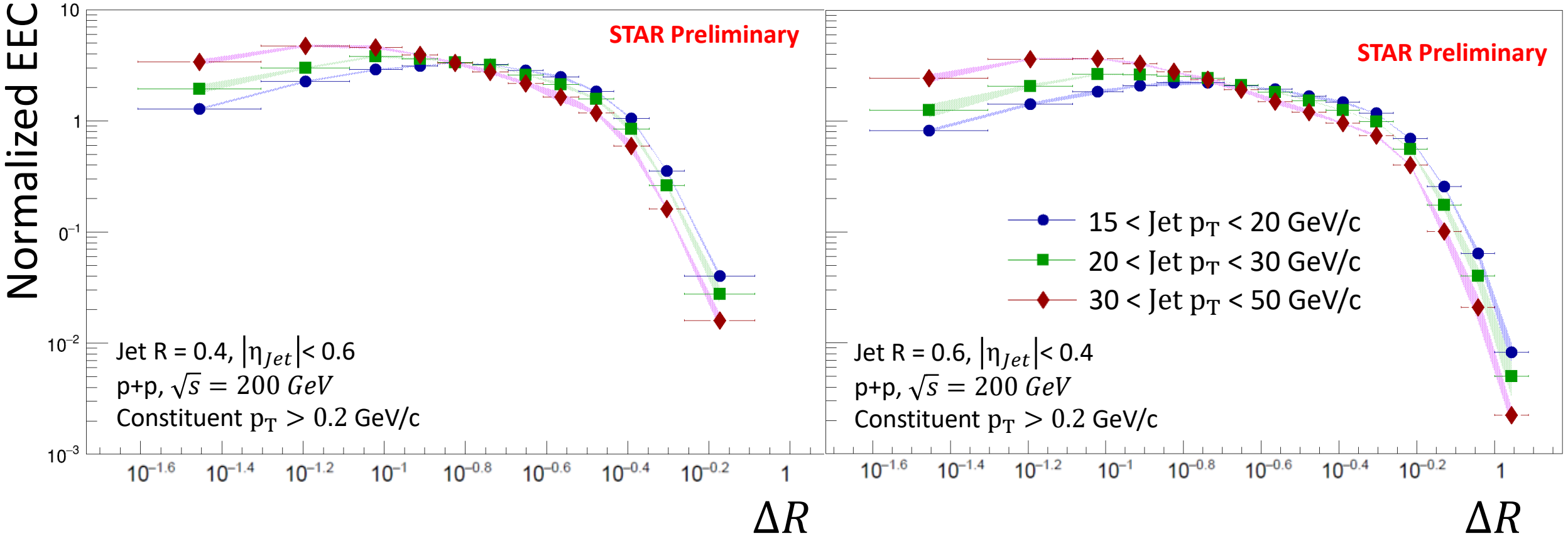
Preliminaries shown at Hard Probes 2023

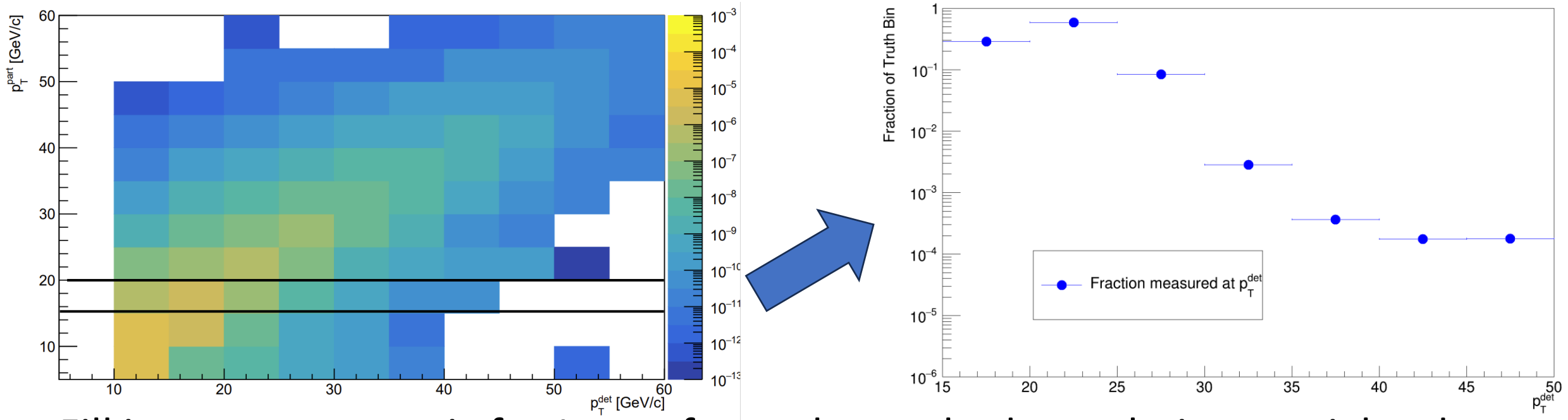


$$\text{Normalized EEC} = \frac{1}{\sum_{Jets}\sum_{i\neq j}\frac{E_i E_j}{{p_{T,Jet}}^2}} \frac{d\left(\sum_{Jets}\sum_{i\neq j}\frac{E_i E_j}{{p_{T,Jet}}^2}\right)}{d\,(\Delta R)}$$

Previous Correction Method- p_T correction

Method performed previously at STAR, Robotková, DIS 2021

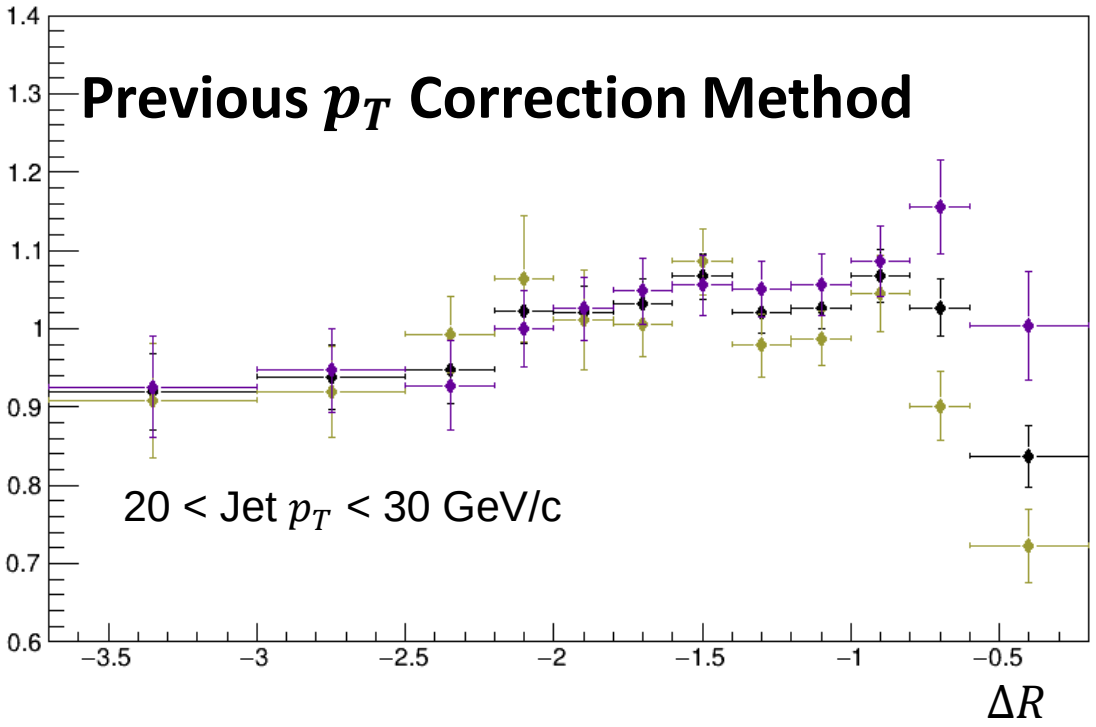
Match jets between particle and detector level simulation samples with $\Delta R_{Jet} < Radius$ and then match charged tracks inside with ΔR_{Track} <0.01

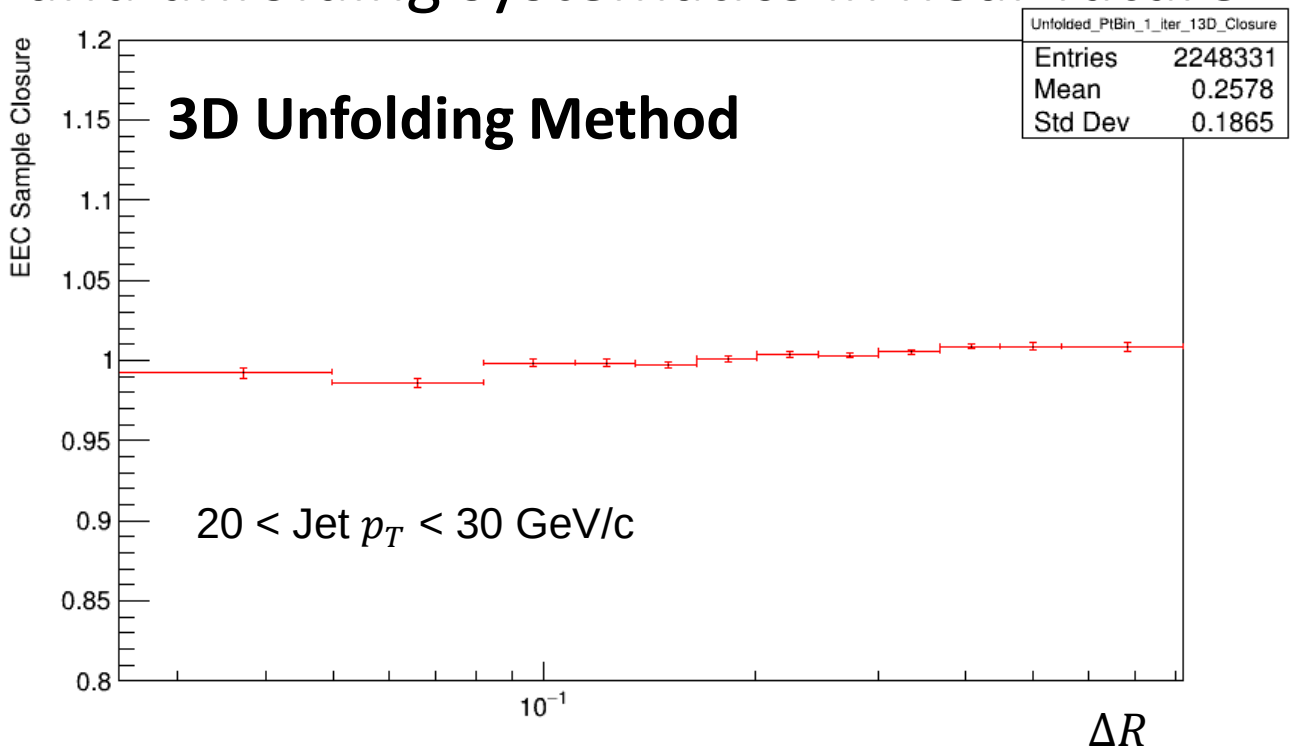


- Fill in response matrix for Jet p_T for each matched correlation– weighted by $\frac{E_i E_j}{{p_{T,Jet}}^2}$
- Take slice of response matrix in Truth p_T to construct that Truth p_T bin out of measured distributions using given weights

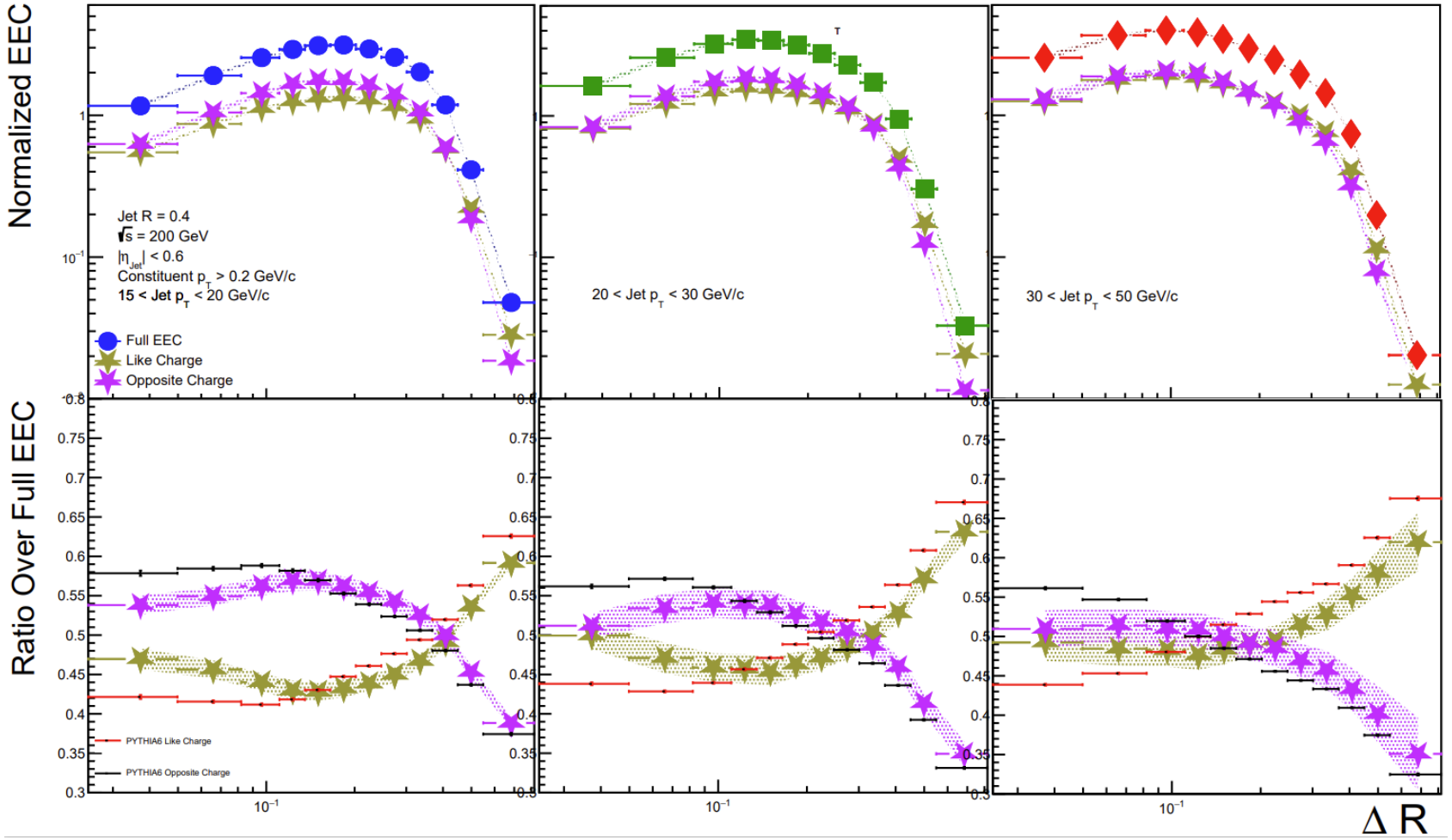
Update: 3D unfolding

- Recently acquired larger embedding sample, allows for Bayesian unfolding which was limited by systematics previously
- This is due to requiring unfolding in three variables, jet transverse momentum, ΔR , and the energy weight $\frac{E_i E_j}{{p_{T,Jet}}^2}$
- Will update more on performance and unfolding systematics in near future





Potential new preliminary: Charged EECs



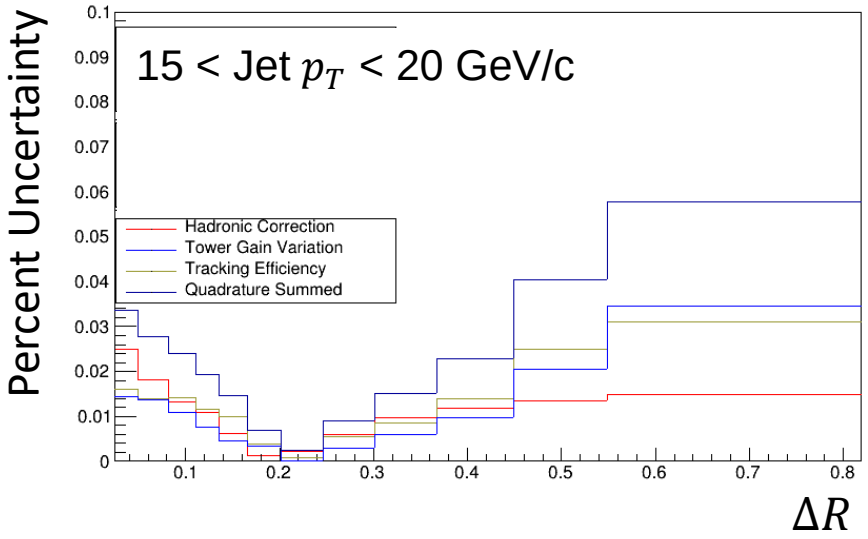
- Examines how the EEC distribution changes for correlations made from particles with like and unlike charges
- See enhancement of Opposite charge correlations at small angles predicted by Lee and Moult in recent paper
- PYTHIA describes general behavior, but is slightly off on magnitude of the effect
- Will aim to make more formal preliminary request prior to deadline

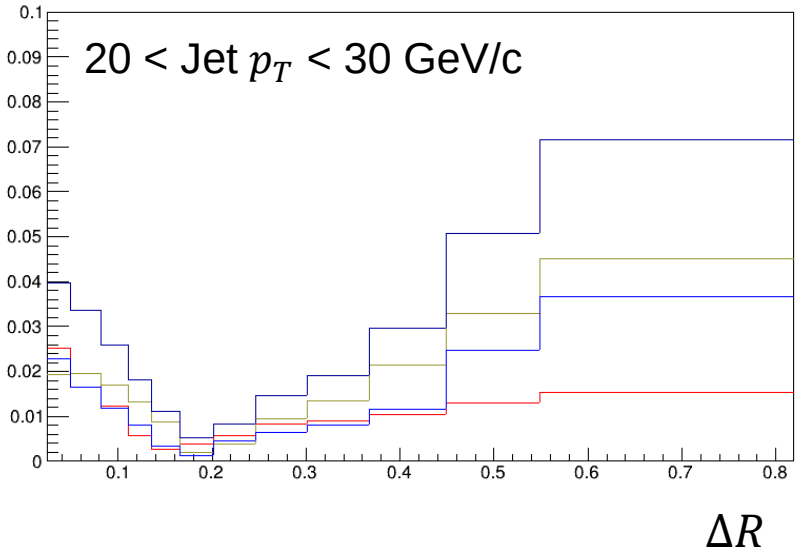
Conclusions

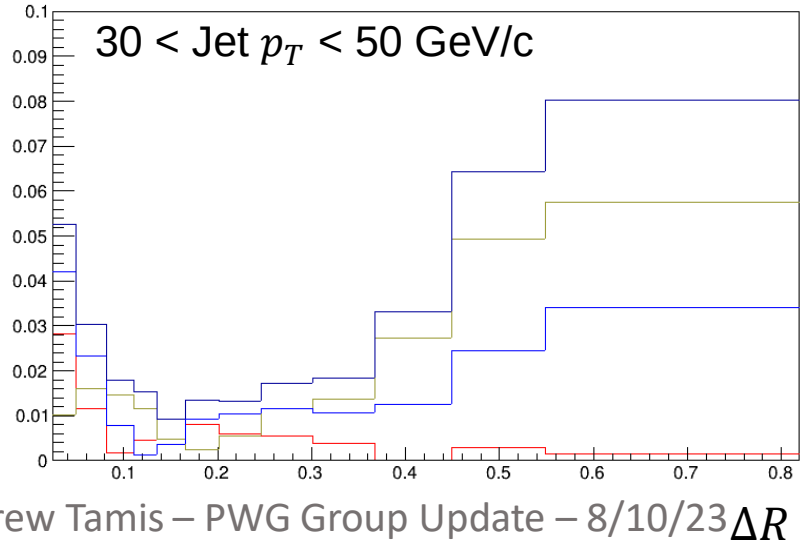
- Poster at quark matter – will include previous preliminary at minimum
- Updated unfolding method due to improved simulation statistics
- Will make more formal preliminary request for the charged EECs plot in the near future.

Backup

Systematics on 3D unfolded EEC







R = 0.4

$|\eta_{Jet}| < 0.6$

Constituent $p_T > 0.2$ GeV/c

Hadronic Correction

-Varied from 100% to 50%

Tower Scale Variation

- **Varied ± 3.8%**

Tracking Efficiency

- 4% Uncertainty