Preliminary figure request:

Dijet p_{T} balance, $A_{\mathrm{J}} \equiv \frac{p_{\mathrm{T,lead}} - p_{\mathrm{T,sub}}}{p_{\mathrm{T,lead}} + p_{\mathrm{T,sub}}}$

p+Au collisions at $\sqrt{s_{\mathrm{NN}}} = 200\ \mathrm{GeV}$

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Note:

This request is for the A_J figure in the paper “Event activity correlations and jet measurements in p+Au collisions at √sNN = 200 GeV” documented at this web address, with current analysis note at this address. This presentation has a brief overview for the figure, but much more detail is given in the linked analysis note.

The paper is currently going to GPC. The request for this preliminary is so that the figure can be shown in the Initial Stages 2019 conference, prior to publication. No other preliminary for this figure exists.

Physics Motivation

- Look for modification of the per-dijet p_{T} balance distribution $A_{\mathrm{J}} \equiv \frac{p_{\mathrm{T,lead}} - p_{\mathrm{T,sub}}}{p_{\mathrm{T,lead}} + p_{\mathrm{T,sub}}}$ for $A_{\mathrm{J}} \in [0,0.6]$ in events selected, separately, at high and low event activity (EA) as indicated by the sum of the BBC East inner tile signal per each event. Modification of A_{J} is a proposed indication of jet quenching in a QGP.

Data and Cuts

- *p*+Au 200 GeV, Run 15
- Triggers:
  - Minimum Bias (MB) trigger: VPDMB-novtx 500004. This trigger requires signal in both the East and West VPD in correlation with the timing of a bunch crossing. This trigger saturates quickly and has a correspondingly high prescale value.
  - High Tower 1 (HT1) trigger: BHT1*VPDMB-30_nobsmd 500206: Requires a hard hit in a BEMC tower (an online ADC value of 11, which translates to about 2.5 GeV) as well as the online VPD primary vertex measurement of $|V_{z,\mathrm{VPD}}| < 30$ cm.
- There are a total of 1067 runs which contain MB triggered events. Run QA is documented here: run_selection.pdf. Links ti run lists:
  - bad_run_list.txt
  - good_run.txt

Event Cuts:

- $|V_z| < 10$ cm
- $|V_z - V_{z,\mathrm{VPD}}| < 6$ cm
- ZDCx $\in [5, 20]$ kHz

Track Cuts:

- $\mathrm{DCA}_{3D} \leq 1$ cm
- $N_{\mathrm{hits,fit}} \geq 20$
- $N_{\mathrm{hits,ratio}} \geq 0.52$
- $|\eta| < 0.9$
- $p_T \in [0.2, 30]$ GeV/c

Towers QA:

- Also cut for $E_T \in [0.2,30]$ GeV/c
- 100% hadronically corrected
- 229 towers marked bad in database
- Additional 89 marked bad, as listed here according to reasoning in Section 2.3 of the Analysis Note

Measurement

- Dijet pT balance at the detector level. This is not particularly interesting in itself, but the detector efficiencies cancel out in the ratio.
- A few things must be done in order to make the ratio valid.

Jet Energy Scale (JES) and Jet Energy Resolution (JER)

- JES and JER are resolvable different between high-EA and low-EA, and high-ZDCX and low=ZDCx events:

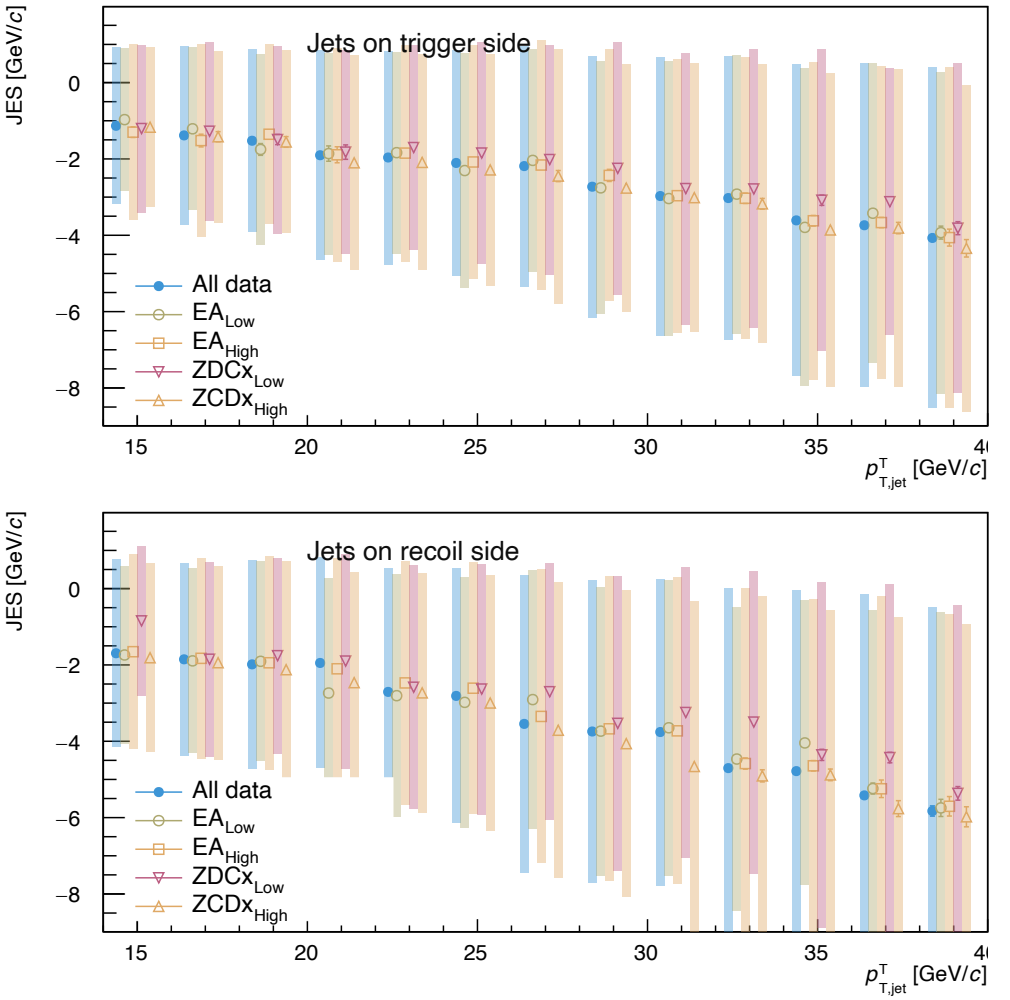


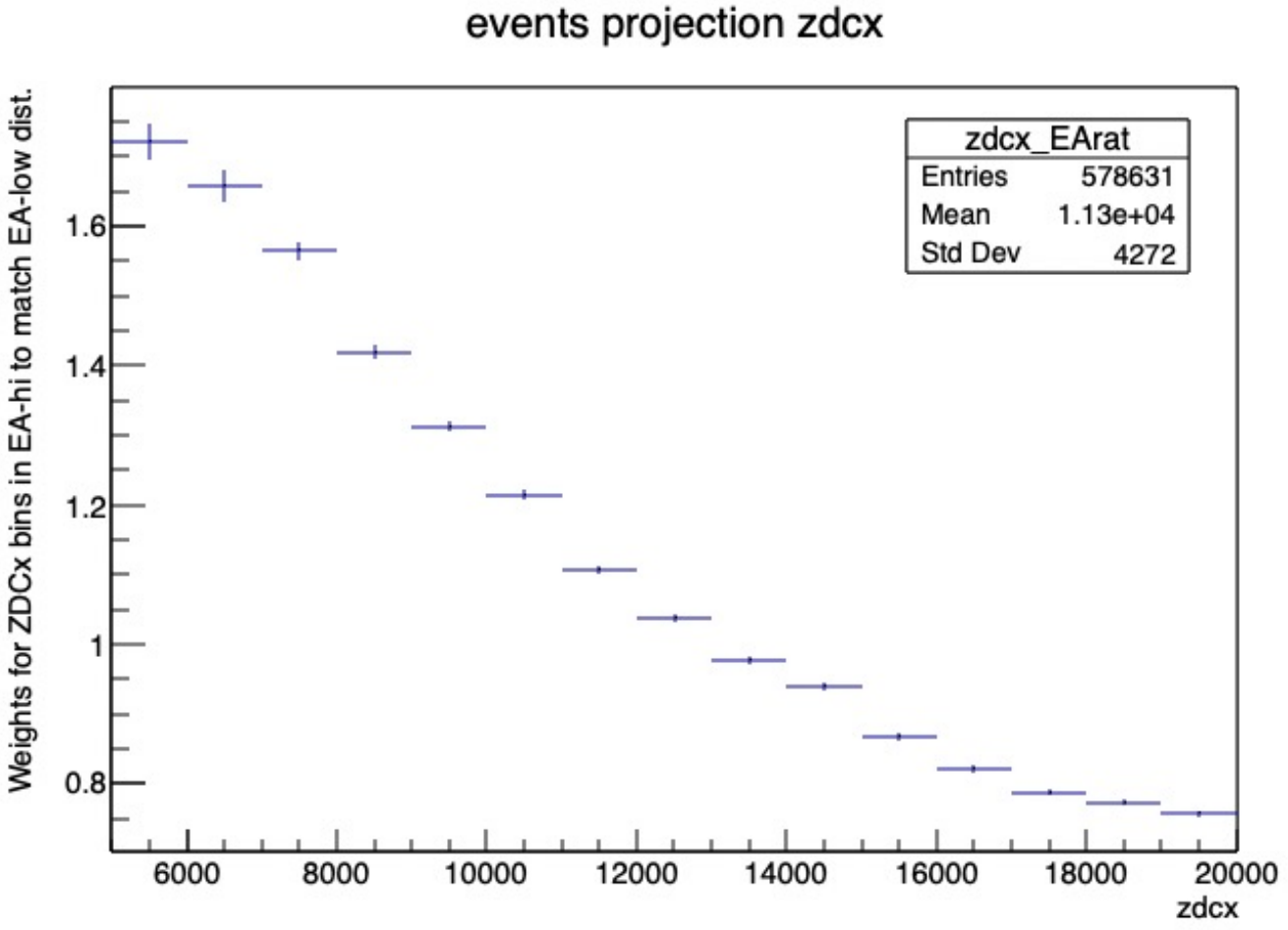
Figure: Jet energy scale and jet energy resolution for embeddings in trigger- and recoil-side jets, also cut for high/low EA and high/low ZDCx (in which high and low are defined as > 15 kHz and > 20 kHz respectively). The JES is the y-axis value, and the JES is represented by the magnitude of the colored bars. Each cluster of values are for the same bin of $p_{\mathrm{T,jet}}^{\mathrm{T}}$ and are offset for visual convenience.

Luminosity (ZDCx) Distribution

- While the JES and JER are not resolvably different at high or low EA or BBC, there is the following differences:
  - ZDCX: There is a drop in tracking efficiency on the order of 8% from the lowest to highest ZDCx values used (5-20 kHz)
  - EA: There are more tracks and towers in high-EA events than low-EA events
- To some extent, the two effects counteract each other
- While neither effect changes the JES and JER, it is possible that they could still affect A_{J} distribution due to the pT selection cuts on the lead and sub-leading dijet

ZDCx correction for high-EA events

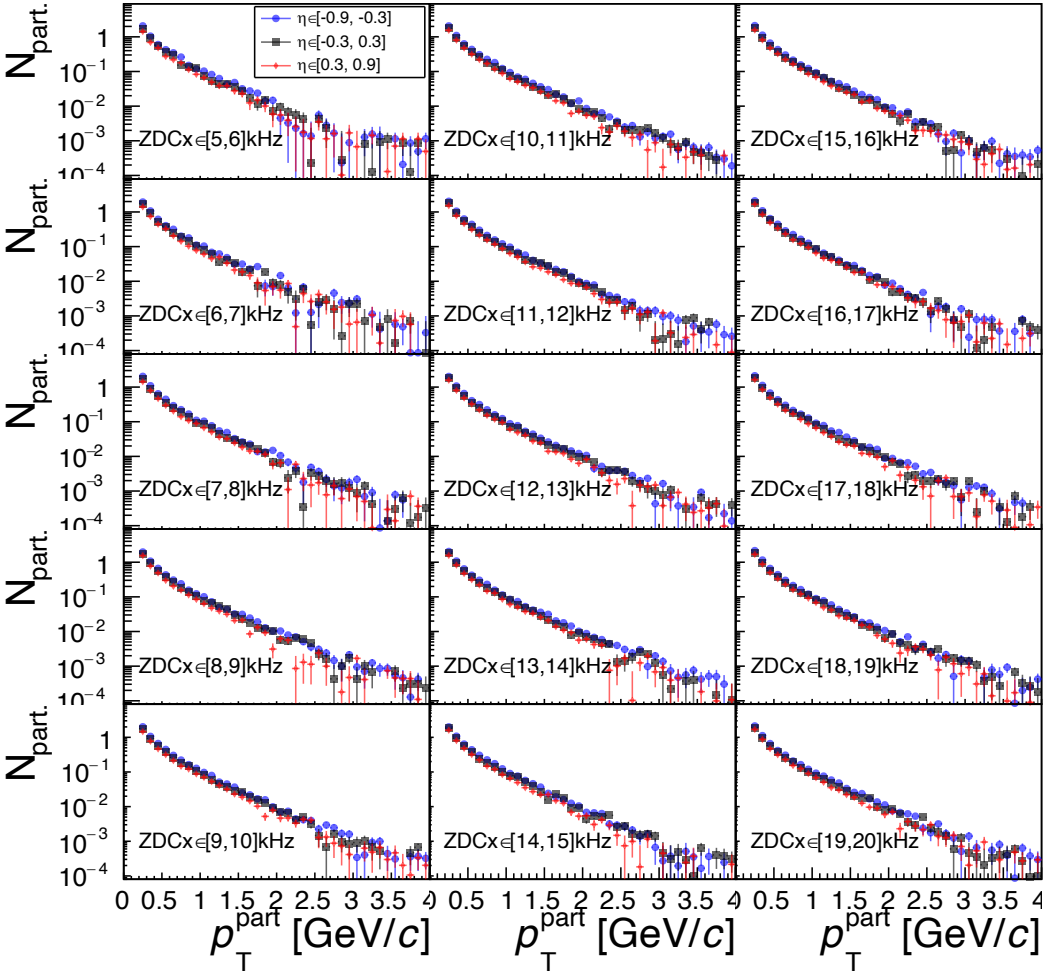
- To account for high ZDCx conditions, the ZDCx-distribution of high-EA events is re-weighted (by 1 kHz bins) to match the low-EA distribution.



Background density correction for Low-EA events

- The detector level p_{T} distribution of how many more particles (tracks and towers together) there are in high-EA events relative to low-EA events is given in this figure.
- There is a distribution of each of 3 rapidity range for 15 bins of ZDCx.

(correction continued on next slide)



(continued)

Background density correction for Low-EA events

- In each low-EA event:
  - Get the three spectra of particles according to the event ZDCx bin
  - Get the mean number of particles in each spectra
  - For each rapidity bin of the data, pick a random number of particles from a Poisson distribution with the mean of the spectra (scaled by 4/3 for the bins measuring to $|\eta| = 1$) – this is the number of particles to add.
    - For each added particle, select it randomly from the pT distribution, and add to the event in a random ϕ and η (flat in both distribution going out to $|\eta| = 1$)
  - Cluster the jets using the event tracks and towers + these these additional particles

Resulting distributions and ratio:

- In each event, if
  $p_{\mathrm{T}}^{\mathrm{lead}} > 12\ \mathrm{GeV}/c$ and
  $p_{\mathrm{T}}^{\mathrm{sub}} > 8\ \mathrm{GeV/c}$
- And if if
  $p_{\mathrm{T}}^{\mathrm{lead}} > 20\ \mathrm{GeV}/c$ and
  $p_{\mathrm{T}}^{\mathrm{sub}} > 10\ \mathrm{GeV/c}$

Measure A_{J} distribution, normalize, plot in ratio.