Implementation of heavy ion measurements in Rivet

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1. Robust Independent Validation of Experiment and Theory

1.1 What is Rivet?
- C++ framework for physics analyses (over 900 and growing!)
- Validates Monte Carlo event generators
- Runs analysis over simulated data, then plots with published data pulled from HepData

1.2 Implementing heavy ion collisions
- Format your data for HepData (See [1]). Make sure to use bins for the relevant histograms.
- Write a class for defining centrality or use an existing class. (See [2] for STAR and PHENIX centrality classes.)
- Identify similar analyses.

2. Undergraduate Participation

- Course-based Undergraduate Research Experiences (CUREs) linked to increased retention in the major, continuation to graduate study, 12 in CURE
- 19 independent students: 8 Summer students, one independent student, technical approval pending.
- 7 URM students, 4 non-traditional students

3. Models

3.1 PYTHIA Angantyr
PYTHIA Angantyr [4] is a Monte Carlo model for heavy ion collisions included in PYTHIA 8.4.5.
- No flow, no jet quenching
- Used the centrality class implemented in Rivet [6]
- 19 independent students: 8 Summer students, one independent student, 12 in CURE

3.2 JEWEL
JEWEL [4] is a Monte Carlo model for partonic energy loss.
- Treats the interplay of QCD radiation and re-scattering microscopics dynamics
- Consistent perturbative framework with minimal assumptions.
- Output contains only particles from the jet or from interactions with the medium

4. Single Hadron R_{AA,0} from ALICE

5. Implementation of jet measurements

- Unfold to correct for fluctuations

6. Acknowledgements

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References


Figure 1: Comparison of R_{AA,0} in 0-5% (left) and 65-80% (right) central Au+Au collisions at √sNN = 200 GeV [8] with Angantyr.
- Required implementation of centrality
- Code available here [2]

Figure 2: Comparison of charged jet p_T from ALICE 0-5% and 30-50% central Pb-Pb collisions at √sNN = 2.76 TeV [12] with JEWEL and Angantyr.

Figure 3: Comparison of charged jet p_T from ALICE 0-10% central Pb-Pb collisions at √sNN = 2.76 TeV [12] with Angantyr and JEWEL.

Figure 4: Ratio of charged jet p_T from ALICE in 0-10% central Pb-Pb collisions at √sNN = 2.76 TeV [12] with Angantyr and JEWEL.

Figure 5: Comparison of charged jet p_T in 0-5% and 30-50% central Pb-Pb collisions at √sNN = 2.76 TeV [12] with JEWEL and Angantyr.