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The study of v_2 with a new double-differential event categorization using multiplicity and spectator neutrons in PHENIX

Tuesday 5 September 2023 17:30 (2h 10m)

When studying the properties of the Quark-Gluon Plasma (QGP) formed in relativistic heavy ion collisions, it is necessary to classify the events based on the size and shape of the QGP. Typically, events are categorized by mapping the impact parameter, which cannot be measured directly, to a bulk observable that varies monotonically with it, such as soft particle production. In the mapping, fluctuations in the initial state nuclei and the nucleon-nucleon interactions are taken into account. Even a tight experimental centrality based solely on multiplicity includes events with quite different shapes due to these fluctuations. To select much more homogeneous sub-samples of events, adding a second, independent qualifier is helpful. A decade ago, event-shape engineering proposed the flow vector as a second qualifier, but it is influenced by final state interactions. Instead, we use spectator neutrons measured in the zero-degree calorimeter of PHENIX as the second dimension. This new approach provides a more precise way to categorize QGP events, which has important implications for understanding the underlying physics of heavy ion collisions. By using this novel 2D event characterization in Au+Au collisions at RHIC, we will demonstrate elliptic flow results with tighter constraints on the initial geometry. We will also discuss how this may be relevant in studying path-length dependent energy loss and possible multiple parton interactions (MPI).

Category

Experiment

Collaboration (if applicable)

PHENIX

Primary author: Dr SHIMOMURA, Maya (Nara Women's University (JP))

Presenter: Dr SHIMOMURA, Maya (Nara Women's University (JP))

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