Physics Undergrads Co-Author Publications for *Phys. Rev. C*.

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For many of UT's undergraduate physics majors, the classroom goes beyond lectures to research labs, where they learn to solve problems and work with scientific colleagues in a real-world environment. Such is the case with Meg Stuart and Aram Bejnood, both of whom work in the relativistic heavy ion group and have recently co-authored publications in the journal *Physical Review C*.

Meg Stuart

Stuart worked with Christine Nattrass, Joel Mazer, and Natasha Sharma to develop a background subtraction model for jet-hadron and di-hadron correlations. Jet-hadron and di-hadron correlations are used to study the low momentum component of jets, the fragments of hard partons, in heavy ion collisions. When a hard parton interacts with the quark gluon plasma, it loses energy and the jet that forms fragments into lower momenta fragments. The properties of the medium can be determined by studying these fragments. Jet-hadron and di-hadron correlations are analogous to spectroscopy. Most jets are formed in pairs with equal energy and momentum, so when a relatively unmodified jet is found, it can be compared to its partner to see how the parton interacted with the medium. The large combinatorial background for these measurements is large, with a signal to background ratio frequently less than 1:100, and the background is correlated with the signal, so an accurate background subtraction method is crucial for precision measurements. The trio worked together to develop a method which uses the correlation itself and its dependence on the reaction plane to determine the background. They demonstrated that this method worked and had higher precision than the standard method in a toy model. The results are published in "Background subtraction methods for precision measurements of di-hadron and jet-hadron correlations in heavy ion collisions."

Aram Bejnood

Bejnood worked with the rest of the group to apply these methods to di-hadron correlations from the STAR collaboration at Brookhaven National Laboratory. The uncertainty due to the background subtraction was up to a factor of five smaller than results using the standard method. These results demonstrated that a feature in the data frequently interpreted as a Mach cone due to a parton moving faster than the speed of sound in the QGP was an artifact of the background subtraction. With this reanalysis, partonic energy loss at low momentum observed at the Relativistic Heavy Ion Collider is now consistent with results from the Large Hadron Collider. They also indicate that the complete jet suppression observed previously was also an artifact of background subtraction. The results appear in "Disappearance of the Mach cone in heavy-ion collisions." Mazur is working on applying this method to his measurements of jet-hadron correlations using the ALICE detector at the Large Hadron Collider.

Meg Stuart is an undergraduate majoring in Physics, Math, and Computer Science. Aram Bejnood is an undergraduate majoring in Math and minoring in physics and chemistry. Natasha Sharma is a former UT postdoc and is currently a Ramanujan Fellow in Chandigarh, India. Joel Mazer is a graduate student at UT working on the ALICE experiment. Christine Nattrass is an assistant professor of physics.

Thanks to Christine Nattrass for providing the text.

Read the papers:

- **Background subtraction methods for precision measurements of di-hadron and jet-hadron correlations in heavy ion collisions** **(http://journals.aps.org/prc/abstract/10.1103/PhysRevC.93.044915)**
- **Disappearance of the Mach cone in heavy-ion collisions** **(https://journals.aps.org/prc/abstract/10.1103/PhysRevC.94.011901)**