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Fluctuations and flow of the world's smallest and hottest fluid

Wednesday, 2 September 2015 11:00 (30 minutes)

Experiments at particle colliders including the Relativistic Heavy Ion Collider at Brookhaven National Laboratory and the Large Hadron Collider at CERN have found that the matter created in heavy ion collisions behaves like an almost perfect fluid. This conclusion relies on the success of hydrodynamic models in describing the bulk features of the collision when a well motivated fluctuating initial state is used. I will review progress in describing this initial state as a dense system of gluon fields using an effective theory of QCD in the high energy limit. I will then discuss its implementation into relativistic viscous fluid dynamic calculations and compare results of the calculation to experimental data from RHIC and LHC. These comparisons can be used to constrain the values of the shear and bulk viscosity of the created system. Furthermore, I will address recent measurements of particle correlations in very small collision systems involving at least one proton projectile that show very similar behavior to heavy-ion collisions. I will discuss whether one can interpret these results as signals of similar collective behavior as we see in heavy ion collisions or whether alternative mechanisms are important in these very small systems.

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