Abstract for an Invited Paper
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The Gauge-String Duality in Nuclear Collisions[1]

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We will discuss modeling collisions of ultrarelativistic heavy ions using the methods of string theory, in particular the gauge-string duality. It has been known throughout the history of the relativistic heavy ion field that the majority of particles (mesons and baryons) produced in the collisions come out with small momenta. Due to asymptotic freedom this implies that the coupling constant for interactions of such particles with each other (and the coupling constant for quarks and gluons which led to their creation) is possibly large. Unfortunately this conclusion implies that perturbation theory methods based on Feynman diagrams, which require a small coupling constant, can not provide a complete description of the production of most of the particles in a heavy ion collision. We will discuss how gauge-string duality method, which originated in string theory, provides us with the tool to describe heavy ion collisions at strong coupling. We will demonstrate the strengths and weaknesses of the method. In particular we will argue that, if the collision is described by strong-coupling physics, the two colliding nuclei would stop shortly after the collision likely producing a thermalized medium of quarks and gluons - the quark-gluon plasma (QGP). We will compare such QGP production scenario with what we know from RHIC experiments.

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