

**Stony Brook University  
The Graduate School**

Doctoral Defense Announcement

**Abstract**

Heavy Ion Collisions from AdS/CFT correspondence

By

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It is now believed that heavy ion collisions have produced a state of strongly coupled quark gluon plasma. The strong coupling of the fields make the perturbative field theoretical calculation less reliable. The gauge/gravity duality has recently emerged as a powerful tool allowing us to study the dynamics of the gauge fields at strong coupling. Many novel features of strongly coupled gauge fields have been revealed in recent studies via the duality. In this dissertation, I will focus on an important aspect in heavy ion collisions: the equilibration of matter and formation of quark gluon plasma.

I will first use a gravitational collapse model, which is dual to thermalization process of the quark gluon plasma. The spectral densities of stress energy tensor are studied and found to show universal behavior as the thermalization is approached. Then I will also describe a model of gravitational shock wave collision, which mimics the relativistic nucleus collisions. The shock wave model allows us to find the apparent horizon, its area giving the entropy production as a function of impact parameter. A critical impact parameter is observed, beyond which no thermalization is possible. I will finally comment on the equivalence between the collisions of sourced shock wave and sourceless shock wave.

**Date:** March 31, 2010

**Time:** 12:30pm

**Place:** Physics Building, C133.

**Program:** Physics

**Dissertation Advisor:** Edward Shuryak