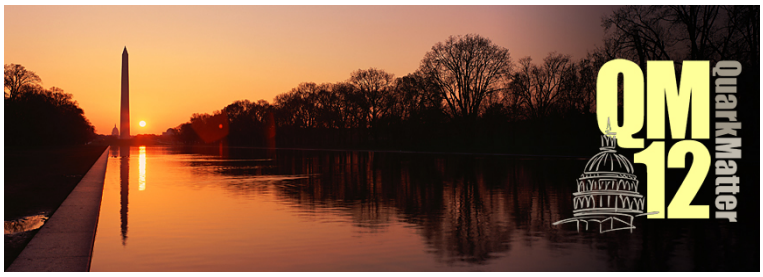

Contribution ID: **128** Type: **Oral Presentation**

Evolution of singularities in unequal time two-point correlator in formation of QGP

Friday, 17 August 2012 16:30 (20 minutes)

One of the most difficult problems still to be understood is the mechanism of fast thermalization in heavy ion collisions. The problem involves dynamics in strong coupling regime and physics far from equilibrium, therefore is hardly tractable by usual method. The gauge/gravity duality naturally maps the formation of quark gluon plasma to another fundamental problem in black hole physics: information loss in a gravitational collapse process. The present work summarizes our recent results on the study of a particular probe: unequal time two-point correlator for gauge theory in the evolution toward thermal equilibrium. In [1], we found that near equilibrium the spectral functions showed a universal pattern as field equilibrates in a quasi-static approximation. We have then systematically extended the previous work to the far from equilibrium region by using the coordinate representation. In the past two years we have developed a divergence matching method in computing the singularities of the unequal time two-point correlator in a time-dependent background. We found the singularities have a nice interpretation with a geometric optics picture [2,3]. Applying this method to the gravitational collapse model, we found the singularities of the unequal time correlator shifted from the real time to the complex time in the formation of QGP [4]. This signature sheds more light on the mechanism of the thermalization and may have interesting implications to heavy ion phenomenology and experiments.

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Session Classification: Parallel 7E: New Theoretical Developments (Chair P. Levai)

Track Classification: New theoretical developments