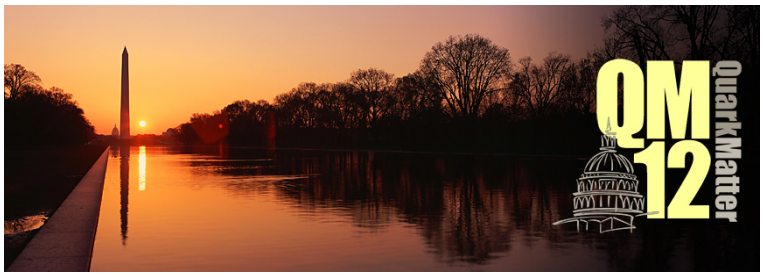

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Emission of Low Momentum Particles at Large Angles from Jet

Saturday, 18 August 2012 10:20 (10 minutes)

Hot and dense QCD matter, namely the quark gluon plasma, is created in high energy heavy ion collisions. High energy partons are also created through initial hard scatterings and have to traverse the QGP medium. These energetic partons are subject to lose their energy due to strong interactions with the medium. So jets in heavy ion collisions are expected to give information about the stopping power of the QGP.
While jets traverse the QGP medium, they could induce collective flow in the fluid by depositing energy and momentum. Thus the space-time evolution of the QGP fluid would be affected when jets pass through the medium. In fact, the CMS Collaboration observed a lot of low momentum hadrons at large angles from a quenched jet [1]. These low momentum hadrons are intimately related with jet energy loss since the total momentum of these hadrons together with the quenched jet balances the momentum of the other jet propagating in the opposite direction. The CMS result can be interpreted as manifestation of a wake of the QGP fluid by jet energy loss.
In this study, we construct a model to describe the dynamics of QGP fluid and jets simulta- neously. We model a source term in the relativistic hydrodynamic equations which originates from the energy and momentum deposited from traversing jets. Without linearization we solve these non-linear hydrodynamic equations numerically in fully three dimensional space and describe the dynamics of the background QGP medium.
A Mach cone like structure and a vortex ring appear behind the jet traversing a uniform medium. When a pair of jets go through a fluid expanding three dimensionally, the Mach cone like structure is distorted by radial flow. As a result, low momentum particles from the medium are preferentially emitted at large angles from the jet axis. The result exhibits the same trend as the one observed by the CMS Collaboration.

References

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