



Contribution ID: 50

Type: **Poster**

Towards a Unified Picture of Jet Modifications in the QGP Using Soft-Collinear Effective Theory

Tuesday 29 September 2015 16:30 (2 hours)

Theoretical investigations and experimental measurements of jet substructure modifications in heavy ion collisions allow us to disentangle cold nuclear matter effects and jet-medium interactions in the quark-gluon plasma, providing a direct probe of the QGP properties. Precision calculations of jet substructure observables will thus become the key to extracting the medium properties. Jet shapes and jet fragmentation functions give the transverse and longitudinal energy profiles inside jets and are sensitive to the jet formation mechanism in the medium. In this talk we will demonstrate the resummation of jet shapes at next-to-leading logarithmic accuracy using Soft-Collinear Effective Theory. This is the first time phase space logarithms in this observable are resummed using renormalization group techniques. We will then present the calculation of jet shape modification in heavy ion collisions caused by Glauber gluon interactions in the background QGP medium. The study of jet shape modification is closely related to the calculation of jet energy loss. Taken together, these observables provide a comprehensive description of the energy distribution of the in-medium parton shower. We will show first results for the modifications of jets beyond the soft gluon emission limit for 2.76 TeV Pb+Pb collisions at the LHC and present predictions for the 5.1 TeV Pb+Pb run.

[1] Y.-T. Chien, I. Vitev, JHEP 1412 (2014) 061

[2] Y.-T. Chien, I. Vitev, JHEP in preparation

On behalf of collaboration:

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Session Classification: Poster Session

Track Classification: Jets and High pT Hadrons