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Novel Methods for Measuring the Fragmentation Function of Jets in Heavy Ion Collisions Using Jet-Hadron Correlations

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In high energy nucleus-nucleus collisions a novel state of nuclear matter, the Quark Gluon Plasma (QGP) is created. Hard partonic scatterings which happen inside the bulk of this nuclear matter serve as an important probe of QGP properties through their energy loss. An important observable for studying the extent of this partonic energy loss is the jet fragmentation function. Previous studies have shown modification of the fragmentation function of jets in Pb-Pb collisions at the LHC for $\sqrt{(}s)$ = 2.76 TeV relative to p-p collisions of similar energy. These studies focus on jets with transverse momentum > 85 GeV/c. Detailed investigation of lower momentum jet fragmentation functions may complement these studies by providing more information on energy loss (and thereby more carefully constrain QGP properties). The main difficulty in studying low momentum jets in heavy ion collisions is the presence of a significant uncorrelated background of low momentum hadrons from soft processes which get grouped together with particles from the hard scattering. One way to deal with this background from soft processes is to use the jet-hadron azimuthal correlation to fit and subtract the soft, flow correlated background information from the jet (on the average). This technique allows one to measure the near side yield in the correlation function after background subtraction for a large number of events binned in jet transverse momentum (p_T) and hadron transverse momentum. From these yields binned in p_T, one can then construct an uncorrected fragmentation function. We discuss the specifics of this proposed method of measuring the fragmentation function including corrections for detector effects. We present the results of a Monte Carlo study using Pythia and a custom made Heavy Ion Background Generator (along with mocked up detector effects) that demonstrate the feasibility of this method.

Collaboration (if applicable)

Track

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