Contribution ID: **696** Type: **Poster**

Interplay of partonic collectivity and energy loss in understanding the Nuclear Modification factors

Nuclear modification factors (R_{AA} or R_{CP}) of charged hadrons and identified particles for heavy-ion collisions at RHIC and LHC have been used to quantitatively study the interplay of the partonic collectivity and hadronic suppression. The outward pressure of strongly interacting partonic medium in the early stage of the collision creates radial boost, which is the key factor for Cronin-like peak structures. The structure could be understood and unified in terms of ratio of particle species and their mass dependence at a particular collision energy. The response of the medium in the high p_T region is same for all charged particle species at a given collision energy, but the suppression increases with increasing energy.

The primary goal of the present work is to understand the underlying physics and disentangle the major factors contributing to the shape of the nuclear modification factors. A new observable, Integrated Suppression Fraction (ISF) defined as the normalized area of the R_{AA} structures within a given p_T window, has been introduced. ISF for an intermediate p_T window plotted as a function of collision energy shows an increasing trend for RHIC energies with saturation at LHC energies. This provides a prediction for (R_{AA}) for the upcoming $Pb-Pb$ run for $\sqrt{s_{\mathrm{NN}}} = 5.02$ TeV. A detailed study of the ISF provides a novel method to understand the role of collectivity and energy loss at these energies. Results for ISF from the avalable experimental data will be presented and compared to the expected energy loss properties from various theoretical models and event generators from different approaches, such as EPOS, Therminator as hydro-like collective models and also microscopic transport models like UrQMD and AMPT.

Preferred Track

Jets and High pT Hadrons

Collaboration

Not applicable

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Session Classification: Poster Session