Contribution ID: **93** Type: **Poster**

A generalized approach to study low as well as high pT regime of transverse momentum spectra

Thursday, 30 July 2020 13:30 (3 minutes)

Studying the QCD matter produced under extreme condition of temperature and density called Quark Gluon Plasma (QGP) is among the important goal of heavy-ion collision experiments. QGP is a state where quarks and gluons are free to move inside a nuclear volume rather than only in nucleonic volume. Transition from hadronic state to QGP occur at the phase boundary where the critical temperature (T_c) is sufficient enough to support the formation of QGP droplet. Search for T_c and the type of phase transition is being explored in the experiments by scanning the QCD phase diagram. In order to get the information of temperature, we utilize the transverse momentum spectra (p_T) of final state particles that are free streaming to the detectors.

Due to the asymptotic freedom and the very nature of QCD coupling constant, the coupling strength is very strong at low p_T values and hence we cannot apply perturbative theories to study the p_T-spectra in this regime. To tackle this issue, we resort to the phenomenological approach with most accepted being the statistical thermodynamical models. However, we have a well established perturbative QCD based power-law form of the distribution function to explain the spectra in high p_T regime which is dominated by the particles produced in hard scattering processes.

In this presentation, we will discuss a unified formalism to explain the spectra including both low as well as high p_T regime. We will present in detail the formalism along with the results obtained using this generalized model with the p_T spectra of charged hadrons produced in Pb$-$Pb collision at different centralities $\&$ centre of mass energies. We will also discuss how this generalized model can be used to get the information about the elliptic flow coefficient directly from the transverse momentum spectra.

Secondary track (number)

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Session Classification: Heavy Ions - Posters

Track Classification: 07. Heavy Ions