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Transverse mass scaling of identified hadrons in pp collisions at RHIC and LHC

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The phase transition predicted by Quantum Chromodyamics (QCD) from ordinary matter to a deconfined Quark−Gluon Plasma (QGP) is being studied in high−energy heavy−ion (AA) collisions at different experiments. The identified hadron spectra provide insight into the particle production mechanism and interaction in the hadronic and QGP phases. Measurements in smaller collision systems such as proton-proton (pp) and proton−nucleus (pA) constitute a fundamental reference for the interpretation of the heavy−ion results. Understanding the mechanism of particle production in elementary pp collisions is one of the major goals of the experiments at the Relativistic Heavy Ion Collider (RHIC) and the Large Hadron Collider (LHC). The production of particles in pp collisions can be roughly categorised into two dominating mechanisms, soft and hard processes. The soft, thermal−like processes populate the low momentum part of the particle spectra and is called underlying event whereas the high momentum region is dominated by hard processes described by fragmentation. In this scenario, an exponential function is used to describe the low part of the transverse momentum (p_T) spectrum while a power−law is used for the high p_T. We will present a systematic study of m_T and $m_T - m_0$ spectra of mesons and baryons at RHIC and LHC energies. The m_T scaling of hadron production in pp collisions at LHC energies seems to hold at lower m_T and breaks down at higher m_T showing a difference in the shape of the m_T spectrum between baryons and mesons which was first observed at RHIC. In order to understand the underlying physics mechanism, a Monte Carlo study has been done using the PYTHIA event generator with two different fragmentation scheme, the string fragmentation (SF) and independent fragmentation (IF). The simulation results demonstrate that this difference exists in both SF and IF scheme. We will also show that the shape of $m_T - m_0$ spectra for pions is different from other hadrons at RHIC and LHC energies. From the PYTHIA simulation it is observed that this difference is due to the contamination of pions from the resonance decay.

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