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Hadron production at centre of mass energies 62.4, 200 and 2760 GeV , RHIC and LHC energies through recombination model

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We use the Recombination Model to explain the hadron production data at center of mass energies 62.4, 200 and 2760 GeV at LHC and RHIC. The Recombination model considers the effective valence quark energy and momentum without taking the sea quarks and gluons explicitly into account. This model has been quite successful in explaining the larger-than-expected baryon-to-meson ratio and the leading particle effect in heavy ion collision experiments. This model also provides a general framework to describe the whole momentum spectrum of the matter created in such experiments, without any restriction to the high or low transverse momenta regime for p_T<20 GeV/c. In this model, the hadron yield is a convolution of the probability of finding the valence quarks with the specific momenta and the probability of recombination of the quarks to produce the hadron. The sources of the recombining quarks can be classified as either of thermal (having transverse momenta < 3 GeV/c) origin or of shower origin (having transverse momenta > 3 GeV/c). We propose the expressions for the probability of recombination of the quarks into produced hadrons with the help of energy-momentum conservation laws. We consider the effect of the confinement of valence quarks inside the hadrons explicitly. For low transverse momentum, we use a thermal distribution of the recombining quarks, and for high transverse momentum, we take the momentum distribution from the fragmentation functions obtained in previous works. Using this formalism, we were able to explain the meson production at low transverse momentum (p_T < 3 GeV/c) satisfactorily for the first time. We also present an empirical formula for the dependence of the hadron yield on the center of mass energy and the number of participants in the collision. We were also able to reproduce the low and intermediate transverse momentum spectra (0 < p_T < 8 GeV/c) of the hadrons satisfactorily.

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