Dynamics of particle production in relativistic nuclear collisions

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How is entropy produced and energy deposited at the earliest instants of a collision of two nuclei at high energy? We will consider two models, the classical field [1] and pQCD+saturation [2] models, both shown to describe the multiplicity data well at central rapidity at RHIC energies. Qualitative difference between the models arises in the rapidity distribution dN/dy: In the pQCD+saturation model, where a collinearly factorized formalism based on two-to-two (semi)hard parton scattering is used, one finds a broad y-distribution [3]. This signals the existence of a plateau near midrapidity in the measured dN/dy as well. The existing classical field calculations, being equivalent to BFKL-type two-to-one scattering, imply spectra exponentially suppressed away from $y = 0$ [4]. In addition to the consequences the different types of kinematics have on the initial spectra, we will discuss how the evolution affects the observed spectra. The models are, however, flexible enough so that they can most likely always be tuned to fit the data on multiplicity. Therefore, we will discuss how the models, after calibration with multiplicity data, describe the second important and experimentally easily accessible quantity: the total transverse energy at central rapidity.

References

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