Models for RHIC and LHC: New Developments

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Abstract

We outline inconsistencies in presently used models for high energy nuclear scattering, which make their application quite unreliable. Many "successes" are essentially based on an artificial freedom of parameters, which does not exist when the models are constructed properly.

The problem is the fact that any multiple scattering theory requires an appropriate treatment of the energy sharing between the individual interactions, which is technically very difficult to implement. Lacking a satisfying solution to this problem, it has been simply ignored.

We introduce a fully self-consistent formulation of the multiple-scattering scheme. A major achievement is the development of new computational techniques which allow for the first time a satisfactory solution of the problem in the sense that calculations of observable quantities can be done strictly within a self-consistent formalism. Inclusion of soft and hard components – very crucial at high energies – appears in a "natural way", providing a smooth transition from soft to hard physics.

We can show that the effect of appropriately considering energy conservation has a big influence on the results, and MUST therefore be included in any serious calculation.