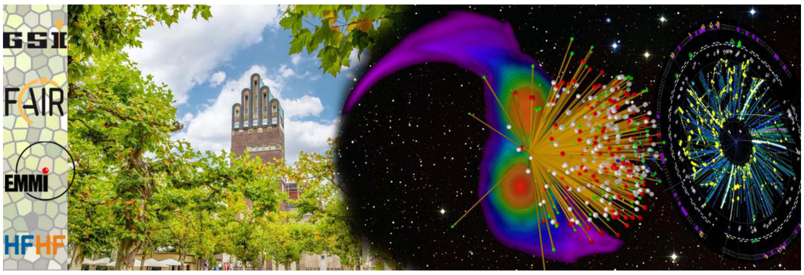

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Transport Model Evaluation Project (TMEP): Status and Future Directions

Tuesday, September 19, 2023 8:30 AM (25 minutes)

Transport models are indispensable in order to obtain information on the nuclear equation-of-state and in-medium properties of nucleons from heavy-ion collisions generally, and, in particular, in the hadronic intermediate-energy regime to constrain such quantities as the density dependence of the symmetry energy, since they are able to take into account the non-equilibrium features of such processes. Because of the complexity of the underlying equations, they are commonly solved by simulations, which involve choices of strategies, which are not always determined by theory. In the past this has led to conflicting results derived from the same experimental data. It is thus important to assess und possibly reduce the uncertainty of transport model studies, which is the idea behind the TMEP.
In the past years we have performed a number of comparative studies of transport simulations with controlled input of physical models both for full heavy-ion collisions and in boxes with periodic boundary conditions approximating nuclear matter conditions. The present result of these studies is on one hand, that considerable differences are seen between the results of different codes, and, on the other hand, that these differences can be traced back to particular strategies of the codes. In some cases we can recommend optimal strategies, others touch basic questions of non-equilibrium physics, such as the amount and treatment of fluctuations.
This contribution will also discuss suggestions for future directions of these studies. As the present comparisons have mostly involved rather simple physical models, one needs to obtain information on the influence of important ingredients for realistic descriptions of HICs, as e.g. momentum-dependent interactions, clustering, and short-range correlations. Secondly, one should study the sensitivity of transport model studies to the physical model, which should be greater than the uncertainty of the predictions. And finally, in order to quantify the uncertainty, it is important that a viable simulation describes not only some rare probes, but also a range of observables which correspond to the degrees of freedom, that dominate the reaction dynamics.

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