A Hamiltonian molecular dynamics model for use in event generators for relativistic nucleus-nucleus interactions

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Simulation of the nuclear reactions induced by heavy ions impinging on material represents a long-standing difficulty for calculations associated with radiation exposure in the space environment. The chief difficulties in describing these interactions are the simultaneous inclusion of quantization with special relativity, and the retention of covariant spatial distributions throughout. Towards this end we follow a variant of the so-called “Quantum Molecular Dynamics” approach, wherein the system is cast in the quasi-phase-space of Wigner densities and evaluated in this case according to the point-like form of Dirac’s generalized Hamiltonian. In this way we realize a description of system interaction in which the effects of special relativity are implicit and angular distribution of final states is a natural result of the simulation without nullifying the quantum-mechanical nature. We present a description of the model and preliminary results.