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Phase transitions and transport in dense nuclear matter from relativistic density functional theory[1] AGNIESZKA WERGIELUK, University of California, Los Angeles, VOLKER KOCH, Lawrence Berkeley National Laboratory — The equation of state of dense nuclear matter, while central in simulations of QCD systems under extreme conditions, is currently inaccessible to first principles calculations. Using relativistic density functional theory, we model the thermodynamics and single-particle equations of motion of nuclear matter over a broad range of temperatures and densities encompassing nuclei, neutron stars, neutron star mergers, and relativistic heavy ion collisions. We obtain a flexible and thermodynamically consistent framework to parameterize the known properties of ordinary nuclear matter and postulate a family of equations of state compatible with the QCD phase transition. Eventually, these equations of state will be constrained by comparison with experimental data. As a first step, we implement the corresponding relativistically covariant single-particle equations of motion within a hadronic transport model and investigate the behavior of dense nuclear matter close to the phase transition.

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Agnieszka Wergieluk
University of California, Los Angeles

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