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On deterministic numerical methods for the quantum Boltzmann-Nordheim equation

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Spectral methods, thanks to their high accuracy and the possibility to use fast algorithms, represent an effective way to approximate the collisional kinetic equations of Boltzmann type, such as the Boltzmann-Nordheim equation. This equation, modeled on the seminal Boltzmann equation, describes using a statistical physics formalism the time evolution of a gas composed of bosons or fermions. Using the spectral-Galerkin algorithm introduced in [FHJ12], together with some novel parallelization techniques, we investigate some of the conjectured properties of the large time behavior of the solutions to this equation. In particular, we are able to observe numerically both Bose-Einstein condensation and Fermi-Dirac relaxation.
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