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Fluctuation Approach to Many-Body Quantum Dynamics ERIK SCHROEDTER, JAN-PHILIP JOOST, MICHAEL BONITZ, Kiel University —
The dynamics of quantum many-body systems following external excitation is of great interest in many areas such as dense plasmas or correlated solids. At present, only the formalism of nonequilibrium Green functions (NEGF) can rigorously describe such processes in more than one dimension. However, NEGF simulations are computationally expensive, among other things, due to their cubic scaling with simulation time T. Only recently, linear scaling with T could be achieved within the G1-G2 scheme[1] which could be demonstrated for advanced selfenergies[2]. To further improve the quality of the description and to include three-particle correlations, here a new approach to the NEGF formalism is presented. Instead of a hierarchy for the N-particle Green functions, we consider an approach that is based on fluctuations. While the resulting equations are fully equivalent to the G1-G2 scheme, the new approach has interesting complementary features such as the capability to simulate many-body effects using stochastic methods[3].

[1]N. Schlünzen *et al.*, *Phys. Rev. Lett.* **124**, 076601 (2020)
[2]J.-P. Joost *et al.*, Phys. Rev. B **101**, 245101 (2020)
[3]D. Lacroix *et al.*, Phys. Rev. B **90**, 125112 (2014)

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