Comparison Between Different Formalisms for the Effective Description of Interacting Dissipative Systems

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Over the last decades nonlinearities have gained increasing interest in chemistry and physics, particularly in the study of systems with nonlinear, chaotic and dissipative dynamics. Nonlinearities are also discussed in quantum mechanics as a possible generalization to incorporate irreversibility and dissipation as they occur in chemical reactions where energy is transferred between reactands and their environment. Recently, we have shown that a logarithmic nonlinear Schrödinger equation (NLSE) for the effective description of dissipative systems, derived from an irreversible Fokker-Planck Equation (FPE), can be linearized via non-unitary transformations. A similar NLSE, derived by Goldin and Doebner also on the basis of a FPE, can be linearized by nonlinear gauge transformations, formally leading to the same linear (explicitly time-dependent) SE. Similarities and differences of the linearization methods, as well as of the physical meaning of both approaches, will be discussed.