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Real-time functional renormalization group for critical dynamics

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Real-time quantities such as spectral functions and transport coefficients can serve to examine the real-time evolution of a system close to equilibrium, as they encode the possible excitations in the medium and show universal static and dynamic scaling behaviour near a critical point. The functional renormalization group (FRG) formulated on the Schwinger-Keldysh closed-time path provides an excellent calculational tool for such real-time correlations. In this talk I will present a novel approach for the systematic construction of causal regulators for the FRG, which comply with the analytic structure of the propagators, and demonstrate that they can be interpreted as a coupling to a fictitious external heat bath with FRG scale dependent spectral distribution. As particular applications I will discuss the relaxational Models A, B and C according to the classification scheme by Halperin and Hohenberg, and show how they can be implemented in the real-time FRG. With this setup I will then present results which demonstrate the generation of dynamic scaling behaviour in spectral functions obtained from one and two-loop self-consistent truncation schemes. Our results for the different dynamic critical exponents z in both d=2 and 3 spatial dimensions compare favorably with existing results from the literature.

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