High-frequency asymptotics of the local vertex function and its algorithmic implementation in the functional renormalization group

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Local vertex functions are a crucial ingredient of several forefront many-body algorithms in condensed matter physics. However, the full treatment of their frequency dependence poses a huge limitation to the numerical performance. A significant advancement requires an efficient treatment of the high-frequency asymptotic behavior of the vertex functions.

We will use the functional renormalization group (fRG) method and its recently developed combination with the dynamical mean-field theory (DMFT), the DMF^2RG, to illustrate the importance of a correct treatment of the vertex function. We will then provide a detailed diagrammatic analysis of the high-frequency structures and their physical interpretation. Based on these insights, we propose a frequency parametrization, which captures the whole high-frequency asymptotics for arbitrary values of the local Coulomb interaction and electronic density.