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Efficient implementation of the parquet equations - role of the reducible vertex function and its kernel approximation[1] GANG LI, NILS WENTZELL, PETRA PUDLEINER, PATRIK THUNSTRÖM, KARSTEN HELD, Vienna University of Technology — We present an efficient implementation of the parquet formalism which respects the asymptotic structure of the vertex functions at both single- and two-particle levels in momentum- and frequency-space. We identify the two-particle reducible vertex as the core function which is essential for the construction of the other vertex functions. This observation stimulates us to consider a two-level parameter-reduction for this function to simplify the solution of the parquet equations. The resulting functions, which depend on fewer arguments, are coined "kernel functions". With the use of the "kernel functions", the open boundary of various vertex functions in the Matsubara-frequency space can be faithfully satisfied. We justify our implementation by accurately reproducing the dynamical mean-field theory results from momentum-independent parquet calculations. The high-frequency asymptotics of the single-particle self-energy and the two-particle vertex are correctly reproduced, which turns out to be essential for the self-consistent determination of the parquet solutions. The current implementation is also feasible for the dynamical vertex approximation.

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Gang Li
Vienna University of Technology

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