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Summing parquet diagrams via the functional renormalization group: x-ray problem revisited[1] PETER KOPIETZ, ANAND SHARMA, PHILIPP LANGE, CASPER DRUKIER, Goethe Universität Frankfurt, Germany
— We present a simple and efficient method for summing so-called parquet diagrams of fermionic many-body systems with competing instabilities using the functional renormalization group. Our method is based on partial bosonization of the interaction using multi-channel Hubbard-Stratonovich transformations. A straightforward truncation of the resulting renormalization group flow retaining only the frequency-independent parts of the two-point and three-point functions amounts to solving coupled Bethe-Salpeter equations for the effective interaction to leading logarithmic order. We apply our method to the x-ray problem and derive the singular frequency dependence of the x-ray response function and the particle-particle susceptibility. Our method can be applied to various other problems involving strong fluctuations in more than one scattering channel.

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