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Excitation spectrum of two-dimensional cold fermionic gases in the dilute limit C. BERTHOD, C. KOLLATH, T. GIAMARCHI, University of Geneva, Switzerland, M. FELD, B. FRÖHLICH, M. KOSCHORRECK, E. VOGT, M. KÖHL, University of Cambridge, United Kingdom — Two-dimensional gases of fermionic atoms have been recently realized, and cooled down to temperatures a few tenths of the Fermi temperature. Such ultracold atom systems are ideal tools to investigate the fundamental properties of Fermi ensembles subject to short-range interactions. One of the key questions is whether the interaction changes the ground state and excitation spectrum in a non-perturbative way, or whether the weak-coupling perturbation theory and Fermi-liquid idea remain valid in two dimensions. In contrast to condensed-matter systems, in atomic gases the perturbation theory must be carried out at finite temperature and far from the Fermi surface for a meaningful comparison with experiment. We have calculated the electronic self-energy of dilute two-dimensional Fermi gases at arbitrary temperature and momentum, using the ladder approximation. This scheme is expected to become exact (in a perturbative sense) in the low-density limit. For short-range attractive interaction, we study the evolution of the excitation spectrum as a function of temperature and interaction strength, and we compare our results with recent experiments.

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