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Exact Ground-state Properties of Atomic Fermi Gases in Two Dimensions[1] HAO SHI, SIMONE CHIESA, SHIWEI ZHANG, William & Mary Coll — Experimental realization of the interacting Fermi gas in three dimensions and the precise comparisons it has allowed with theory and computation have lead to rapid advances in the study of strongly paired fermions. Two-dimensional systems are being realized and offer many new opportunities. We perform exact calculations on the two-dimensional strongly interacting, unpolarized Fermi gas with a zero-range attractive interaction. A new auxiliary-field approach is used which is exact and accelerates the sampling of imaginary-time paths by a force bias technique. The method allows calculations with long imaginary-time and large lattice sizes. We present the calculated equation of state, the contact parameter, the condensate fraction, and the pairing correlation function. The structure of the pairing wave function is determined as a function of $k_F a$, we will also discuss the effect of spin-orbit coupling.

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