SEMINAR

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Abstract

"Quantum Monte Carlo study of a resonant Bose-Fermi mixture."
We study resonant Bose-Fermi mixtures at zero temperature, with different relative concentrations of the bosons. We use for the first time a Quantum Monte Carlo method with Fixed-Node approximation, to explore the system from the weak to the strong coupling limit. A repulsive interaction among bosons is introduced to provide stability to the bosonic component. Beyond the unitarity limit, the resonant attractive interaction supports a bound fermionic dimer. At the many-body level, increasing the boson-fermion coupling the system undergoes a quantum phase transition from a state with condensed polaronic bosons immersed in a Fermi sea, to a normal Fermi-Fermi mixture of the composite fermions and the bare fermions in excess. We obtain the equation of state and we characterize the momentum distributions both in the weakly and in the strongly interacting limits, finding interesting signatures of the different many-body ground states. We compare Quantum Monte Carlo results to T-matrix calculations and we draw a preliminary phase diagram as a function of the Bose-Fermi scattering length and the concentration of the bosons.