

## Bose-Fermi mixtures with pairing

A. Guidini,<sup>1</sup> G. Bertaina<sup>2</sup>, D. Galli<sup>2</sup>, and P. Pieri<sup>1</sup>

<sup>1</sup>*School of Science and Technology, Physics Division, University of Camerino, Via Madonna delle Carceri 9, I-62032, Camerino, Italy*

<sup>2</sup>*Dipartimento di Fisica, Università degli Studi di Milano, Via Celoria 16, I-20133 Milano, Italy*

I will review recent work by us on the properties of Bose-Fermi mixtures with a tunable pairing interaction between bosons and fermions. A many-body diagrammatic approach, able to describe the condensed phase of a Bose-Fermi mixture from weak to strong boson-fermion couplings, will be presented [1]. This approach will be validated by comparing it with previous [2] and new dedicated fixed-node diffusion Monte Carlo calculations. By using both methods, a universal behavior of the condensate fraction and bosonic momentum distribution with respect to the boson concentration is found in an extended range of boson-fermion couplings and concentrations. For vanishing boson density, the bosonic condensate fraction reduces to the quasiparticle weight  $Z$  of the Fermi polaron studied in the context of polarized Fermi gases, unifying in this way two apparently unrelated quantities. Finally, I will discuss an interesting effect occurring in the molecular limit of the boson-fermion coupling, where the condensation is completely suppressed [3]. This phenomenon is an indirect effect on bosons of the Pauli exclusion principle acting on fermions, and is the counterpart in Bose-Fermi mixtures of the so called “Sarma phase” discussed for polarized Fermi gases.

pierbiagio.pieri@unicam.it

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[3] A. Guidini, G. Bertaina, E. Fratini, and P. Pieri, Phys. Rev. A **89**, 023634 (2014).