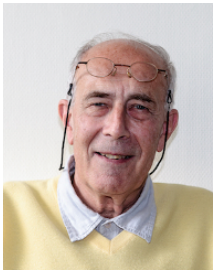

ID de Contribution: **169** Type: **Talk**

Josephson effect at finite temperature throughout the BCS-BEC crossover with the inclusion of pairing fluctuations

jeudi 23 mars 2023 09:15 (30 minutes)

The BCS-BEC crossover is a research topic common to ultra-cold Fermi gases and the nuclear matter [1]. It represents a useful tool for testing fundamental theories such as the connection between superconductivity and fermionic superfluidity. At zero temperature, a reasonable description of this crossover can be obtained by a mean-field approach. In fact, this approximation provides accurate enough results even at finite temperature provided that the Cooper pair size is much larger than the average inter-particle distance (weak inter-particle interaction). However, a mean-field approach fails when the Cooper pair size is comparable or even smaller than the average-interparticle distance (strong-interparticle interaction). In this case it is necessary to include pairing fluctuations beyond mean-field to obtain reliable results [2]. In the present work, we include pairing fluctuations over and above mean-field in the LPDA (Local Phase Density Approximation) equation, which is a coarse-grained version of the Bogoliubov-de Gennes equations. The LPDA equation is a (highly) non-linear differential equation for the gap parameter, which allows one to study inhomogeneous superfluid systems with a considerably reduced computational time and memory space with respect to the original Bogoliubov-de Gennes equations [3]. In particular, in the present work we address the Josephson effect using a modified (mLPDA) version of the LPDA equation which includes pairing fluctuations on top of the original equation. We show that the outcomes of our numerical simulations for the coupling and temperature dependence on the critical current favorably compare to recent experimental results obtained at LENS with ultra-cold Fermi gases [4,5].

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