

Probing the BCS-BEC crossover with persistent currents

Presenting Giovanni Pecci

Piero Naldesi¹,
Luigi Amico,^{2, 3, 4, 5}
Anna Minguzzi¹

1.Univ. Grenoble Alpes, CNRS, LPMCM, 38000 Grenoble, France

2.Quantum Research Centre, Technology Innovation Institute, Abu Dhabi, UAE

3.CNR-IMM & INFN-Sezione di Catania, Via S. Sofia 64, 95127 Catania, Italy

4.Centre for Quantum Technologies, National University of Singapore, 3 Science Drive 2, Singapore 117543, Singapore

5.LANEF Chaire d'excellence, Univ. Grenoble-Alpes & CNRS, F-38000 Grenoble, France

Abstract:

We study the persistent currents of an attractive Fermi gas confined in a tightly-confining ring trap and subjected to an artificial gauge field all through the BCS-BEC crossover. At weak attractions, on the BCS side, fermions display a parity effect in the persistent currents, ie their response to the gauge field is paramagnetic or diamagnetic depending on the number of pairs on the ring. At resonance and on the BEC side of the crossover we find a doubling of the periodicity of the ground-state energy as a function of the artificial gauge field and disappearance of the parity effect, indicating that persistent currents can be used to infer the formation of tightly-bound bosonic pairs. Our predictions can be accessed in ultracold atoms experiments through noise interferograms.

REFERENCES

[1] G. C. Strinati, P. Pieri, G. Röpke et al., Phys. Rep. 738, 1 (2018)

[2] A. Leggett, in Granular Nanoelectronics (NATO ASI Ser. B,251 Plenum, New York, 1991) p. 297.

[3] J. Fuchs, A. Recati, and W. Zwerger, Phys. Rev. Lett. 93, 090408 (2004).

FIGURES

