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Two-dimensional Fermi gases

MICHAEL KOEHL, University of Cambridge

Pairing of fermions is ubiquitous in nature and it is responsible for a large variety of fascinating phenomena like superconductivity, superfluidity of 3He, the anomalous rotation of neutron stars, and the BEC-BCS crossover in strongly interacting Fermi gases. When confined to two dimensions, interacting many-body systems bear even more subtle effects, many of which lack understanding at a fundamental level. Most striking is the, yet unexplained, effect of high-temperature superconductivity in cuprates, which is intimately related to the two-dimensional geometry of the crystal structure. In particular, the question how many-body pairing is established at high temperature and whether it precedes superconductivity are crucial questions to be answered. We will report on recent experiments of pairing in a two-dimensional atomic Fermi gas in the regime of strong coupling. We perform angle-resolved photoemission spectroscopy to measure the spectral function of the gas and we observe a many-body pairing gap even above the predicted superfluid transition temperature.