高研20周年
系列学术活动

清华大学高等研究院
科学馆104室

冷原子物理新进展系列报告 之一

June 28, 2017

2:00-3:00pm

俞振华 (中山大学)

Title: Universal Three-body Bound States in Mixed Dimensions beyond the Efimov Paradigm

Abstract

The Efimov effect was first predicted for three particles interacting at an s-wave resonance in three dimensions. Subsequent study showed that the same effect can be realized by considering two-body and three-body interactions in mixed dimensions. We consider the three-body problem of two bosonic A-atoms interacting with another single B-atom in mixed dimensions. We find that under certain circumstances, there emerge universal three-body bound states in mixed dimensions beyond the Efimov paradigm. We discuss how our mixed dimensional systems can be realized in current cold atom experiment and how the effects of these universal three-body bound states can be detected.

4:00-5:00pm

胡辉 (Swinburne University of Technology)

Title: Route to Observing Fulde-Ferrell Superfluids via a Dark-State Control of Feshbach Resonances

Abstract

We propose that the long-sought Fulde-Ferrell superfluidity with nonzero momentum pairing can be realized in ultracold two-component Fermi gases of K-40 or Li-6 atoms, by optically tuning their magnetic Feshbach resonances via the creation of a closed-channel dark state with a Doppler-shifted Stark effect. In this scheme, two counter-propagating optical fields are applied to couple two molecular states in the closed channel to an excited molecular state, leading to a significant violation of Galilean invariance in the dark-state regime and hence to the possibility of Fulde-Ferrell superfluids. We develop a field theoretical formulation for both two-body and many-body problems and predict that the Fulde-Ferrell state has remarkable properties, such as anisotropic single-particle dispersion relation, suppressed superfluid density at zero temperature, anisotropic sound velocity and rotonic collective mode. The latter two features can be experimentally probed using Bragg spectroscopy, providing a smoking gun proof of Fulde-Ferrell superfluidity.

Reference

1. L. He et al., arXiv:1705.04830.

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