武汉物数所理论交叉学术交流系列报告

(第一三一期)

Impurity in a Bose-Einstein Condensate and the Efimov effect

Jesper Levinsen

Monash University, Melbourne, Australia

2015年11月09日(周一) 上午10:30-11:30

频标楼4楼报告厅

About the Speaker:

Jesper Levinsen is a senior research fellow of Monash University at Australia. He is a very young and talented theoretical researcher. He gratulated with PhD degree from the University of Colorado at Boulder, USA. He has received several internationally competing fellowships including Marie-Curie Intra European Fellow and Carlsberg Foundation Fellowship, University of Cambridge, etc. He has published more than 7 PRLs in recent years. Current research interest: strongly interacting quantum systems on the interface between condensed matter physics and the physics of ultracold atomic gases. He works on aspects of superfluidity, impurities in degenerate quantum gases, few-body physics, and low-dimensional systems.

Abstract:

We investigate the zero-temperature properties of an impurity particle interacting with a Bose-Einstein condensate (BEC), using a variational wavefunction that includes up to two Bogoliubov excitations of the BEC. This allows one to capture three-body Efimov physics, as well as to recover the first non-trivial terms in the weak-coupling expansion. We show that the energy and quasiparticle residue of the dressed impurity (polaron) are significantly lowered by three-body correlations, even for weak interactions where there is no Efimov trimer state in a vacuum. For increasing attraction between the impurity and the BEC, we observe a smooth crossover from atom to Efimov trimer, with a superposition of states near the Efimov resonance. We furthermore demonstrate that three-body loss does not prohibit the experimental observation of these effects. Our results thus suggest a route to realizing Efimov physics in a stable quantum many-body system for the first time. (Phys. Rev. Lett. 115, 125302 (2015), Phys. Rev. Lett. 115, 115, 160401 (2015))

主办单位:武汉物数所理论与交叉研究部