
Seminar

Probing few-body physics using ultra-cold quantum gases: Universality of the Three-Body Efimov Parameter

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Physics governing few-body bound states has attracted the attention of physicists for a long time. In 1970, Vitaly Efimov predicted an infinite series of trimer states with universal geometric scaling for a system of three identical bosons with resonant two-body interaction. Counterintuitively, these trimer states can exist even in the absence of corresponding two-body bound states. This exotic phenomena predicted for a variety of systems ranging from nuclear to atomic and molecular physics eluded observation for 36 years till it was observed in ultra-cold Cs atoms and thereafter for a variety of atomic species.

In this seminar, I will talk about our experiment on few-body physics with ultra-cold atoms where we have demonstrated for the first time the universality of the three-body Efimov parameter, the critical scattering length for the appearance of the first trimer state, for narrow Feshbach resonances. We took measurements for both intermediate and narrow resonances, where the three-body parameter was predicted to be non-universal. In contrast, our observed ratio of the three-body parameter with the van der Waals radius is the same universal ratio as for broader resonances. The universality of the three-body parameter suggests that few-body phenomena in a wide range of physical systems with varying length and energy scales can be understood well using ultra-cold atomic systems.

Thursday, Dec 18th 2014

11:30 AM (Tea/Coffee at 11:15 AM)

Seminar Hall, TCIS