

DAMOP15-2015-000249

Abstract for an Invited Paper
for the DAMOP15 Meeting of
the American Physical Society

Boson droplets without and with an impurity: The large two-body s-wave scattering length limit¹

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Universal behavior in ultracold atomic systems emerges when the magnitude of the s-wave scattering length is much larger than the other length scales of the underlying two-body potentials. For example, in the large scattering length regime, three identical bosons at zero temperature exhibit the Efimov effect. This talk discusses extensions of the Efimov scenario to more than three particles. Two different systems are considered: First, the properties of N identical bosons interacting through finite- and zero-range two-body potentials are discussed. The dependence of the N -boson energy and structural properties on the interaction model and, where appropriate, the regularization scheme in the three-body sector is investigated. Second, motivated by recent experimental investigations of Cs-Cs-Li Efimov resonances, the few-body properties of $N-1$ non-interacting identical heavy bosons, which interact with a light impurity through a large s-wave scattering length, are investigated. For Cs-Cs-Cs-Li, the existence of two four-body states, which are universally linked to the energy of the n -th Cs-Cs-Li Efimov trimer, is predicted.

¹Supported by the NSF.