Finite Size Effects in LHY Droplets

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Quantum droplets, stabilized by the Lee-Huang-Yang corrections, are governed by nonlinear interaction of dimension-dependent power that differs from the mean-field interaction of Bose-Einstein condensates. In this paper we investigate the superfluid properties of the quantum droplets by simulating the emergence of a scissor mode in a three-dimensional quantum droplet in a deformed harmonic oscillator after a rotational quench. We focus on the number of atoms dependence of the mode frequency and compare it with Bose-Einstein condensates and the analytical expression in the thermodynamic limit. We show that the finite size effects are defined by the interaction exponent and characterize this dependence. Finally, we demonstrate that the scissors mode frequency remains clearly identifiable even under strong quenches, which should facilitate the experimental observation of our findings.

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