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Manifestations of dipolar collisions in thermal and BEC gases of dysprosium YIJUN TANG, Stanford University, ANDREW SYKES, LPTMS, CNRS, Univ.Paris Sud, Université Paris-Saclay, NATHANIEL BURDICK, Stanford University, DMITRY S. PETROV, LPTMS, CNRS, Univ.Paris Sud, Université Paris-Saclay, BENJAMIN LEV, Stanford University — Ultracold and quantum gases of dysprosium provide the opportunity to explore the physics of strongly dipolar gases. In this talk, we report on two recent experiments that highlight this physics. The first is a direct measurement of collisions between two Bose-Einstein condensates with strong dipolar interactions. A collision halo corresponding to the two-body differential scattering cross section is observed. The results demonstrate a novel regime of quantum scattering, relevant to dipolar interactions, in which a large number of angular momentum states become coupled during the collision. We perform Monte-Carlo simulations to provide a detailed comparison between theoretical two-body cross sections and the experimental observations. The second is a measurement of the anisotropic expansion of ultracold bosonic dysprosium gases at temperatures above quantum degeneracy. We develop a theory to express the post-expansion aspect ratio in terms of temperature and microscopic collisional properties by incorporating Hartree-Fock mean-field interactions, hydrodynamic effects, and Bose-enhancement factors. Our results extend the utility of expansion imaging by providing accurate thermometry for dipolar thermal Bose gases.

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