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Manifestations of the roton mode in dipolar Bose-Einstein condensates RYAN WILSON, SHAI RONEN, JILA and Department of Physics, University of Colorado, Boulder, Colorado 80309-0440, USA, HAN PU, Department of Physics and Astronomy, and Rice Quantum Institute, Rice University, Houston, Texas 77251-1892, USA, JOHN BOHN, JILA and Department of Physics, University of Colorado, Boulder, Colorado 80309-0440, USA — We investigate the structure of harmonically trapped Bose-Einstein condensates (BECs) with long-range anisotropic dipolar interactions. We find that even a small perturbation in the trapping potential can lead to dramatic changes in the condensate’s density profile for sufficiently large dipolar interaction strengths and trap aspect ratios. By employing a generalized perturbation theory, we relate these oscillations to a previously-identified “roton-like” mode that is believed to exist in dipolar BECs ¹. The same physics is responsible for radial density oscillations in vortex states of dipolar BECs that have been reported previously ².

¹ S. Ronen, D. C. E. Bortolotti, and J. L. Bohn, Phys. Rev. A **74**, 013623 (2006).

² S. Yi and H. Pu, Phys. Rev. A **73**, 061602(R) (2006).

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