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Structure and stability of a dipolar condensate with a singly quantized vortex RYAN WILSON, JOHN BOHN, SHAI RONEN, JILA and Department of Physics, University of Colorado, Boulder, Colorado 80309-0440, USA — In this work, we investigate the structure and stability of singly quantized vortices in Bose-Einstein condensates with long-range dipolar interactions. Using an efficient numerical algorithm based on Hankel transforms, we solve the Gross-Pitaevskii equation by minimization of the GP Energy functional and compute the excitation spectrum by solving the Bogoliubov-De Gennes (BdG) equations. The BdG modes define a stability region for the dipolar condensates and reveal the nature of their instability. We find that condensates with singly quantized vortices in pancake traps with polarization along the trap axis become unstable due to an angular roton. The number of radial and angular nodes in this roton is found to be proportional to the condensate size. Additionally, we confirm the presence of radial ripples on the ground state structures of these condensates and indicate a well defined region in which they are stable.

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