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Stability Spectroscopy of Rotons in a Dipolar Bose Gas JOHN CORSON, JILA, NIST, and University of Colorado Boulder, RYAN WILSON, JQI, NIST, and University of Maryland, JOHN BOHN, JILA, NIST, and University of Colorado, Boulder — We study the stability of a quasi-one-dimensional dipolar Bose-Einstein condensate that is perturbed by a weak lattice potential along its axis. Our numerical simulations demonstrate that systems exhibiting a roton-maxon structure destabilize readily when the lattice wavelength equals either half the roton wavelength or a low roton subharmonic. We apply perturbation theory to the Gross-Pitaevskii and Bogoliubov de Gennes equations to illustrate the mechanisms behind the instability threshold. The features of our stability diagram are a novel signature of roton physics, and their experimental observation would constitute a direct measurement of the roton wavelength for quasi-one-dimensional geometries.

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