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Low-energy excitations of a Bose-Einstein condensate of rigid rotor molecules[1] JOSEPH SMITH, Western Washington University, EVAN JONES, SETH RITTENHOUSE, RYAN WILSON, US Naval Academy, BRANDON PEDEN, Western Washington University — We investigate the properties of the ground state and low-lying excitations of an oblate Bose-Einstein condensate composed of rigid rotor molecules in the presence of an external polarizing electric field. We build in a quantum model of molecular polarizability by including the full manifold of rotational states. The interplay between spatial and microscopic degrees of freedom via feedback between the molecular polarizability and inter-molecular dipole-dipole interactions leads to a rich quasi-particle spectrum. Under large applied fields, we reproduce the well-understood density-wave rotonization that appears in a fully polarized dipolar BEC, but under smaller applied fields, we predict the emergence of a spin wave instability and possible new stable ground state phases.

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