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Dipolar 2D and Quasi-2D Bosons with Non-zero Dipole Tilt Angle PENGTAO SHEN, KHANDKER QUADER, Department of Physics, Kent State University — We study properties of dipolar bosons both in the cases of 2D and quasi-2D (tightly confined in trap in a z-direction), with dipoles oriented at an angle to the direction perpendicular to the 2D plane. Starting from time-dependent Gross-Pitaevski equations, and the resulting Bogoliubov-de Gennes equations, we calculate the excitation spectrum of the Bose-Einstein condensate, and map out resulting phase diagrams as functions of tilt angle, interaction strength and density. In pure 2D, we find the development of maxon-roton behavior leading to roton instabilities at large densities for small tilt angles, and at low densities for large tilt angles. The behavior is anisotropic in k-space; accordingly the roton instabilities occur in the k_y direction, suggestive of inhomogeneity and stripe phase, with density mode becoming soft in the y direction. This is reflected in the behavior of our liquid structure function. We also find our calculated condensate depletion rates to vary appreciably with title angle. We compare our pure 2D and quasi-2D results, and discuss similarities and differences.

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