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Roton phenomena and stability properties of dipolar condensates[1] ALEKSEY FEDOROV, Russian Quantum Center, IGOR KURBAKOV, YURII LOZOVIK, Institute of Spectroscopy RAS — Experimental and theoretical studies of novel quantum phenomena in dipolar systems have a great impact for atomic physics. These systems provide an interface between physics of strongly and weakly correlated matter. Being typical for strongly correlated systems, the roton-maxon excitation spectrum, originally observed in superfluid helium, occurs to appear in a weakly interacting dipolar gases. In this contribution, two dipolar bosonic systems are under consideration: dipolar excitons in semiconductor layers of heterostructures and tilted dipolar particles in a quantum layer. In weak correlation regime, we predict a generation of the roton-maxon excitation spectrum for BEC of dipolar excitons in a semiconductor layer. We discuss observation of the roton-maxon spectrum for exciton BEC in GaAs heterostructures. We calculate the stability diagrams for 2D tilted bosonic dipolar particles in a quantum layer. Breaking of the rotational symmetry for a system of tilted dipoles leads to the convergence of the condensate depletion even up to the threshold of the roton instability, with mean-field approach being valid. We discuss observation of these effects in experiments with ultracold atoms and polar molecules.

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