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Explicit contribution of molecule radius in dynamical properties of dipolar BECs PAVEL ANDREEV, LEONID KUZMENKOV, M. V. Lomonosov Moscow State University, Moscow, Russia. — We make generalization of the mean-field theory of dipolar BECs to account finite size of molecules. We do this generalization in two steps. First we consider full potentials of dipole-dipole interactions, which are different for point-like electric and magnetic dipoles. We use it to show analytically different behavior of electric and magnetic dipolar BECs revealing change of the dipolar part of the Bogoliubov spectrum on 30-100 percent depending on direction of wave propagation. For instance we find that electric dipolar BECs reveal no roton instability, when magnetic dipolar BECs can reveal it for all directions of wave propagation. At second step we present method of including of the finite size of molecules in hydrodynamic equations for electric dipolar BECs. We calculate spectrum of collective excitations. We find that finite size of particles decreases dipolar part of the spectrum on 10 percent (for molecule radius 4 10^{-8} cm) in compare with point-like particles. Hence we present an updated mean-field theory of dipolar BECs, which explicitly contains size of molecules and gives large contribution in non-equilibrium collective properties of dipolar BECs.

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