

Abstract Submitted  
for the DAMOP15 Meeting of  
The American Physical Society

**On mechanisms of BEC stability and fermions instability for electric dipolar quantum gases with the exchange part of dipole-dipole interaction** PAVEL ANDREEV, Faculty of physics, Lomonosov Moscow State University — In spite of the long-range nature of the dipole-dipole interaction, the self-consistent field part of the dipole-dipole interaction in BECs equals to zero. Hence the dipole-dipole interaction is related to the exchange part of the dipole-dipole interaction in BECs. However the exchange part of the dipole-dipole interaction in BECs coincides with the result of the formal application of the self-consistent field to dipolar BECs. Considering the electric dipole-dipole interaction in accordance with the Maxwell equations we obtain the positive and stable contribution of dipoles in the Bogoliubov spectrum. We obtain a different picture at the study of dipolar degenerate fermions, where there are both parts of the dipole-dipole interaction. The self-consistent field part gives the anisotropic positive contribution and the exchange part gives the negative isotropic contribution. The sign of the full contribution of dipoles depends on the direction of wave propagation. Hence the dipolar part of the spectrum of fermions brings the instability at large enough dipole moment, when the dipolar part overcomes the Fermi pressure. Strong dependence of the electric dipole-dipole interaction on the spin polarization is described as well.

Pavel Andreev  
Faculty of physics, Lomonosov Moscow State University

Date submitted: 27 Jan 2015

Electronic form version 1.4