Strong correlated 2D dipole exciton system.

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We show by *ab initio* quantum Monte Carlo calculations that dipole excitons which are under experimental study now actually are strong interacting systems. This manifest itself in essential peculiarities in excitation spectra –existence of roton minimum, structure and condensate depletion which we discuss in the talk.

Generalized local density approximation for Kosterlitz-Thouless crossover of 2D dipole excitons in wide exciton trap is proposed.

Bose condensation of 2D dipole excitons and quantum crystallization in extended system and 2D trap are analyzed.

The ground-state phase diagram of 2D dipole exciton system is studied. In the gas phase the condensate fraction is calculated as the function of density. The collective excitation branch and appearance of roton minimum is analyzed.

Quantum phase transition of 2D dipole exciton system to new, crystal state controlled by the density of the system is considered. Possible experiments and 2D structures for observation of this new exciton phase are discussed.

2D composite exciton superfluidity in bilayer electron system is discussed the role of marginality of the system being analyzed.

References

1. *Yu. E. Lozovik, I. L. Kurbakov (to be publ.)*
2. *G.E.Astrakharchik, J.Boronat, I.L.Kurbakov, Yu.E.Lozovik, Phys.Rev.Lett., 98, 060405 (2007) .*
3. *G. E. Astrakharchik, J.Boronat, J.Casulleras, I.L. Kurbakov, Yu.E.Lozovik, Phys. Rev.A 75, 063630 (2007).*
4. *M. Willander, Phys. Lett. A 366, 487-492 (2007).*
5. *Yu.E.Lozovik, I.L.Kurbakov, G.E.Astrakharchik, J. Boronat, M. Willander, Sol.St.Comms., 144, 399-404 (2007).*
6. *Yu. E. Lozovik, I. L. Kurbakov, G. E. Astrakharchik, M. Willander, J.Exp.Theor.Phys., 106, No.2, 296-315 (2008).*