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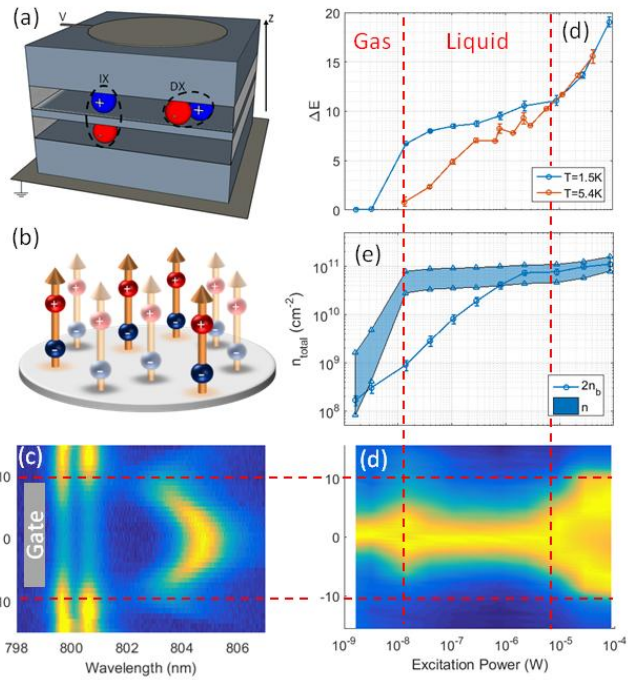
Two-dimensional dipolar exciton fluids on a chip



While we understand well how two classical dipoles interact with each other, the problem becomes much more complex and interesting when we put many dipoles together and form a dipolar fluid, especially when collective quantum effects become important. The possible phases of two-dimensional (2D) interacting dipolar particles is a long-sought problem in many-body physics.
In parallel to real cold dipolar atoms and molecules, indirect excitons in GaAs semiconductor bilayers also form a system of 2D atomic-like dipolar quasiparticles with four internal spin degrees of freedom, two of which are dark.
Not only such dipolar excitons exhibit strong manybody interactions and correlations, but also they are a unique dissipative system where the thermodynamics of their center-of-mass degrees of freedom could be intimately related to their internal spin degree of freedom.

This link can lead to new and interesting effects.

In this talk I will review some of our most recent results on dipolar exciton fluids in GaAs bilayer systems.

In particular, I will present our recent observation that as a fluid of dipolar excitons is cooled down, it exhibits strong particle correlations not seen in weakly interacting gases, followed by a spontaneous condensation into a high density dipolar liquid state that strikingly seems to be made of mostly dark dipoles.

I will also present the concept of vertical coupling of dipolar exciton fluids and the expected bound complexes and dipolar drag in such vertically coupled systems.

19. Januar 2017, 10.00 Uhr – 10.45 Uhr
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