

SES11-2011-000020

Abstract for an Invited Paper
for the SES11 Meeting of
the American Physical Society

Superfluidity in bilayer systems of cold polar molecules

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An exciton is a quasiparticle state formed by an electron bound to a “hole.” Many years ago it was proposed theoretically that a population of excitons can condense into a spontaneously broken symmetry ground state characterized by excitonic superfluidity. The quest for the experimental realization of the exciton condensate has lasted decades. Recently bilayer systems have emerged as some of the most promising systems in which this state can be realized. The physics of exciton condensation in bilayer systems is very general. In this talk I will present the theory of “excitonic condensation” and spontaneous interlayer superfluidity in cold polar molecules bilayers [1] that because of the great control characteristic of cold atom systems and their intrinsic lack of disorder are ideal systems to study exciton condensates.

[1] R. M. Lutchyn, E. Rossi, S. Das Sarma *Spontaneous interlayer superfluidity in bilayer systems of cold polar molecules*, Phys. Rev. A, **82**, 061604(R) (2010).