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External Field Effecting Excitonic Superfluid in Drag Geometry

JUNG-JUNG SU, ALLAN H. MACDONALD, Department of Physics, University of Texas at Austin — We will report on transport properties of excitonic superfluid under the influence of external applied field in generalized drag geometries. In such geometry, voltages are applied to the driven layer and a tunnable load resistance is added across the drag layer, which enable current flows in the drag layer when an excitonic condensate is established. The physics of the excitonic superfluid is described macroscopically by classical model and justified by microscopic mean-field plus non-equilibrium Green's function(NEGF) approach. We found that the excitonic superfluid only exist in the voltage configurations in which charge conservation law is satisfied, given a zero tunneling system. This system is then well described by a set of circuit, on the premise that the quasiparticle current can not flow through the system, and the current thus obtained is in great consistent with our NEGF calculation. Finally, we proposed a method of detecting tunneling strength by the non-conservation of charge in the presence of bare tunneling.

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