

Abstract Submitted
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Ising Phase in AA Stacked Bilayer Graphene¹ HERBERT FERTIG, Indiana University, LUIS BREY, Instituto de Ciencia de Materiales de Madrid,(CSIC) — AA stacked bilayer graphene bears a close resemblance to biased, double layer graphene (in which a strong barrier separates the two layers), with layer bonding and anti-bonding states of the AA system playing the roles of layer states in the double layer system. The latter has a U(1) symmetry which can break, to form a condensed exciton groundstate. The AA system however has only Ising symmetry. In this presentation we analyze the possibility that electron-electron interactions break this to open a gap in the energy spectrum. We find that, in the mean field approximation, the ground state has a charge density wave character, with the charge modulation of each layer out of phase. We calculate the gap and the mean field critical temperature as a function of the strength of the Coulomb interaction, taking screening into account self-consistently with the calculation of the gap. We also analyze the transition between ordered and thermally disordered phases based on a continuum model, and find that the transition is controlled by an effective U(1) stiffness. We argue that in the limit of zero layer separation, for which the full U(1) symmetry of the Hamiltonian is restored, the Ising transition continuously goes into a Kosterlitz-Thouless transition.

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