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Topological phases in the zeroth Landau level of bilayer graphene[1]

ZLATKO PAPIC, Department of Electrical Engineering, Princeton University, DMITRY ABANIN, Perimeter Institute for Theoretical Physics — We study the phase diagram of the zeroth Landau level of bilayer graphene in the presence of strong mixing between two degenerate orbital sublevels, as well as the screening of the effective Coulomb interaction. Using large scale exact diagonalization calculations, we find stable quantum Hall states at filling factors $\nu = -1, -4/3, -5/3, -8/5, -1/2$. We discuss the nature of these ground states and their collective excitations in terms of the known states in GaAs semiconductors using a truncated interaction model. Furthermore, we present evidence that the $\nu = -1/2$ fraction, which was recently reported experimentally, is unlikely a two-component "331" state, but instead is of non-Abelian nature and related to the Moore-Read Pfaffian wave function.

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