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Bilayer graphene as a helical quantum Hall ferromagnet[1] RENE COTE, JEREMIE P. FOUQUET, WENCHEN LUO, Universite de Sherbrooke — The two-dimensional electron gas (2DEG) in a graphene bilayer supports a variety of uniform broken-symmetry ground states in Landau level $N = 0$ and at integer filling factors $\nu \in [-3, 4]$. When a bias is applied between the layers at filling factors $\nu = 1, 3$, the ground state evolves from an interlayer coherent state at small bias to a state with orbital coherence at higher bias where *electric* dipoles associated with the orbital pseudospins order spontaneously in the plane of the layers. We show that by further increasing the bias the 2DEG goes first through an electron crystal with an orbital pseudospin texture at each site and then into a helical state where the pseudospins rotate in space. The pseudospin textures in the crystal and the helical states are due to the presence of a Dzyaloshinsky-Moriya interaction in the effective pseudospin Hamiltonian when orbital coherence is present in the ground state. We study in detail the electronic structure these nonuniform states as well as their collective excitations and compute their electromagnetic absorption.

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