Abstract Submitted
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Synthesizing and Observing Electric and Magnetic Gauge Fields in Molecular Graphene[1] DOMINIK RASTAWICKI, CHARLIE D. CAMP, KENJIRO K. GOMES, MING RUE D. THIAN, ALEX W. CONTRYMAN, HARI C. MANOHARAN, WONHEE KO, WARREN MAR, Stanford University — Molecular graphene is an artificial analogue of graphene that can be built using a scanning tunneling microscope (STM). It is realized by constraining surface-state electrons to a honeycomb lattice, which we have shown reproduces the Hamiltonian of natural graphene. We experimentally demonstrate that creating strains within the honeycomb lattice modifies the Hamiltonian in the same way that true laboratory-frame electric and magnetic fields do. In our experiments we have created artificial magnetic fields that can reach values as high as 60 T, and which can change their magnitude significantly over a distance as short as 2 nm. Some of the new physical phenomena we have been able to observe include: gauge invariance for lattices with very different real-space strains but the same artificial fields, emergence of Landau levels due to constant artificial magnetic fields, occurrence of a confined state at an interface straddling a sign-inversion of the effective magnetic field, and effective chemical doping and potential changes associated with applied electric gauge fields.

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