Abstract Submitted
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Symmetry Breaking in Hofstadter's Butterfly in graphene[1] CARLOS FORSYTHE, Department of Physics, Columbia University, CORY DEAN, LEI WANG, Department of Mechanical Engineering, Columbia University, PATRICK MAHER, FERESHTE GHAHARI, Department of Physics, Columbia University, PILKYUNG MOON, MIKITO KOSHINO, Department of Physics, Tohoku University, TAKASHI TANIGUCHI, KENJI WATANABE, National Institute for Materials Science, KEN SHEPARD, Department of Electrical Engineering, Columbia University, JIM HONE, Department of Mechanical Engineering, Columbia University, PHILIP KIM, Department of Physics, Columbia University — We will present magnetotransport measurements in hBN encapsulated bilayer graphene devices where one of hBN substrates provides a weak modulation of lattice potential. Under a strong magnetic field, interplay between periodic electric potential and quantizing magnetic field lead to a fractal energy spectrum known as Hofstadter's butterfly. In graphene, while spin and layer symmetry breakings are expected in dual gated devices under large magnetic fields, valley symmetry breaking in the Hofstadter regime is not so easily understood. We will present the observance of these measured gaps along with a discussion of symmetry breaking in our BLG-hBN devices. Further quantitative analysis of these breakings will be presented through the temperature dependence of quantized conductance at these gaps. Through careful modulation of temperature and electron density, we have extracted a range of activation energies associated with symmetry breakings.

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