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Unconventional Sequence of Fractional Quantum Hall States in Suspended Graphene BENJAMIN FELDMAN, Harvard University, BENJAMIN KRAUSS, JURGEN SMET, Max-Planck-Institut fur Festkorperforschung, AMIR YACOBY, Harvard University — Graphene provides a unique platform to study many-body correlations due to the relativistic nature of its charge carriers and their fourfold degeneracy. We report local electronic compressibility measurements of a suspended graphene flake performed using a scanning single-electron transistor. Between filling factors $v = 0$ and 1, our measurements reveal incompressible fractional quantum Hall states at $v = 1/3$, $2/3$, $2/5$, $3/5$, $3/7$, $4/7$ and $4/9$, which clearly follow the standard composite fermion sequence. In contrast, between $v = 1$ and 2, incompressible states occur only at $v = 4/3$, $8/5$, $10/7$ and $14/9$. These fractions correspond to a subset of the composite fermion sequence involving only even numerators, suggesting a robust underlying symmetry. We extract the energy gaps of each fractional quantum Hall state as a function of magnetic field and find that $v = 1/3$, $2/3$, $4/3$, and $8/5$ are strongest at low field, persisting below 1.5 T. Our results provide insight into the interplay between electronic correlations and SU(4) symmetry in graphene.

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