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Magnetically induced correlated states in suspended graphene[1]

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Quantum Hall effect (QHE) plays an important role in understanding the electronic properties of graphene. The anomalous QHE provides the first experimental evidence of the "ultra-relativistic" nature of graphene's charge carriers. Because of the theoretical expectation that interactions and correlations should be important in this material, there have been long-standing yet baffled efforts in observing the manifestation of the collective quantum behavior, the fractional QHE (FQHE), in graphene. We show that such difficulty arises from the obscuring effect of the disorders which are mainly associated with the substrates supporting the graphene films. Using suspended graphene devices probed by two-terminal charge transport measurements, we are able to isolate the samples from substrate-induced perturbations and to avoid effects of finite geometry. FQHE at filling factor 1/3 has been successful observed. At low carrier density, we find a field-induced transition to an insulator that competes with the FQHE, allowing its observation only in the highest quality samples.

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