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Composite Fermions waltz to the tune of a Wigner crystal[1]
HAO DENG, YANG LIU, MANSOUR SHAYEGAN, LOREN PFEIFFER, KEN WEST, KIRK BALDWIN, Department of Electrical Engineering, Princeton University — We present a new technique and experimental results that directly probe the magnetic-field-induced Wigner crystal (WC) in a 2D electron system. We measure the magneto-resistance of a bilayer electron system with unequal layer densities at high magnetic fields. One layer has a very low density and is in the WC regime ($\nu \ll 1$), while the other ("probe") layer is near $\nu = 1/2$ and hosts a sea of composite fermions, quasi-particles formed by attaching two flux-quanta to each interacting electron. The composite fermions feel the periodic electric potential of the WC in the other layer and exhibit magneto-resistance maxima whenever their cyclotron orbit encircles certain integer number (up to 37) of the WC lattice points. The positions of the maxima reveal that the WC has a triangular lattice and yield a direct measure of its lattice constant. Our results provide a striking example of how one can probe an exotic many-body state of 2D electrons using equally exotic quasi-particles of another many-body state.

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