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The Quantum Hall Effect Revisited TOBIAS KRAMER, University Regensburg, E.J. HELLER, R.E. PARROTT, Harvard University, C.-T. LIANG, National Taiwan University, C.F. HUANG, National Measurement Laboratory, Taiwan, K. Y. CHEN, National Taiwan University, L.-H. LIN, National Chiayi University, Taiwan, J.-Y. WU, National Chiao Tung University, Taiwan, S.-D. LIN, National Chiao Tung University, Taiwan — Experiments shown here reveal inflection points of the Hall resistivity at half-integer filling factors 5/2 and 7/2 which become more pronounced with increasing current and finally lead to half-integer plateau like structures. These features contradict the edge-state picture of the quantum Hall effect (QHE) and also the disorder picture of the QHE, which cannot explain a gap directly in the middle of a Landau level. We present a novel approach to the quantum Hall effect, which allows us to calculate the electronic transport in a highly non-uniform Hall field, which is present in two opposite corners of a Hall bar, the hot-spots. Precisely in one corner electrons are injected into the device and we derive the local density of states there. We obtain a self-consistent equation for the current-voltage relation through the Ohmic contact and thus a computable theory of the quantum Hall effect, which predicts a unique modulation and splitting of Landau levels caused by the presence of a high electric field exactly in line with the experimental observations.

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