An alternative model of the integer quantum Hall effect TOBIAS
KRAMER, Physics Department Harvard University — Contrary to common be-
lief, the current emitted by a contact embedded in a two-dimensional electron gas
(2DEG) is quantized in the presence of electric and magnetic fields. This obser-
vation suggests a simple, clearly defined model for the quantum current through a
Hall device that does not invoke disorder or interactions as the cause of the integer
quantum Hall effect (QHE), but is based on a proper quantization of the classical
electron drift motion. The theory yields a quantitative description of the breakdown
of the QHE at high current densities that is in agreement with experimental data.
Furthermore, several of its key points are in line with recent findings of experiments
that address the dependency of the QHE on the 2DEG bias voltage, results that
are not easily explained within the framework of conventional QHE models. For
additional information, see also http://arxiv.org/abs/cond-mat/0509451 (accepted
by IJMPB) and the article references on http://people.deas.harvard.edu/∼tkramer

Tobias Kramer
Physics Department Harvard University

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