Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Length Scale of Bulk Quantum Hall Effect MICHAEL BLEIWEISS, Naval Academy Preparatory School, Newport, RI, MING YIN, Benedict College, Columbia, SC, JAFAR AMIRZADEH, Nanocenter, University of South Carolina, Columbia, SC, TIMIR DATTA, Nanocenter, University of South Carolina, Columbia, SC — Quantum hall effects (QHE) are consequences of the condensation of the charge carriers into a novel macroscopic quantum state. Condensation produces steps in the hall resistance (R_{xy}) in fundamental units of h/e^2 (25812.8 Ohms), which correlate with Shubnikov-deHass oscillations in R_{xx} and is represented graphically by the von Klitzing plot; which is a "double-y" graph of the hall resistance R_{xy} and magnetoresistance R_{xx} isotherms as functions of B. In two-dimensions electrical resistance per square is scale independent so the steps in R_{xy} are in ohms. QHE condensation occurs in bulk systems as well. However, resistance of three-dimensional conductors depends on the sample geometry and the relevant transport coefficient, resistivity (ρ_{xy}), which is dimensionally different from resistance. Hence the QHE plateaus in bulk samples are not directly expressed in ohms. In this case the macroscopic ρ_{xy} can be related to the R_{xy} by a quantum length factor "L", we define L such that $R_{xy} = L^{-1}(\rho_{xy})$.By analyzing literature data [Kul'bachinskii, V.A. et al., JETP Let., **70**, 767, 1999] we determine that for Sb_2Te_3,L is equal to 1.7 nm a remarkable microscopic scale. This factor L is not just the ratio of the macroscopic length to the cross-sectional area of the conductor; instead, it is an effective length associated with the quantum hall states.

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Date submitted: 01 Dec 2004 Electronic form version 1.4