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Bending the quantum Hall effect: Novel metallic and insulating states in one dimension[1]

MATTHEW GRAYSON, Walter Schottky Institut, Tech. Univ. Muenchen

One-dimensional conductors are the wires that will connect the circuits of tomorrow's nanoworld, so it is important to characterize their possible conducting phases. We study a novel one-dimensional wire state which arises at the corner of two quantum Hall systems joined at a 90 degree angle, and observe one-dimensional metallic and insulating states. Such non-planar confinement structures are unconventional for the quantum Hall effect and reveal the striking observation of a macroscopic one- dimensional state whose conductance increases with decreasing temperature. This single system can map out generic properties of disordered one-dimensional conductors since the metallic, critical, or insulating character is tunable with an external parameter, the magnetic field.

[1]In collaboration with L. Steinke, D. Schuh, M. Bichler, L. Hoeppel, J. Smet, K. Klitzing , D. K. Maude, and G. Abstreiter