Invited Talk

Invited Talk

HL 18.1 Tue 9:30 ER 270
Quantum Spin Hall Insulator State in HgTe Quantum Wells
— Hartmut Buhmann1, Markus König1, Steffen Wiedmann1, Christoph Brüne1, Andreas Roth1, Laurens W. Molenkamp1, Xiao-Liang Qi2, and Shou-Cheng Zhang2 — 1Physikalisches Institut, EP3, Universität Würzburg, Würzburg, Germany — 2Department of Physics, Stanford University, Stanford CA, USA

Recent theory predicted that the quantum spin Hall effect, a fundamentally new quantum state of matter that exists at zero external magnetic field, may be realized in HgTe/(Hg,Cd)Te quantum wells [1]. We fabricated such sample structures with low density and high mobility in which we could tune, through an external gate voltage, the carrier conduction from n-type to p-type, passing through an insulating regime. For thin ‘normal’ quantum wells (well width $d < 6.3$ nm), the insulating regime showed the conventional behavior of vanishingly small conductance at low temperature. However, for thicker ‘inverted’ quantum wells ($d > 6.3$ nm), the nominally insulating regime showed a plateau of residual conductance close to $2e^2/h$ [2]. Further investigations confirmed that these observations provide experimental evidence of the quantum spin Hall effect.