HL 18: Invited Talk Buhmann

Time: Tuesday 9:30–10:15 Location: ER 270

Invited Talk HL 18.1 Tue 9:30 ER 270

Quantum Spin Hall Insulator State in HgTe Quantum Wells — •Hartmut Buhmann[1], Markus König[1], Steffen Wiedmann[1], Christoph Brüne[1], Andreas Roth[1], Laurens W. Molenkamp[1], Xiao-Liang Qi[2], and Shou-Cheng Zhang[2] — [1]Physikalisches Institut, EP3, Universität Würzburg, Würzburg, Germany — [2]Department of Physics, Standford University, Standford 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.

[1] B.A. Bernevig, T.L. Hughes, S.-C. Zhang, Science **314**, 1757 (2006).

[2] M. König, S. Wiedmann, C. Brüne, A. Roth, H. Buhmann, L.W. Molenkamp, X.L. Qi, and S.C. Zhang, Science **318**, 766 (2007).