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Quantum Spin Hall Effect and Topological Phase Transition in HgTe Quantum Wells SHOU-CHENG ZHANG, Stanford University, B. ANDREI BERNEVIG, Princeton University, TAYLOR HUGHES, Stanford University — We show that the Quantum Spin Hall Effect, a state of matter with topological properties distinct from conventional insulators, can be realized in HgTe/CdTe semiconductor quantum wells. By varying the thickness of the quantum well, the electronic state changes from a normal to an “inverted” type at a critical thickness d_c . We show that this transition is a topological quantum phase transition between a conventional insulating phase and a phase exhibiting the QSH effect with a single pair of helical edge states. We also discuss the methods for experimental detection of the QSH effect.

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