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Tunable Anderson metal-insulator transition in quantum spin Hall insulators CHUI-ZHEN CHEN, Institute of Physics, Chinese Academy of Sciences, Beijing 100190, China, HAIWEN LIU, International Center for Quantum Materials, School of Physics, Peking University, Beijing 100871, China, HUA JIANG, College of Physics, Optoelectronics and Energy, Soochow University, Suzhou 215006, China, QING-FENG SUN, International Center for Quantum Materials, School of Physics, Peking University, Beijing 100871, China, ZIQIANG WANG, Department of Physics, Boston College, Chestnut Hill, Massachusetts 02167, USA, X.C. XIE, International Center for Quantum Materials, School of Physics, Peking University, Beijing 100871, China — We study disorder effects in Bernevig-Hughes-Zhang (BHZ) model (unitary system), and find that Anderson transition of quantum spin Hall insulator (QSHI) is determined by model parameters. In contrast to the common belief that 2D unitary system scales to insulator except at certain critical points, we find that an exotic metallic phase emerges between QSHI and normal insulator phases in InAs/GaSb-type BHZ model. On the other hand, direct transition from QSHI to normal insulator is found in HgTe/CdTe-type BHZ model. Furthermore, we show that the metallic phase originates from the Berry phase and can survive both inside and outside the gap.

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