Abstract Submitted
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Direct Real Space Imaging of Quantum Spin Hall Edge States in HgTe Quantum Well[1] YUE MA, WORASOM KUNDHIKANJANA, JING WANG, REYES CALVO, YONGLIANG YANG, KEJI LAI, MATTHIAS BAENNINGER, MARKUS KÖNIG, Stanford University, CHRISTOPHER AMES, CHRISTOPH BRÜNE, HARTMUT BUHMANN, PHILIP LEUBNER, Universität Würzburg, QIAOCHU TANG, KUN ZHANG, XINXIN LI, Shanghai Institute of Microsystem and Information Technology, LAURENS MOLENKAMP, Universität Würzburg, SHOU-CHENG ZHANG, DAVID GOLDHABER-GORDON, MICHAEL KELLY, ZHI-XUN SHEN, Stanford University — Microscopic real space imaging of the helical edge states is an important milestone to fully elucidate quantum spin Hall effect as a new state of quantum matter. By employing a unique cryogenic microwave impedance microscope, we directly imaged quantum spin Hall edges in a gapped HgTe quantum well. The edge state size increases monotonically as the Fermi level is tuned from p-type across the Dirac point into n-type. Whereas this result is counter-intuitive within any particle-hole symmetric model, it actually agrees well with the 8-band model of real material. Real space evolution of the edge states shows surprising dependence on the magnetic field which could not be explained by Landau level physics assuming a clean system. Alternative scenarios will be discussed.

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