Abstract Submitted
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Charging Dirac states at grain boundaries in the 3D topological insulator Bi_2Se_3[1] Y. LIU, Y.Y. LI, S. RAJPUT, University of Wisconsin, Milwaukee, D. GILKS, V.K. LAZAROV, The University of York, UK, M. WEINERT, L. LI, University of Wisconsin, Milwaukee — Using scanning tunneling microscopy and transmission electron microscopy, we demonstrate the existence of antiphase boundaries between neighboring grains shifted by a fraction of a quintuple layer in the MBE-grown 3D topological insulator Bi_2Se_3 (0001) films [1,2]. Scanning tunneling spectroscopy and first-principles calculations further reveal that these boundaries provide electrostatic fields that locally charge the Dirac states, modulating the carrier density, and shifting the Dirac point by up to 120 meV. This intrinsic electric field effect, demonstrated here near interfaces between Bi_2Se_3 grains, provides direct experimental evidence at the atomic scale that the Dirac states are indeed robust against extended structural defects and tunable by electric field.

[1] Y. Liu et al. PRL **108**, 115501 (2012).
[2] Y. Liu et al. PRL **110**, 186804 (2013).

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