Abstract Submitted
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Micro-metric electronic patterning of a topological band structure using a photon beam[1] MARK GOLDEN, EMMANOUIL FRANTZESKAKIS, NICK DE JONG, YINGKAI HUANG, DONG WU, YU PAN, ANNE DE VISSER, ERIK VAN HEUMEN, TRAN VAN BAY, BEREND ZWARTSENBERG, PIETER PRONK, SHYAMA VARIER RAMANKUTTY, ALONA TYTARENKO, University of Amsterdam, NAN XU, NICK PLUMB, MING SHI, MILAN RADOVIC, Paul Scherrer Institut, ANDREI VARKHALOV, Helmholtz Zentrum Berlin — The only states crossing E_F in ideal, 3D TIs are topological surface states. Single crystals of Bi_2Se_3 and Bi_2Te_3 are too defective to exhibit bulk-insulating behaviour, and ARPES shows topologically trivial 2DEGs at E_F in the surface region due to downward band bending. Ternary & quaternary alloys of Bi/Te/Se/Sb hold promise for obtaining bulk-insulating crystals. Here we report ARPES data from quaternary, bulk-insulating, Bi-based TIs. Shortly after cleavage in UHV, downward band bending pulls the bulk conduction band below E_F, once again frustrating the "topological only" ambition for the Fermi surface. However, there is light at the end of the tunnel: we show that a super-band-gap photon beam generates a surface photovoltage sufficient to flatten the bands, thereby recovering the ideal, "topological only" situation. In our bulk-insulating quaternary TIs, this effect is local in nature, and permits the writing of arbitrary, micron-sized patterns in the topological energy landscape at the surface.

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