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Recent Results on Topological Phase Transition and Texture Inversion in Tunable Topological Insulators[1] SU-YANG XU, YUQI XIA, Princeton University, LEWIS ANDREW WRAY, Lawrence Berkeley National Laboratory, SHUANG JIA, Princeton University, FABIAN MEIER, JAN HUGO DIL, Paul Scherrer Institute, JURG OSTERWALDER, Univerisity of Zurich, BARTOSZ SLOMSKI, Paul Scherrer Institute, ARON BANSIL, HSIN LIN, Northeastern University, ROBERT CAVA, M. ZAHID HASAN, Princeton University — The recently discovered three-dimensional or bulk topological insulators are expected to exhibit exotic quantum phenomena. It is believed that a trivial insulator can be twisted into a topological state by modulating the spin-orbit interaction or the crystal lattice, driving the system through a topological quantum phase transition. By directly measuring the topological quantum numbers, we report the observation of a phase transition in a tunable spin-orbit system, $BiTl(S_{1-\delta}Se_{\delta})_2$, in which the topological state formation is visualized (S.-Y. Xu *et al.*, *Science* (2011)). In the topological state, vortex-like polarization states are observed to exhibit three-dimensional vectorial textures, which collectively feature a chirality transition as the spin momentum-locked electrons on the surface go through the zero carrier density point. Such phase transition and texture inversion can be the physical basis for observing fractional charge ($\pm e/2$) and other fractional topological phenomena. We also present some of our recent results that reveal further novel spin and electronic properties of the system close to the critical point of the topological phase transition.

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