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Mapping visible-light direct optical excitations of a topological insulator via trARPES HADAS SOIFER, Stanford Univ, SLAC National Accelerator Lab, J. A. SOBOTA, Stanford Univ, SLAC National Accelerator Lab, Lawrence Berkeley National Lab, A. V. GAUTHIER, S.-L. YANG, H. XIONG, H. PFAU, C. ROTUNDO, P. S. KIRCHMANN, Z. X. SHEN, Stanford Univ, SLAC National Accelerator Lab — Topological insulators have been in the focus of condensed-matter research in recent years. In particular, much effort was dedicated to optically manipulate the spin-textured electrons in the topological surface states. In this work we use time- and angle-resolved photoemission spectroscopy (trARPES) to induce and probe direct optical transitions to unoccupied states of the topological insulator Bi_2Se_3. We tuned the excitation wavelength in the visible regime, and studied the ultrafast dynamics of the electronic excitation and decay. The detailed time-resolved data allowed us to clearly resolve different contributions to the excited population. We used a time-mapping procedure to identify the initial states, and observed processes involving topological surface states as either the initial or excited state. Our results reveal the intricacies of photo-excitations of topological surface states, and establish pump-tuning in the visible regime as a tool for optical control of topological insulators.

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