Abstract Submitted
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**Photoemission of $Bi_2Se_3$ with Circularly Polarized Light: Probe of Spin Polarization or Means for Spin Manipulation?**[1] O. RADER, J. SÁNCHEZ-BARRIGA, A. VARYKHALOV, Helmholtz-Zentrum Berlin, J. BRAUN, Ludwig-Maximilians-Universität München, S.-Y. XU, N. ALIDOUST, Princeton University, O. KORNILOV, Max-Born-Institut Berlin, J. MINÁR, Ludwig-Maximilians-Universität München, K. HUMMER, University of Vienna, G. SPRINGHOLZ, G. BAUER, Johannes Kepler Universität Linz, R. SCHUMANN, Max-Born-Institut Berlin, L.V. YASHINA, Moscow State University, H. EBERT, Ludwig-Maximilians-Universität München, M.Z. HASAN, Princeton University, G. BAUER, Johannes Kepler Universität Linz — Topological insulators are characterized by Dirac cone surface states with spins aligned in the surface plane and perpendicular to their momenta. Recent theoretical and experimental work implied that this specific spin texture should enable control of photoelectron spins by circularly polarized light. However, these reports questioned the so far accepted interpretation of spin-resolved photoelectron spectroscopy. We solve this puzzle and show that vacuum ultraviolet photons (50-70 eV) with linear or circular polarization probe indeed the initial state spin texture of $Bi_2Se_3$ while circularly polarized 6 eV low energy photons flip the electron spins out of plane and reverse their spin polarization. Our photoemission calculations, considering the interplay between the varying probing depth, dipole selection rules and spin-dependent scattering effects involving initial and final states explain these findings, and reveal proper conditions for light-induced spin manipulation for future applications in opto-spintronic devices.

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