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Shift charge and spin photocurrents in Dirac surface states of topological insulator KUN WOO KIM, Korea institute for advanced study, TAKAHIRO MORIMOTO, University of California, Berkeley, NAOTO NAGAOSA, RIKEN Center for Emergent Matter Science; University of Tokyo — The generation of photocurrent in condensed matter is of main interest for photovoltaic and opto-electronic applications. Shift current, a nonlinear photoresponse, has attracted recent intensive attention as a dominant player of bulk photovoltaic effect in ferroelectric materials. In three-dimensional topological insulators Bi_2X_3 (X: Te, Se), we find that Dirac surface states with a hexagonal warping term support shift current by linearly polarized light. Moreover, we study "shift spin current" that arises in Dirac surface states by introducing time-reversal symmetry breaking perturbation. The estimate for the magnitudes of the shift charge and spin current densities are 0.13 I_0 and 0.40 I_0 (nA/m) for Bi_2Te_3 with the intensity of light I_0 measured in (W/m^2), respectively, which can offer a useful method to generate these currents efficiently.

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