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Optical response of relativistic electrons in the polar BiTeI semiconductor J.S. LEE, Graduate program of Photonics and Applied Physics, Gwangju Institute of Science and Technology (GIST), Gwangju 500-712, Korea, G.A.H. SCHOBER, Department of Applied Physics, University of Tokyo, Tokyo 113-8656, Japan, M.S. BAHRAMY, Correlated Electron Research Group (CERG) and Cross-Correlated Materials Research Group(CMRG), ASI, RIKEN, Wako 351-0198, Japan, H. MURAKAWA, Multiferroics Project, ERATO, Japan Science and Technology Agency (JST), Tokyo 113-8656, Japan, Y. ONOSE, R. ARITA, N. NAGAOSA, Department of Applied Physics, University of Tokyo, Tokyo 113-8656, Japan, Y. TOKURA, Department of Applied Physics and Quantum Phase Electronics Center (QPEC), University of Tokyo, Tokyo 113-8656, Japan — The transitions between the spin-split bands by spin-orbit interaction are relevant to many novel phenomena such as the resonant dynamical magneto-electric effect and spin Hall effect. Here, we present a combined experimental and theoretical study of the dynamics of relativistic electrons in the recently discovered giant bulk Rashba spin splitting system BiTeI. Several novel features are observed in the optical spectra including sharp edge singularity due to the reduced-dimensionality of joint density of states and a systematic doping dependence of the intraband transitions between the Rashba-split branches. These confirm the bulk nature of the Rashba-type splitting in BiTeI and manifest relativistic nature of the electron dynamics in a solid.

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