Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Ultrafast spin switching in a canted antiferromagnetic YFeO3 driven by pulsed THz radiations TAEHEON KIM, SUN YOUNG HAMH, JEONG WOO HAN, Gwangju Institute of Science and Technology (GIST), CHUL KANG, CHUL-SIK KEE, Advanced Photonics Research Institute, Gwangju Institute of Science and Technology, SEONGHOON JUNG, JAEHUN PARK, Pohang Accelerator Laboratory, POSTECH, YUSUKE TOKUNAGA, RIKEN Center for Emergent Matter Science (CEMS), YOSHINORI TOKURA, University of Tokyo, JONG SEOK LEE, Gwangju Institute of Science and Technology (GIST) — We investigate a detailed process of the precessional motion of the magnetic moment in the canted antiferromagnetic YFeO3 which is excited by a linearly polarized terahertz (THz) pulse at room temperature. By tuning the spectral component of the input THz pulse around the quasi-ferromagnetic mode located near 0.3 THz, we have experimentally clarified the resonance effect in the THz control of the spin state. We could confirm this result also from the simulation based on the Landau-Lifshitz-Gilbert equation with two sub-lattice model for the canted antiferromagnet. Furthermore, we demonstrate that the spin state can be switched all-optically on a picosecond time-scale using THz pulses of square and oscillating shapes. Whereas the oscillating THz pulse with a spectral component resonant with the magnetic excitations is necessary for an efficient magnetization switching, we check the possibility of a further reduction of the necessary THz field strength by examining influences of variations in the anisotropy energy and Dzyaloshinskii-Moriya interaction upon the switching behaviors.

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Date submitted: 14 Nov 2014 Electronic form version 1.4