Coherent THz control of magnetization in orthoferrites

Tae-heon Kim[1], Sun Young Hamh[1], Jeong Woo Han[1], C. Kang[2], Chul-Sik Kee[2], Seonghoon Jung[3], Jaehun Park[3], Y. Tokunaga[4], Y. Tokura[4,5], and Jong Seok Lee[1*]

[1]Department of Physics and Photon Science, Gwangju Institute of Science and Technology (GIST), Gwangju 500-712, Republic of Korea

[2]Advanced Photonics Research Institute (APRI), Gwangju 500-712, Republic of Korea

[3]Pohang Accelerator Laboratory, POSTECH, Pohang 790-784, Republic of Korea

[4]RIKEN Center for Emergent Matter Science (CEMS), Wako 351-0198, Japan

[5]Department of Applied Physics, University of Tokyo, Tokyo 113-8656, Japan

We investigate a detailed process of the precessional switching of the magnetic moment in the canted antiferromagnetic YFeO3 which is excited by linearly polarized terahertz pulse. By tuning the spectral component of the input THz pulse, we have experimentally clarified the resonance effect in the THz control of the spin states. We could confirm this result from the simulation based on the Landau-Lifshitz-Gilbert equation with two sub-lattice model for the canted antiferromagnet. Based on these results, we discuss a possibility of the complete switching of magnetization to the opposite direction with a tailored THz pulse in its spectral component, pulse duration, and peak intensity.