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Low-magnetic field control of electromagnon N. KIDA, ERATO Multiferroics Project, S. ISHIWATA, Y. TAGUCHI, CMRG-RIKEN, R. SHIMANO, ERATO and Univ. Tokyo, T. ARIMA, Tohoku Univ., Y. TOKURA, ERATO, Univ. Tokyo, and CMRG-RIKEN — Since the 1960s, there has been intense debate concerning the presence of the spin excitation driven by the electric field of light E^{ω} in ferroelectric magnets. This is recently revived by the observation of the absorption peak structure around 3 meV in a ferroelectric magnet $TbMnO_3$ [1]. As an origin of this excitation, the hybridized spin excitation with electric polarization (now called electromagnon) was considered [2]. However, this issue remains controversial by our THz spectroscopic studies on a family of RMnO$_3$ [3] (R = Tb, Dy, and $Gd_{0.7}Tb_{0.3}$) in a variety of spin phases tuned by temperature and magnetic field. Here we report an optical investigation of the low-energy (2−10 meV) spin dynamics for other ferroelectric magnets, hexaferrite, by using THz time-domain spectroscopy. We find the signature of the genuine electromagnon at THz frequencies. As a manifestation of the strong magnetoelectric coupling inherent to the electromagnon, we demonstrate the low-magnetic field ($\sim$ 100 Oe) control of the optical constants at THz frequencies. [1] A. Pimenov *et al.*, Nat. Phys. **2**, 97 (2006). [2] D. Senff *et al.*, PRL **98**, 137206 (2007). [3] N. Kida *et al.*, PRB **78**, 104414 (2008); Y. Takahashi *et al.*, PRL **101**, 187201 (2008); N. Kida *et al.*, J. Phys. Soc. Jpn. Dec. issue (2008).

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