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Magnetic field induced directional dichroism of spin waves in multiferroic $BiFeO_3$ at THz frequencies[1] URMAS NAGEL, T. RÕÕM, Nat.-l Inst. of Chem. Phys. & Biophys., Tallinn, Estonia, S. BORDÁCS, I. KÉZSMÁRKI, Budapest University of Technology and Economics, Hungary, H.T. YI, S.-W. CHEONG, Rutgers Univ., New Jersey, JUN HEE LEE, RANDY S. FISHMAN, Oak Ridge National Laboratory, Tennessee — Using far infrared spectroscopy in high magnetic fields we show that spin excitations in $BiFeO_3$ simultaneously interact with the electric and magnetic field components of light resulting in directional dichroism (DD) of absorption. DD in $BiFeO_3$ arises because an applied static magnetic field induces a toroidal moment in the cycloidal spin structure. Strong DD is observed even in the room-temperature state of the material. The results are explained on the microscopic level as an interplay of five different interactions: isotropic exchange couplings between nearest and next nearest neighbors, an easy-axis anisotropy along the ferroelectric polarization, Dzyaloshinskii-Moriya (DM) interaction that creates the cycloid and DM interaction that causes spin canting.

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