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THz spectroscopy and directional dichroism in the high magnetic field AFM phase of bulk $BiFeO_3$[1] TOOMAS RÕÕM, J. VIIROK, U. NAGEL, National Institute of Chemical Physics and Biophysics, D. FARKAS, S. BORDÁCS, I. KÉZSMÁRKI, BUTE, Budapest, Hungary, H. ENGELKAMP, HFML, Radboud Uni., Nijmegen, The Netherlands, K. THIRUNAVUKKUARASU, J. KRZYSTEK, NHMFL, Tallahassee, Florida, R. S. FISHMAN, ORNL, Materials Science and Technology Division, Oak Ridge, Tennessee, Y. OZAKI, Y. TOMIOKA, T. ITO, Electronics and Photonics Research Institute, AIST, Tsukuba, Japan — Magnetic ordering can induce local electric polarization via three mechanisms in $BiFeO_3$: spin-current, exchange-striction, and single-ion anisotropy. Only the spin-current mechanism causes the observed large non-reciprocal directional dichroism (NDD) at THz frequencies in the cycloidal state [PRL, 115:127203 (2015)]. However, the static magneto-electric effect persists even in the canted AFM state [Nat. Comm., 6:5878, (2015)] where the cycloid is destroyed by high magnetic field. Single crystal samples were studied in fields up to 35 T with $\mathbf{B} \parallel \mathbf{a}$, $\mathbf{B} \perp \mathbf{a}$ and $\mathbf{B} \parallel \mathbf{c}$. NDD was found in the canted AFM phase above 18 T. The number of observed spin wave modes is not consistent with a current model of two AFM-coupled spin sublattices in the canted AFM phase.

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