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Non-reciprocal directional dichroism in the AFM phase of $BiFeO_3$ at THz frequencies[1] URMAS NAGEL, T. RÕÕM, Natl Inst of Chem Phys Biophys, Tallinn, D. FARKAS, D. SZALLER, S. BORDÁCS, I. KÉZSMÁRKI, Budapest University of Technology and Economics, Hungary, H. ENGELKAMP, HFML, Radboud University Nijmegen, The Netherlands, Y. OZAKI, Y. TOMIAKI, T. ITO, Electronics and Photonics Research Institute, National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Japan, RANDY S. FISHMAN, Oak Ridge National Laboratory, Tennessee, USA — We did THz absorption spectroscopy of $BiFeO_3$ single crystals in the AFM phase, where the spin cycloid is destroyed in magnetic fields between 18 T and 32 T in Voigt geometry at 1.6 K. If $\mathbf{B_0} \parallel [1\bar{1}0]$, we see strong directional dichroism (DD) of absorption of the magnon mode with light propagating along the direction of the ferroelectric polarization $\mathbf{k} \parallel \mathbf{P} \parallel [111]$ and $\mathbf{e}^\omega \parallel [1\bar{1}0]$, $\mathbf{b}^\omega \parallel [\bar{1}\bar{1}2]$. The sign of DD can be reversed (ı) by reversing the direction of $\mathbf{B_0}$ or (ii) by flipping the sample, thus reversing the propagation direction of light. The observed effect is caused by the strong magneto-electric coupling in the collinear AFM phase.

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