Abstract Submitted
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Theory for the Spin State and Spectroscopic Modes of Multiferroic $CaBaCo_4O_7$[1] RANDY FISHMAN, Oak Ridge National Laboratory, SANDOR BORDACS, ISTVAN KEZMARKI, VILMOS KOCSIS, Budapest University of Technology and Ecomomics, URMAS NAGEL, TOOMAS ROOM, National Institute of Chemical Physics Department, Y. TOKUNAGA, Y. TAKAHASHI, Y. TAGUCHI, Y. TOKURA, RIKEN Center for Emergent Matter Science — With alternating Kagome and triangular lattices, the type I multiferroic $CaBaCo_4O_7$ is highly frustrated. Magnetic frustration produces a non-collinear, ferrimagnetic spin state with a net magnetic moment of about 1 m_B along the b axis below 60 K. Based on the the field dependence of the three observed spectroscopic modes between 0.8 and 2.7 THz and on the field dependence of the magnetization up to 14 T, we construct a microscopic model for this compound. Using the symmetry of the crystal, the model is constructed in terms of eight independent nearest-neighbor exchange interactions as well as both in-plane and easy-axis anisotropies. With three observed Co species (spins 1.45, 1.0, and 1.2), the magnetic unit cell contains 16 spins. Our results indicate that the easy-plane and hexagonal anisotropy in the triangular layers is far larger than the anisotropy in the kagome layers. The observed spin-induced polarization along the c axis is produced by magnetostriction. We also predict other spin-wave modes outside the window of the spectroscopic measurements.

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