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Magnetic diffraction at MURR and possible magnetic ordering in magnetoelectric $HoAl_3(BO_3)_4$ TOM HEITMANN, University of Missouri Research Reactor, QIANG ZHANG, Ames Laboratory, U.S. DOE, K.C. LIANG, Texas Center of Superconductivity and the Department of Physics, University of Houston, L.M. BEZMATERNYKH, V.L. TEMEROV, Institute of Physics, Siberian Division, Russian Academy of Sciences, Krasnoyarsk, 66036, Russia, B. LORENZ, Texas Center of Superconductivity and the Department of Physics, University of Houston, DAVID VAKNIN, Ames Laboratory, U.S. DOE — We report on single-crystal diffraction studies of $HoAl_3(BO_3)_4$ we have performed to unravel its magnetic properties. $HoAl_3(BO_3)_4$ is among a number of compounds with the trigonal huntite crystal structure (R32, No. 155) that display magnetoelectric (ME) coupling and is notable as having one of the strongest ME effects [Liang et a. PRB 83, 180417(R) (2001)]. To test for any putative magnetic ordering, we have performed single-crystal neutron diffraction measurements on flux grown $HoAl_3(BO_3)_4$ crystals. We report preliminary results on the appearance of a crystallographic reflection that is forbidden in the huntite structure at a temperature that is consistent with the appearance of the ME effect. We associate this reflection with the emergence of antiferromagnetic ordering of the Ho^{3+} moments that establishes a broken time-reversal symmetry, the prerequisite condition for the ME effect. These experiments will be placed in the context of the burgeoning collaborative effort between MURR and the neutron scattering group at the Ames Laboratory.

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