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Resonant magnetic scattering of multiferroic $HoMnO_3$ in an applied electric field S. NANDI, A. KREYSSIG, L. TAN, J.W. KIM, J.Q. YAN, Ames Laboratory and Dept. of Physics and Astronomy, Iowa State Univ., J.C. LANG, D. HASKEL, Advanced Photon Source, Argonne National Laboratory, R.J. MCQUEENEY, A.I. GOLDMAN, Ames Laboratory and Dept. of Physics and Astronomy, Iowa State Univ. — The multiferroic material $HoMnO_3$ displays electrical polarization $P_c = 5.6$ μC cm^{-2} along the hexagonal **c** axis below the Curie temperature $T_C = 875$ K and antiferromagnetic Mn^{3+} ordering at the Néel temperature, $T_N = 75$ K. The recently reported ferromagnetic response of Ho^{3+} by an applied electric field opens up the possibility of electric field controlled magnetic data storage. However, both the role of Ho^{3+} in magnetism and details of the magnetic structure of Ho^{3+} have been topics of significant debate. Using element specific x-ray resonant magnetic scattering and x-ray magnetic circular dichroism, we have focused on resolving this controversy. Both quadrupole and dipole Ho L_{III} resonances were observed below 40 K. In zero field, Ho^{3+} orders antiferromagnetically with moments along the c direction below 40 K and undergoes a transition to a different magnetic order below 4.5 K. The role of Ho^{3+} upon the application of an external electric field in the temperature range 1.7-80 K will be discussed. – The support by U.S. DOE (DE-AC02-07CH11358 and DE-AC02-06 CH11357) is acknowledged.

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