Crystal Field Excitations in Multiferroic HoMnO$_3$ OWEN VAJK, University of Missouri - Columbia, MICHEL KENZELMANN, JEFF LYNN, SUNG-BAEK KIM, SANG-WOOK CHEONG — Antiferromagnetic and ferroelectric order coexist in hexagonal HoMnO$_3$, and strong coupling between these two order parameters has been previously observed. Neutron scattering measurements of the low-energy excitations in HoMnO$_3$ reveal a complex spectra of Ho$^{3+}$ crystal-field excitations which depend upon both temperature and applied magnetic field. These crystal-field changes are correlated with changes in the magnetic symmetry of the Mn$^{3+}$ magnetic sublattice. Measurements of the magnon excitations near these crystal field levels indicates strong coupling between the Mn$^{3+}$ moments and the Ho$^{3+}$ crystal field levels. This coupling may play a critical role in explaining the interaction of ferroelectricity and antiferromagnetism in HoMnO$_3$.