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IR phonons induced by the helical magnetic order in multiferroic $TbMn_2O_5$[1] ROLANDO VALDES AGUILAR, A. SUSHKOV, H.D. DREW, University of Maryland. College Park, MD 20742, S.W. CHEONG, Rutgers University. Piscataway, NJ 08854 — The interplay between magnetic order and the lattice in multiferroic crystals has produced such interesting phenomena as polarization reversal and change of dielectric properties with magnetic fields [2]. Ferroelectricity in the multiferroic materials $REMn_2O_5$ (RE = rare earth) is thought to originate from a helical antiferromagnetic order. In order to study this possiblity we have made an infrared study of $TbMn_2O_5$. We find that several IR phonons show correlations with the distinct magnetic and dielectric phase transitions. Of special interest is the phonon spectrum for light polarization along the b axis where a mode at $\sim$ 706 cm^{-1} exists only in the commensurate magnetic phase with $\mathbf{k}$ = (1/2,0,1/4) in the temperature range of 24-33 K. Possible scenarios for this phonon are: (1) the appearance of zone-folded modes; (2) the activation of previously silent modes due to the reduction of crystal symmetry. These scenarios are discussed in terms of the spin-lattice coupling in this class of materials.

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[2]Hur, N et al. Nature **429** (2004) 392.

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