Search for the soft mode phonons in TbMnO$_3$, TbMn$_2$O$_5$, and DyMn$_2$O$_5$ multiferroics using Raman and Far Infrared Transmission Spectroscopy$^1$ A.A. SIRENKO, New Jersey Institute of Technology, S. PARK, N. HUR, S-W. CHEONG, Rutgers University, C. ULRICH, L. MACHTOUB, B. KEIMER, Max-Planck Institute FKF, Stuttgart, Germany, G.L. CARR, NSLS Brookhaven Nat’l Lab — One of the possible explanations of the anomalies in the dielectric properties of TbMnO$_3$ and TbMn$_2$O$_5$ multiferroics [Nature 426, 55 (2003) and Nature 429, 392 (2004)] is the phonon softening. Raman spectra of the optical phonons in TbMnO$_3$, TbMn$_2$O$_5$, and DyMn$_2$O$_5$ single crystals have been measured in the temperature range between 4 and 300 K and in the magnetic field up to 13 T. Different scattering configurations and orientations of magnetic field with respect to the crystallographic directions have been investigated. Structural phase transition in both TbMn$_2$O$_5$ and DyMn$_2$O$_5$ was found at T=150 K. FT-IR transmission spectra in TbMnO$_3$ have been measured in the frequency range between 20 and 250 cm$^{-1}$ and in the temperature range between 10 and 300 K in magnetic field up to 11 T oriented along the c- axis. TbMnO$_3$ single crystal is transparent below 120 cm$^{-1}$. No clear indication for the phonon softening has been found so far.

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