Far- and mid-infrared emission and reflection of magnetoelectric $\text{RMnO}_3$ and $\text{RCrO}_3$ ($\text{R}=\text{Rare Earth}$) NESTOR E. MASSA, LANAIS EFO-CEQUINOR, UNLP, La Plata, Argentina, LEIRE DEL CAMPO, DOMINGOS DE SOUSA MENESSES, PATRICK ECHEGUT, CNRS-CEMHTI, Orléans, France, MARIA JESUS MARTINEZ-LOPE, JOSE ANTONIO ALONSO, ICMM-CSIC, Madrid, Spain — Far- and mid-infrared emission and reflection spectra of ferroelectric hexagonal $\text{TmMnO}_3$ show that small polarons, a paramagnetic collective electronic mode, and lower than $T_N$ soft hybrid modes are in concomitant relation. CO$_2$ laser heating in dry air triggers oxidation and Mn$^{3+}$-Mn$^{4+}$ double exchange hopping conductivity. A collective excitation in the paramagnetic phase is assigned to $e_g$ electrons in THz low energy d-orbital fluctuations. It locks-in at the E-type antiferromagnetic onset ($T_N \sim 80K$) into soft bands that harden simultaneously down to 4 K with temperature dependence given by the magnetic long range order coupling of the collective electric dipole. They have $T_N$ as critical temperature and critical exponents suggesting a second order phase transition. They also match zone center spin wave modes measured in isomorphous LuMnO$_3$ (Lewtas et al, Phys. Rev. B 82, 184420 (2010)). Both excitations, magnons y electric dipoles, are generated by electrons $e_g$ in deformed d-orbitals. Sharing this behavior with orthorhombic NdMnO$_3$ there is no evidence of new phonons in a structural deformation down to 4K Preliminary results in ErCrO$_3$ ($T_N \sim 130$ K) show the emerging soft bands in an order-disorder scenario. Overall, we conclude that magnetoelectric deformations in an orbital fluctuating environment are close related to magnetoelectric couplings.