Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Emergence of the multiferroic state in RMnO$_3$ (R = Sm and Nd) crystals G. BALAKRISHNAN, D. O'FLYNN, C.V. TOMY, M.R. LEES, Department of Physics, University of Warwick, Coventry CV4 7AL, UK — In order to understand the emergence of multiferroic behaviour in the RMnO$_3$ compounds, it is educational to study the relationship between ferroelectricity and magnetoelastically induced lattice modulations. Lattice modulations in RMnO$_3$ are strongly dependent on the Mn-O-Mn bond angle (Φ), which in turn is determined by the ionic radii (r_R) of the R atoms. Multiferroic properties have been observed in the orthorhombic RMnO$_3$ (R = Tb,Dy) compounds, in which Φ is close to 145°. In order to induce multiferroic behaviour in other magnetic members of the orthorhombic RMnO$_3$, and to tune the structure to be in the same region of the phase diagram as Tb/DyMnO$_3$, it is necessary to substitute at the R site with a suitable (smaller) atom. We have achieved this in SmMnO$_3$ and NdMnO$_3$ by substitutions at the Sm and Nd sites with smaller R ions. In the optimally substituted compounds (40 to 50%), we observe an additional magnetic transition. Investigations of the dielectric properties of the crystals reveal anomalies in the dielectric properties coincident with this magnetic transition, analogous to those exhibited by Tb/DyMnO$_3$, indicative of multiferroic behaviour. We present detailed investigations of the magnetic, dielectric and structural properties in single crystals of selected compositions.

Geetha Balakrishnan
Department of Physics, University of Warwick, Coventry CV4 7AL, UK

Date submitted: 18 Nov 2008 Electronic form version 1.4