Abstract Submitted
for the SES16 Meeting of
The American Physical Society

Electric Field Effect on the Magnetic Order in Multiferroic $LuMnO_3$[1] CHUNRUO DUAN, JUNJIE YANG, DESPINA LOUCA, Univ of Virginia, LELAND HARRIGER, NIST Center for Neutron Research — Multiferroic materials have been intensively studied in recent years. The main focus lays on the coupling of the ferroelectric and magnetic orders. Among the varieties of the multiferroics is the rare-earth manganites $LuMnO_3$, with a hexagonal $P6_3cm$ crystal structure. This structure consists a triangular layer of Mn^{3+} with S=2, surrounded by O^{2-} ions in a bipyramid local structure, and the rare-earth element goes in between the layers, making the intralayer spin-spin interaction stronger than the interlayer spin-spin interaction. Although geometrically frustrated, the spin on Mn ions can order antiferromagnetically at T_N ˜90 K. The ferroelectric transition, on the other hand, happens at much higher temperature (T_E >900 K) with the ion displacement in the c direction. Despite the fact that these two transition temperatures are well separated, our neutron scattering experiments on single crystal $LuMnO_3$ carried at SPINS at NCNR demonstrate an electric field effect on magnetic peak intensity. This electric field effect on magnetic peaks can be explained by the coupling of ferroelectric domain walls and AFM walls, and a Monte Carlo simulation with the domain wall coupling is able to reproduce the observed effect.

[1]Electric Field Effect on the Magnetic Order in Multiferroic LuMnO3

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Date submitted: 14 Oct 2016 Electronic form version 1.4