Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Control of Magnetism via Layer Thickness Modification in the $LaMnO_3/SrMnO_3$ Digital Superlattices and the Prediction of a Spin-Polarized 2DEG BIRABAR NANDA, SASHI SATPATHY, University of Missouri-Columbia — We study the effect of layer thickness on the magnetic properties in the $(LMO)_{2n}/(SMO)_n$ superlattices using density-functional calculations. The change in the magnetic properties is shown to be controlled by the leakage of the Mn-e_g electrons from the LMO side to the SMO side. For n = 1 superlattice, the weak potential barrier allows the Mn-e_g electrons to spread across the entire superlattice, so that a uniform ferromagnetic behavior is obtained through carrier mediated Zener double exchange. For larger n, the strong potential barrier restricts the e_g electron transfer to few layers adjacent to the interface, thus leaving the magnetism unchanged and bulk like away from the interface, while modifying the magnetism in the interfacial region. Finally, taking the example of a delta doped superlattice, $(SMO)/(LMO)_1/(SMO)$, we predict the formation of a spin-polarized two dimensional electron gas. The 2DEG, generated due to the confinement of the La (d) electrons in the direction normal to the interface, mediates a ferromagnetic alignment of the Mn-t_{2g} spins via double exchange which in turn spin polarizes the 2DEG.
† Work supported by the US Department of Energy
1. B. R. K. Nanda and S. Satpathy, arXiv:0810.2126; B. R. K. Nanda and S. Satpathy, Phys. Rev. Lett. **101**, 127201 (2008)

Birabar Nanda
University of Missouri-Columbia

Date submitted: 21 Nov 2008 Electronic form version 1.4