Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Nematicity in charge and orbital ordered structure: a new description of phase transitions in $La_{0.33}Ca_{0.67}MnO_3$ JING TAO, W.G. YIN, Y. ZHU, Condensed Matter Physics & Materials Science Dept, Brookhaven National Laboratory, Upton, NY 11973, K. SUN, Dept of Physics, University of Michigan, Ann Arbor, MI 48109 — Doped manganites have a well-known unidirectional superlattice modulation at low temperatures, although the origin of the modulation is still under debate. The phase transition of the modulation in this compound has been characterized by the superlattice reflections and the transition temperature was determined when the modulation becomes long-range. Here we report a new description of the phase transition in $La_{0.33}Ca_{0.67}MnO_3$ from the aspect of symmetry by measuring anisotropy based on transmission electron microscopy results. Instead of one phase transition, we found that the electronic structures undergo smectic, nematic and isotropic behaviors upon warming. Comparing to previous characterizations of the phase transition in $La_{0.33}Ca_{0.67}MnO_3$, this symmetry measurement enables a better unification between electronic structure and other properties such as the crystal lattice variation. Moreover, we directly observed the creation of dislocation pairs in the smectic phase, which is consistent with the dislocation-proliferation mechanism predicted by the nematicity theory in correlated systems. The defect observations also suggest the charge and orbital ordering nature of the modulation in $La_{0.33}Ca_{0.67}MnO_3$.

Jing Tao
Condensed Matter Physics & Materials Science Dept,
Brookhaven National Laboratory, Upton, NY 11973

Date submitted: 14 Nov 2013 Electronic form version 1.4