Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Probing Octahedral Rotations and Ferroelectric Domain Structures by Nonlinear Optics[1] VENKATRAMAN GOPALAN, DANIEL LITVIN, Pennsylvania State University — Oxygen octahedron is a basic structural unit in perovskite and related complex oxides. Octahedral rotations, involving rotations of the octahedral units are by far the most common phase transitions in complex oxides. Their symmetry is typically represented by conventional space groups and Glazer notation. We will first show that structures with octahedral rotations possess two-color symmetry that is completely isomorphic with magnetic point groups and space groups. (This is irrespective of whether the material is itself magnetic or not.) More broadly, we will discuss a range of "roto" properties in analogy with "magneto" properties, such as rotoelectric, piezorotation, rotooptic, and rotomagnetic effects. We will also address questions such as: (1) How do we define a composite symmetry in structures with two or more rotational and/or spin order parameters? (2) How are the rotation reversal symmetry operation and time reversal symmetry operation related in such systems? (3) What are the transformation rules for property tensors in such systems? (4) How can we probe magnetic color symmetries?

[1]National Science Foundation

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Date submitted: 18 Dec 2009 Electronic form version 1.4