Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Electric polarization reversal under high magnetic field in square lattice antiferromagnet $Ba_2CoGe_2O_7$ JAE WOOK KIM, S.H. CHUN, S.H. KIM, KEE HOON KIM, Seoul National University, Y. JO, L. BALICAS, NHMFL, Y.J. CHOI, S.-W. CHEONG, Rutgers University, F. BALAKIREV, N. HARRISON, LANL — Recently, $Ba_2CoGe_2O_7$ was found to develop electric polarization (P) below T_N=6.7 K [1]. Interestingly, P along the a-axis increases linearly, crossing zero at H=0 when magnetic field (H) is applied along the c-axis. To investigate the linear H-dependence of P further, we measured P dielectric constant (ε), and magnetization (M) under high H up to 45 T. On application of high H, P increases linearly up to H ∼15 T but suddenly decreases to a constant negative value. A peak in ε is found at the P-reversal point which is suppressed with increasing H to lower temperature with a concomitant sharpening up to H ∼36 T at T=0.6 K Furthermore, $M(H)$ curves below T_N show saturation above the P-reversal magnetic field, indicating that the negative P state is due to the fully ordered spin configuration. This phenomenon is similar to the case of multiferroic $BiMn_2O_5$, in which Preversal is driven by a spin-flop crossover [2]. However, in $Ba_2CoGe_2O_7$, P-reversal does not accompany a H induced magnetic phase transition. We discuss possible mechanisms for this unique magnetoelectric behavior and suggest possible quantum phase transition behavior. [1] H. Yi *et al.*, Appl. Phys. Lett. 91, 212904 (2008). [2] Jae Wook Kim *et al.*, arXiv:0810.1907.

Jae Wook Kim
Seoul National University

Date submitted: 21 Nov 2008 Electronic form version 1.4