Abstract Submitted for the MAR09 Meeting of The American Physical Society

Mechanism of Spontaneous Electric Polarization Flop in TbMnO<sub>3</sub> HAJIME SAGAYAMA, Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, NOBUYUKI ABE, Department of Physics, Tohoku University, TAKA-HISA ARIMA, Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, KAZUAKI IWASA, Department of Physics, Tohoku University — Orthorhombic perovskite  $TbMnO_3$  is one of the typical multiferroic systems. Spontaneous electric polarization (P) along the *c*-axis which originates from the spiral configuration of  $Mn^{3+}$  spins rotating in the *bc*-plane appears below  $T_C$  (~27K). P//c is turned to the direction along the a-axis by applying a magnetic field along a- or b-axis. Magnetic structure analysis and a spin-polarized neutron diffraction study of  ${}^{160}\text{Gd}_{0.7}\text{Tb}_{0.3}\text{MnO}_3$  strongly suggest that P//a in TbMnO<sub>3</sub> in high magnetic fields also originates from spin spiral rotating in the *ab*-plane as in the case of P//c. It has been pointed out that anisotropic Tb f-electron magnetic moments play an important role for the complicated electric polarization flop. In this study, we have confirmed the change of spin basal plane of  $TbMnO_3$  from the bc- to ab- plane by applying a magnetic field along the b-axis using spin-polarized neutron diffraction technique. We observed that a magnetic fields induce a C-type antiferromagnetic structure caused by the local anisotropy of Tb magnetic moments. We have succeeded in explaining the electric polarization flop of  $TbMnO_3$  in terms of a coupling between Mn<sup>3+</sup> spins and anisotropic Tb magnetic moments.

> Hajime Sagayama Institute of Multidisciplinary Research for Advanced Materials, Tohoku University

Date submitted: 20 Nov 2008

Electronic form version 1.4