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Spiral magnetic order in the ferroelectric phase of $Gd_{0.7}Tb_{0.3}MnO_3$ YUICHI YAMASAKI, Y. TOKURA, K. SASAI, M. MATSUURA, K. HIROTA, University of Tokyo, D. OKUYAMA, ERATO-MF, H. SAGAYAMA, N. ABE, T. ARIMA, Y. NODA, Tohoku University — Perovskite manganite $Gd_{0.7}Tb_{0.3}MnO_3$ possesses a ferroelectric phase with an electric polarization along the a axis ($P||a$) in zero magnetic field, while RMnO$_3$ (R=Tb and Dy) undergo ferroelectric transitions with P along the c axis ($P||c$). The $P||a$ phase emerges upon the incommensurate to commensurate transition of the lattice modulation in a similar way of the magnetic field induced $P||a$ phase of $TbMnO_3$. The polarized neutron diffraction and the magnetic structure analysis of the $^{160}Gd^{3+}$-enriched single crystal of $Gd_{0.7}Tb_{0.3}MnO_3$ were performed to uncover the coupling between the magnetic order and the ferroelectric polarization $P||a$ on a microscopic level. We found that the ferroelectric transition occurs concomitantly with the collinear to spiral spin transformation and the spin helicity can be controlled by the electric field applied on cooling. Namely, the ferroelectric polarization in the $P||a$ phase can be explained by the spin current model as well as the $P||c$ phases known for $TbMnO_3$.

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