Orthorhombic TbMnO₃[1] is a multiferroic compound that exhibits a flop in the electrical polarization from c to the a-direction with an applied magnetic field either along a or b axis. We have studied the magnetic field dependence of the incommensurate wave vectors (qₘn, qₜb) associated with the polarization and the magnetic ordering by neutron and x-ray single crystal diffraction with H||a and b. The polarization flop transition corresponds to a first-order transition from an incommensurate multi-q-structure to a commensurate single q-structure with q=1/4 at H||a, H>9T T_c~28K. In our X-ray measurements, the induced magneto-elastic coupling is observed as a structural modulation at twice the magnetic wavevector (2qₘn,qₜb). The temperature and field dependence of the magnetic and superlattice reflections are consistent with a soliton formalism which predicts a stable commensurate single q=1/4-phase.


Keywords: 1/4-phase, polarization flop, soliton formalism