Change of hyperfine parameters in multiferroic HoMn$_{0.99}$Fe$_{0.01}$O$_3$  Sung Baek Kim$^1$, Kang Ryong Choi$^2$, Chul Sung Kim$^2$ (Laboratory of Pohang Emergent Materials and Department of Physics, POSTECH, Pohang 790-784, Korea.$^1$, Department of Physics, Kookmin University, Seoul 136-702, Korea.$^2$) We have investigated Mössbauer spectra of HoMn$_{0.99}$Fe$_{0.01}$O$_3$ and the magnetic hyperfine interaction coupled with electric order parameter can be observed from Mössbauer spectra. The spectra below magnetic Nel temperature ($T_N=72$ K) show one set of hyperfine split sextet and the spectra above $T_N$ exhibit two lines with an equal intensity, indicating that the Fe$^{3+}$ ions occupy the Mn$^{3+}$ site of HoMnO$_3$. The isomer shift value at room temperature is found to be 0.16 mm/s. The temperature dependence of electric quadrupole splitting values show sharp features at 5 K and 37 K. Also, the abrupt change of magnetic hyperfine field occurs simultaneously with the anomaly of dielectric constant $\varepsilon(T)$. Using the Mössbauer technique we report evidence for the coupling of the electric and magnetic order parameters of HoMnO$_3$ and observed the transition temperatures accurately.

**Keywords**: Mössbauer, Electric quadrupole splitting, Magnetic hyperfine field, Multiferroic, HoMnO$_3$