The relationship between MHD mode rotation and the plasma flow has been investigated on Large Helical Device (LHD). Understanding of characteristics of MHD modes is one of a key issue for its control, which is required to produce high beta plasma. In the heliotron configuration without net current, an interchange mode is one of key instabilities because of magnetic hill formation and the onset and parameter dependence of the mode have been investigated in various configurations.\textsuperscript{1)}

The electron density scan experiment was performed in order to widely change the radial electric field and poloidal flow. The experimental parameters were set as follows: toroidal magnetic field $B_t = -1.75$ T and magnetic axis $R_{ax} = 3.60$ m. The port-through power of NBI is constant. The averaged beta value is about 1.5 %. Figure 1 shows changes of rotation frequencies of poloidal plasma flow ($\omega_\theta$), poloidal flow ($\omega_\phi$), and electron diamagnetic frequency ($\omega_e^*$) as a function of electron density. The positive sign corresponds to the ion diamagnetic direction.

The equilibrium calculation shows that resonances of $m/n = 1/1$ and $3/4$ modes are located in the periphery but inside the last closed flux surface (LCFS) and $m/n = 2/3$ resonance is just outside the LCFS, that is, stochastic layer. These modes rotate in the electron diamagnetic direction with several kHz in the laboratory frame and the frequencies gradually decrease with the density. Toroidal flow is almost zero at any resonance, which is quite different from tokamaks.

Experimental results suggest that any “pure” MHD frequency in the plasma frame is quantitatively consistent with the electron diamagnetic drift frequency within the measurement error. This means that the observed modes freeze the electron fluid as well as tearing mode.\textsuperscript{2)} In this experiments, there is no significant difference between MHD modes inside/outside the tearing mode.\textsuperscript{3)} In the high beta plasmas with more than 3 %, the modes where the resonance is clearly located at the core of stochastic layer, such as $m/n = 1/2, 2/5$ and so on, have been dominantly observed.\textsuperscript{3)} The further experiments are expected to clarify the characteristics of the stochastic modes.