§15. Magnetic Fluctuations Observed in Low Density Plasmas in CHS

Sakakibara, S., Yamada, H., Toi, K., CHS Group

In low density plasmas of CHS, it has been observed that co- direction of neutral beam injection strongly influences the characteristics of MHD mode.[1] Typically, $m/n = 2/1$ modes are observed in low density plasmas with the magnetic axis position $R_{ax} \leq 0.92$m, and in particular, appear as a repetitive burst (burst mode) in the case of co-injection of neutral beam (NB). This mode is not observed in the counter injection even with the same β value and the same electron density as those in the co-injection case. The fluctuation level of the burst mode is strongest in all operational regime of CHS plasmas. The soft X-ray measurement sometimes shows a small scale internal disruption correlated with the bursts. Effects of the small net toroidal currents, in particular beam driven currents, on this mode were experimentally investigated from a viewpoint of interchnge mode. [2]

Figure 1 shows the discharges with different toroidal currents I_p produced with the NB co-injection. The vacuum magnetic axis position R_{ax} = 0.92m and toroidal field $B_t = 0.9$T. The line averaged electron density n_e is less than 2 ~ 3 $\times 10^{19}$ m^{-3} and volume averaged diamagnetic beta $<\beta_{dia}>$ is about 0.2%. The polarity of Ip is defined as the same as beam injection. Case 1 is the discharge without Ohmic current, and I_p which consists of beam driven current and bootstrap one is about 4kA. Case 2 ~ 4 are discharges with Ohmic current in the counter direction and each I_p reaches 1kA, -1kA, and -3kA, respectively. The burst modes observed in these discharges have the coherent component of more than 90%. Figure 2 shows the changes of the amplitude of the burst modes as a function of I_p in Fig.1. As shown in this figure, these characteristics strongly depend on the direction of I_p.

The burst-mode was observed only in the case of NB co- injection irrespective of I_p. If it is an interchange mode, the repetitive behavior is possibly caused by the fact that the local parameters, such as local pressure gradient, at the resonant surface may affect the diamagnetic rotation or the saturation level of global mode, although the effect of I_p, which is used here, on magnetic configuration is smaller than that of the pressure profile or finite-β effect.

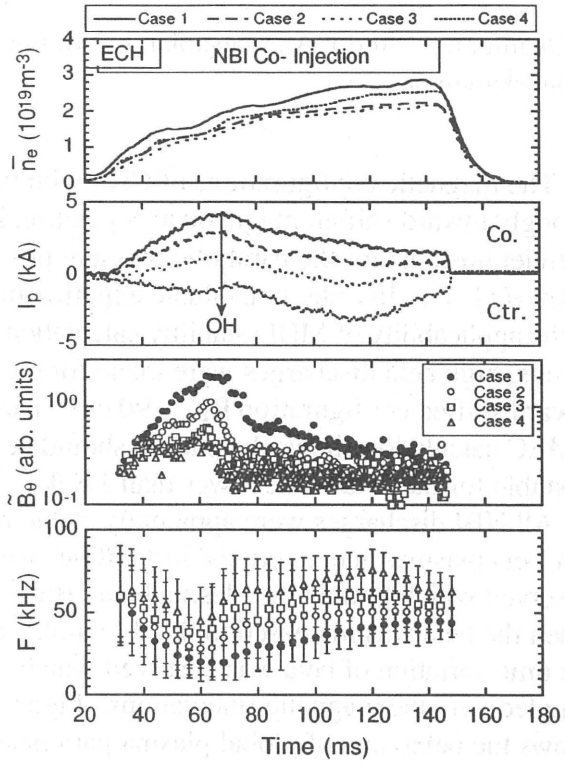

Fig. 1. Discharges with different toroidal current in NB co- injection.

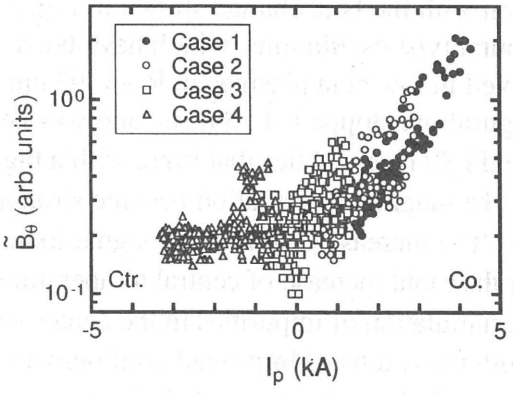

Fig 2. Amplitude of the burst mode observed in the discharge shown in Fig.1.

Reference
1) Sakakibara, S. et.al, J. Phys. Soc. Jpn. 63 (1994) 4406.
2) Sakakibara,S. et.al, Fusion Technology 27 (1995) 231.