

§14. MHD Activities Observed in Inward Shifted Configurations

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The magnetic configurations of CHS with the strongly inward shifted magnetic axis position is Mercier unstable for the parabolic pressure profile : $p(r) \propto (1 - r^2)$. In order to evaluate experimentally the applicability of MHD stability calculation results, high beta discharges were made for the inward shifted configuration $R_{ax} = 90$ cm. The VMEC calculation shows the plasma should be unstable for the beta value lower than 1.8 %.

All NBI discharges were apparently stable for low beta plasmas and no crucial instabilities were observed which limited the plasma beta. But when the beta was increased to 0.8 %, a noticeable time variation of beta was observed which coupled with the magnetic fluctuations. Figure 1 shows the behaviors of global plasma parameters. The beta started to increase at about 80 msec and dropped at 89 msec. The similar change was observed in the line-averaged density.

The magnetic fluctuation showed the clear relation with the beta change shown in Fig. 2. The burst type oscillations, which have been observed in low beta plasmas in $R_{ax} = 92$ cm configuration, stopped at 78 msec and was kept stable till 89 msec. After that time, with a big burst, the magnetic fluctuation became stronger again. The increase of soft X ray signal indicates either the rapid increase of central temperature or the accumulation of impurities in the center which are both the results of improved confinement.

Figure 3 shows the expanded plotting of magnetic fluctuation signal at the crash of enhanced beta. At 89 msec, the magnetic fluctuation started to increase in advance of any other signals. At the maximum of magnetic fluctuation, the density crash began and the increase of oxygen impurity radiation was followed. Such sequence showed that the MHD activities were destabilized with the peaked pressure profile produced in the central region and caused the beta crash.

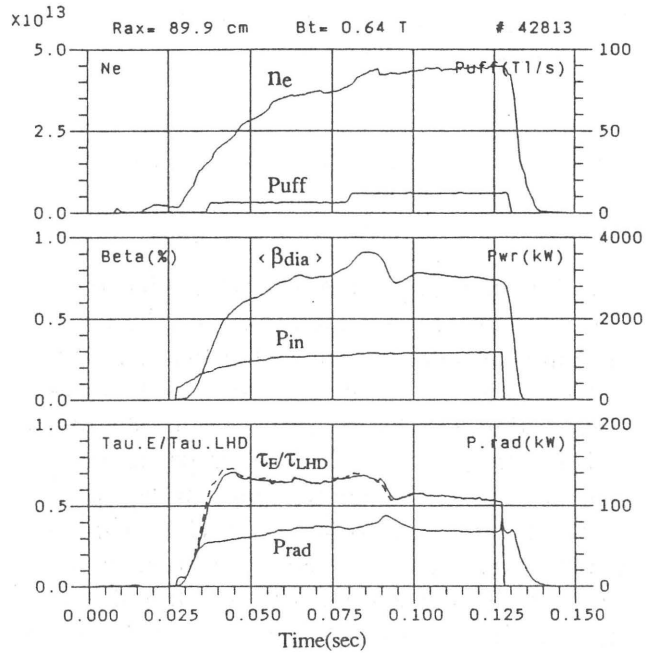


Fig. 1 Time behavior of global parameters.

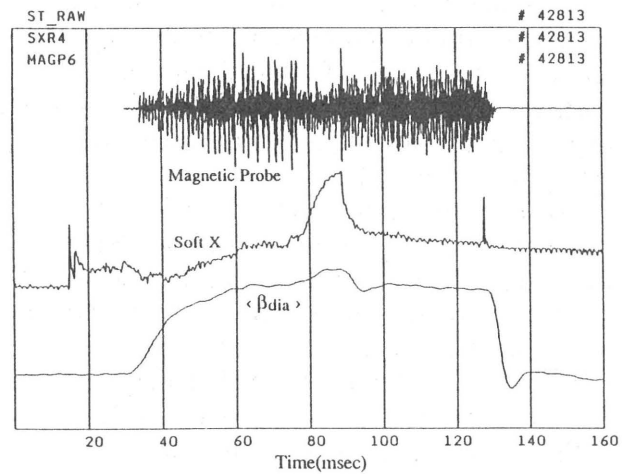


Fig. 2 Magnetic probe and soft X ray signal.

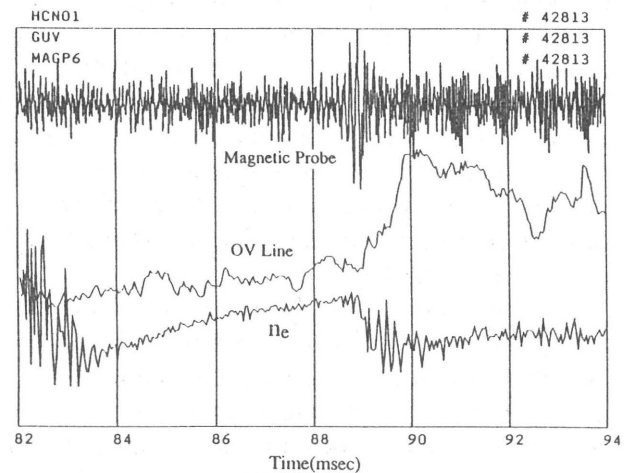


Fig. 3 Expanded plot at beta crash