

Initial plasma confinement experiments in tokamak-helical hybrid device TOKASTAR-2

K. Baba, K. Yamazaki, H. Arimoto, T. Oishi, K. Okano, M. Hasegawa, T. Shoji

*Department of Energy Engineering and Science, Graduate School of Engineering,
Nagoya University, Furo-cho, Chikusa-ku, Nagoya 464-8093, Japan*

baba-kazuhisa09@ees.nagoya-u.ac.jp

Tokamak and helical systems have been widely recognized as efficient toroidal magnetic plasma confinement devices. TOKASTAR-2 [1] is a new plasma confinement device which has both confinement properties. There are outer helical field coils with the toroidal period $n=2$ or 1 outside of eight toroidal field coils. One of main purpose of this experiment is to evaluate effects of external helical field application on tokamak plasma confinement.

Present status of TOKASTAR-2 is in the phase that electron cyclotron resonance of radio frequency wave creates plasmas. In this conference, analysis of magnetic field surface, plasma production near electron cyclotron heating (ECH) resonance layer, estimation of electron density and temperature, and radial density profile in this device are presented. Electron density and temperature were measured using single or double Langmuir probe. Central density and temperature are estimated in order of 10^{16}m^{-3} and 10eV respectively. In the measurement of plasma density profile in space, using double probe, plasma density profile is analyzed assuming that measured probe current is proportional to plasma density at respective measuring position of probe. Figure 1 shows temporal evolution of probe current which were measured at each position of radial direction. In this case, simple toroidal magnetic field was applied and plasma current was not induced. Figures (a),(b),(c) and (d) of Fig. 1 denote temporal evolution of probe current at major radius $R=17, 13, 9, 7\text{cm}$, respectively. As shown in this figure, during 2~3 ms, peak of probe signal is observed at the inner radial position at the early stage. The peak position goes to the outside gradually. During 3~5ms, signal level is almost constant at $R=17\text{cm}$. Moreover during 5~6ms, peak of signal is observed at inside direction. Therefore, initiated plasma at the inside position moves outward, and return to the inside, which corresponds to the movement of ECH layer.

Analysis of magnetic field surface and ECH resonance layer position in the poloidal cross section is being carried out by using computer calculation codes. New experimental results of outer helical field application will be also presented in the poster.

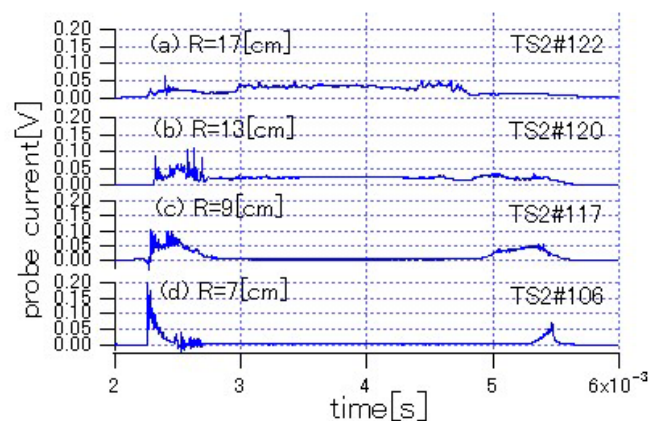


Figure1. Temporal evolution of probe current.

(a) Major radius $R=17\text{[cm]}$, (b) 13[cm] ,
(c) 10[cm] , (d) 7[cm] .

[1] K. Yamazaki et al., 14th International Congress on Plasma Physics (Fukuoka, Japan, 2008/9/8-12).

[2] K. Okano et al., this conference.