

§16. Study of Heliotron J Peripheral Plasma Using Fast Camera

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1. Aim

The technique of plasma measurement using fast camera is widely applied on many tokamaks and STs, and this method is very powerful two-dimensional tool for analysis of peripheral plasma behavior. The turbulence in peripheral region becomes the center of attention to relate the confinement recently. Mostly this turbulence looks like filament in tokamak and ST, and this filament like behavior is also seen in LHD plasma. Therefore, it is very interesting that this phenomenon generally exist in helical system. Heliotron J [1] has $I=1$ helical magnetic field and ∇B can be small to expect good particle confinement, and the bumpiness can be also change by varying the toroidal magnetic field. In 2004 the movable limiter (cannon ball type) was installed in Heliotron J to study the peripheral plasma and plasma-wall interaction.

Our aim is to study the peripheral plasma using the combination of the movable limiter, Langmuir probe and fast camera.

2. Instrumental set up

The camera was installed at one of the corner section in Heliotron J. Using fiber optics the camera was controlled remotely by PC in control room.

3. Summary

The low frequency harmonic oscillation in peripheral region was found in H-mode[2]. The density is rather high ($1.5\text{-}3\times 10^{19}\text{m}^{-3}$). The low frequency oscillation were reported in several tokamaks already, however, this is first observation in the helical systems. This result was reported in [3-6].

Fig.1 and 2 show the movable limiter and harmonic oscillation in H-mode plasma. This oscillation is 5.7kHz by Fast Fourier Transform. This oscillation occurred the beginning of the H-mode and lasts 10-20ms. The further study will be investigated soon.

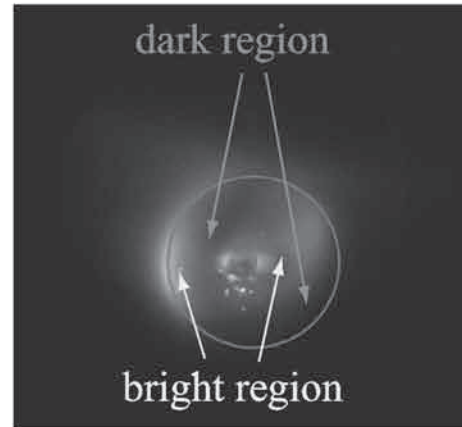


Fig.1 Typical field of view using fast camera
Red circle shows the outline of the movable limiter.

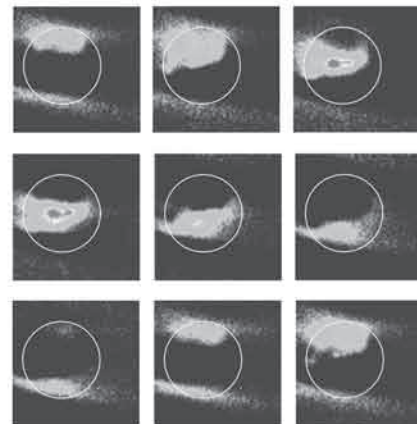


Fig. 2 Harmonic oscillation in H-mode plasma
Only 5.7kHz component is shown

References

- 1). T. Obiki, et al.: Plasma Phys. Control. Fusion **4** 1151 (2000)
- 2). F. Sano, et al.: J. plasma Fusion Res. **79**, No.11 1111(2003)
- 3). T.Mizuuchi, et al.: J Nucl. Mater. **337-339** 332(2005)
- 4). N.Nishino, et al.: J. Plasma Fusion Res. **1278** 179 (2004)
- 5). N. Nishino, et al.: J Nucl. Mater. **337-339** 1073(2005)
- 6). Kawazome, et al.: J Nucl. Mater. **337-339** 490(2005)