

§48. CPD Plasma Measurement Using a Fast Video Camera

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1. Experimental set up

The viewing port for a fast camera is 50mm inside of the vacuum vessel to get the wide-angle view, and using the wide-angle lens with the coherent fiber bundle. Telecentric optics is used to be able to resize the images. In this experiment H α filter is used between lenses before camera.

2. Results and discussion

Fig.1 (b) top shows the plasma current of CPD. This shot the maximum plasma current is about 10kA. The current start up is about 25ms, there are many oscillations around the 2-8kA before it's peak. Fig.1 (a) shows the image of CPD plasma of 30000 fps (frames per second), and the plasma current is 10kA. The image showed that the region near the center stack was very bright. Fig. 1 (b) bottom shows the waveform of the pixel data near the center stack and plasma current. The current peaks are coincident with the H α bottom, and vice versa. These phenomena suggest that the vertical field is somewhat strong to keep the plasma position stable and the plasma moves inside direction easily. Then the outer plasma region collides the center stack, and the plasma

shrinks (plasma current decrease). During this period the magnetic probe signal suggests that plasma vibrates vertical direction. The streak image from the camera data shows the plasma motion (not shown in Figure), however, the bright line in the streak image does not look like sin curve. Therefore, the plasma motion is not simple vibration. As a result, the initial discharge phase of CPD plasma has some MHD instability and the plasma collides the center stack. These motion should be analyzed in the near future to get the stable CPD discharges.

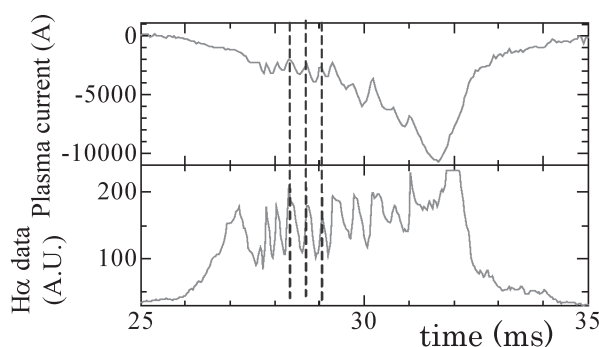
To compare the magnetic surface from EFIT at the plasma current maximum time with the plasma image at the same time the images almost agree with the LCFS of the EFIT results. Moreover the poloidal rotation is observed by the camera images. The direction of the rotation was the clock-wise direction in Fig1.(a).

3. Future plan

As the CPD plasma starts this year, it is very important to get the stable plasma discharge. The fast camera is very useful to visualize the motion of CPD plasma and it is planed to measure the plasma motion intensively by the fast camera and multi-code H α monitor this year.



(a) H α data near the center stack shown as white dot



(b) H α peaks are coincidence with current

Fig.1 Waveform of CPD plasma current and H α signal from camera images