

§27. Characterization of Dust Dynamics in LHD (2)

Ashikawa, N., Tomita, Y., Masuzaki, S., Goto, M., Sagara, A., Ohno, N. (Nagoya Univ.)

The dynamic behavior of dust particles has been investigated using visible and infrared region cameras in the Large Helical Device (LHD). Moving dust particles in LHD are measured with a high-speed camera to analyze their dynamics. This movement of dust particles is an important issue for future fusion devices such as FFHR to understand characterizations of core penetration efficiency and impact of dust of varying size and chemical composition on the core plasma performance in different conditions and geometries. In addition, we hope to evaluate dust movements by comparing experimental data and theoretical modelings. At present we tested a dust launch experiment using the same type of dust particles in DIII-D, TEXTOR, MAST and LHD. The glassy carbon dust is used in a sphere shape type with a diameter of 8 micron.

In LHD, carbon sphere dusts are installed in the divertor region from the 4.5L port using the material probe system. A high-speed camera measured this movement of dust from the upper port at 4.5U and this visible image is shown in Fig.1. ECH heating is starting at 0.3 s and the intensities of dust particles are increasing from 0.8 s. The holder position for dust particles is at the bottom end of the brightness region. Dust particles are moving mainly one direction as a belt.

Figure 2(a) shows the time evolution of normalized CIII impurities at the 1-O and 4-O ports. At the 4-O port, the CIII/H intensity is increasing from 0.5 s and it has peak intensities at 1.3 s. A peak intensity at 1-O occurs at the same time and it is a similar to time evolution of intensities by a high-speed camera. A region of 4-O port is close to an injected port of dust particles at 4.5L, and then the carbon dust particles ablated around same region. Figure 2 (b) shows a comparison of normalized CIII line in different toroidal sections at 1.3 s. This result also shows the ablating region of carbon dust particles is localized around 4-O port.

For the next step experiment of these dust movements, this dust distribution on the torus is important to consider for the installation of detection/counting systems, a laser scattering system for dust particles.

This work is performed with the support under the NIFS budget ULPP515. This works is IEA-ITPA joint experiment of DSOL-21.

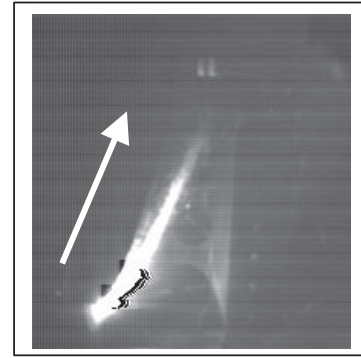


Fig.1 Injected dust movement by high-speed visible camera at the 4.5 port section.

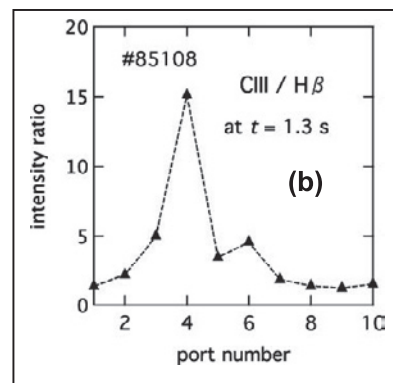
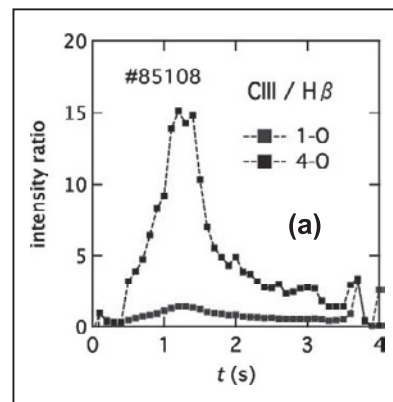


Fig. 2 (a) Time evolutions of the normalized CIII line by spectroscopy measurement at 1-O and 4-O sections. (b) Comparison of normalized CIII line in different toroidal sections at 1.3 s. Spectrometers are installed at each outer port with wide field of view.