27D46P

高速カメラ計測によるヘリオトロンJ周辺プラズマ乱流中のフィラメント構造特性の加熱条件に対する依存性

Effect of heating conditions on filamentary structures in Heliotron-J edge plasma turbulence observed with fast cameras

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It is important to investigate the characteristic of the plasma fluctuation to understand the edge plasma transport. In Heliotron J, some fast cameras are used to visualize the structure of the edge plasma fluctuation. A fast camera at #14.5 section looks up vertically from the bottom of the torus and focuses near the Last Closed Flux Surface (LCFS), which a Langmuir probe array is inserted from the top of the torus (Fig. 1). Figure 2 shows an example of the fast camera image for ECH plasma. As shown in Fig. 2, filamentary structures are observed in the edge plasma perturbation. The details of these filamentary structures seem to depend on the discharge conditions. The purpose of this experiment is, therefore, to characterize the filamentary structures and to investigate the effect on the edge plasma transport.

In order to eliminate the effects of background lights and noises from the fast camera raw data, a time averaged value in a specific time window of Δt is subtracted from each pixel data.

$$\tilde{x}(t) = x(t) - \frac{1}{\Delta t}\int_{-\Delta t/2}^{\Delta t/2} x(t)dt$$

Furthermore, the structures of different sizes are separated and extracted by using different time scale filters.

Figures 3 (a) and (b) show the extracted data by using 200 μs filter and the data by using 30 μs ~ 200 μs filter, respectively.

In Fig. 3 (a), it is observed large-scale structures with about 2 kHz cycle. On the other hand, in Fig. 3 (b), it is observed small-scale structures with about 10 kHz cycle. The small-scale structures shown in Fig.3 (b) seem to poloidally propagate in the electron diamagnetic drift direction (ω_{*e}) (Fig.2). From Fig.3 (a), the large-scale structures also seem to propagate to the same direction.

In the presentation, we will discuss the sizes, frequencies, velocities of filamentary structure and the correlation with probe data for different heating conditions.

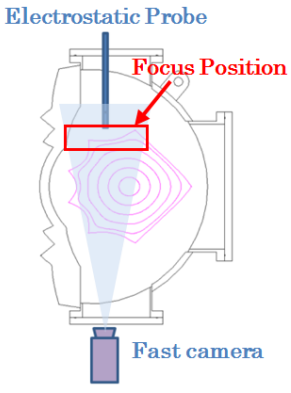

Fig.1 View sight of fast camera

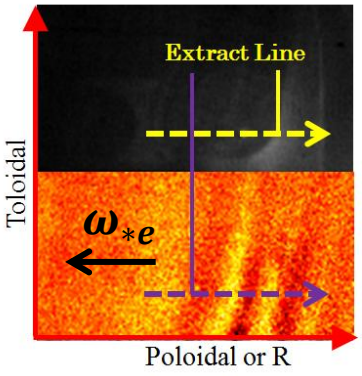

Fig.2 fast camera image (upper) filamentary structure(lower)

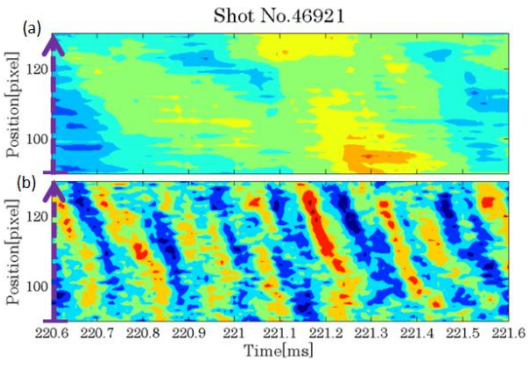

Fig.3 Movement of filamentary structures