

Property of Intermittent Bursts in Edge Plasma of Large Helical Device

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It has been known that the edge fluctuations play an important role in the energy and particle transport in the edge region of the torus plasma. In addition to the coherent fluctuations and turbulent fluctuations, recently, there has been a growing interest in intermittent or burst-like phenomena like edge localized modes (ELMs) and blobs. For the purpose of the measurement of such non-toroidal and/or poloidal symmetrical phenomena, we have developed a two-dimensional thermal lithium beam probe (2D-LiBP) [1,2] to measure edge density and its fluctuations. In this paper, blob characteristics observed in the Large Helical Device (LHD) with the 2D-LiBP is presented.

Intermittent positive spikes of the Li I light (670.8nm), corresponding to the electron density fluctuations, are observed by 8-channel-photomultiplier tubes (PMTs). Some spikes seem to propagate radially. For the analysis of the intermittent spikes like blobs, we utilized probability density function (pdf) analysis and wavelet analysis [3] so as to derive the effective or collective blob velocity V_b^{eff} , instead of the time-of-flight method for individual blobs. Fig.1 shows the results of wavelet analyses. The block arrows in the figure represent the V_b^{eff} vectors for blobs flying in or from the reference measurement spot. In the low electron density regime, the blobs seem to fly almost outward, which is the same result often seen in the tokamak edge plasma. However the transport characteristics are changed with increase in the edge electron density. This kind of change in the transport property has not been observed in tokamaks. The reason for this may be attributed to the edge difference of the magnetic field structures between tokamaks and heliotrons.

[1] H. Tsuchiya *et al.*, Rev. Sci. Instrum. **77**, 10F526 (2006).

[2] H. Tsuchiya *et al.*, Plasma Fusion Res. **2**, S1096 (2007).

[3] V.P. Budaev *et al.*, Nucl. Fusion **46**, S175 (2006).

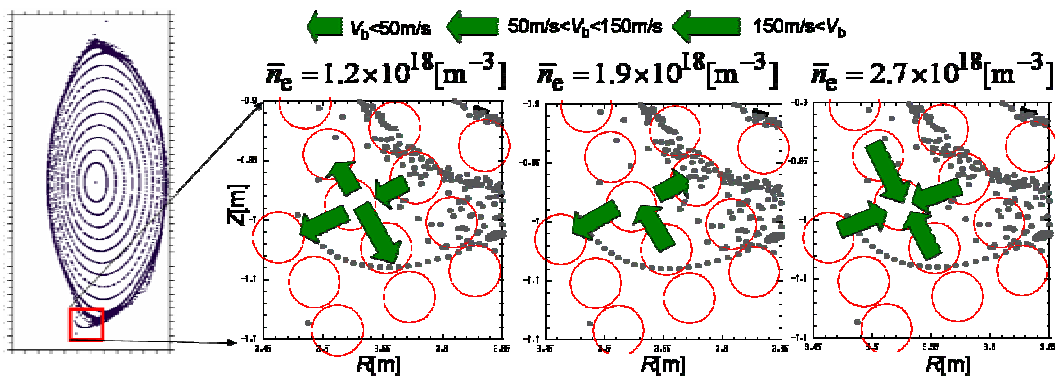


Fig.1 Diagram of effective blob velocity