ELM propagation in the high-field-side Scrape-off Layer of the JT-60U tokamak

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Experimental study of edge and SOL plasma dynamics during ELM has been recently progressed using fast time-resolving diagnostics such as Langmuir probes and fast TV camera. In particular, evolution of ELM filaments is of great interest to understand heat and particle transport from the plasma edge to the divertor and the first wall, and poloidal and toroidal distributions should be determined. In JT-60U, the filament structure was measured at different poloidal locations (i.e. outer midplane, null-point, and inner SOL above baffle) with fast sampling of 500 kHz, which was synchronized with the principal fast diagnostics such as D_α emission and magnetic pickup coils. In this paper, filament structure and its time evolution measured with reciprocating probes were presented focusing on those at outer (low-field-side) and inner (high-field-side) SOLs. In particular, at the inner SOL, filament structure with 7-8 multi-peaks was, for the first time, determined only close to sepatratrix (midplane radius corresponds to less than 4 mm). Delay of the first peak was ~40 μs after start of large MHD activity, and the delay was faster than characteristic time of the parallel convection from the outer midplane to the inner probe (~230 μs). At the same time, Mach numbers at the multi-peaks reached plasma sound velocity ($M_{//}$~1). These results show that ELM filaments extend from outer to inner plasma edge, and a part of the filaments are exhausted to the inner SOL. This model can explain the fact that starts of D_α emission signals at the inner and outer divertors (and ion saturation current) are simultaneous. Conduction heat (or fast electrons) transport is also discussed. In-out asymmetry of the filament structure and dynamics in the edge and divertor target will be discussed to determine the propagation models.