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P5.1015 Structure generation of the edge radial current during the L-H transition on JT-60U

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In this study, we analyzed the structure generation of the edge radial current (j_r) by means of Poisson's equation with a measured E_r data (CXRS diagnostic) in JT-60U NBI heating plasmas [1-4]. About 200 ms after the start of NBI heating, a slow L-H transition takes place, which evolves into a fully-developed H-mode spending a few 100ms. During this slow transition process, a smooth decrease in D emission, increase in the edge line-averaged electron density and steepening of ion temperature take place. The Er-well bottom value at ~3 cm inside the LCFS becomes large up to -40 kV/m as a similar time-scale of the change in the density [5], while the jr shows a local Max. value of 0.01-0.02 A/m^2 just after a slow L-H transition and its broader radial structure propagates toward plasma core region in the time-scale of ~100ms as seen in the pedestal development. On the other hand, we found that a localized jr structure with positive or negative polarities of its absolute peak value of 0.4-0.5 A/m^2 occurred spontaneously during the later ELM-free H-phase at which a complex multi-stage E_r-transition was seen with a fast time-scale. This observation suggests a co-existence of the non-linear physical mechanism for the j_r generation at the plasma edge region in terms of its variation in the time-scale and radial structure. Comparison with a theoretical model, including fast-ion loss current due to the ripple loss effect, is also discussed.

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