2nd Asia-Pacific Conference on Plasma Physics, 12-17,11.2018, Kanazawa, Japan

Nonmodal solitary perturbation prior to the collapse of edge pedestal in high-confinement tokamak plasmas

J. E. Lee[1], G. S. Yun[1], W. Lee[2], M. H. Kim[1], M. Choi[2], H. K. Park[2,3], J. G. Bak[2], W. H. Ko[2]

[1] Pohang University of Science and Technology
[2] National Fusion Research Institute
[3] Ulsan national Institute of Science and Technology

e-mail: jieun_lee@postech.ac.kr

Understanding the semi-periodic explosive relaxation of steep pressure gradient region at the plasma boundary (called pedestal) in high-confinement mode (H-mode) state, which can cause severe damage at the strike points on the plasma facing components by the ejection of hot particles, is one of the major issues in magnetic fusion plasma research.

Linear stability analyses and extensive studies showed that pedestal collapses are associated with exponentially growing peeling-ballooning eigenmodes with intermediate toroidal mode number *n* that are driven by the high pressure gradient and current density in the pedestal. In the KSTAR tokamak, quasi-stable eigenmodes (QSMs) which are structurally similar to the peeling-ballooning modes have been routinely observed via imaging diagnostics. However, the QSMs alone neither burst nor initiate the pedestal relaxation. Instead, nonmodal solitary perturbation (SP) develops within few hundreds of μs before the pedestal collapse [1]. The SP, distinct in spatial structure, amplitude and flow velocity from the QSM, is localized both poloidally and radially with low *n*. The appearance of SP, just prior to the collapse, suggests that the edge pedestal collapse is strongly associated with SP rather than QSM. It is conjectured, that the SP develops in the presence of strong shear flow and bursts through a localized magnetic reconnection.

References

[1] J. E. Lee *et al*., “Solitary perturbation in the steep boundary of magnetized toroidal plasma”, *Sci, Rep.,* **7**, 45075 (2017)