Contribution ID: **3134** Type: **not specified**

P1.1090 Enhancement of Nonlinear Regulation Dynamics in SMBI-stimulated L-H transition of HL-2A

Monday, 8 July 2019 14:00 (2 hours)

See the full abstract here:
http://ocs.ciemat.es/EPS2019ABS/pdf/P1.1090.pdf

For future fusion devices, like ITER, controllable L-H transition and reducing the power threshold are highly desirable when the available heating power is marginal for accessing the H-mode. Theoretic models have predicted that the L-H transition can be triggered by particle injection below the threshold (P < Pth) [1]. In the HL-2A tokamak, the L-H transition can be triggered by supersonic molecular beam injection (SMBI), a plasma fueling tool, which was first proposed in the HL-1 tokamak, then applied on several tokamaks and stellarator [2]. Figure 1 shows the dynamics of turbulence, geodesic acoustic mode (GAM) and limit cycle oscillations (LCOs) in the SMBI-triggered transition. It has been found that nonlinear interactions are enhanced by SMBI. These enhanced processes quench the turbulence and maintain the turbulence collapse. Finally, the turbulent transport is reduced and the L-H transition is triggered. Statistic result indicates that SMBI can reduce the H-mode threshold. It suggests that SMBI can be an external method for realization of a controllable L-H transition.

References
[1] K. Miki et al., Phys. Rev. Lett. 110, 195002 (2013). [2] L.H. Yao et al., Nucl. Fusion 47, 1399 (2007)

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Presenter: ZHONG, W. (EPS 2019)

Session Classification: Poster P1

Track Classification: MCF