Contribution ID: **69** Type: **Poster**

# TH/P4-02: Spatio-Temporal Evolution of the L-H and H-L Transitions

*Wednesday, 10 October 2012 14:00 (4h 45m)*

Understanding the L-H and H-L transitions is crucial to successful ITER operation. In this paper, we present novel theoretical results on: a.) the spatio-temporal dynamics of the L-H and H-L transitions; b.) the physics origin of the grad-B-drift asymmetry in the power threshold. Special emphasis is given to the role of zonal flows (ZFs). We have significantly extended earlier transition models to develop a 5-field reduced mesoscale model which evolves turbulence intensity, zonal flow shear, pressure, and density profiles and mean poloidal mass flow in radius and time. The mean E x B velocity is calculated via radial force balance using density, pressure and poloidal velocity. Studies of a slow power ramp up reveal evolution from L-I (Intermediate) -H phases. The I-phase exhibits nonlinear waves (locally, a limit-cycle oscillation (LCO)) which are nucleated near the LCFS, from the L-phase pre-transition edge. As the heat flux approaches criticality, the LCO phase delay between intensity and zonal flow shear evolves, while the nonlinear LCO period and amplitude increase, i.e. the cycle slows. Transition occurs when the instantaneous LCO ZF shear is driven sufficiently to quench the turbulence, thus allowing rapid growth of the mean shear which then locks in the transition.

## Country or International Organization of Primary Author

USA

**Primary author:** Mr DIAMOND, Patrick (USA)

**Co-authors:** Dr XU, Guosheng (Chinese Academy of Sciences); Dr MIKI, Kazuhiro (WCI Center for Fusion Theory, NFRI); Dr MALKOV, Mikhail (University of California, San Diego); Dr FEDORCZAK, Nicolas (CMT-FO-University of California, San Diego); Dr GURCAN, Ozgur (Ecole Polytechnique); Dr HAHM, Taik Soo (Seoul National University); Mr KOSUGA, Yusuke (University of California, San Diego)

**Presenter:** Mr DIAMOND, Patrick (USA)

**Session Classification:** Poster: P4

**Track Classification:** THC - Magnetic Confinement Theory and Modelling: Confinement