AAPPS-DPP2020, 26-31,10.2020, Remote e-conference

AAPPS-DPP2020 Invited/Plenary Nomination Form

0. **Recommender's name, E-mail and affiliation**
   Name: Patrick. H. Diamond
   E-mail: diamondph@gmail.com
   Affiliation: University of California San Diego, USA

1. **Session category:** Choose session category
   F

2. **Type:** Invited

3. **Speaker:**

   Name: Weixin Guo
   E-mail: wxguo@hust.edu.cn
   Affiliation: Huazhong University of Science and Technology, Wuhan, China

4. **Rationale**:

This work presents new results on L-H transition in a stochastic B-field induced by resonant magnetic perturbation using the a mean field model. It definitely merits an Invited Talk.

5. **Short abstract for 4th Asia-Pacific Conference on Plasma Physics**

Authors: Weixin Guo, Min Jiang, Patrick H. Diamond, C.-C. Chen, Lu Wang, HanHui Li, and Ting Long
Title: A Mean Field Model of the L→H Transition in a Stochastic Magnetic Field
Abstract:

RMPs are one means to mitigate or control ELMs and thus control transient heat loads on plasma facing components. However, one tradeoff for this benefit is a higher power threshold for the L→H transition. Motivated by this, we present a new theory of the L→H transition in a stochastic magnetic field. The aim is to assess the physics underpinning the impact of stochasticity on the L→H transition and its dynamics.

The model consists of coupled equations for mean radial electric field, poloidal rotation, toroidal rotation, density ion temperature and turbulence intensity. Novel features include a Maxwell stress on poloidal rotation V_θ induced by the stochastic magnetic field. This tends to work against V_θ, since it has the same phase as, but sign opposite to, the Reynolds stress. The magnetic stress on V_φ can reverse the toroidal rotation on the stochastic layers. Stochastic magnetic fields induce a non-diffusive, multi-component particle flux, which can explain RMP-induced pump-out. In addition, stochastic magnetic fields can degrade the coherence of $\tilde{V}_r$ and $\tilde{V}_\theta$ in the Reynolds stress, thus weakening the L→H trigger mechanism. Finally, stochastic fields necessarily carry a portion of the ion heat flux.

Results so far indicate that $\langle \tilde{b}_r \tilde{b}_\theta \rangle \neq 0$ breaks ambipolarity, so both amplitude and profile of $|b_r|^2$ are significant, $\langle J_r \rangle$ (induced by $\langle \tilde{b}_r \tilde{b}_\theta \rangle$) drives an intrinsic toroidal torque, V'_E ensures that $\langle \tilde{b}_r \tilde{b}_\theta \rangle$ opposes $\langle V_r V_\theta \rangle$, and that $|b_r|^2$ can modify T_i and n profiles. Ongoing work is concerned with quantifying power threshold dependencies. Both a 0-D and 1-D version of the model are under study.

*Supported by the U.S. Department of Energy and MOST, China