Contribution ID: **250** Type: **Poster**

# EX/P7-05: Relating the L-H Power Threshold Scaling to Edge Turbulence Dynamics

*Friday, 12 October 2012 08:30 (4 hours)*

Understanding the physics of the L-H transition power threshold scaling dependencies on toroidal field and density [1] is critical to operating and optimizing the performance of ITER. Measurements of long-wavelength (k_perp \rho_I<1)turbulent eddy dynamics, characteristics, flows, and flow shear in the near edge region of DIIID plasmas have been obtained during an ion gyro-radius scan (varying toroidal field and current) and density scan in a favorable geometry (ion \nabla B drifts towards the X-point), demonstrating the underlying mechanisms that influence the macroscopic L-H power threshold scaling relations. It is found the integrated long wavelength density fluctuation amplitudes scale with \rho* approaching the L-H transition, suggesting stronger drive of zonal flows for more favorable condition at lower toroidal field. Turbulence poloidal flow spectrum evolves from Geodesic Acoustic Mode (GAM) dominant at lower power to Low-Frequency Zonal Flow (LFZF) dominant near the L-H transition, and the effective shearing rate correspondingly increases. An inferred Reynolds Stress, <tildenu$_r(t)tildenu_theta(t) >$, $from BES velocimetry measurements [2] is found to increase near the L-H transition. Similar observations were made by the Langmuir probe measurements. At lower density, a clear increase of the LFZF transition, which is not evident at higher density. Taken together, these results are qualitatively/semi-quantitatively consistent with the density and toroidal field scaling of the L-H transition power threshold.$

[1] E.J. Doyle, et al., Nucl. Fusion 47, S18, 2007.
[2] G.R. McKee, et al., Rev. Sci. Instrum. 75, 3490, 2004.

This work was supported in part by the US Department of Energy under DE-FG02-89ER53296, DE-FG02-08ER54999, DE-FG02-07ER54917, DE-FC02-04ER54698, and DE-FG02-08ER54984.

## Country or International Organization of Primary Author

USA

**Primary author:** Ms YAN, Zheng (USA)

**Co-authors:** Dr RUDAKOV, Dmitry L. (University of California San Diego); Dr MCKEE, George R. (University of Wisconsin-Madison); Dr BOEDO, Jose A. (University of California San Diego); Dr DIAMOND, Patrick H. (University of California San Diego); Dr GOHIL, Punit (General Atomics); Dr FONCK, Raymond J. (University of Wisconsin-Madison); Dr GROEBNER, Richard J. (General Atomics); Dr OSBORNE, Thomas H. (General Atomics)

**Presenter:** Ms YAN, Zheng (USA)

**Session Classification:** Poster: P7

**Track Classification:** EXC - Magnetic Confinement Experiments: Confinement