Contribution ID: **638** Type: **Poster**

TH/P4-15: Theory of Rapid Formation of Pedestal and Pedestal width due to Anomalous Particle Pinch in the Edge of H-mode Discharges

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

A theory based on a turbulent particle pinch is proposed to explain the rapid formation of sharp density gradients in tokamak edge plasmas, in particular the pedestal region. The inward radial particle flux in the pedestal results from the interaction between small scale electron temperature gradient driven (ETG) turbulence and self-consistently formed "electron geodesic acoustic modes" (el-GAMs). To address this phenomenon, the el-GAM modulational instability driven by the ETG turbulence background is studied. The ETG level of fluctuations and particle pinch are estimated through the back reaction of eGAMs on ETG turbulence. It is found that the particle pinch is quite sensitive to magnetic shear, safety factor, ratio of electron to ion temperatures and atomic mass number. In the absence of particle source in the pedestal, the density gradient length scale, of the order of the pedestal width, is estimated. It is shown that it is proportional to the major radius, up to some dependence on the poloidal beta. Moreover it does not depend on the normalized gyro-radius. This scaling agrees with DIII-D and JET similarity experiments [Beurskens et al., Nucl Fusion 51, 124051 (2009)]. This dependence is favorable when extrapolated to the pedestal width in ITER in spite of its low normalized gyro radius. It is also shown that the density scale length becomes sharper by increasing the magnetic shear. A new H-mode pedestal pressure scaling is derived assuming that the pressure gradient is limited by the ballooning instability.

Acknowledgements: One author (R. Singh) thanks Drs. O. Gürcan and J. Anderson for fruitful discussions.

Country or International Organization of Primary Author

India

Primary author: Prof. KAW, Predhiman Krishan (Institute for Plasma Research)

Co-authors: Dr LOARTE, Alberto (ITER Organization); BOURDELLE, C (CEA); Dr CAMPBELL, David (ITER Organization); BORA, Dhiraj (ITER Organisation); NORDMAN, H (Chamlers Institute of Technology); Mr SINGH, Raghvendra (India); SINGH, Rameswar (IPR, Bhat, Gandhinagar); GARBET, X (CEA)

Presenter: Mr SINGH, Raghvendra (India)

Session Classification: Poster: P4

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