Contribution ID: **581** Type: **Poster**

Robust H-mode Pedestal Compatibility with SOL and Divertor Plasma Constraints

Wednesday, 19 October 2016 08:30 (4 hours)

Experiments on DIII-D have advanced the physics basis for simultaneously achieving a high pressure H-mode pedestal for high core plasma confinement with a highly dissipative divertor for protection of plasma facing components in future reactor tokamaks. These studies show achievement of this goal is governed by the coupling of several pedestal and divertor processes including: 1) the pedestal density profile dependence on the recycling neutral ionization source, 2) the separatrix density required to achieve strong divertor dissipation for high power exhaust, 3) the direct effect of dissipative divertor operation on pedestal performance, and 4) maintaining adequate power flux across the separatrix for robust H-mode confinement. A closed divertor configuration is shown to reduce the core plasma density, even for divertor detachment onset, due to a reduction in the pedestal ionization source. The separatrix density is found to increase with power, resulting in a variation in the accessible ratio of separatrix to pedestal top density. Robust pedestal pressure is found compatible with dissipative divertor operation, as long as collisionality remains low enough for optimal MHD stability, and core radiation from impurity seeding is limited to maintain sufficient power flux across the separatrix. The results suggest that a robust pedestal may be compatible with highly dissipative divertor operation for the lower core collisionality expected in future larger tokamaks. Taken together the pedestal requirements imply that innovative divertor solutions will be required to obtain dissipative operation at lower core density as future tokamaks scale to larger size and higher field.

This work is supported by the U.S. DOE under DE-FC02-04ER546981, DEAC52-07NA273442.

Paper Number

EX/P3-25

Country or International Organization

United States

Primary author: Dr LEONARD, Anthony W. (USA)

Co-authors: MCLEAN, A.G. (Lawrence Livermore National Laboratory); MOSER, A.L. (General Atomics); MAKOWSKI, M.A. (Lawrence Livermore National Laboratory); STANGEBY, P.C. (University of Toronto Institute for Aerospace Studies); GROEBNER, R.J. (General Atomics); OSBORNE, T.H. (General Atomics)

Presenter: Dr LEONARD, Anthony W. (USA)

Session Classification: Poster 3

Track Classification: EXS - Magnetic Confinement Experiments: Stability