Contribution ID: **369** Type: **Oral**

The Role of Drifts and Radiating Species in Detached Divertor Operation at DIII-D

Wednesday, 19 October 2016 10:45 (20 minutes)

A comprehensive experimental campaign at DIII-D has advanced understanding and modeling of the effects of drifts and radiating species in diverted plasma up to ITER-relevant collisionality. Unique diagnostic capabilities are employed to show directly that plasma drifts lead to in/out asymmetries as well as shifts in radial parameter profiles throughout the divertor legs, and are a critical factor for predicting detachment onset, and particle and heat fluxes for a detached divertor. These results are reproduced by first-of-its-kind boundary modeling of H-mode discharges with a full physics description of drifts using UEDGE in both toroidal field directions, confirming that the interplay of radial and poloidal E×B drifts are primarily responsible for target asymmetries and localization of high density/low temperature plasma in the scrape-off layer. SOLPS modeling of L-mode Helium discharges with negligible carbon emission suggests that molecules and atomic contributions may play a role in explaining a consistent shortfall in divertor radiation observed in boundary modeling of multiple tokamaks. These and future planned studies of detachment provide valuable physics insight informing the implementation of high-Z plasma facing components at key locations poloidally in DIII-D in 2016.

Paper Number

EX/2-1

Country or International Organization

United States

Primary author: Dr MCLEAN, Adam (Lawrence Livermore National Laboratory)

Co-authors: BRIESEMEISTER, A. (Oak Ridge National Laboratory); MOSER, A.L. (General Atomics); LEONARD, A.W. (General Atomics); SAMUELL, C. (Lawrence Livermore National Laboratory); SANG, C. (Institute of Plasma Physics, Chinese Academy of Sciences); LASNIER, C.J. (Lawrence Livermore National Laboratory); RUDAKOV, D. (University of California San Diego); THOMAS, D. (General Atomics); HILL, D.N. (General Atomics); KOLEMEN, E. (Princeton Plasma Physics Laboratory); UNTERBERG, E.A. (Oak Ridge National Laboratory); PORTER, G.D. (Lawrence Livermore National Laboratory); WANG, H. (Oak Ridge National Laboratory); GUO, H.Y. (General Atomics); BYKOV, I. (University of California San Diego); CANIK, J. (Oak Ridge National Laboratory); GUTERL, J. (General Atomics); BOEDO, J.A. (University of California San Diego); ELDER, J.D. (University of Toronto Institute for Aerospace Studies); WATKINS, J.G. (Sandia National Laboratory); FENSTERMACHER, M. (Lawrence Livermore National Laboratory); GROTH, M. (Aalto University); MAKOWSKI, M.A. (Lawrence Livermore National Laboratory); STANGEBY, P.C. (University of Toronto Institute for Aerospace Studies); DING, R. (Institute of Plasma Physics, Chinese Academy of Sciences); ALLEN, S.L. (Lawrence Livermore National Laboratory); ABRAMS, T. (General Atomics); ROGNLIEN, T. (Lawrence Livermore National Laboratory); OSBORNE, T.H. (General Atomics); PETRIE, T.W. (General Atomics); MEYER, W. (Lawrence Livermore National Laboratory)

Presenter: Dr MCLEAN, Adam (Lawrence Livermore National Laboratory)

Session Classification: Divertor & SOL Physics 1

Track Classification: EXD - Magnetic Confinement Experiments: Plasma–material interactions; divertors; limiters; scrape-off layer (SOL)