Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

Electron Transport Stiffness and Heat Pulse Propagation on DIII-D[1] C.C. PETTY, J.C. DEBOO, S.P. SMITH, K.H. BURRELL, General Atomics, A.E. WHITE, MIT, J.C. HILLESHEIM, UCLA, C.H. HOLLAND, UCSD
— Experiments on DIII-D have measured the stiffness of electron heat transport using a new method that combines heat pulse (HP) propagation and power balance (PB) analysis. Using a single modulated gyrotron, in addition to 5 cw gyrotrons, the radial profiles of T_e oscillations from the fundamental to the 9^{th} harmonic are fit to determine the diffusion (D_{HP}), convection (V_{HP}) and damping coefficients. The T_e gradient is then systematically scanned by varying the electron cyclotron heating profile on a shot-by-shot basis using the cw gyrotrons. Numerically integrating D_{HP} over this scan gives D_{PB}, and the difference between the diffusive heat flux from D_{PB} and the total power-balance heat flux determines V_{PB}. The ratio of D_{HP} to D_{PB} measures the transport stiffness, defined as the fractional increase in diffusive heat flux divided by the fractional increase in the T_e gradient. In L-mode plasmas, a sudden increase in electron transport stiffness is seen when the T_e scale length exceeds the theoretically predicted threshold value. Similar electron transport stiffness is observed with and without additional NBI.

[1]Work supported by US DOE under DE-FC02-04ER54698, DE-FC02-93ER54186, DE-FG02-08ER54984, DE-FG02-07ER54917 and DE-FG02-06ER54871.

C.C. Petty
General Atomics

Date submitted: 16 Jul 2012 Electronic form version 1.4