Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

Lower Hybrid Heating and Current Drive[1] XIANGRONG FU, WENDELL HORTON, IFS, University of Texas at Austin, YVES PEYSSON, JOAN DECKER, CEA/DSM/IRFM, Institute for Magnetic Fusion Research — Lower hybrid current drive (LHCD) is the most robust and efficient method of driving the tokamak current with external radio frequency waves in steady-state tokamak operation. The electron distribution functions in the LHCD experiments contain substantial parallel thermal fluxes with radial gradients that are greater than those in the current and temperature profiles. We re-examine the growth rates of the electron temperature gradient (ETG) modes in these plasmas based on an analytic model for electron distribution function with three temperatures $T_\perp$, $T_{\|F}$, and $T_{\|B}$. The stability and turbulent transport is also analyzed using the electron distribution functions computed with a combined ray tracing/Fokker Planck code (DELPHINE C3P/LUKE). Electron Landau damping is reduced compared to its value in a Maxwell distribution. These potential instability drives are controlled by the magnetic sheared induced electron Landau damping that becomes strong as the fluctuations propagate into regions of large parallel wavenumber away from the mode rational surfaces. The feedback of the ETG turbulence on the propagation of the penetration of RF fields that shape the electron distribution function feeding the ETG growth rate make the problem a complex dynamical system.

[1]This work is supported by DoE grant to the University of Texas at Austin and the CEA/DSM/IRFM grant to Cadarache Laboratory.

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Date submitted: 24 Jul 2012 Electronic form version 1.4