Lower hybrid current drive in a high density diverted tokamak*

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Experimental observations of LHCD at high density (line averaged $n_e > 10^{20}$ m^{-3}) on the Alcator C-Mod tokamak are presented in this paper. Bremsstrahlung emission from relativistic fast electrons in the core plasma drops sharply in single null discharges well below the density limit previously observed on limited tokamaks ($\Omega/\Omega_{LH} \sim 2$). Modeling and experimental evidence suggest that the absence of LH driven fast electrons at high density may be due to collisional absorption in the scrape off layer. Experiments show that the expected current drive density dependence is recovered for inner wall limited discharges across the range of densities scanned ($0.5x10^{20}$ $m^{-3} < n_e < 1.5x10^{20}$ m^{-3}). Increasing T_e in the periphery of the plasma ($0.8 > r/a > 1.0$) also results in a modest increase in non-thermal electron emission at high n_e. High field (B_φ = 8T), high current (I_p = 1.2 MA), ICRF heated He discharges at high n_e show an increase in non-thermal electron signatures, though not as large as for limited discharges. Ray tracing/Fokker-Planck simulations of these discharges predict the observed sensitivity to plasma position when the effects of collisional absorption in the SOL are included in the model.

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