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Lower hybrid current drive in a high density diverted tokamak
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— LHCD is the primary non-inductive current drive mechanism on Alcator C-Mod, a compact tokamak with parameters (plasma density, B_ϕ, magnetic topology, and LH wave frequency) similar to ITER. Efficient current drive has been demonstrated on C-Mod at moderate densities ($\bar{n}_e \sim 0.5\times10^{20}$ m^{-3}). However, as density increases fast electron bremsstrahlung and non-thermal ECE, which are used as proxies for fast electrons generated by LHCD, drop faster than expected based on data from limited tokamaks. The steep decline of fast electron emission at high density is attributed to collisional damping of the LH waves in the SOL combined with weak Landau damping of the LH waves inside the confined plasma. Experiments have identified several methods to mitigate the impact of parasitic absorption in the SOL. Higher non-thermal emission is observed in discharges with elevated off-axis T_e as well as in limited discharges. Ray tracing/Fokker-Planck simulations of these discharges predict the observed dependencies when the effects of collisional absorption in the SOL are included in the model. Supported by USDoE awards DE-FC02-99ER54512 and DE-AC02-09CH11466.

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