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**Progress towards steady-state regimes with LHCD in Alcator C-Mod**[1] RON PARKER, PAUL BONOLI, MIT PSFC, ORSO MENEGHINI, General Atomics, SYUN'ICHI SHIRAIWA, GREG WALLACE, MIT PSFC, RANDY WILSON, PPPL, SEUNG GYOU BAEK, IAN FAUST, MIT PSFC, BOB HARVEY, CompX, AMANDA HUBBARD, MIT PSFC, ALEXANDER SMIRNOV, Moscow State University, AND THE C-MOD TEAM — Non-inductive discharges with $\overline{n}$ = 0.5x10$^{20}$ m$^{-3}$, $I_p$ = 0.5 MA and B$_T$ = 5.4 T have been obtained with LHCD in Alcator C-Mod. Sawteeth are suppressed and MSE-constrained EFIT profiles reveal modestly reversed shear, with q$_0$ $\sim$ 2 and q$_{min}$ $\sim$ 1.5. LHCD efficiency is in the range $\eta$ = 2.0 - 2.5x10$^{19}$ A/Wm$^2$, in line with the LHCD efficiency assumed for advanced regimes sustained in part by LH in ITER. Accessing ITER relevant steady-state regimes in C-Mod with $f_{BS} \sim 50\%$ requires increasing the density to $\overline{n} \sim$ 1.5x10$^{20}$ m$^{-3}$ with $T_{e0} > 5$ keV . However, at $T_{e0} < 3$ keV, the efficiency and all indications of fast electron generation fall rapidly above $\overline{n} \sim$ 1x10$^{20}$ m$^{-3}$, well below the limit set by wave accessibility. Ray tracing and full wave simulations have been carried out to investigate the cause of the drop in efficiency and both indicate that the SOL can play an important role in absorbing LH waves, either in the SOL or near but inside the separatrix. Recently, decay instabilities on the high field side have been identified as an additional loss mechanism. Regardless of the absorption process, simulations show that fast electron production can be maintained up to $\overline{n} \sim$ 1.5x10$^{20}$ m$^{-3}$ by assuring strong single-pass absorption, a conclusion that has been verified in 8 T He plasmas with $T_{e0} \sim 5$ keV.

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