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LHCD on Alcator C-Mod[1] ORSO MENEGHINI, SYUNICHI SHIRAIWA, IAN FAUST, RONALD PARKER, GREGORY WALLACE, MIT-PSFC
— Non-inductive discharges and reversed shear profiles with eITB were achieved on C-Mod using LHCD at moderate density ($\bar{n}_e < 10^{20}$ m^{-3}). However an anomalous loss of CD efficiency is observed at higher density, limiting the development of AT regimes. Fullwave simulations using the LHEAF code reproduce the experimental drop in hard X-Ray emissivity, revealing a different physical picture than what was developed previously using raytracing codes, which relied on a strongly collisional SOL to reproduce the experiments. These results may be explained by the combined effect of an $n_{\|}$ upshift (localizing the damping in the plasma periphery) and radial diffusion of fast electrons. The implications are profound and suggest that the key to improving the LHCD performance at high density is to operate at high Te and to push the power deposition profile inward to avoid prompt loss of fast electrons. Increased hard X-Ray emissivity was indeed confirmed for high Te=4.5keV, Bt=8T, Ip=1.2MA plasmas. AT scenario development has motivated the design of an off-midplane antenna which exploits velocity space synergy with the existing launcher to improve performance at higher density.

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