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Observation of Revered Shear Alfvén Eigenmodes During the Sawtooth Cycle in Alcator C-Mod[1]

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Reversed shear Alfvén eigenmodes (RSAEs) have been identified in Alcator C-Mod plasmas between sawtooth crashes at ITER relevant densities of $n_{e0} \leq 1.5\ 10^{20}\ m^{-3}$ with 2-5 MW of ICRH power absorbed by H minority heating. The dependence of this phenomenon on n_e, I_p and L versus H- mode confinement will be presented. The ideal MHD code NOVA [1] is used to model the RSAE spectra measured by the phase contrast imaging diagnostic and Mirnov coils and shows that q_{min} can relax to approximately 0.92 prior to the sawtooth crash. Furthermore, these calculations predict that the RSAEs can be unstable with even a slightly reversed shear q profile in the presence of an ICRF generated fast ion (H minority) tail. The formation of a reversed shear q profile during the sawtooth cycle may be explained using a resistive diffusion model starting with current density and temperature profiles that are centrally flattened during the sawtooth crash. Results of multiple resistivity models will be compared in light of the experimental observations. We postulate that the formation of a reversed shear q profile during the sawtooth cycle is similar to that of the current ramp where the parallel current peaks off axis [2]. The implications of these results will be discussed in relation to the observation that Alfvén eigenmodes enhance transport [3] and that reversed shear q profiles are expected to be detrimental to core fast ion confinement.

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[1]In collaboration with M. Porkolab, L. Lin, Y. Lin, N. Tsujii, S.J. Wukitch (MIT), and G.J. Kramer (PPPL)