Abstract Submitted
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Characterization of neo-classical tearing modes in high-performance I-mode plasmas with ICRF mode conversion flow drive on Alcator C-Mod[1] YIJUN LIN, R. GRANETZ, M.L. REINKE, J.E. RICE, S.M. WOLFE, S.J. WUKITCH, MIT PSFC, ALCATOR C-MOD TEAM — Neo-classical tearing modes (NTM's) have been observed on Alcator C-Mod in high performance I-mode plasmas (B_{t0} ~5.2 T) that are heated by a combination of ICRF D(H) minority heating at 80 MHz and D(He3) mode conversion (MC) heating at 50 MHz. Due to the stabilizing effect by the energetic minority hydrogen ions, long sawtooth (≥40 ms) and large sawtooth crashes (ΔT_{e0} ≥3 keV) are produced in these hot (T_{e0} ≤9 keV) plasmas. NTMs with (m=4, n=3), (5, 4), (3, 2) and (2, 1) have been observed. The onset criteria of the (3, 2) NTMs, β_p ~0.4-0.7, β_N ~1.0-1.4, β_N/ρ_i^* ~200-350, ν_{NTM} (q=3/2)~0.04-0.25, approximately follow the trend that obtained from DIII-D and ASDEX Upgrade. For the (3, 2) mode, the saturated width W_{sat} ~0.8-1 cm, which is 3-4 times the ion banana width. Although the NTMs have a small effect on confinement degradation ($\Delta\beta/\beta \sim$ a few percent), they have significant effect on plasma rotation. MC flow drive generates large toroidal rotation above 100 km/sec in L-mode, and when the plasma enters I-mode, plasma rotation is expected to increase significantly due to the additional intrinsic rotation torque from the edge T_e pedestal. The appearance of the (3, 2) mode usually rapidly reduces the rotation speed, and the (2, 1) mode, if it occurs, would completely halt the rotation.

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