# Correlation Between Plasma Rotation and Electron Temperature Gradient Scale Length in LOC/SOC Transition at Alcator C-Mod*

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Understanding the mechanism governing the linear ohmic confinement (LOC) and the transition to saturated ohmic confinement (SOC) has long been a focus of tokamak research. It is commonly accepted that at low density, the confinement is dominated by electron-scale turbulence while at high density, the turbulence is dominated by ion temperature gradient. At Alcator C-Mod tokamak, the core rotation reversal was shown to be consistent with this *ansatz*.[1] A recent study at AUG suggests that the intrinsic rotation behavior is rather determined by local plasma parameters regardless of the heating method or the confinement regime.[2] This idea was explored and it was found that although the intrinsic rotation depends on the electron temperature gradient scale length ($L_{Te}$), ultimately this behavior is a function of the confinement regime. For this measurement, the high-resolution (1 $\mu$s, 7mm) electron cyclotron emission diagnostic at C-Mod (FRCECE) coupled with the $B_T$ jog technique allows direct $L_{Te}$ measurements. In the $B_T$ jog technique, a 1.5% change in the toroidal magnetic field scans the viewing volume of the ECE by ~1 cm, and the ratio of the average of the signal to the change in the signal during its ramp-up yields $L_{Te}$. *Rice et al* showed that there is a connection between some seemingly unrelated parameters: at the radius with the steepest gradient, the electron temperature is the same in the $T_e$ profiles of edge-cooled LOC or SOC discharges.[3] Also at the radius with the steepest gradient, the toroidal rotation profiles have the same values in LOC or SOC discharges.[1] Here we catalog another component to the phenomenological study: at this radius there exists a low frequency mode (~3 kHz) in the ECE spectrum, which vanishes above the LOC/SOC critical collisionality. As the density, and hence the collisionality increased into SOC regime, a new mode (~6 kHz) appears. The presence of these modes questions the role of MHD effects in LOC/SOC transition.

*This material is based upon work supported by the U.S. Department of Energy Office of Science, Office of Fusion Energy Sciences under Award Number DE-FG03-96ER-54373.

[1] Rice *et al*, Nucl. Fusion **53**, 033004 (2013).
[2] McDermott *et al*., Nucl. Fusion **54**, 043009 (2014).
[3] Gao *et al*., Nucl. Fusion **54**, 083025 (2014).