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Electron Temperature Gradient Scale Measurements in ICRF Heated Plasmas at Alcator C-Mod

SAEID HOUSHMANDYAR, PERRY E. PHILLIPS, WILLIAM L. ROWAN, Institute for Fusion Studies, The University of Texas at Austin, NATHANIEL T. HOWARD, MARTIN GREENWALD, PSFC, MIT — It is generally believed that the temperature gradient is a driving mechanism for the turbulent transport in hot and magnetically confined plasmas. A feature of many anomalous transport models is the critical threshold value (\(L_C\)) for the gradient scale length, above which both the turbulence and the heat transport increases. This threshold is also predicted by the recent multi-scale gyrokinetic simulations, which are focused on addressing the electron (and ion) heat transport in tokamaks [Howard et al, Phys. Plasma 23, 056109 (2016)]. Recently, we have established an accurate technique (B\(T\)-jog) to directly measure the electron temperature gradient scale length (\(L_{Te} = T_e/\nabla T\)) profile, using a high-spatial resolution radiometer-based electron cyclotron emission (ECE) diagnostic [Houshmandyar et al, RSI (2016)]. For the work presented here, electrons are heated by ion cyclotron range of frequencies (ICRF) through minority heating in L-mode plasmas at different power levels, TRANSP runs determine the electron heat fluxes and the scale lengths are measured through the B\(T\)-jog technique. Furthermore, the experiment is extended for different plasma current and electron densities by which the parametric dependence of \(L_C\) on magnetic shear, safety factor and density will be investigated.

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