Light Impurity Toroidal Rotation and Momentum Transport for $0.35 < \varrho < 0.85$ in Alcator C-Mod Plasmas*

I.O. Bespamyatnov [a], W.L. Rowan [a], K.W. Gentle [a], R.S. Granetz [b], A. Ince-Cushman [b], R. M. McDermott [b], and J.E. Rice [b]

[a] Fusion Research Center, The University of Texas at Austin,
[b] MIT Plasma Science and Fusion Center

Spatially and temporally resolved B^{+5} toroidal velocity profiles are reported for the region of $0.35 < \varrho < 0.85$ in Alcator C-Mod. Charge Exchange Recombination Spectroscopy (CXRS) is routinely used to measure boron density, temperature and flow velocities in C-Mod. Boron is an abundant, intrinsic, light impurity that is well suited for study of plasma transport.

Recently, much attention has been devoted to rotation and momentum transport in tokamak plasmas. These topics play important roles in plasma stabilization during transition to high confinement modes (H-mode, ITB). This leads to heightened interest in plasma experiments with no external momentum input. Alcator C-mod is one such experiment. Spontaneous (intrinsic) toroidal rotation of seeded, heavy impurity (Ar) has been observed and studied at C-Mod by means of x-ray spectroscopy.[1]

The work presented here is focused on a momentum transport study using a light impurity, boron, and employs local, CXRS measurements. Spatially, the region of interest is that of ITB formation. First, the measured toroidal velocity will be compared with calculated neoclassical values.[2] Then it will be combined with poloidal CXRS measurements in the same spatial region, to study momentum transport physics of the L-mode to H-mode transition and ITB formation. It has already been shown that the toroidal rotation term is one of the main contributions to the inference of the radial electric field from the force balance equation.[3]

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1) J.E. Rice, et al, Nuclear Fusion 44 (2004)

2) Y. B. Kim, et al, Physics of Fluids B 3, 2050 (1991).

3) I.O. Bespamyatnov, et al, "Impurity poloidal rotation and other CXRS measurements for $0.2 < \varrho < 0.95$ in Alcator C-Mod plasmas", APS-DPP, Orlando, Florida 2007