

Impurity Transport for $\rho < 1$ in the Alcator C-Mod Tokamak*

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Impurity transport measurements will be presented for L-mode and EDA H-mode discharges in the Alcator C-Mod tokamak. These are the initial results using new diagnostic techniques for data from the last run campaign. For the next run campaign, targeted experiments are planned. Empirical descriptions of impurity transport will contribute to studies of ITB discharges and the collisionality dependence of density peaking. Impurity transport measurements will be correlated with turbulence measurements during the transition from EDA H-mode to ITB.

Impurity transport can be studied on many C-Mod discharges using the data that is readily available from the charge exchange recombination spectroscopy (CXRS) diagnostic. Using this diagnostic, B^{+5} profiles are available for every discharge for which the diagnostic beam is injected into the plasma. In the same spectral range, we also observe ambient spectra consisting of B^{+1} and B^{+4} lines. Used alone, the measured profile of a fully stripped impurity (B^{+5}) can be used to estimate diffusion relative to pinch (D/v). This assumes the conventional model for the impurity flux, which represents the flux as the the sum of diffusive and convective components. This model is useful for comparison with neoclassical and even quasilinear transport. More detailed empirical description of impurity transport can be constructed by adding B^{+1} and B^{+4} profiles and employing a transport code such as MIST. Also, it may be possible to use all of the profiles in comparisons with gyrokinetic simulations although this certainly remains to be demonstrated.

Since this is the first presentation of this material, the emphasis will be on experimental challenges and the accuracy of the measurements, and what these imply for upcoming experiments. Specifically, the experimental challenges are maintenance of channel-to-channel calibration for invessel optics throughout a campaign, development of emission models for the B^{+1} , B^{+4} , and B^{+5} spectral lines, and estimation of the attenuation of the diagnostic neutral beam. These problems were addressed and resolved during the last two C-Mod campaigns.

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