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EX/P3-01: Poloidal Variation of High-Z Impurity Density due to Hydrogen Minority ICRH on Alcator C-Mod

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In the Alcator C-Mod tokamak, strong, steady-state variations of molybdenum density within a flux surface are routinely observed in plasmas using hydrogen minority ion cyclotron resonant heating. In/out asymmetries, up to a factor of 2, occur with either inboard or outboard accumulation depending on the major radius of the minority resonance layer. Quantitative comparisons between existing parallel high-Z impurity transport theories and experimental results show good agreement when the resonance layer is on the high-field side (HFS) of the tokamak but disagree substantially for low-field side (LFS) heating. Impurity accumulation on the LFS of a flux surface can be explained by the centrifugal force, and is the first observation of intrinsic rotation generating an in/out asymmetries. The accumulation of impurity density on the HFS of a flux surface is shown to be driven by a poloidal potential variation sustained by magnetically trapped non-thermal, cyclotron heated minority ions. Parallel impurity transport theory is extended to account for these fast-ion effects and shown to agree with experimentally measured impurity density asymmetries.

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