H-α/D-α Spectroscopy on Alcator C-Mod

by

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Abstract

A high-resolution optical spectrometer has been recently implemented on the Alcator C-Mod tokamak to measure the neutral hydrogen/deuterium (H/D) ratio at the plasma edge. The spectrometer determines the ratio by observing Balmer-α transitions of each species. Auxiliary heating of plasma in the Alcator C-Mod tokamak is accomplished by means of D(H) minority ICRF. Wave absorption is a sensitive function of the minority concentration, and kinetic theory predicts a critical value for which the single-pass RF absorption is maximum. All shots up to the present have employed passive control of the H/D ratio by means of baking, electron cyclotron discharge cleaning (ECDC), and boronization of the vacuum vessel prior to a run. Minority (hydrogen) concentrations have been measured as low as 2%. Since kinetic theory predicts a critical value of ~ 5% for these shots, this presents an opportunity to compare theory with experiment. Recent measurements have been made of plasma stored energy vs. minority concentration. For a given RF power input and constant plasma current, experiment agrees fairly well with theory.

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