

Abstract Submitted
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An Integrated Data Analysis model to determine ion effective charge from beam attenuation and charge exchange emission measurements¹ M.D. NORBERG, D.J. DEN HARTOG, L.M. REUSCH, Univ of Wisconsin-Madison — We have created a forward model for charge-exchange impurity density measurements that incorporates neutral beam attenuation measurements self-consistently for determining the ion effective charge Z_{eff} in MST PPCD plasmas. Detailed knowledge of Z_{eff} is critical to determining the resistive dissipation of hot plasmas and requires knowledge of the impurity content and dynamics. Previously, Z_{eff} profiles were determined from soft-x-ray brightness measurements by using charge-exchange impurity density measurements as prior information using an Integrated Data Analysis (IDA) method. The model is extended to include a self-consistent calculation of the neutral beam attenuation and includes measurements of the beam Doppler-shift spectrum and shine-through particle flux. Methods of experimental design are employed to calculate the information gained from different diagnostic combinations. The analysis shows that while attenuation measurements alone do not provide a unique impurity density measurement in the case of a multi-species inhomogeneous plasmas, they do provide a valuable measurement of the Z_{eff} profile and constrain the range of contributing impurity densities.

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