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**Non-linear Fitting of Charge Exchange Recombination Spectra with Energy-Dependent Cross Section Included<sup>1</sup>**

R.J. GROEBNER, K.H. BURRELL, General Atomics, L.R. BAYLOR, ORNL — The energy-dependence of the cross section for charge exchange between fully ionized ions and a high energy hydrogenic neutral beam has been incorporated into the non-linear analysis of data from the DIII-D Charge Exchange Recombination (CER) spectroscopy system. As compared to analysis in which the “cross-section effect” is ignored, this analysis provides corrections to the inferred ion temperatures and velocities, with the corrections becoming more important as the temperature of the ions increases. The analysis is based on an exact one-dimensional velocity integral for the CER line shape. This integral is evaluated either numerically or analytically with the analytic version generally providing very good accuracy despite using some approximations. A numerical convolution of the measured instrumental function with the velocity integral is used to generate the theoretical model used for comparison with the measured spectra in a non-linear least squares fitting process. Derivatives of the theoretical model relative to the fit parameters are calculated numerically. This analysis procedure is stable and substantial testing indicates that correct results are being produced.

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Prefer Oral Session  
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