

Spectral MSE Synthetic Diagnostic on EAST

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We have developed a new synthetic diagnostic (NBASS) for the Motional Stark Effect diagnostic and applied it to the EAST tokamak in preparation for experimental demonstration of plasma current measurements using spectral MSE. The code simulates the D_α emission spectrum of the heating neutral beams, taking into account the quadratic motional Stark effect, Paschen-Back effect, non-statistical beam atom excited state population, radial electric field, and beam densities calculated using ALCBEAM[†]. The code calculates the emission over a grid of points centered on the viewing chord in order to accurately calculate broadening and predict asymmetries which may result in systematic uncertainties during line fitting. Background spectra are also calculated for free-free bremsstrahlung, charge exchange recombination emission, and neutral halo emission. The synthetic spectra were fitted using line shift (LS-MSE) and line ratio (LR-MSE) techniques to predict random and systematic uncertainties in EAST and ITER scenarios. The code has been tested on Alcator C-Mod using measurements of the DNB, showing agreement between the simulated spectra and measurement.

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