

Measurements of the Internal Magnetic Field on DIII-D Using Intensity and Spacing of the Motional Stark Multiplet*

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We describe a new diagnostic system, B-Stark, that has been developed for the DIII-D tokamak to measure the magnitude and direction of the internal magnetic field. This diagnostic relies on the relative line intensities and spacing of Stark split D_α emission from the neutral beams. To find the magnetic pitch angle, we use the ratio of the intensities of the π_3 and σ_1 lines. These lines originate from the same upper level, and so are not dependent on the population levels. This technique may have advantages over a Motional Stark Effect (MSE) diagnostic in future devices, such as ITER. We have done an optimization of the viewing direction for the available ports on DIII-D to choose the installation location. With this placement we have a near optimal viewing angle of 59.6 degrees from vertical. All hardware has been installed for one chord, and we have been routinely taking data since January 2007. We fit the spectra using a simple Stark model in which we set the upper level populations of the D_α transition as free variables. We also describe an alternate fitting model using an atomic physics code to calculate the expected population levels. The magnitude and pitch angle of the magnetic field obtained using this diagnostic technique compare well with measurements from MSE and EFIT.

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