

Effect of Plasma Radial Electric Field on Motional Stark Effect Measurements and Equilibrium Reconstruction

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Abstract

Motional Stark Effect (MSE) has become the leading diagnostic technique for measurement of the internal poloidal field profile in neutral beam heated tokamak plasmas. The technique relies upon the measurement of the polarization angle of Stark broadened neutral beam D_α emission due to the strong $\mathbf{E} = \mathbf{v}_{\text{beam}} \times \mathbf{B}$ motional electric field. In many recently discovered enhanced confinement regimes in tokamaks, a strong radial electric field E_r is also present in the plasma. It is shown that in these cases, the effect of E_r on the interpretation of MSE measurements is significant and cannot be neglected. The importance of this effect is illustrated with the analysis of the q profile in a high-performance discharge from the DIII-D tokamak.

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