

# **Data Acquisition Upgrade of the Motional Stark Effect Diagnostic on DIII-D for MHD Fluctuation Measurements and Improved Current Profiles**

J.D. King, M.A. Makowski, C.T. Holcomb, S.A. Allen, D.N. Hill, M.A. Van Zeeland<sup>a</sup>,  
T.L. Rhodes<sup>b</sup>, W.H. Meyer, R. Geer, D. Pham<sup>b</sup>, and E.C. Morse<sup>c</sup>

*Lawrence Livermore National Laboratory, CA*

*<sup>a</sup>General Atomics, San Diego, CA*

*<sup>b</sup>University of California, Los Angeles*

*<sup>c</sup>University of California, Berkeley*

kingjd@fusion.gat.com

Measurement of internal magnetic fluctuations is of great importance to the study of neoclassical tearing modes and magnetohydrodynamic (MHD) structures. To make such measurements Fourier analysis was employed to analyze data from a newly installed 500kHz multi-channel digitizer on the DIII-D motional Stark effect (MSE) diagnostic. Full spectral analysis provides a way to self-diagnose sources of systematic MSE error. High frequency MHD intensity and magnetic fluctuations were identified as previously unknown sources of error. The effect of this error on pitch angle calculations is shown. Digital lock-ins were also installed to improve current profiles. The lock-in's algorithm is outlined and an oscillating artifact is described. Work supported by US DOE under DE-AC52-07NA27344, DE-FC02-04ER54698, DE-FG03-08ER54984, and DE-FG03-89ER51116.