

Overview of Equilibrium Reconstruction on DIII-D Using New Measurements from an Expanded Motional Stark Effect System*

C.T. Holcomb,¹ M.A. Makowski,¹ S.L. Allen,¹ W.H. Meyer,¹ R.A. Chipman,² S.C. McClain²

¹Lawrence Livermore National Laboratory, 7000 East Avenue, Livermore, California 94551 USA

²University of Arizona, 1630 East University Boulevard, Tucson, Arizona 85721 USA

Motional Stark Effect (MSE) measurements constrain equilibrium reconstruction of the DIII-D tokamak using the code EFIT. In 2007, two new MSE arrays were brought online, bringing the total system to five arrays and 64 channels. We present the first EFIT reconstructions using the expanded system. Safety factor and E_r profiles produced by fitting to data from the two new arrays and one of the other three agree well with independent measurements. The expected performance of the combined system that motivated the expansion has been reported previously (Holcomb et al., RSI, 77, 10, 10E506, 2006). Here, we present the first measurements and EFIT reconstructions using the expanded system. Safety factor and E_r profiles produced by fitting to data from the two new arrays and one of the other three agrees well with independent measurements. Comparison of the data from all five arrays shows that two of the older arrays yield significantly different results unless the measured calibration factors are adjusted by a large amount which depends on toroidal field and plasma current direction. The optics of one array has a plasma facing debris shield and mirror that have become coated. The other has a radial view and no mirror. The inability to measure an accurate calibration for this array that is universally applicable suggests an unknown source of polarized background light that depends on plasma conditions. We consider fast ion recombination as one possible source.

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