

Experimental Imaging of Separatrix Splitting on DIII-D

M.W. Shafer¹, E.A. Unterberg¹, D.M. Orlov², T.E. Evans³, J.H. Harris¹, D.L. Hillis¹, R. Maingi¹,
R.A. Moyer², R. Nazikian⁴, A. Wingen¹

¹Oak Ridge National Laboratory, PO Box 2008, Oak Ridge, Tennessee 37831-6169, USA

²University of California San Diego, 9500 Gilman Dr., La Jolla, California 92093-0417, USA

³General Atomics, P.O. Box 85608, San Diego, California 92186-5608, USA

⁴Princeton Plasma Physics Laboratory, P.O. Box 451, Princeton, NJ 08543-0451, USA

Abstract. Perturbations in the plasma boundary due to the application of non-axisymmetric $n = 3$ fields ($\delta B / B \sim 10^{-4} - 10^{-3}$) were measured in the X-point region in DIII-D by tangential imaging of Extreme Ultra-Violet (EUV) and Soft X-Ray (SXR) emission. Vacuum field calculations show that these perturbations take the form of lobes extending outward from the unperturbed separatrix. These structures can be resolved in experiment by performing a differential measurement of the image for different toroidal phases of the applied perturbation. Forward modeling of the line-integrated image with a synthetic diagnostic is used to directly compare the measurement to vacuum-field calculations. Results indicate the existence of these lobes match well with the measured data. These lobes are observed to shift poloidally on the high-field side of the magnetic axis as the edge magnetic safety factor is varied, consistent with vacuum field calculations.