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Theory Experiment

Edge Soft X-Ray Imaging Measurements of 3D Plasma Response to Resonant Magnetic Perturbations,* M.W. Shafer, E.A. Unterberg, A. Wingen, J.H. Harris, D.L. Hillis, *ORNL*; T.E. Evans, *GA*; D.M. Orlov, *UCSD* — Three-dimensional (3D) perturbations in the edge plasma due to the application of non-axisymmetric fields are measured in the X-point region in DIII-D by tangential imaging of Ultra-Soft (USXR) and Soft X-Ray (SXR) emission in an effort to understand the internal plasma response. To date, 3D structures are resolved by performing a differential measurement of the image for different toroidal phases of the applied perturbation. Forward modeling of the line-integrated image is used to directly compare to the measurements. Vacuum field calculations show perturbations of the boundary take the form of lobes extending outward from the unperturbed separatrix and moving poloidally as the edge safety factor changes. These results match well with the USXR emission measurements. Using SXR emission measurements, structure is measured for the first time in the steep-gradient region inside the separatrix and is consistent with modeled internal 3D topological features.

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