

## Abstract

DIII-D experiments using new detailed magnetic measurements show that linear, single-fluid ideal magnetohydrodynamics (MHD) theory accurately describes the external structure of three-dimensional equilibria at low beta, providing a validated basis on which to exploit 3D fields for plasma control. At higher beta near the ideal kink mode stability limit, the measured structure shows contributions by multiple stable eigenmodes, in qualitative agreement with the kinetic extension of ideal MHD. These detailed comparisons provide the first evidence of the simultaneous stimulation of an internal and external kink from a single perturbing field implying that non-axisymmetric coil design for a high beta tokamak power plant will require careful optimization of the poloidal spectrum.

**PACS Nos:** 52.55.-s, 52.55.Fa, 52.30.Cv, 52.55.Tn, 52.65.Kj, 52.30.