Landau Resonant Modification of Multiple Kink Mode Contributions
to Three-dimensional Tokamak Equilibria

J.D. King¹, E.J. Strait¹, N.M. Ferraro¹, J.M. Hanson², S.R. Haskey³, M.J. Lanctot¹,
Y.Q. Liu⁴, N.Logan⁵, C. Paz-Soldan¹, D. Shiraki⁶, and A.D. Turnbull¹

¹General Atomics, San Diego, California, USA
²Columbia University, New York, New York, USA
³Plasma Research Laboratory, Research School of Physical Sciences and Engineering,
The Australia National University, Canberra, ACT 0200, Australia
⁴Culham Centre for Fusion Energy, Culham Science Centre, Abingdon, Oxfordshire,
OX14 3DB, United Kingdom
⁵Princeton Plasma Physics Laboratory, Princeton, New Jersey, USA
⁶Oak Ridge National Laboratory, Oak Ridge, Tennessee, USA

Abstract. Detailed measurements of the plasma’s response to applied magnetic
perturbations provide experimental evidence that the form of three-dimensional (3D)
tokamak equilibria, with toroidal mode number \( n = 1 \), is determined by multiple stable
kink modes at high-pressure. For pressures greater than the ideal magnetohydrodynamic
(MHD) stability limit, as calculated without a stabilizing wall, the 3D structure transitions
in a way that is qualitatively predicted by an extended MHD model that includes kinetic
wave-particle interactions. These changes in poloidal mode structure are correlated with
the proximity of rotation profiles to thermal ion bounce and the precession drift
frequencies suggesting that these kinetic resonances are modifying the relative
amplitudes of the stable modes. These results imply that each kink may eventually be
independently controlled.

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