Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

The physics of locked tearing mode stabilization by rotating 3D fields in the presence of static error fields S. INOUE, QST, M. OKABAYASHI, N.C. LOGAN, PPPL, N.Z. TAYLOR, ORAU, E.J. STRAIT, GA, J. SHIRAISHI, M. TAKECHI, G. MATSUNAGA, A. ISAYAMA, S. IDE, QST — Effective screening-out of static error fields (EFs) using rotating resonant magnetic perturbation (RMP), i.e., self-stabilized regimes, are found by nonlinear resistive MHD simulation [Inoue+, NF16&PPCF17] and validated using DIII-D experimental observations of tearing mode (TM) locking to uncorrected EFs. Simulations with a single rational surface have predicted the dominant single TM behaviors measured in DIII-D when applying rotating external fields. These behaviors include a standing wave type response when the internal TM is locked to the intrinsic EF and a propagating wave response when it is locked to the external rotating fields. Despite the qualitative consistency between AEOLUS-IT simulation and DIII-D experiment, details of stabilized regime measurements, where double and triple helicity responses due to toroidicity and poloidal shaping were also discovered [Okabayashi+, IAEA18], do not agree. Recent multi-helicity simulations suggest a self-stabilizing mechanism via anti-phasing between double-helicity structures. These improve consistency with observations and improve detailed understanding of locked TM control. This detailed cross-validation suggests that the physical process of the TM/RMP interaction proceeds quasi-/non-linearly and with multiple helicity structures, which goes beyond the linear stability model prediction. *Supported by the US DOE under DE-FC02-04ER54698 & DE-AC02-09CH11466.

Shizuo Inoue
National Institutes for Quantum and Radiological Science and Technology

Date submitted: 10 Jul 2019 Electronic form version 1.4