

Introduction to recent KSTAR international collaboration analysis

S.A. Sabbagh¹, Y.S. Park¹, J.H. Ahn¹, J.W. Berkery¹,
J.M. Bialek¹, Y. Jiang¹, J.D. Riquezes¹, S.D. Scott²

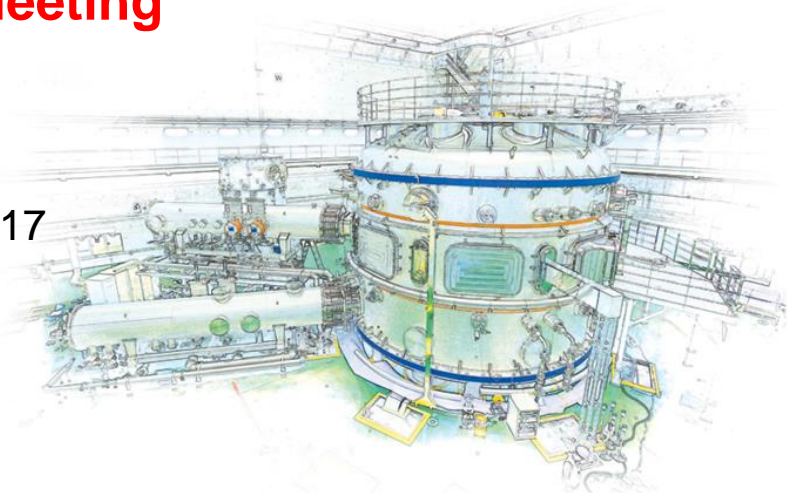
¹*Department of Applied Physics, Columbia University, New York, NY*

²*PPPL, Princeton, NJ*

NSTX-U Physics Meeting

PPPL

November 29th, 2017
Princeton, NJ



Supported by US DOE grant DE-SC0016614

Present KSTAR international collaborative research follows from our NSTX/-U research effort

- DOE solicitation

- “Collaborative Research in Magnetic Fusion Energy Sciences on International Long-Pulse Superconducting Tokamaks”

- Research Proposal Title

- “Disruption Prediction and Avoidance in High Beta Long Pulse KSTAR Plasmas”

- Personnel

- Columbia U.:

- Sabbagh (Lead PI), Y.S. Park, J.H. Ahn, Y. Jiang (full time)
- Berkery, Bialek (part time); J.D. Riquezes (Columbia student)

- PPPL: S. Scott (~full time, inst. PI), M. Boyer, B. LeBlanc (part time)

- MIT/ORISE: E.S. Marmor (inst. PI), B. Mumgaard

Presented collaborative physics research is required analysis for disruption prediction and avoidance

This meeting

- Element 1: Improvements and new capabilities enabling disruption characterization and forecasting (with related experiments)
 - More detailed equilibrium reconstruction: kinetic required, with MSE
 - Stability physics: kinetic MHD, NTM, kink/ballooning/RWM
 - TRANSP analysis supporting stability analysis
 - Disruption event characterization and forecasting
- Element 2: Improvements/support to key diagnostics:
 - C-Mod MSE background polychrometer sent to KSTAR (10 channels), building 15 more channels to support 25 total channels (2018)
 - Some support for Thomson diagnostic checkout
- Element 3: Experimental active control of dynamic error fields and global MHD instability
 - Support PID control implementation
 - Model-based RWM state-space control
 - Synthetic diagnostics to support disruption prediction

This meeting

Talks are a subset of the presentations shown at the recent APS DPP17 meeting

- Six presentations given at the APS DPP meeting
- Today's presentations
 - ❑ Transport and stability analyses supporting disruption prediction in high beta KSTAR plasmas (Jae Heon Ahn)
 - ❑ Kinetic equilibrium reconstruction of KSTAR plasmas including internal pitch angle profile measurement (Yanzheng Jiang)
- Tomorrow's presentations
 - ❑ MHD stability analysis and global mode identification for high beta operation in KSTAR (Young-Seok Park)
 - ❑ Automated identification of MHD mode bifurcation and locking in tokamaks (Sabbagh for J.D. Riquezes)
 - ❑ Brief outline of on-going KSTAR international collaboration research (Sabbagh)