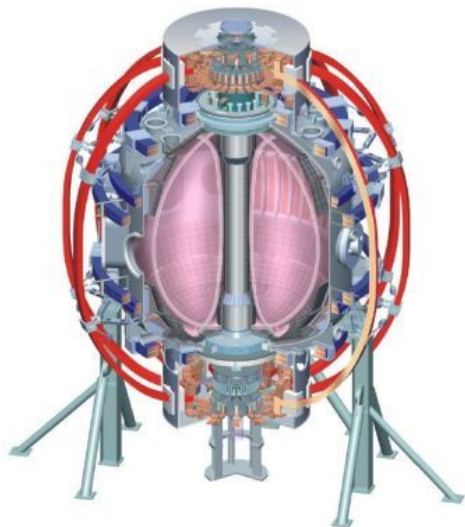


Summary of Macroscopic Stability TSG FY2010 Forum XP Prioritization

College W&M
Colorado Sch Mines
Columbia U
CompX
General Atomics
INEL
Johns Hopkins U
LANL
LLNL
Lodestar
MIT
Nova Photonics
New York U
Old Dominion U
ORNL
PPPL
PSI
Princeton U
Purdue U
SNL
Think Tank, Inc.
UC Davis
UC Irvine
UCLA
UCSD
U Colorado
U Illinois
U Maryland
U Rochester
U Washington
U Wisconsin

J. Menard (Deputy)
S. Sabbagh (Leader)
J.K. Park (Theory and Modeling)

NSTX FY2010 Research Forum
LSB B318, PPPL
December 3, 2009



Culham Sci Ctr
U St. Andrews
York U
Chubu U
Fukui U
Hiroshima U
Hyogo U
Kyoto U
Kyushu U
Kyushu Tokai U
NIFS
Niigata U
U Tokyo
JAEA
Hebrew U
Ioffe Inst
RRC Kurchatov Inst
TRINITI
KBSI
KAIST
POSTECH
ASIPP
ENEA, Frascati
CEA, Cadarache
IPP, Jülich
IPP, Garching
ASCR, Czech Rep
U Quebec

Macroscopic MHD TSG 2010 XPs: as proposed

1. Error field threshold study at high-beta – reduced torque (J. Park)	1.0 – 1.5 days	
2. Resonant Field Amplification of n=2 and n=3 applied fields (J. Park)	0.5 – 1.0 days	
3. Error field threshold scaling in H mode - next step devices (Buttery)	1.0 days	
4. 2/1 NTM stability (and EF sensitivity) vs q profile (Buttery)	1.0 days	
5. Effect of rotation on amplitude of 3/2 NTMs (La Haye)	1.0 days	
6. Onset beta of 2/1 NTMs with counter rotation, rev. flow shear (La Haye)	1.0 days	<u>Counter Injection</u>
7. Halo current study w/ extended diagnostic capability + LLD (Gerhardt)	1.0 days	
8. Optimization of beta-control (Gerhardt)	1.0 – 1.5 days	
9. Looking for ITPA MHD WG3 relevant data in NSTX (Gerhardt)	0.0 days	
10. Comparison of RFA suppression using different sensors (Gerhardt)	1.0 days	
11. Optimized RWM feedback for high $\langle \beta_N \rangle_{\text{pulse}}$ at low v and I_i (Sabbagh)	1.0 days	
12. NTV behavior: low collisionality and maximum variation of ω_E (Sabbagh)	1.0 days	
13. Global MHD / ELM stability vs edge current, n^*q_{ped} , edge v (Sabbagh)	1.5 days	
14. Passive/active stability of kink, RWM, V_ϕ control: KSTAR Joint (Y. Park)	1.0 days	
15. Measuring resonance frequencies relevant for RWM stab. (Reimerdes)	0.5 – 1.0 days	
16. LQG controller for RWM stabilization (Katsuro-Hopkins)	1.0 days	
17. Search for tokamak disruption precursors (Wong)	0.0 days	
18. Peeling-ballooning stability and access to QH-mode in NSTX (Sontag)	1.5 days	
19. Influence of LLD-induced collisionality, profile on ST stability (Menard)	1.5 days	
20. Effects of non-res. fields on low/moderate beta locking threshold (Menard)	1.0 days	
21. Determination of, navigation through weak RWM stability $V_\phi(\psi)$ (Berkery)	1.0 days	
22. RWM stabilization by energetic particles (Berkery)	1.0 days	
23. Assess DEFC near-magnetic-axis using Fishbone-driven RFA (Michio)	0.0 – 1.0 days ?	

Run time guidance: 6 – 8 run days

Run days: 20.5 – 23.5

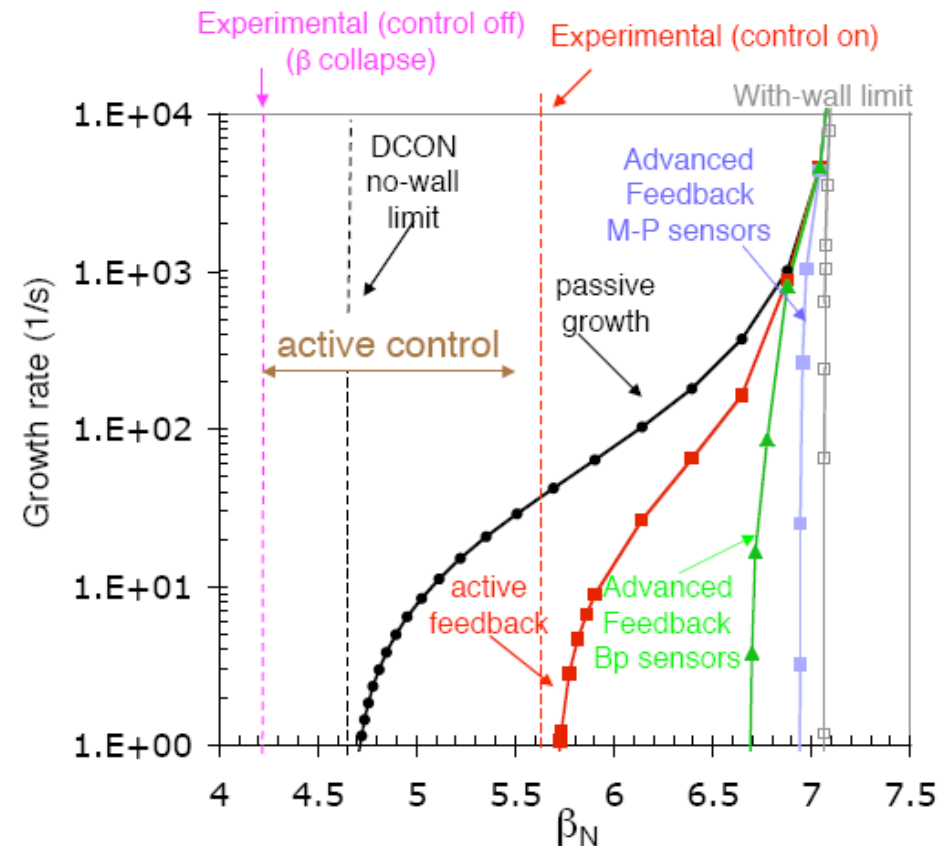
Proposals chosen as 1st and 2nd priority span full range of key macro-stability physics topics

- Milestone R10-1
 - “Assess sustainable beta and disruptivity near and above ideal no-wall limit”
- Key Physics Topics
 1. Resistive wall mode physics and stabilization
 2. Mode-induced disruption physics and mitigation
 3. Non-axisymmetric field-induced plasma viscosity
 4. Tearing mode/NTM physics
 5. Dynamic error field correction
 6. High plasma shaping and global stability
- Also cross-cutting/enabling, ITER high priority

Approximately ½ of MS TSG run-time allocation is for proposals directly supporting the FY2010 milestone

• Milestone R10-1 - Assess sustainable beta and disruptivity near and above ideal no-wall limit

- Optimization of beta-control – disruptivity
 - (Gerhardt) 0.5 days
- LQG controller for RWM stabilization
 - (Katsuro-Hopkins) 1.0 days
- Optimized RWM feedback for high $\langle\beta_N\rangle$ pulse at low n and I_i
 - (Sabbagh) 1.0 days
- Comparison of RFA suppression using different sensors
 - (Gerhardt) 1.0 days



Key Physics Topics (1)

- Resistive wall mode physics and stabilization
 - Determination of, navigation thru weak RWM stability $V_{\phi}(\psi)$ (Berkery) 1 days
 - Measuring resonance frequencies relevant for RWM stab. (Reimerdes) - days
- Mode-induced disruption physics and mitigation
 - Halo current study w/ extended diagnostic capability + LLD (Gerhardt) 1 days
- Non-axisymmetric field-induced plasma viscosity
 - NTV behavior: low collisionality, maximum variation of ω_E (Sabbagh) 0.5 days
- Tearing mode/NTM physics
 - Error field threshold study at high-beta – reduced torque (J. Park) 1.5 days
 - Effects of non-res. fields on low/moderate beta locking (Menard) - days
 - Error field threshold scaling in H mode - next step devices (Buttery) - days
 - 2/1 NTM stability (and EF sensitivity) vs q profile (Buttery) 0.5 days

Key Physics Topics (2)

- Dynamic error field correction
 - Comparison of RFA suppression using different sensors (Gerhardt) Milestone
- High plasma shaping and global stability
 - **Recommended for 2.0 days of cross-cutting and enabling time**
 - Optimization of beta-control XMP (Gerhardt) 0.5 days
 - Influence of LLD-induced collisionality, profile on ST stability (Menard, others) 1.5 days
- Proposals to consider for ITER high priority research
 - Global MHD/ELM stability vs edge J, n^*q_{ped} , edge n (Sabbagh) 1.0 days
 - Peeling-ballooning stability, access to QH-mode (Sontag) 1.0 days

Macroscopic Stability TSG 2010 XPs: prioritized

	1. Error field threshold study at high-beta – reduced torque (J. Park)	1.5 days
	2. Effects of non-res. fields on low/moderate beta locking threshold (Menard)	- days
	3. Error field threshold scaling in H mode - next step devices (Buttery)	- days
	4. Optimization of beta-control - disruptivity (Gerhardt)	0.5 days
	5. Determination of, navigation through weak RWM stability $V_\phi(\psi)$ (Berkery)	1.0 days
	6. Measuring resonance frequencies relevant for RWM stab. (Reimerdes)	- days
	7. Halo current study w/ extended diagnostic capability + LLD (Gerhardt)	1.0 days
6.0 days	8. LQG controller for RWM stabilization (Katsuro-Hopkins)	1.0 days
	9. Optimized RWM feedback for high $\langle\beta_N\rangle$ pulse at low n and li (Sabbagh)	1.0 days
8.0 days	10. Comparison of RFA suppression using different sensors (Gerhardt)	1.0 days
	11. 2/1 NTM stability (and EF sensitivity) vs q profile (Buttery)	0.5 days
	12. NTV behavior: low collisionality and maximum variation of ω_E (Sabbagh)	0.5 days
	13. RWM stabilization by energetic particles (Berkery)	1.0 days
	14. Resonant Field Amplification of n=2 and n=3 applied fields (J. Park)	0.5 – 1.0 days
	15. Effect of rotation on amplitude of 3/2 NTMs (La Haye)	1.0 days
	16. Passive/active stability of kink, RWM, V_ϕ control: KSTAR Joint (Y. Park)	1.0 days
ITER	17. Global MHD / ELM stability vs edge current, n^*q_{ped} , edge n (Sabbagh)	1.0 days
	18. Peeling-ballooning stability and access to QH-mode in NSTX (Sontag)	1.0 days
CCE	19. Optimization of beta-control XMP (Gerhardt)	0.5 days
	20. Influence of LLD-induced collisionality, profile on ST stability (Menard)	1.5 days
	21. Onset beta of 2/1 NTMs with counter rotation, rev. flow shear (La Haye)	1.0 days
	22. Search for tokamak disruption precursors (Wong)	0.0 days
	23. Assess DEFC near-magnetic-axis using Fishbone-driven RFA (Michio)	0.0 – 1.0 days ?
	24. Looking for ITPA MHD WG3 relevant data in NSTX (Gerhardt)	0.0 days

Run time guidance: 6 – 8 run days

(original) Run days: 20.5 – 23.5