

ELM Mitigation in NSTX by $n=2+3$ RMP

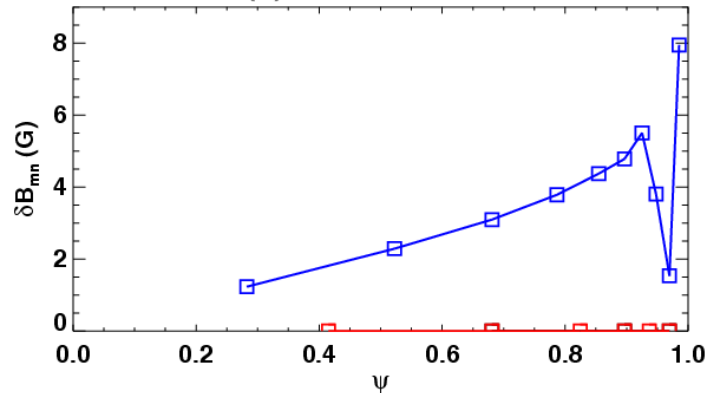
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Jonathan E. Menard, Rajesh Maingi, Allen Boozer, and...

DIII-D ELM Mitigation

- Chirikov ~ 1 near edge
- Well coupled with only edge
- Free band of stochasticity as used in XGC ??

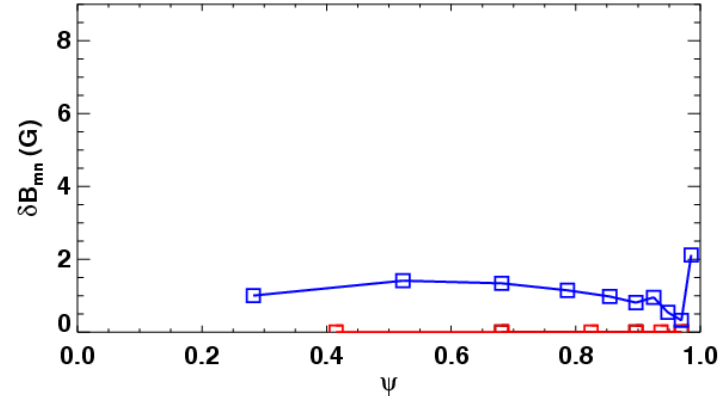
DIII-D_g126006.03600_icoil_even
n1 n2 n3

(a) Resonant field

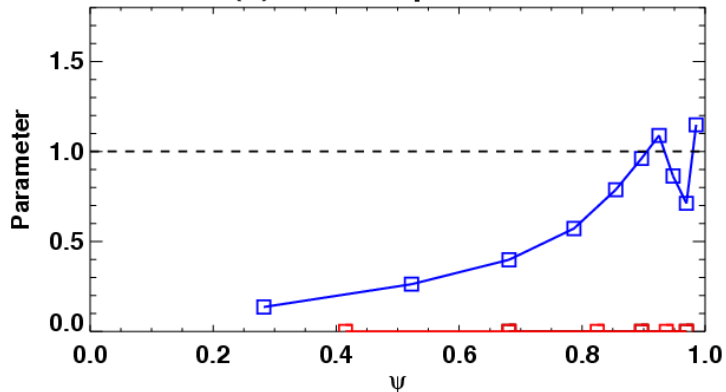


DIII-D_g126006.03600_icoil_odd
n1 n2 n3

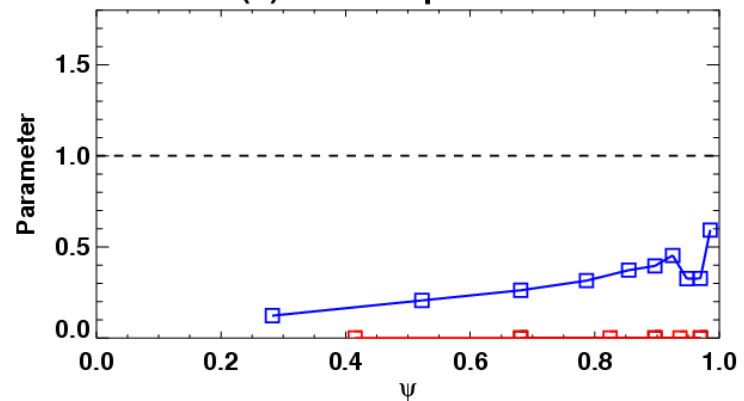
(a) Resonant field



(b) Chirikov parameter



(b) Chirikov parameter



NSTX ELM Mitigation using n=3



□ N=3 can produce Chirikov ~ 1 near edge with ~2kA for low q plasma

#123662, $q_{95} \sim 5.6$

Most similar to DIII-D Icoil even case



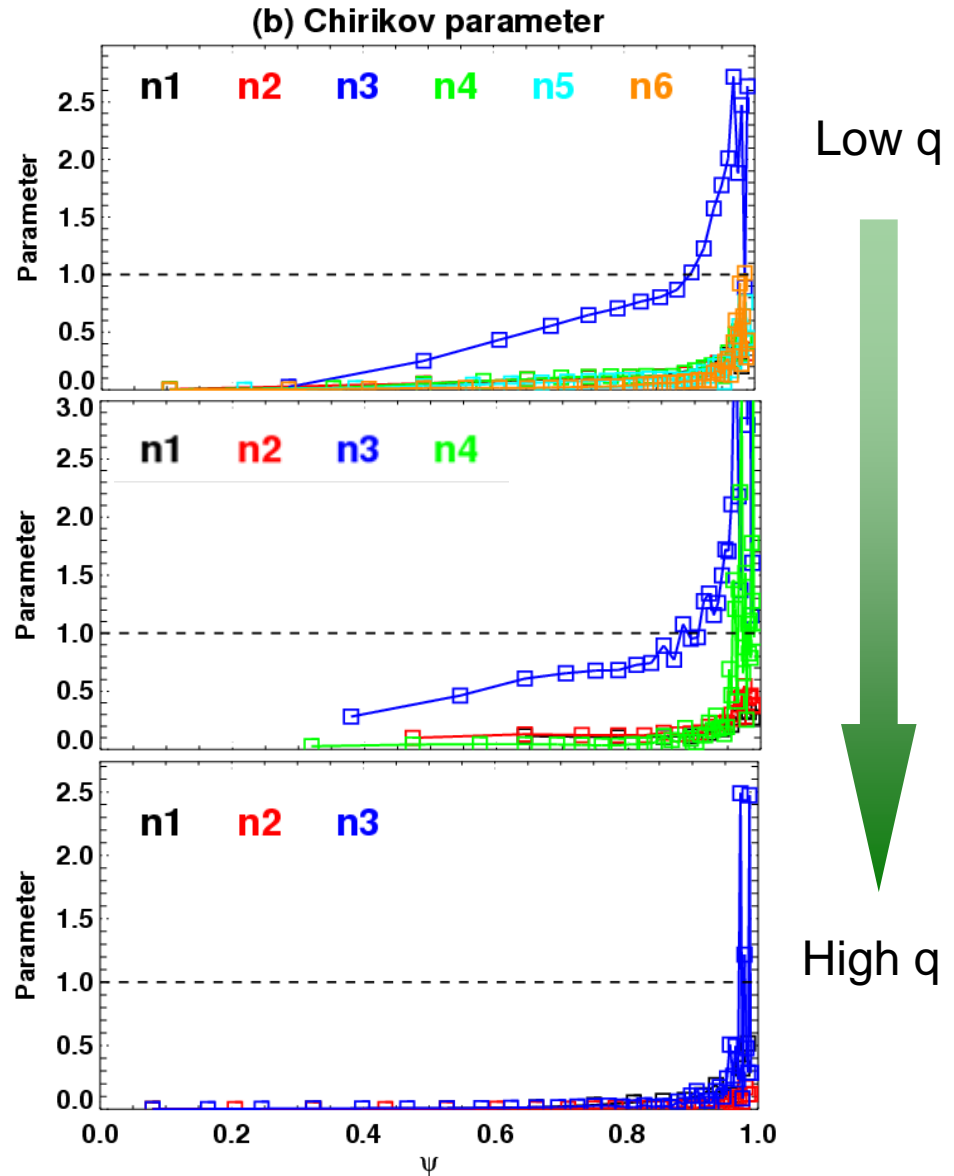
#124331, $q_{95} \sim 7.5$

*It destabilized ELM in XP703, Why?
Strong damping of edge rotation*



#125006, $q_{95} \sim 13.0$

Intrinsic shielding and poor coupling with sensitive field



NSTX ELM Mitigation using n=2



□ N=2 can produce Chirikov ~ 1 near edge with $\sim 3\text{kA}$ for low q plasma

#123662, $q_{95} \sim 5.6$

*Most similar to DIII-D
Icoil even case*

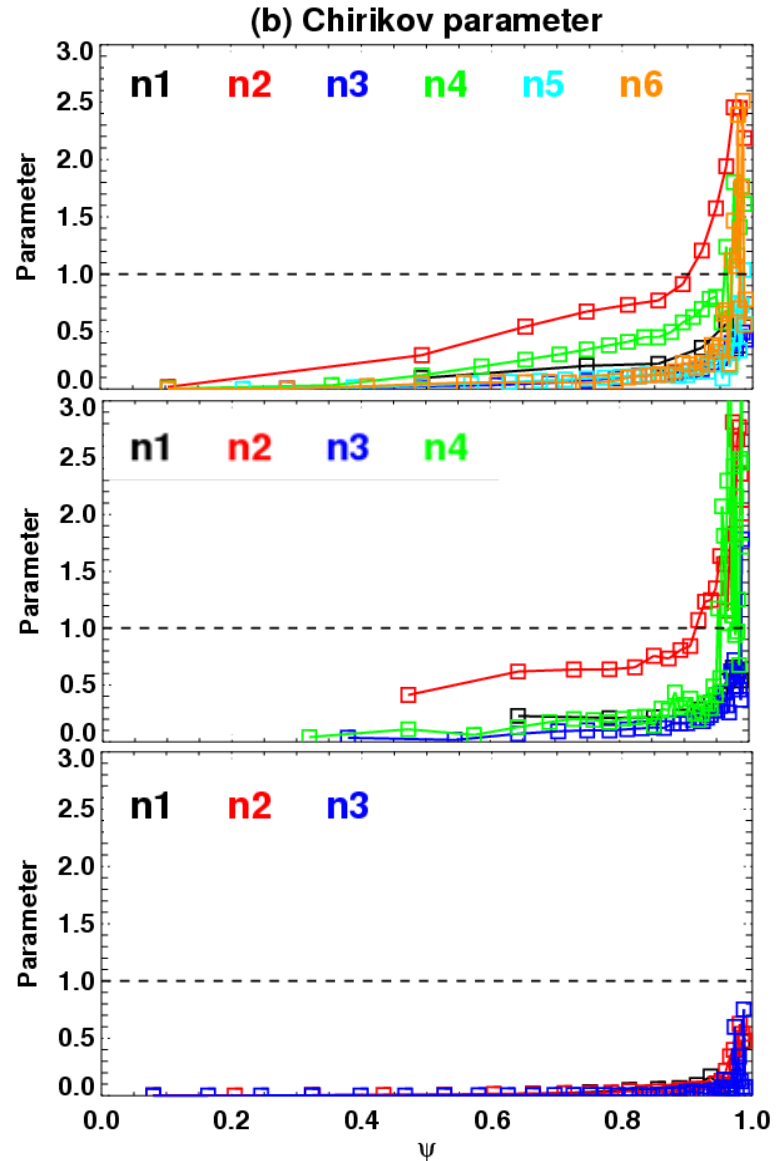


#124331, $q_{95} \sim 7.5$

*Poor coupling with
sensitive field*



#125006, $q_{95} \sim 13$
*Intrinsic shielding and
poor coupling with
sensitive field*



Shot plan ~0.5 day for n=2+3 (24 shots)



- ❑ Using 3 power supplies with 1 antiseriaes (180) and 2 series connections (120)
- ❑ Usual diagnostics, and various pre-programmed SPA currents
- ❑ Starting with reference shot #123662 (q95~6), or most recent one followed by other ELM experiments,
 - Reproduce target plasma and ELM : 3 shots
 - Apply n=3 field with different amplitudes (1~2kA): 3 shots
 - Apply n=2 field with different amplitudes (2~3kA): 3 shots
 - Apply n=2+3 mixing field with different combinations when failed: 3 shots
- ❑ Repeat the experiment for higher q, reference shot #124331 (q95~8): 12 shots
- ❑ If successful, repeat the experiment with higher q, but with n=1: ???

Possibility with $n=1$

□ $N=1$ can produce Chirikov ~ 1 near edge with 1~3kA for high q plasma

#124331, $q_{95} \sim 7.5$ 2kA
Locking might occur →

#123852, $q_{95} \sim 8.2$ 1kA
Similar to DIII-D Icoil even case →

#125006, $q_{95} \sim 13$ 3kA
Still strong shielding and poor coupling, but similar to DIII-D Icoil even case →

