
XP 20: Characterization of Resistive Wall Modes at Low Aspect Ratio

S. A. Sabbagh, F. Paoletti, J. Bialek, A. Garofalo, A. Glasser,
G. Navratil, A. Boozer, J. Menard, E. Fredrickson, D. Gates,
S. Kaye, D. Mueller, J. Manickam, M. Okabayashi

NSTX Forum - 1/15/2001

ET1 MHD Stability Group - 2001 Experimental Plans Session

Princeton Plasma Physics Laboratory



S. A. Sabbagh

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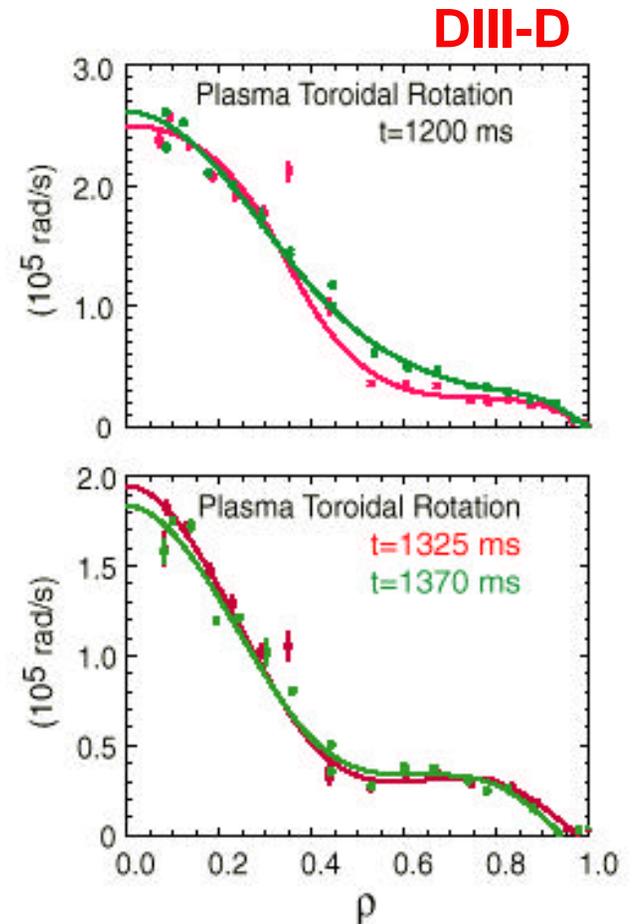
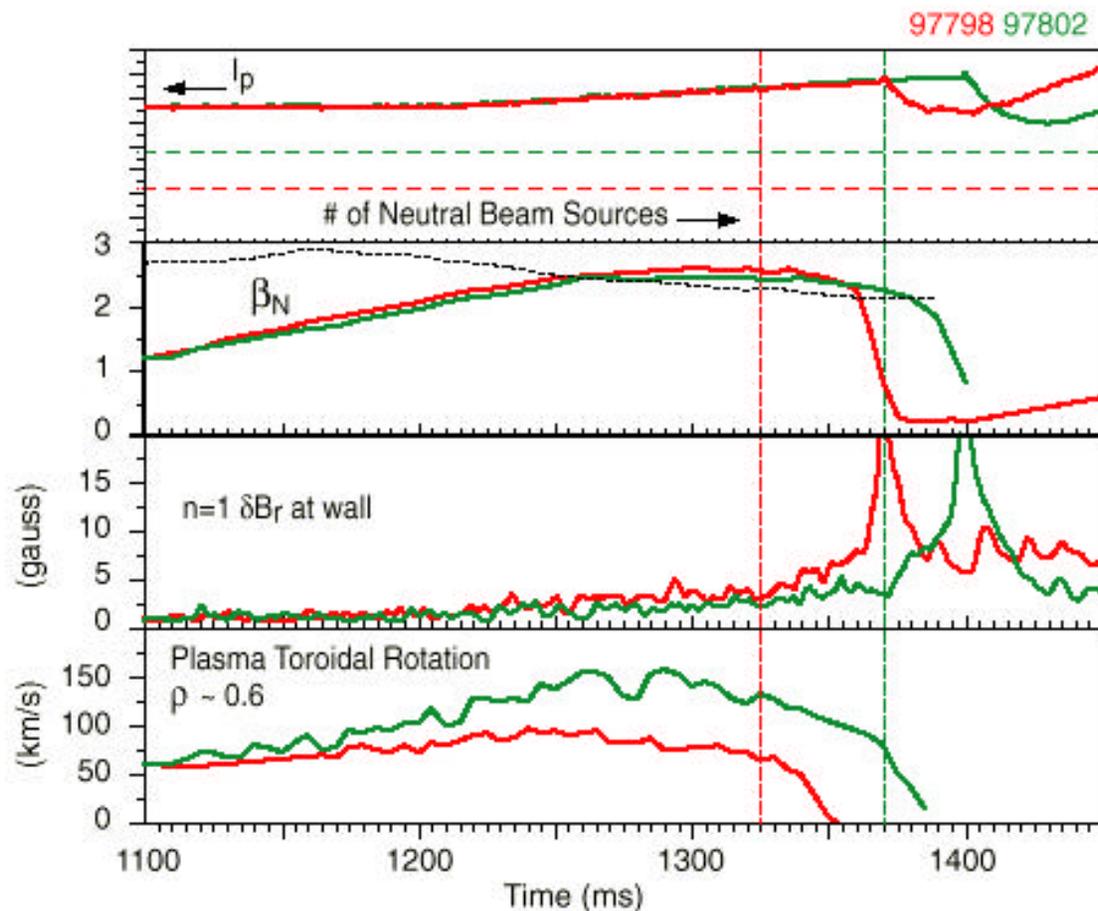
■ Goals

- Exceed the no-wall ideal MHD limit in NSTX as determined by ideal MHD stability analysis of experimental plasmas
- Document characteristics of the resistive wall mode in low aspect ratio plasmas exceeding the no-wall ideal MHD limit
- Compare to similar experiments on DIII-D to document differences and similarities of the mode at low and moderate aspect ratio.
- Compare expectations of mode structure, dynamics, and stability between theory and experiment

■ Status

- ET1 group review completed, full review pending

RWM onset is determined by reduction of plasma rotation

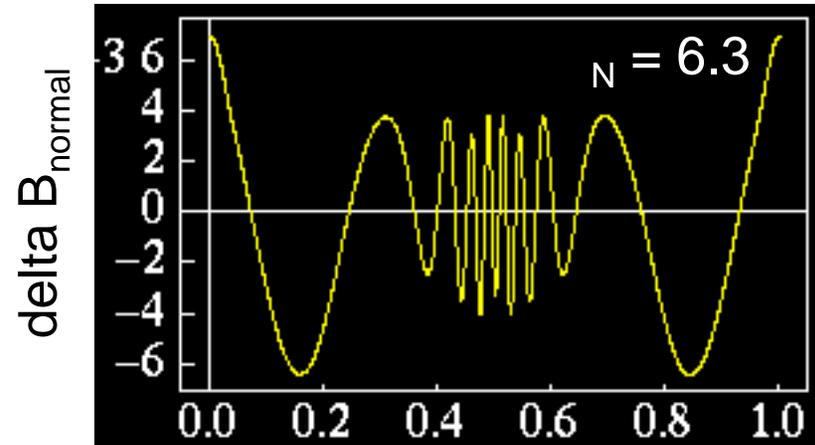
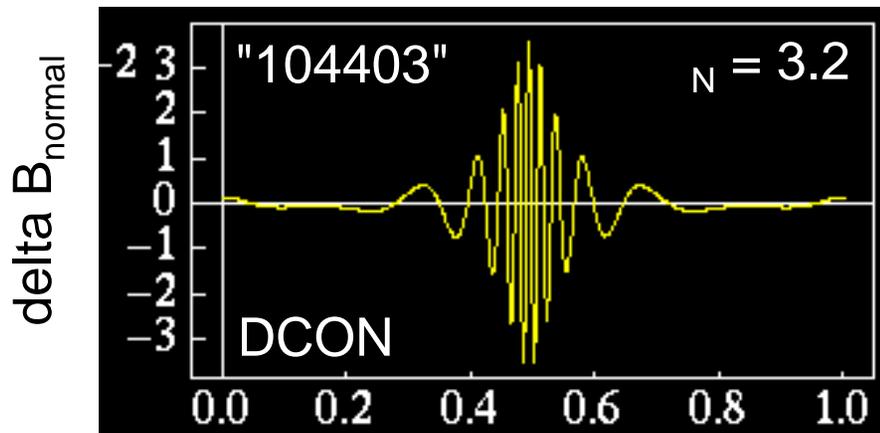


A. Garofalo

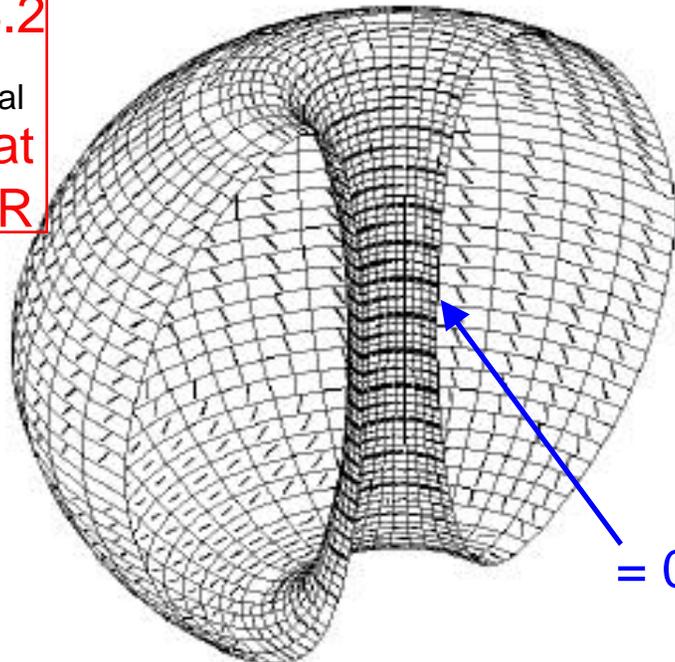
A careful plan for RWM production and characterization is required

- Ideal stability calculations based on XP17 plasmas show that high ℓ_i , $q_0 \sim 1$ plasmas do not benefit from wall stabilization
- Similar calculations show wall stabilization becomes effective on low ℓ_i , $q_0 \sim 1.5$ experimental plasmas
 - see F. Paoletti talk this session for more detail
- Wall stabilization may still not be effective at low ℓ_i
 - Large outer gap ~ 13 cm used with HHFW to produce plasmas at $q_0 \sim 1.5$ makes wall ineffective
 - reduce outer gap after increased q_0 is established in hot plasma
 - At low ℓ_i , present maximum $n \sim 3$, computed mode perturbation largest on inboard side
 - May need to create higher n at high ℓ_i first to create large outboard mode amplitude

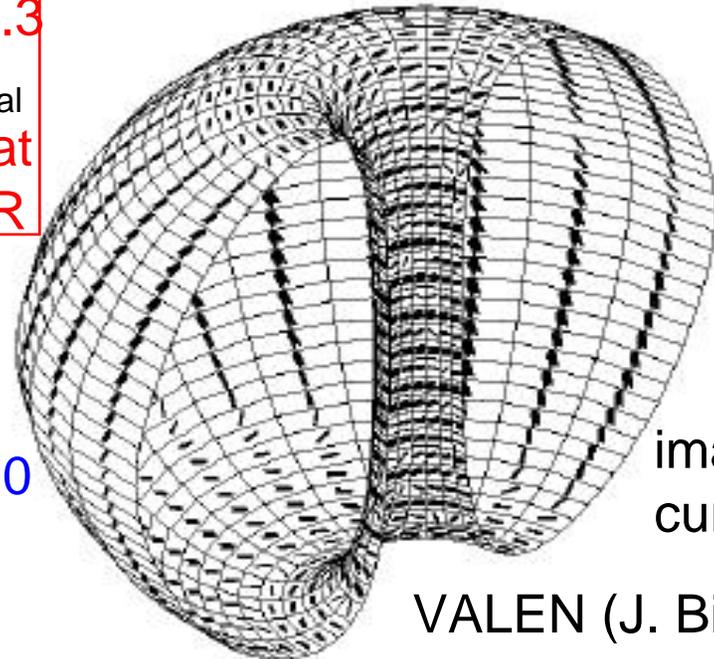
Stabilization with outer plates may require high N



$N = 3.2$
 B_{normal}
 large at
 small R



$N = 6.3$
 B_{normal}
 large at
 large R



$= 0.0, 1.0$
 $= 0.5$

image
 currents

VALEN (J. Bialek)

■ Input for analysis of passive and active mode control system



NSTX

S. A. Sabbagh

XP: 20 - Required and Desired Diagnostics

■ Required

- Flux loops and integrated poloidal Mirnov coil data
- CHERS toroidal rotation measurement
- Saddle coil measurements
- Thomson scattering
- Mirnov coils measuring radial field perturbation

■ Desired

- Second toroidal position USXR array
- Toroidal Mirnov array
- Measurements of currents in passive conducting structures
- Fast camera