XP - Effectiveness of Configuration on Resistive Wall Mode Stabilization

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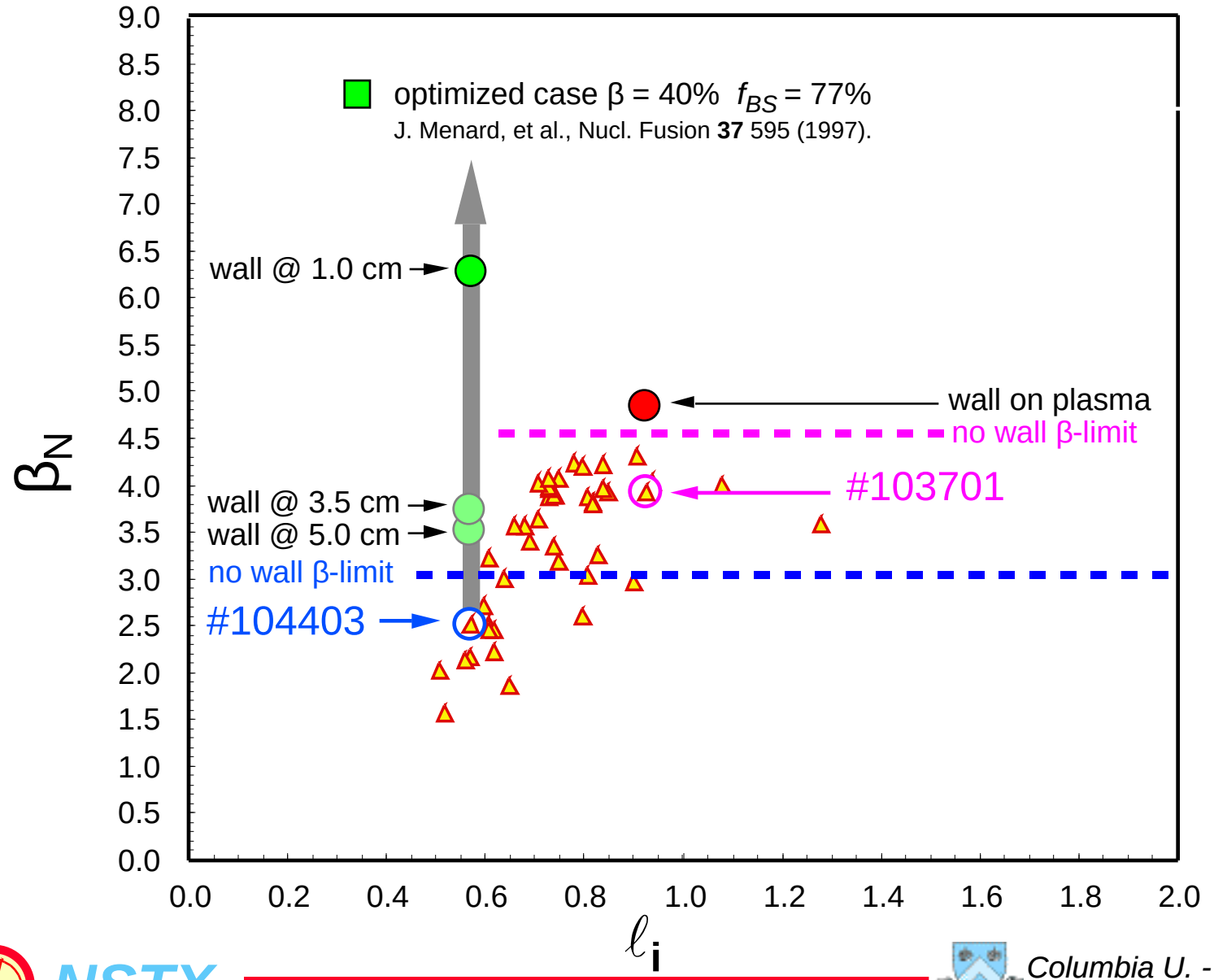
Bridging the gap towards high performance operation

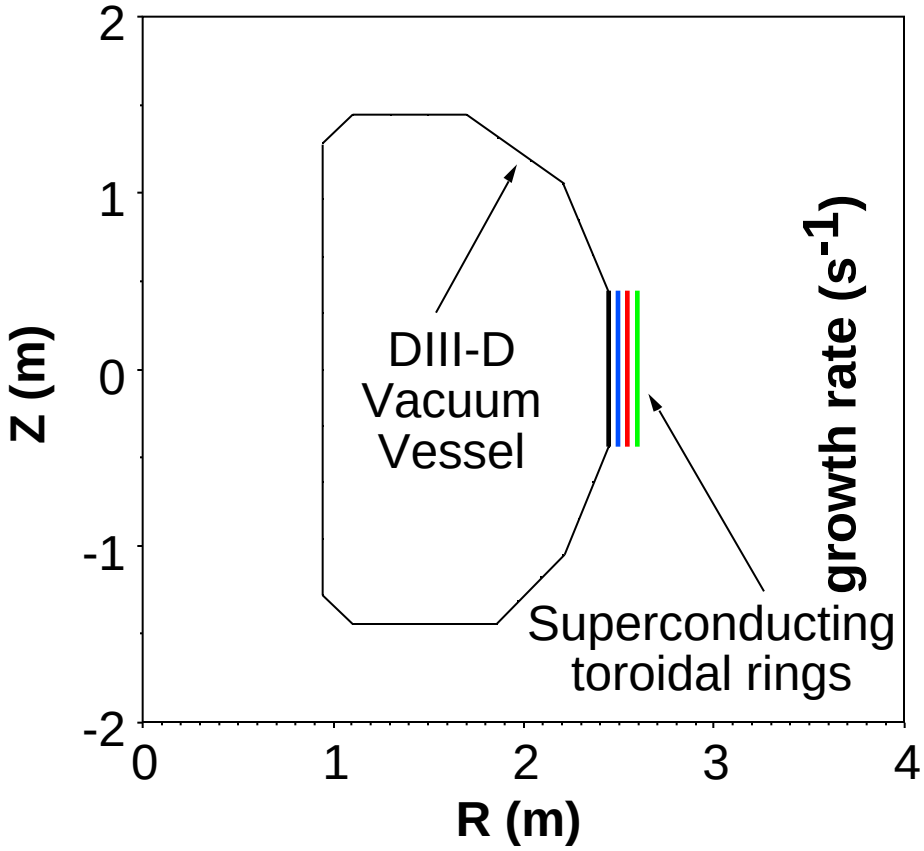
- Plasma operation above the no-wall β-limit (RWM studies)
  - Reproduce RWM target ⟶ (see results of XP #20) (4 SHOTS)
  - Characterize growth rate of mode vs. plasma-wall gap (~15 SHOTS)
    - Starting point at low ℓ_i (~ 0.57) shot #104403
  - Compare growth rate results with modeling
    - Verify and calibrate VALEN for low aspect ratio RWM
    - Reconstruct with VALEN full set of magnetic measurements and compare to data to start active mode control design
  - Study toroidal rotation stabilizing effect (~10 - 15 SHOTS)
    - Quantify effect on growth rate and attempt modification of rotation using different NBI setups
  - Quantify extension of discharge length vs. plasma-wall gap
    - Quantify any increase in maximum β_N reached

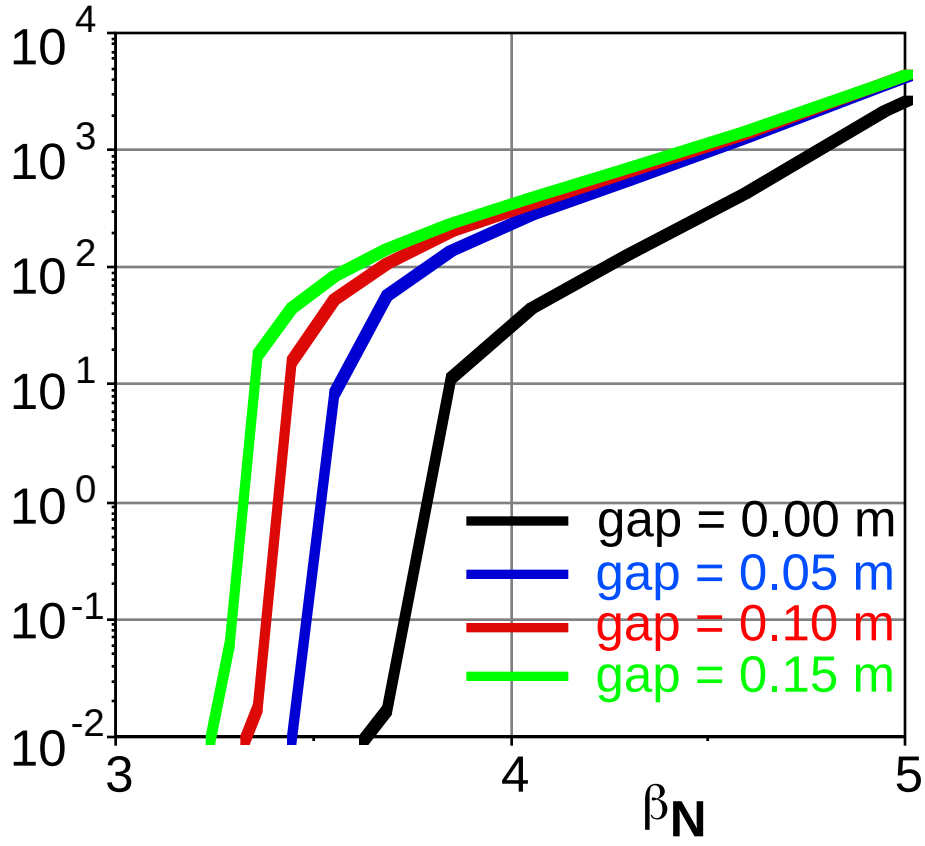
Searching for a path to increased performance



DIII-D RWM growth rate depends on wall position

- Increasing growth rate as superconducting toroidal ring is moved away from plasma



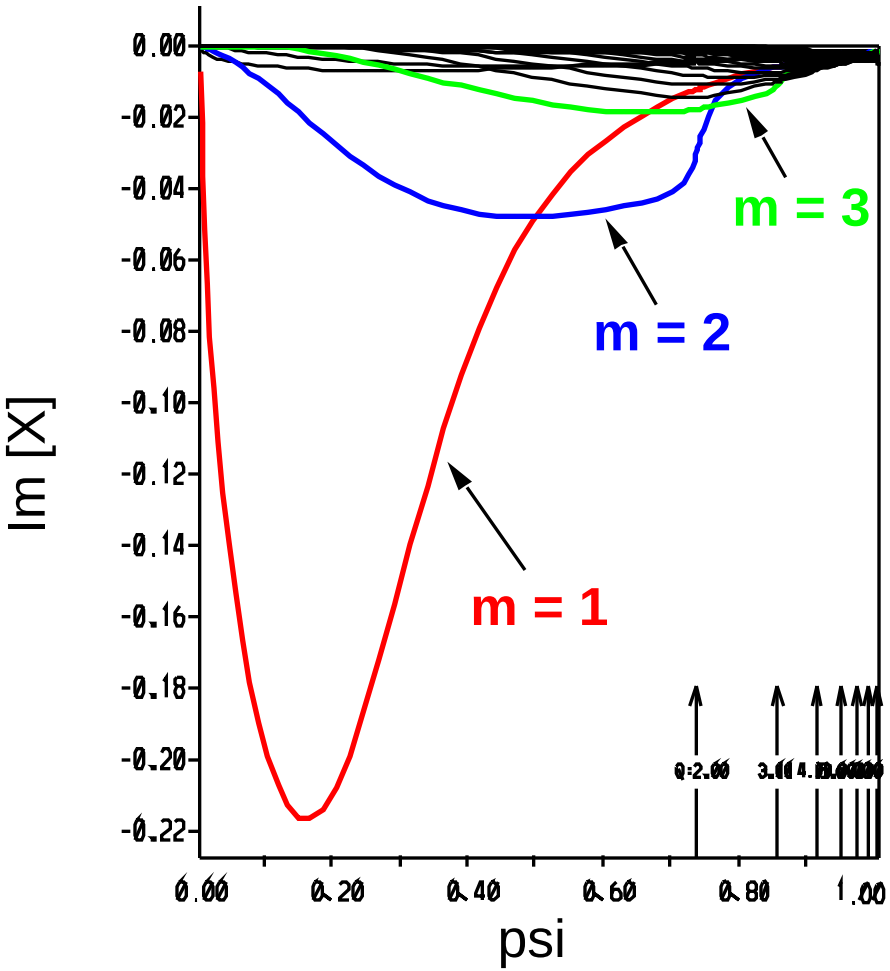


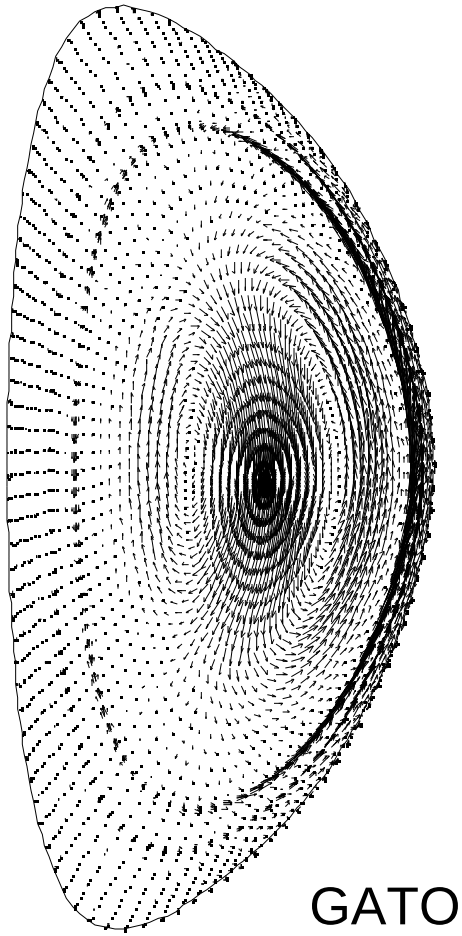
VALEN - (J. Bialek)

Centrally localized mode structure at high ℓ_i

sh#:103701 extrapolated to β_N = 4.6

$\Phi = 90^o$



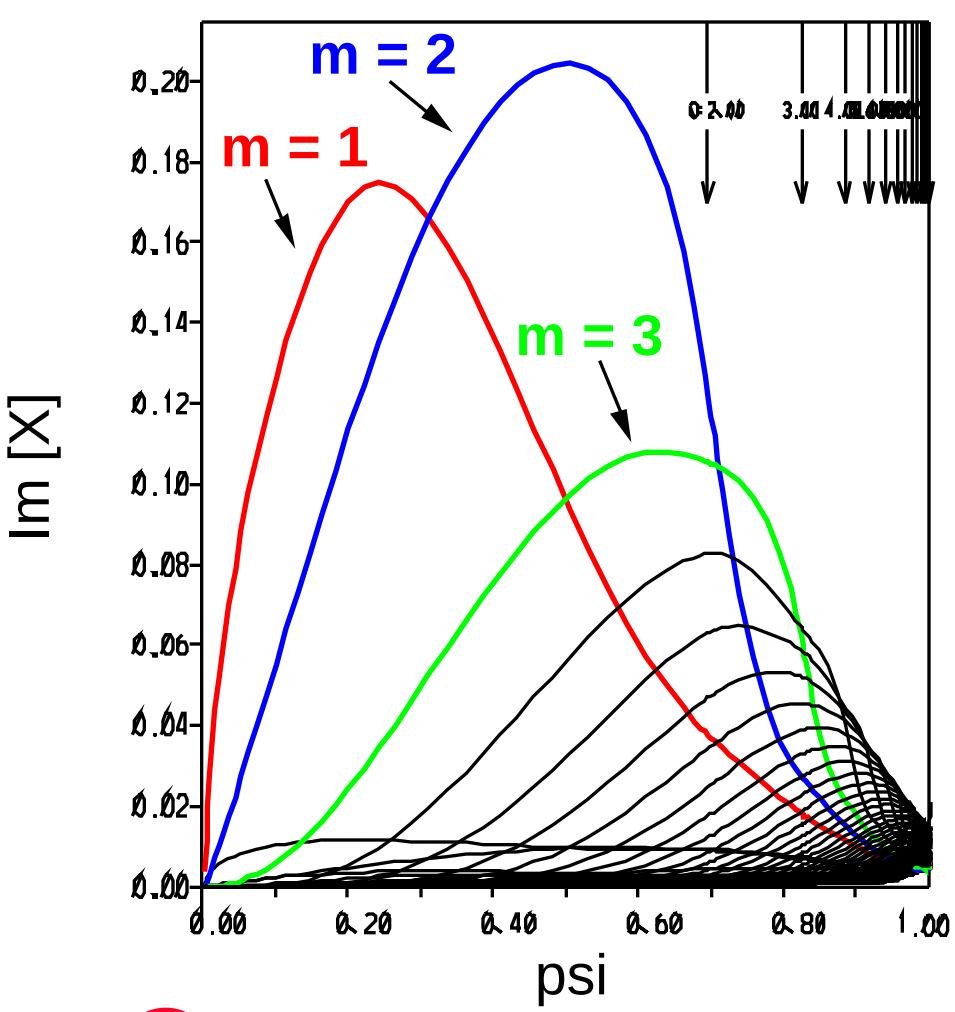


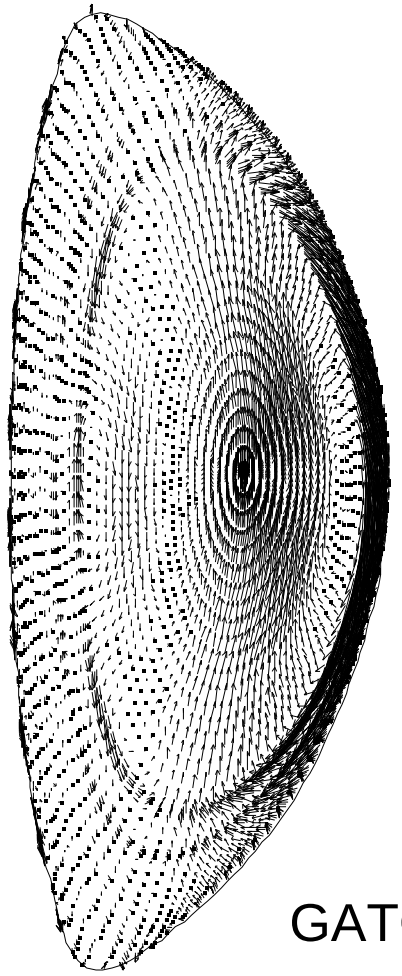
GATO

Global internal mode structure at low ℓ_i

sh#:104403 extrapolated to $\beta_N = 6.3$

$\Phi = 90^o$

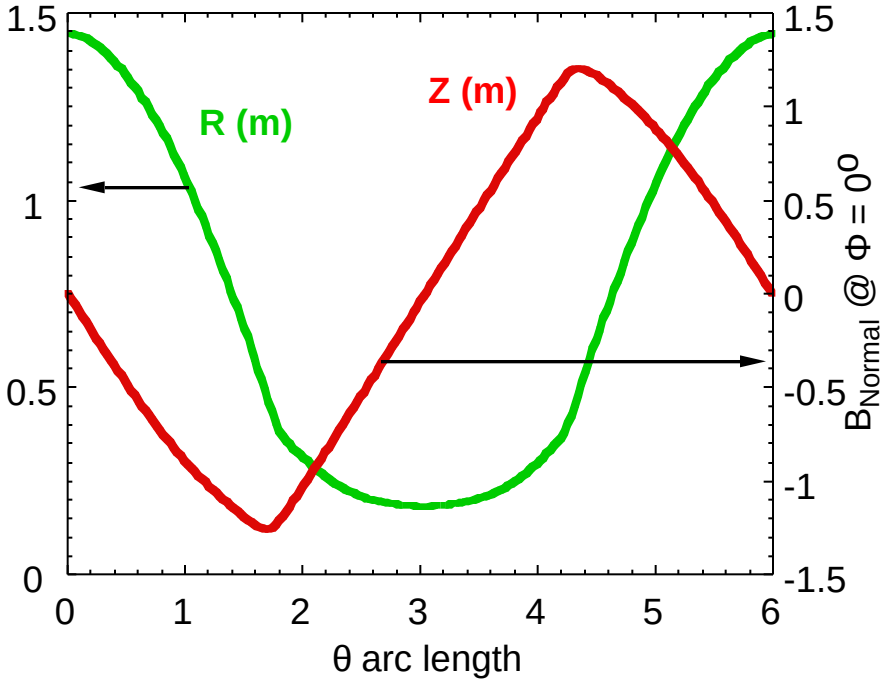


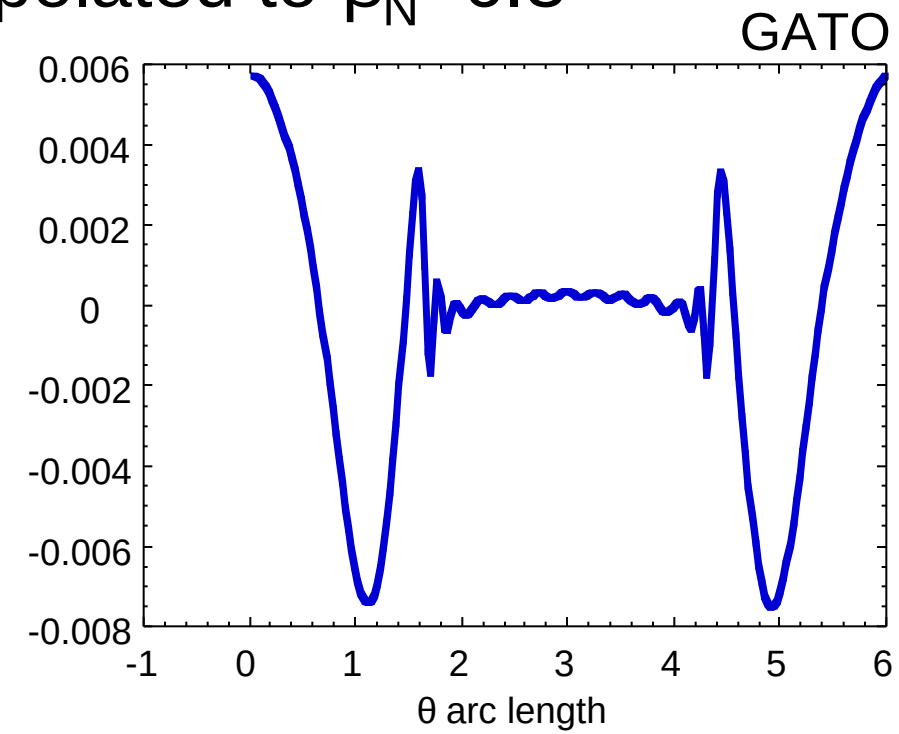


GATO

High β B_{Normal} perturbation allows active stabilization

sh. #104403 extrapolated to β_N=6.3





- Larger B_{Normal} perturbation on outboard compared to inboard
- Active stabilization system placed on passive plates can affect mode

Required and desired diagnostics capabilities

- Needed diagnostics:
  - Flux loop; B probes; I_p data; I_{PF} data; ...; for EFITs
  - Passive plates diagnostics
  - Mirnovs for detection of (m,n) numbers
  - Saddle loop coils
  - Soft X-rays array
  - Thomson scattering
  - Plasma TV
  - CHERS toroidal rotation measurements
- Desired diagnostics:
  - Interferometer
  - Hα, VIPS, Visible bremsstrahlung
  - Bolometer, IRTV