NSTX/DIII-D RWM Similarity XP

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XP Review

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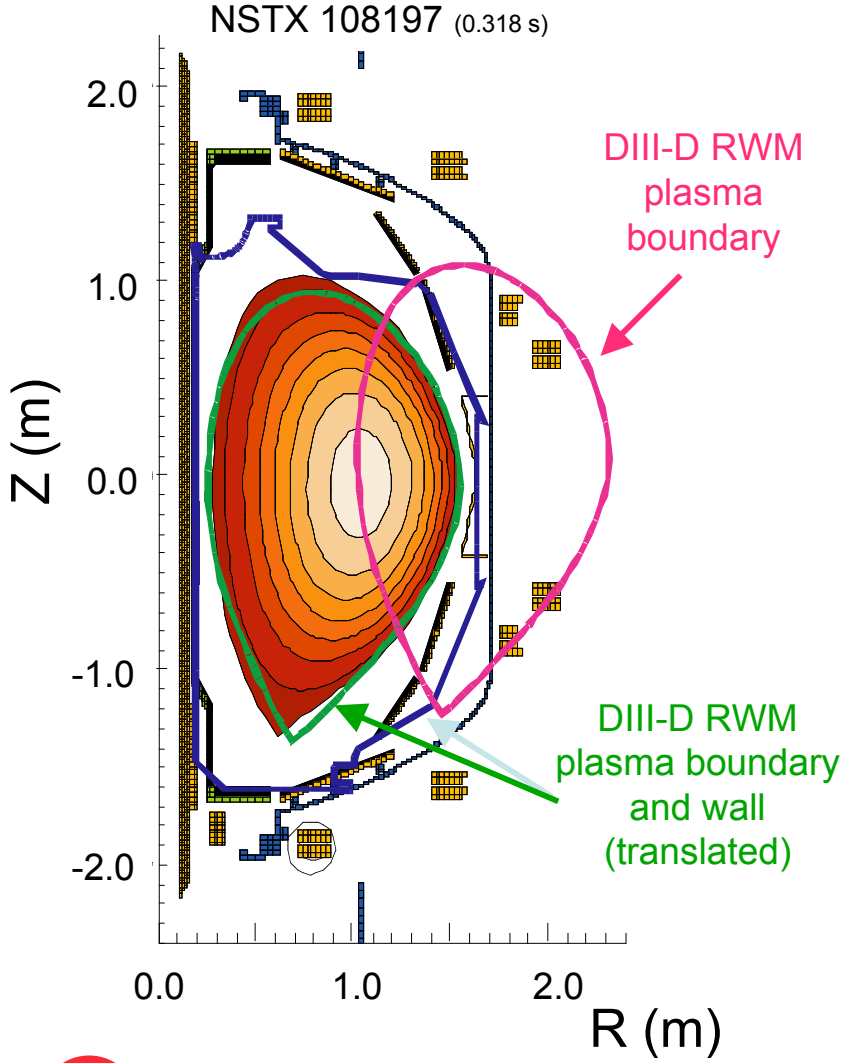
Similarity XP to Explore Aspect Ratio Effects on RWM Stability

- Critical rotation / magnetic braking
  - $\omega_\phi/\omega_A = 1/4q^2$ limit observed in NSTX
    - is this limit aspect ratio dependant?
  - rotation damping profile
    - mode structure changes at low A
- Resonant field amplification
  - DIII-D observes dependence on C_β
- MHD spectroscopy
  - low frequency error field resonance
  - determination of RWM growth rate
- Passive stability
  - trapped particle effects

$$C_\beta \equiv \frac{\beta_N - \beta_{N\_no-wall}}{\beta_{N\_ideal-wall} - \beta_{N\_no-wall}}$$

DIII-D / NSTX Boundary already well matched

(Sontag, Reimerdes, Garofalo, Sabbagh, Strait, LaHaye, Okabayashi, Buttery, etc.)



- Target development required
  - need high-β_N discharge with correct shape at 0.3 T
  - LSN most desirable to access $\beta_N > \beta_{N\ no\text{-}wall}$ regime DIII-D
- Experience from XP 452 & XP 455 will provide guidance
  - optimal coil polarity
  - error field amplitude
  - MHD spectroscopy limits

Shot List

Task	Number of Shots
1) Establish DIII-D similar shot - *RWM stable*	5
▪ Ip = 0.8 MA, LSN , $\kappa \leq 2$, $\delta \leq 0.5$-0.6, $\beta_N > \beta_{N\ no\text{-}wall}$	
2) Magnetic braking / critical rotation studies	4
▪ apply error field to minimize rotation damping (2)	
▪ apply error field to maximize rotation damping during MHD quiescent period with $\beta_N > \beta_{N\ no\text{-}wall}$ (1)	
▪ repeat braking with $\beta_N < \beta_{N\ no\text{-}wall}$ (1)	
3) MHD spectroscopy - *4 point frequency scan*	5
▪ oscillate about DC field that minimizes rotation damping	
▪ repeat at frequency with max response with $\beta_N < \beta_{N\ no\text{-}wall}$	
4) RFA study - *0.1 s pulse on top of min. V_ϕ damping field*	4
▪ apply constant error field with varying β_N (3)	
▪ $\beta_N < \beta_{N\ no\text{-}wall}$ control case also (1)	
5) Passive RWM stability study	4
▪ push β_N in target discharge to induce RWM collapse	
	22 total