

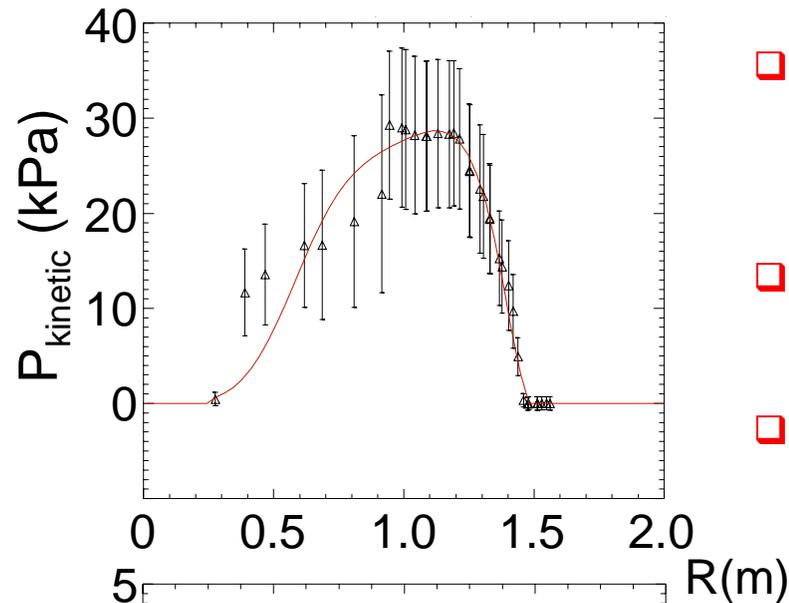
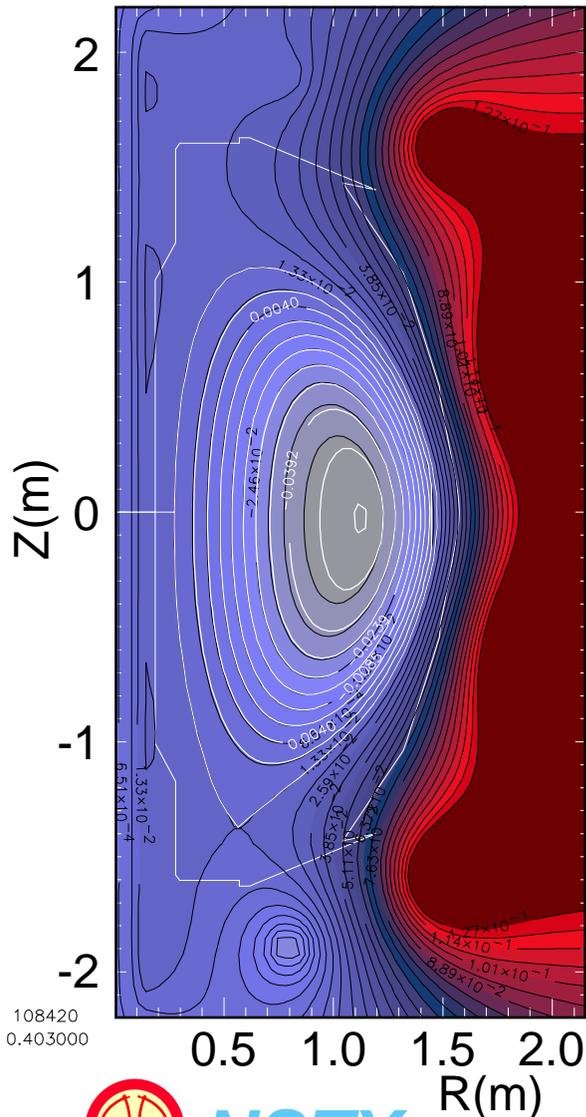
# XP: Aspect Ratio Effects near the High $\beta_p$ Equilibrium Limit

## □ Goals

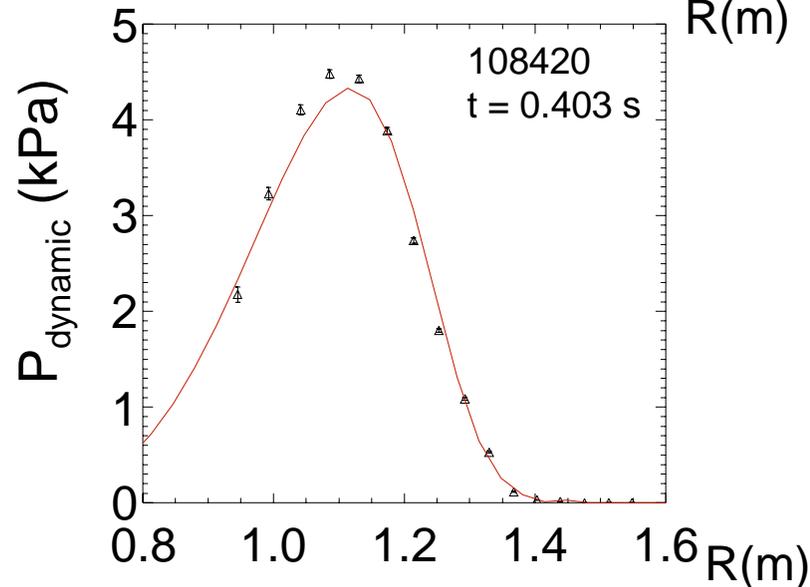
- Examine aspect ratio dependence of rotation effects at high  $\beta_p$ 
  - Maximize  $\Delta_{\text{Shafranov}}/a = 1/(2A) * (\beta_p(1 + 5/6 M^2) + 1/4)$ ; (High A limit)
  - Test strong theoretical dependence of  $(R_{\text{Pmax}} - R_{\text{axis}})/a$  on aspect ratio
- Produce maximum  $\beta_p$  and  $\beta_N$  in NSTX
  - Approach (reach?) the equilibrium limit ( $\epsilon\beta_p > 1$ )
  - Reach  $\beta_N \sim 8$  (NSTX conceptual design milestone)
  - Test equilibrium reconstruction at maximum  $\beta_p$
- Determine global stability / confinement in new equilibrium regime
  - Increased diamagnetism and omnigenity; drift reversal
  - test theoretical expectation of improved confinement

# Maximum $\beta_p$ configurations will test EFIT rotation reconstructions

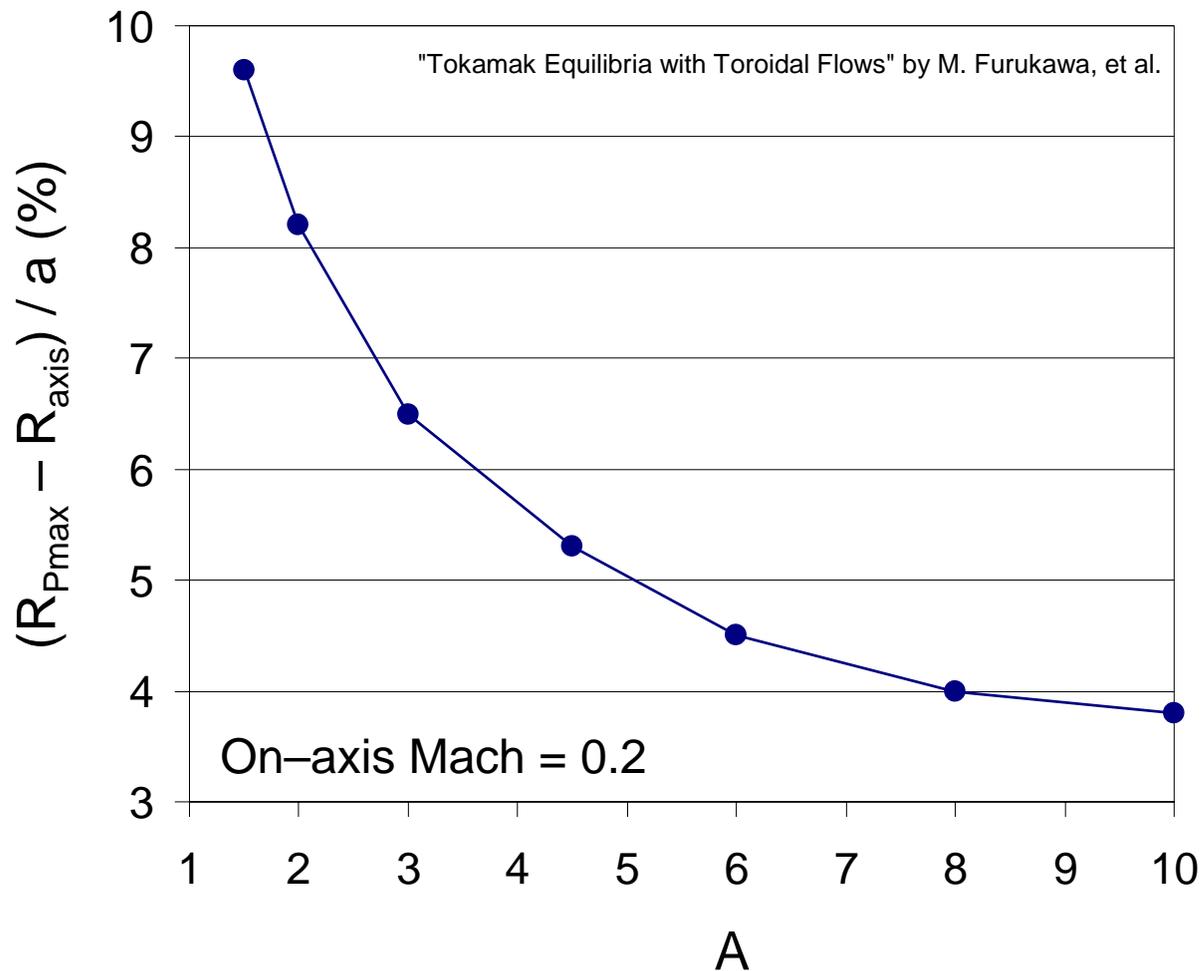
## Poloidal flux and pressure



- Shafranov shift maximized at high  $\beta_p$
- Rotational shift of pressure contours
- $(R_{\text{pmax}} - R_{\text{axis}})/a = 8\%$



# Rotational shift of pressure contours has strong aspect ratio dependence



## Run plan

- ❑ Set up equilibria of various aspect ratio
- ❑ Stagger NBI timing to produce varying Mach
- ❑ Utilize  $I_p$  ramp-down to produce maximum  $\beta_N$ ,  $\beta_p$ 
  - ❑ CY03 shot had maximum  $\beta_N \sim 6.8$  during  $I_p$  ramp
  - ❑ Diamagnetism increased in this phase

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# Duration and Required / Desired Diagnostics

❑ XP could be completed in 1.5 run days

❑ Required

- ❑ EFIT with flux iso-surface constraint (reduced error on q profile)
- ❑ CHERS toroidal rotation measurement (with increased resolution)
- ❑ Internal RWM sensors
- ❑ Thomson scattering
- ❑ Diamagnetic loop
- ❑ USXR

❑ Desired

- ❑ MSE
- ❑ Advanced USXR diagnostics
- ❑ Toroidal Mirnov array
- ❑ Fast camera

