# *Summary of XP813 – Momentum Transport Studies Using n=3 Non-Resonant Braking*

W.M. Solomon

# *Momentum Transport Studies Using n=3 Non-Resonant Braking*

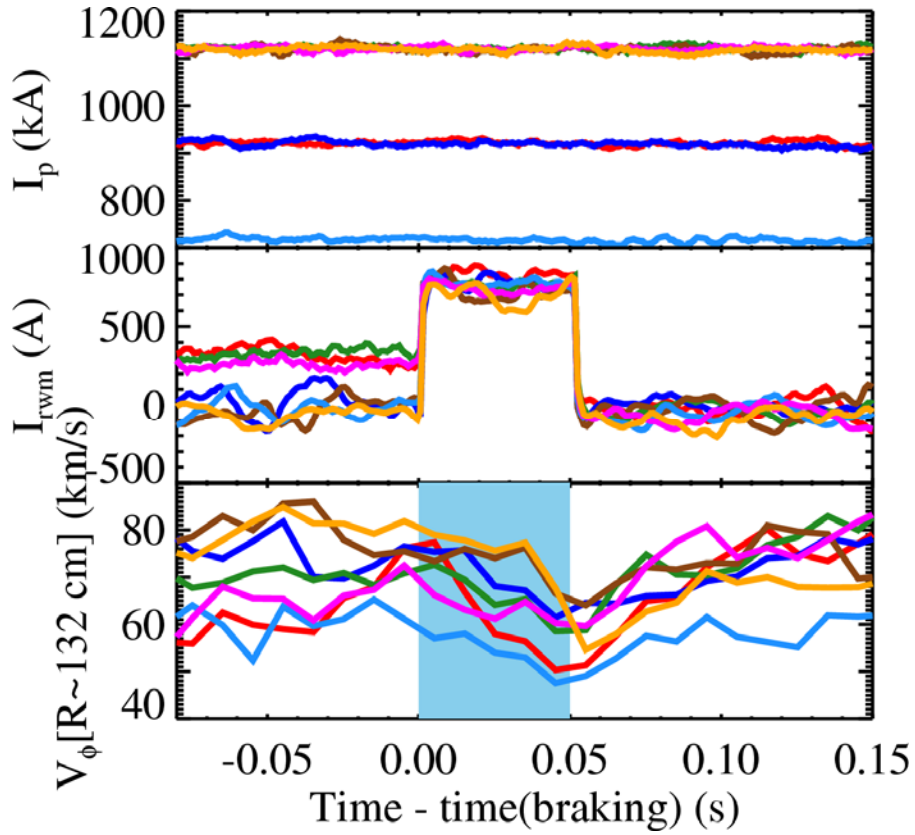
NSTX

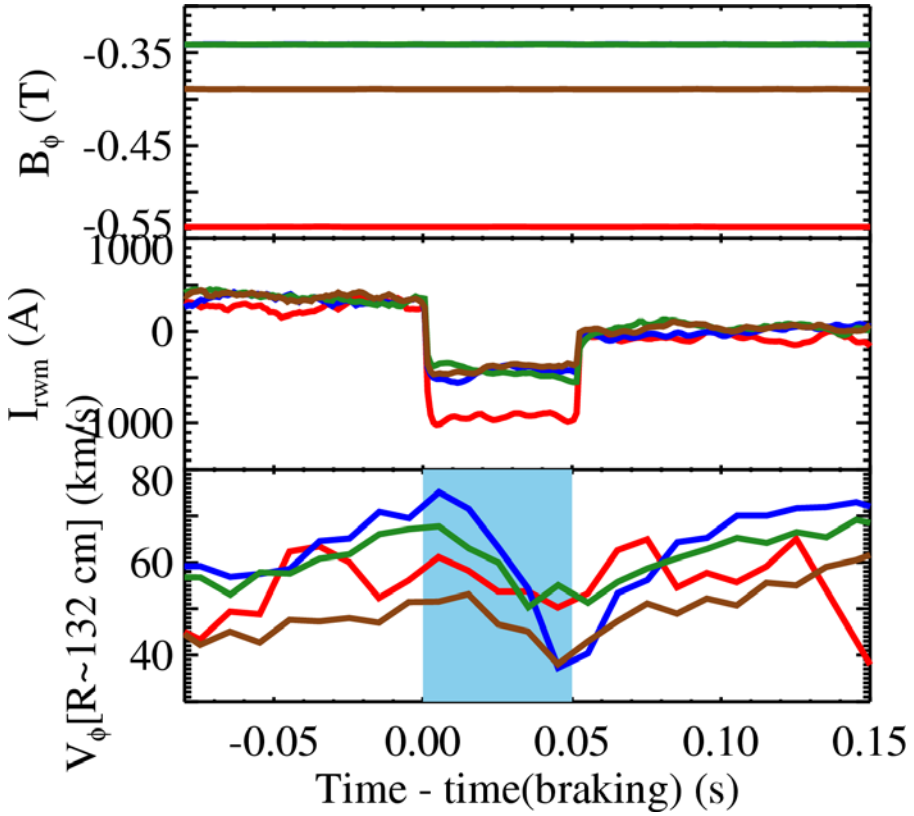
- Aim:
  Continue characterizing NSTX momentum transport
  - Experimentally distinguish turbulent pinch theories
    - ✓ Achieved large variation in density scale length, depending on when in the discharge the perturbation was applied
  - Look at $I_p$ and $B_\phi$ variation in momentum transport (resolved into $\chi_\phi$ and $V_{pinch}$)
    - ✓ Successfully completed both $I_p$ and $B_\phi$ scan

- Technique:
  - Use n=3 non-resonant magnetic perturbations to distort the rotation profile, allowing for separation of the roles of momentum diffusion vs non-diffusive (pinch).

# Acquired Excellent Data for Both $I_p$ and $B_t$ scans

- TRANSP analysis required to investigate rotation relaxation following perturbation
  - Does $\chi_\phi$ (and $V^{pinch}$) scale like $\chi_i$ or does e- transport matter?



# n=3 Perturbation Provided Necessary Non-Local Distortion to Rotation Profile

NSTX

- Simple model for momentum flux

$$\Gamma_\phi = -mnR\left(\underbrace{\chi_\phi \frac{\partial V_\phi}{\partial r}}_{diffusion} - \underbrace{V_\phi V_\phi^{pinch}}_{convection}\right)$$

- Elliptic tracks of $dV_\phi/dr$ vs $V_\phi$ indicate that determination of $\chi_\phi$ and $V_\phi^{pinch}$ possible.
  - Must change $V_\phi$ independently of $dV_\phi/dr$ to avoid collinearity of data set