

# XGC0 Kinetic simulation of RMPs with plasma response

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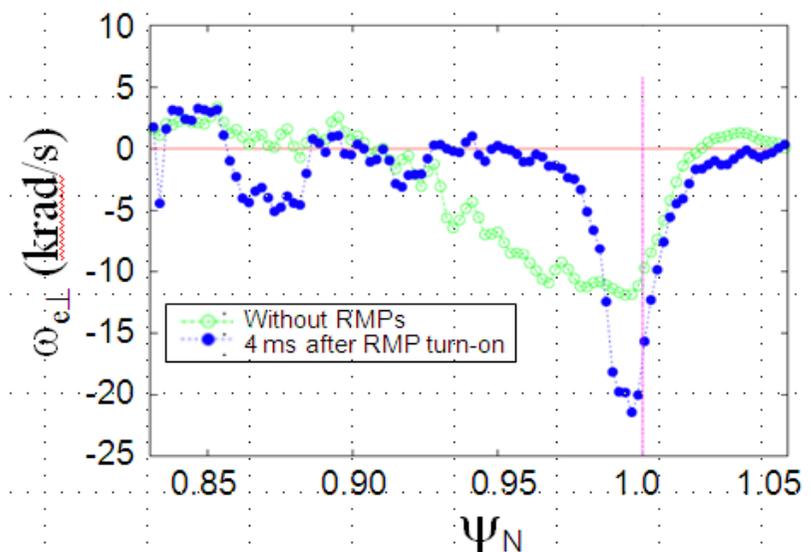
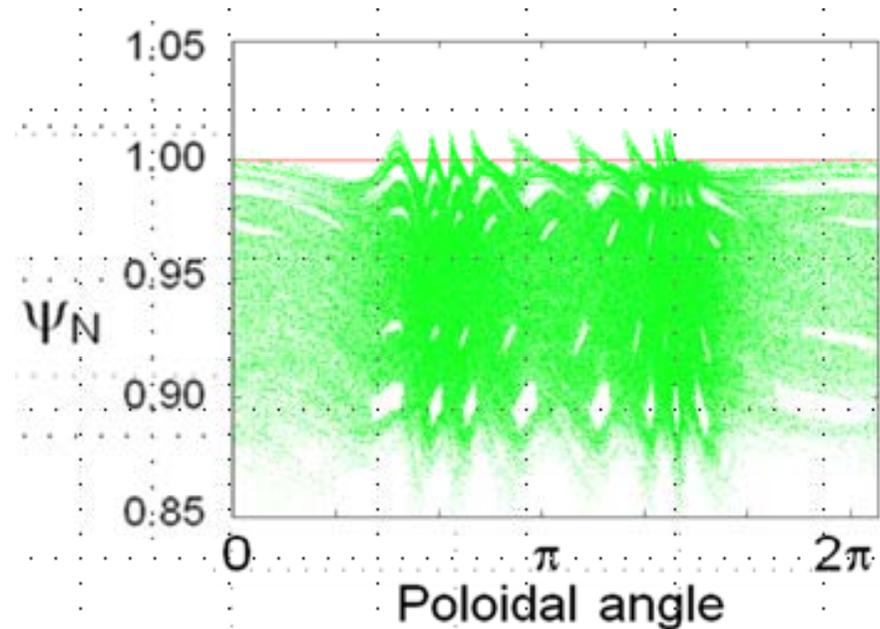
- Two coupled systems of equations are to be satisfied simultaneously
  - XGC0 full-f kinetic (PIC)

$$\left( \frac{\delta J_{\parallel}}{B} \right)_{mn} = F[\delta\psi_{mn}(r_i)]$$

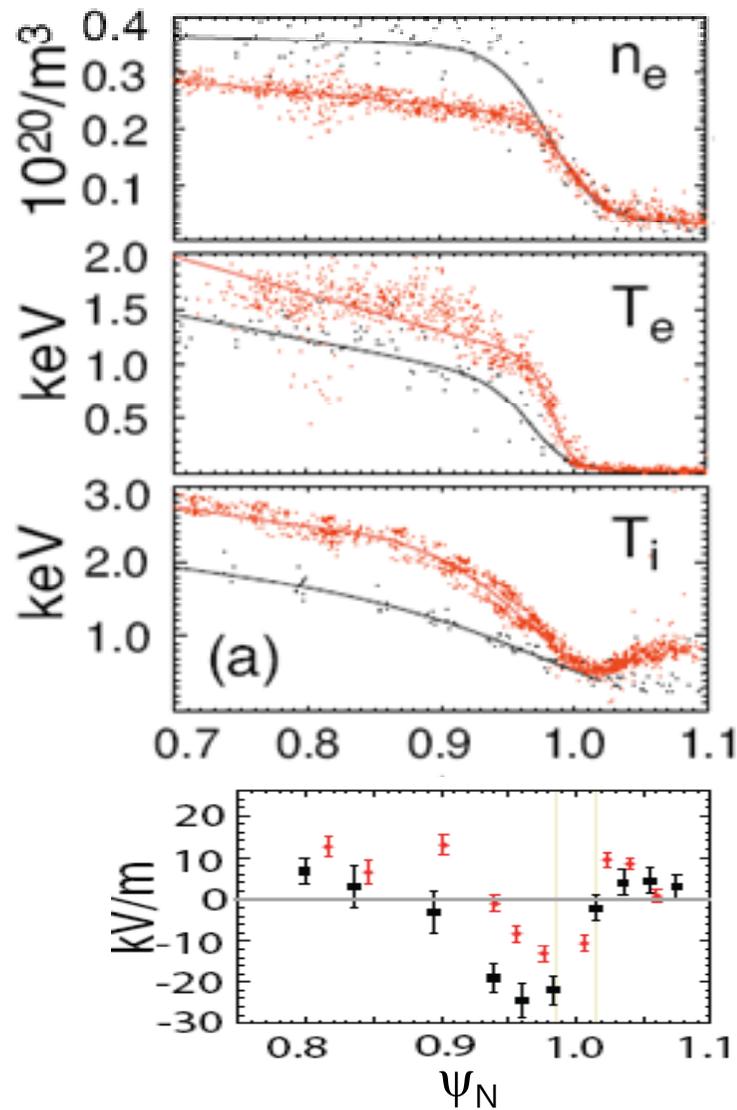
- Ampere's equation solver (PDE)

$$\Delta^* \delta\psi_n = \mu_0 I \left( \frac{\delta J_{\parallel}}{B} \right)_{mn} e^{im\theta}$$

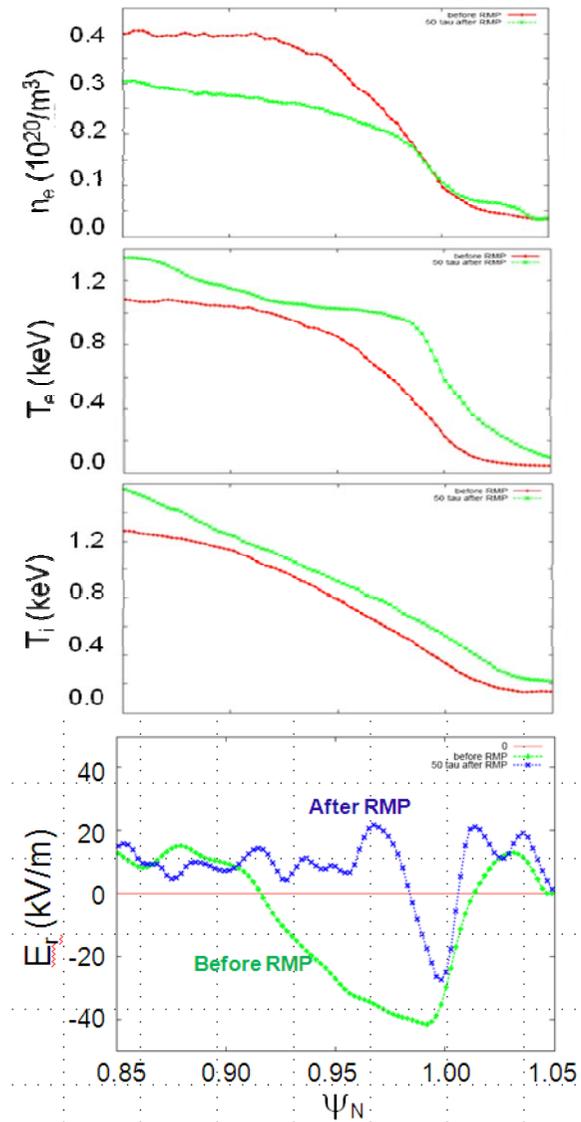
- Damped Newton method works well
- $V_{e\perp}$  flow-locking with local RMPs is observed
  - Large  $V_{e\perp} \leftrightarrow$  Damped local resonant components
  - Vanishing  $V_{e\perp} \leftrightarrow$  Undamped or amplified local RMP components, yielding stochastic B



# Validation with DIII-D experiment



DIII-D Experiment 126006. Black is before and red is after RMP turn-on.



Simulation. Red is before and green is 4ms after the RMP turn-on..