

# Feedback control of toroidal rotation and stored energy for NSTX/NSTX-U

Imene R. Goumiri

**Goal:** prescribe rotation profiles to reduce MHD instabilities

A loss of the plasma stored energy can cause severe damages inside the vessel of the device.

**Tools:** modeling + model reduction + feedback control theory

**Data:** TRANSP Analysis for NSTX / TRANSP Predictive for NSTX-U

$$(nm) \langle R^2 \rangle \frac{\partial \omega}{\partial t} = \left( \frac{\partial V}{\partial \rho} \right)^{-1} \frac{\partial}{\partial \rho} \left[ \frac{\partial V}{\partial \rho} (nm) \chi_\phi \langle R^2 (\nabla \rho)^2 \rangle \frac{\partial \omega}{\partial \rho} \right] + \sum_{i=1}^4 T_{\text{NBI}i} + T_{\text{NTV}}$$
$$\frac{\partial W}{\partial t} + \frac{W}{\tau_E} = \sum_{i=1}^4 P_{\text{NBI}i}(t)$$

**Need:** expert knowledge on uncertain parameters (robustness study)  
experimental validation on NSTX-U