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Modeling and control of plasma rotation for NSTX using Neoclassical Toroidal Viscosity (NTV) and Neutral Beam Injection (NBI) IMENE GOUMIRI, CLARENCE ROWLEY, Princeton Univ, STEVEN SABBAGH, Columbia Univ, DAVID GATES, STEFAN GERHARDT, PPPL — A model-based system to control plasma rotation in a magnetically confined toroidal fusion device is developed to maintain plasma stability for long pulse operation. This research uses experimental measurements from the National Spherical Torus Experiment (NSTX) and is aimed to control plasma rotation by using momentum from injected neutral beams and viscosity generated by three-dimensional applied magnetic fields as actuators. Based on the data driven model obtained, a feedback controller is designed to theoretically sustain the toroidal momentum of the plasma in a stable fashion and to achieve desired plasma rotation profiles. On going work includes extending this method to NSTX Upgrade which has more complete radial coverage of the neutral beams momentum sources which enable simultaneous control of plasma stored energy (Beta control).

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