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Category Number and Subject: 5.6.5. NSTX Spherical Torus

Theory Experiment

System Modeling, Validation, and Design of Shape Controllers for NSTX,* M.L. Walker, D.A. Humphreys, N.W. Eidietis, J.A. Leuer, A.S. Welander, *General Atomics*; E. Kolemen, *PPPL* –Modeling of the linearized control response of plasma shape and position has become fairly routine in the last several years. However, such response models rely on the input of accurate values of model parameters such as conductor and diagnostic sensor geometry and conductor resistivity or resistance. Confidence in use of such a model therefore requires that some effort be spent in validating that the model has been correctly constructed. We describe the process of constructing and validating a response model for NSTX plasma shape and position control, and subsequent use of that model for the development of shape and position controllers. The model development, validation, and control design processes are all integrated within a Matlab-based toolset known as TokSys. The control design method described emphasizes use of so-called decoupling control, in which combinations of coil current modifications are designed to modify only one control parameter at a time, without perturbing any other control parameter values.

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