Control simulation of neoclassical tearing modes in KSTAR Y.S.
PARK, Seoul National University, Y.S. HWANG, Seoul National University — Control of neoclassical tearing modes (NTMs) is one of the key issues to achieve stable high performance discharges for future advanced tokamaks. In KSTAR, active suppression of m/n = 3/2 and 2/1 NTMs will be pursued by using a 3MW electron cyclotron current drive (ECCD) system. To develop a NTM control system in KSTAR, a prototype NTM control simulator is developed. A NTM stability model is constructed by the modified Rutherford equation (MRE) with KSTAR equilibrium parameters. In the NTM controller, the plasma radial position is controlled to align the ECCD to the resonant flux surface where the tearing mode resides by utilizing the fast in-vessel control coils (IVCCs) of KSTAR. To model radial plasma responses during the control sequence, a linear, non-rigid plasma model is constructed by following perturbed equilibrium formulation. Performance of the prototype simulator is assessed in terms of suppressing the NTM modes in KSTAR and utilized to provide controller design criteria for the complete suppression of the modes. The prototype simulator will be used to develop a new NTM control algorithm for the model-based advanced controller with high control efficiency.

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