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Predictive Transport Modeling of Hybrid Scenario Operation in KSTAR Tokamak J.M. PARK, J.-Y. KIM, Korea Basic Science Institute — High performance discharges of hybrid scenario in the KSTAR tokamak are predicted by an integrated transport code C2 (Coupled 2-D). The present simulations are focused on (a) finding optimum operation scenarios to establish and sustain a broad current profile with $q_0 \geq 1$ for preventing sawtooth which is believed to trigger large amplitude neoclassical tearing mode (NTM), and (b) estimating and control of edge pedestal parameters and divertor heat load which are influenced significantly by edge localized mode (ELM) observed usually in hybrid scenario operation. For this purpose, the C2 code is being integrated with the self-consistent transport models associated with various MHD activities including sawtooth oscillations, NTM island evolution, and ELM crash by peeling-ballooning mode. The simulation results show that the desired q-profiles can be obtained with the baseline heating and current drive systems of KSTAR by earlier central heating and subsequent off-axis current drive during the current rise phase, although the current ramp-up rates of KSTAR superconducting coils are too slow to adopt a conventional fast ramp-up method. The predicted temperatures at the top of the edge pedestal in the main heating phase are found to be reasonably in good agreement with the scaling laws obtained from the standard ELMy H-mode discharges. It is also shown that the maximum divertor heat load during ELMs can be reduced significantly by increasing plasma density with a careful control of gas-puffing rates.

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