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Integrated Scenario Modeling for Advanced Scenario Development in DIII-D[1] J.M. PARK, M. MURAKAMI, Oak Ridge National Laboratory, H.E. ST JOHN, L.L. LAO, J.R. FERRON, R. PRATER, General Atomics — Integrated predictive simulations are carried out to guide design of Advanced Tokamak (AT) experiments with upgraded DIII-D hardware. Recent advances in the theory-based modeling include improved transport models for particle and momentum and integration with realistic feedback control algorithms as used in the DIII-D experiments. The modeling tools are validated successfully against recent AT experiments: (i) sustained ($\sim$2 s) operation with $\beta_N \approx 4$ (50% above the no-wall stability limit) with internal transport barrier using toroidal field ramp, and (ii) fully noninductive operation [in-principle steady state (SS)] with $\beta_N \approx 3.5$. Present simulation efforts focus on optimizing SS conditions at higher β by utilizing the increased electron cyclotron and fast wave power in a pumped double-null configuration, indicating that SS can be achieved with $\beta_N \geq 4$ for longer than a current relaxation time using the upgraded hardware planned for DIII-D.

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J.M. Park
Oak Ridge National Laboratory

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