

Abstract Submitted
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Advanced Tokamak Development in DIII-D¹ C.M. GREENFIELD,
General Atomics, ADVANCED SCENARIO THRUST GROUP TEAM — Advanced Tokamak research in DIII-D seeks to develop a scientific basis for steady-state high performance tokamak operation. We discuss recent work in several areas. Experiments in weak negative central shear plasmas with $q_{min} \approx 2$ have demonstrated conditions with no inductively driven current anywhere ($f_{NI} \approx 100\%$), maintained for several confinement times with $\beta_N \approx 3.5$. Similar plasmas are stationary with $f_{NI} \approx 90\%$ and duration limited only by hardware. In other experiments, $\beta_N \approx 4$ is maintained for 2 s with strongly negative magnetic shear and internal transport barriers, exceeding previous performance in similar conditions. This is allowed by broadened profiles and active MHD instabilities control. These studies are supported by recent experiments to develop active current profile control using neutral beam and electron cyclotron current drive as actuators and real-time equilibrium calculations, including MSE measurements. These results motivate future research incorporating improved current profile, rotation and particle control capabilities now being added to DIII-D.

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