

Abstract Submitted
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Overview of Initial NSTX-U Experimental Operations¹ DEVON BATTAGLIA, PPPL, AND THE NSTX-U TEAM — Initial operation of the National Spherical Torus Experiment Upgrade (NSTX-U) has satisfied a number of commissioning milestones, including demonstration of discharges that exceed the field and pulse length of NSTX. ELMy H-mode operation at the no-wall β_N limit is obtained with Boronized wall conditioning. Peak H-mode parameters include: $I_p = 1$ MA, $B_{T0} = 0.63$ T, $W_{MHD} = 330$ kJ, $\beta_N = 4$, $\beta_N/I_i = 6$, $\kappa = 2.3$, $\tau_{E,tot} > 50$ ms. Access to high-performance H-mode scenarios with long MHD-quiescent periods is enabled by the resilient timing of the L-H transition via feedback control of the diverting time and shape, and correction of the dominant n=1 error fields during the I_p ramp. Stationary L-mode discharges have been realized up to 1 MA with 2 s discharges achieved at $I_p = 650$ kA. The long-pulse L-mode discharges enabled by the new central solenoid supported initial experiments on error field measurements and correction, plasma shape control, controlled discharge ramp-down, L-mode transport and fast ion physics. Increased off-axis current drive and reduction of fast ion instabilities has been observed with the new, more tangential neutral beamline. The initial results support that access to increased field, current and heating at low-aspect-ratio expands the regimes available to develop scenarios, diagnostics and predictive models that inform the design and optimization of future burning plasma tokamak devices, including ITER.

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