

Abstract Submitted
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The NSTX-U Research Program¹ STANLEY KAYE, DEVON BATTAGLIA, WALTER GUTTENFELDER, RAJESH MAINGI, Princeton Plasma Physics Laboratory, NSTX-U TEAM — NSTX-U is a high-powered Spherical Tokamak (ST) whose mission is to establish the physics basis for next-step ST facilities, broaden the scientific understanding of plasma confinement for ITER, and maintain U.S. world leadership in ST research capabilities. In particular, the research in NSTX-U will be critical for informing the design of a Compact Fusion Pilot Plant. NSTX-U will have a mission-oriented research program that addresses key gaps over the next five years. 1) Extend confinement and stability studies to low collisionality and high- β . NSTX-U will operate at collisionalities 5x lower than NSTX, allowing validation of the strong improvement of core and pedestal confinement with decreasing collisionality. 2) Develop operation at large bootstrap fraction and advance the physics basis required for non-inductive, high-performance and low-disruptivity operation. NSTX-U will develop operational scenarios with $f_{BS} = 60-90\%$ and $\beta_N = 4-6$ for multiple current redistribution times, and it will operate fully non-inductively for plasma currents up to 1 MA. 3) Develop and evaluate conventional and innovative power and particle handling techniques to optimize plasma exhaust in high performance scenarios. Research in this area will evolve towards implementation of flowing liquid lithium components.

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