

Abstract Submitted  
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**NSTX Plasma Start-up using Transient CHI**<sup>1</sup> DENNIS MUELLER, MICHAEL G. BELL, Princeton University, ROGER RAMAN, TOM R. JARBOE, BRIAN A. NELSON, University of Washington, RICKY MAQUEDA, Nova Photonics — Non-solenoid based start-up is essential for development of a fusion reactor based on the spherical torus concept. A method of non-inductive startup, referred to as transient coaxial helicity injection (Transient CHI), was successfully developed on the Helicity Injected Torus (HIT-II) experiment and employed on the National Spherical Torus Experiment (NSTX) to produce up to 160 kA of toroidal plasma current on closed flux surfaces without use of the central solenoid. In this method, plasma current is produced by discharging a capacitor bank between coaxial electrodes in the presence of toroidal and poloidal magnetic fields chosen such that the plasma rapidly expands into the chamber. When the injected current is rapidly decreased, magnetic reconnection occurs near the injection electrodes with the toroidal plasma current forming closed flux surfaces. Detailed experimental measurements made on NSTX include fast time-scale visible imaging of the entire process.

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