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DESIGN, INSTALLATION AND PERFORMANCE OF THE NEW INSULATOR FOR NSTX CHI EXPERIMENTS *

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Coaxial Helicity Injection (CHI), a noninductive method to initiate plasma and generate toroidal plasma current, is being investigated in the National Spherical Torus Experiment (NSTX). The center stack and outer vacuum vessel are separated by insulating gaps at the top and bottom of the slim central column so that a high voltage (< 2 kV) can be applied between them from a pulsed power supply or a capacitor bank to initiate an arc discharge. In the presence of a suitable poloidal magnetic field, the discharge is initiated at the lower gap (the injector gap) and because of the strong toroidal field develops a helical structure resulting in substantial toroidal plasma current being driven. In NSTX, up to 390 kA of toroidal current has been generated for an injected current of 25 kA. The early investigations of CHI however frequently developed arcs across the insulator at the top of the machine (the absorber gap) which terminated the desired discharge. This arcing greatly restricted the operational space available for CHI studies. During 2002, the absorber region was modified to suppress these arcs. The new design includes a new ceramic insulator on the high field side of the absorber region with a much longer tracking distance between conducting elements at the different potentials. Furthermore, two new coils were installed near the absorber to minimize the poloidal field connecting the center stack and outer vacuum vessel. During the subsequent experimental campaign, CHI operation was less prone to arcing in the absorber and those arcs that did occur did not terminate the main discharge. The performance of the new insulator during the upcoming 2005 campaign will be presented.

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