

## **Error Fields and Locked Modes in NSTX**

*J.K. Park, J. Menard, R. Feder, G. Labik, C. Ludescher, A. Sontag, C. Tcheyan, and NSTX Team*

The full set of six mid-plane external error field and resistive wall mode control coils has now been installed and utilized on NSTX. Locked-mode threshold experiments performed with these coils imply that a 1-2 Gauss resonant  $2/1$  intrinsic error field is present in NSTX. The in-vessel  $B_R$  sensor array and direct measurements of poloidal field coil shapes (where available) indicate the presence of an effective shift of the lower primary vertical field coil (PF5) relative to the nominal machine centerline. The error field magnitude predicted by this shifted PF5 model is consistent with the results from locked-mode experiments, but the toroidal phase angle differs by as much as 60 degrees. Thus far, the  $2/1$  resonant error field threshold for mode locking has been measured as a function of plasma density in NSTX, and locking as a function of  $q$ ,  $B_T$ , and elongation in LSN will be investigated in the near term. These studies will allow comparison to the threshold scaling derived from higher aspect ratio experiments. Plans for error field studies extended to higher- $\beta$  plasmas will also be discussed. Simultaneously, magnetic field characteristics of external error field coils are investigated in the context of how a desired and pure ( $n=1, 3$ ) compensating field can be produced. This preliminary study will continue on more efficient pre-programmed and dynamic control of error fields in NSTX.