

Abstract Submitted
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Magnetic Alignment of NCSX.¹ M.C. ZARNSTORFF, N. POMPHREY, Princeton Plasma Physics Laboratory, Princeton, NJ 08543 — The National Compact Stellarator Experiment (NCSX), currently under construction, is a modular quasi-axisymmetric stellarator designed to study confinement and stability of high-beta plasmas. It has 18 modular coils, 18 planar weak toroidal field coils, and 6 pairs of poloidal field coils. A novel technique has been developed to magnetically measure the relative deviations in the coils' shapes and positions by measuring differences between mutual or self-inductances (between field-coils) that should be identical due to design symmetries. Non-zero differences indicate deviations in the location, orientation, or shape of one or more coils. For the fully assembled NCSX, there are 1001 linearly independent symmetric inductance differences, which is sufficient to determine, in principle, the 270 relative location and orientation parameters for the coils and ~ 15 relative shape moments per coil. From the calculated coupling coefficients and estimates of measurement signal to noise, the minimum measurable position or shape deviation amplitude is $\sim 0.02 - 0.1$ mm. The technique is applicable to either modular stellarators or tokamaks.

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