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Theory Experiment

Unique Scenario Development Issues for KSTAR First Plasma,* J.A. Leuer, D.A. Humphreys, A.W. Hyatt, M.L. Walker, *General Atomics*, S.W. Yoon, S.H. Hahn, Y.K. Oh, *NFRI*, N.W. Eidietis, *ORISE* – KSTAR commissioning constraints including site power constraints, low vacuum baking temperature, magnetic diagnostics limitations, and coil magnetic properties combine to produce a very small operational window for plasma breakdown and initial plasma operation. We describe these challenges and unique solutions developed for KSTAR machine commissioning. KSTAR is the first major tokamak to use high performance Nb₃Sn superconductor in its magnets. However, this required use of magnetic material (Incoloy 908) in the magnet construction. Analysis methods, including 2-D and 3-D finite element methods, were developed to simulate the influence of this nonlinear magnetic material. Methods were developed to include the nonlinear material influence in standard reconstruction models. Successful first plasma required inclusion of these unique features in the KSTAR scenario development. The analysis methods will be discussed and aspects of the first plasma campaign will be described.

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