

Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

A proposed simple stellarator - SAS¹ DAVID GATES, PPPL (1), S. COWLEY, K. HAMMOND, S. LAZERSON, (1), M. LANDREMAN, U. Maryland, D. MAURER, J. SCHMITT, Auburn U., O. SCHMITZ, U. Wisconsin, M. ZARNSTORFF, C. ZHU, (1) — A new concept for making 3D fields using permanent magnets has led to a proposal for a new experiment, called SAS, to be located at the Princeton Plasma Physics Laboratory. The idea, born from the observation that stellarator shaping fields are nearly magneto-static, is to use permanent magnets in concert with a simple toroidal solenoid with planar coils to create an optimized stellarator. The proposed device will use components of the cancelled NCSX experiment, including the toroidal field coils and the vacuum vessel, along with an array of neodymium magnets which are mounted to a structure near the plasma boundary. Neodymium magnets have surface residual magnetic fields of 1.4T, but careful arrangement of the geometry can amplify this value using Halbach arrays. The toroidal field anticipated for this device will be in the neighborhood of 0.5T. Initial calculations indicate that the total mass of magnetic material required for the planned machine at the target TF field is $\sim 2\text{m}^3$. Concept designs will be presented including methods for holding the magnets and support structures for the various components. Additionally, we present results from new optimization methods that have led to improvements in several physics attributes of the planned equilibrium.

¹This work is funded by DoE Contract number DE-AC02-09CH11466

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Date submitted: 03 Jul 2019

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