Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Parametric studies of next-step spherical tokamaks using high-temperature superconductors[1] JONATHAN MENARD, TOM BROWN, PPPL, LAILA EL-GUEBALY, University of Wisconsin - Madison, YUHU ZHAI, PPPL — High-temperature superconducting (HTS) magnets are potentially attractive for compact spherical tokamak (ST) applications due to higher operating temperature which could reduce thermal shielding requirements and reduce device size relative to configurations that utilize low-temperature superconductors (LTS). HTS conductors can also operate with very high current densities and high magnetic fields. Recent studies have shown that for elongation and kink stability dependencies on aspect ratio consistent with NSTX data, accounting for the engineering limits of HTS magnets, and having only a modest central solenoid, the optimal aspect ratio for an HTS tokamak pilot plant is between A = 1.7 and 2.3 depending on inboard shielding thickness. These results point to the interesting finding that the optimal aspect ratio for a compact HTS pilot plant may be near A = 2 which is an unexplored configuration in the present fusion program. The potential implications for required energy confinement, plasma formation and sustainment, power exhaust, and other performance parameters will be discussed.

[1]Work Supported by U.S.D.O.E. Contract No. DE-AC02-09CH11466

Jonathan Menard
PPPL

Date submitted: 24 Jul 2015 Electronic form version 1.4