Abstract Submitted
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Design studies of Vulcan, a compact steady-state tokamak for boundary studies using HTS magnets[1] L. BROMBERG, P.T. BONOLI, A.E. HUBBARD, J. SCHULZ, D. WHYTE, MIT PSFC, Cambridge MA 02139 — Recent advances in high temperature superconductors (HTS) have been dramatic. We present investigation of a near-term tokamak design using present day HTS materials, conventional structures and manufacturing. The device is intermediate-scale ($\sim$ 1 m major radius, 7 T on axis), operating in H and limited D, for studies involving long-term operation with surface averaged power density ~ 1 MW/m^2 and hot walls to study plasma-facing component issues and plasma sustainment under conditions relevant to fusion reactors. We will discuss operation time required under different plasma conditions to achieve steady state conditions. The design uses demountable joints at 40-50 K for easy access to the first wall and divertor, with capability for single-piece maintenance. Compact designs for He cooled first walls are described. Plasma heating and current drive options for this compact, high density plasma will be presented. Engineering/plasma tradeoffs will be described, including performance as a function of machine size and cost.

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Amanda Hubbard
MIT Plasma Science and Fusion Center

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