Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

SPARC Integrated Design and Operational Scenarios[1] ALEXANDER CREELY, DAN BRUNNER, CHRIS CHROBAK, Commonwealth Fusion Systems, DARREN GARNIER, ROBERT GRANETZ, MARTIN GREENWALD, JAMES IRBY, BRIAN LABOMBARD, ADAM KUANG, YIJUN LIN, Massachusetts Institute of Technology Plasma Science and Fusion Center, ROBERT MUMGAARD, Commonwealth Fusion Systems, MATTHEW REINKE, Oak Ridge National Laboratory, RYAN SWEENEY, STEVEN WUKITCH, Massachusetts Institute of Technology Plasma Science and Fusion Center, THE SPARC TEAM —
The SPARC tokamak is a critical next step toward commercial fusion energy. Having progressed through several design iterations, SPARC has now baselined major parameters at Version 2 (V2) and is proceeding with detailed engineering design. With $B_0 = 12.2$ T, $R_0 = 1.85$ m, $a = 0.57$ m, and a goal of $Q > 2$, SPARC is a compact, high-field, D-T tokamak that will directly access conditions expected in a fusion power plant [A. J. Creely et al., *J. Plasma Phys.* Submitted]. Empirical projections of plasma performance indicate that there is considerable margin over the $Q > 2$ goal, predicting up to $Q \approx 11$ with $H_{98,y2} = 1$. In addition to this primary reference discharge, several other plasma scenarios have been scoped out for SPARC, including L-mode operation, lower field and current scenarios, and an X-point target advanced divertor scenario. The engineering design has now incorporated detailed analysis of many key systems, including the toroidal and poloidal field coils, the central solenoid, the vacuum vessel, neutron shielding, and others, leading to the current machine design.

[1]Research supported by Commonwealth Fusion Systems

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Date submitted: 22 Jun 2020 Electronic form version 1.4