Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Physics-Based Integrated Modeling and Exploration of Fusion Performance in SPARC Plasmas[1] PABLO RODRIGUEZ-FERNANDEZ, NATHAN T. HOWARD, MARTIN J. GREENWALD, JERRY W. HUGHES, MIT-PSFC, ALEXANDER J. CREELY, CFS, CHRISTOPHER HOLLAND, UCSD, JOHN C. WRIGHT, STEPHEN WUKITCH, MIT-PSFC, SPARC TEAM — SPARC is designed to be a high-field, medium-size machine (v0 parameters: B=12T, R=1.65m) aimed at achieving net energy gain with ICRF as its primary heating mechanism. Empirical predictions with conservative physics (H98=1.0) indicate that SPARC baseline plasmas will generate more than 50MW of fusion power, reaching $Q > 2$. To build confidence that SPARC will realize its mission, physics-based integrated modeling has been performed. The TRANSP code coupled with the physics-based TGLF turbulence model confirms $Q > 2$ operation is feasible for SPARC parameters. In this analysis, ion cyclotron waves are simulated with the full wave TORIC code and alpha heating is included with the Monte-Carlo fast ion NUBEAM module. Exploration of the parameter space also indicates that Q can be enhanced with small variations from baseline, providing a pathway to increase performance while moving away from stability boundaries. This talk presents the workflow to study SPARC plasmas, discusses assumptions and introduces trends of performance against geometric and engineering parameters.

[1]Research supported by Commonwealth Fusion Systems.

Pablo Rodriguez Fernandez
Massachusetts Institute of Technology

Date submitted: 03 Jul 2019

Electronic form version 1.4