Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Elevating zero-dimensional predictions of tokamak plasmas to self-consistent theory-based simulations[1] T. SLENDEBROEK, Oak Ridge Associated Universities, J. MCCLENAGAN, O. MENEGHINI, B.C. LYONS, S.P. SMITH, J. CANDY, General Atomics — A new workflow in the OMFIT integrated-modelling framework has been developed to predict profiles and energy confinement, based on zero-dimensional (0D) tokamak quantities. This workflow addresses one of the present limitations of systems studies, which currently relies on the experimental energy confinement scaling law $\tau_{98,y2}$. We seek to obtain a fully theoretical prediction by progressively dropping assumptions and replacing simple scaling laws with state-of-the-art theory-based physics models. In OMFIT the PRO-create (profiles creator) module generates physically plausible plasma profiles and a consistent equilibrium using the same $\tau_{98,y2}$ 0D parameters. This result forms the starting point for the STEP (Stability, Transport, Equilibrium, and Pedestal) module which iterates between equilibrium, sources, core transport, and pedestal calculations to obtain a self-consistent solution. We will report on the validation of this workflow, as has been carried out on the ITER H-98P(y,2) database and a series of DIII-D plasmas, yielding a theory-based energy confinement scaling, and its applications towards the evaluation of potential DIII-D upgrades and the design optimization of next generation fusion devices.

[1]Work supported by DoE Contracts DE-SC0017992 (AToM), DE-FG02-95ER54309 (GA theory).

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Date submitted: 02 Jul 2020 Electronic form version 1.4