Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

1-Dimensional Equilibrium of C-2W plasma S GUPTA, Tri Alpha Energy, Inc., D. C BARNES, AND THE TAE TEAM, TAE Technologies Inc. — In TAE Technologies' current experimental device, C-2W (also called "Norman") [1], record breaking, advanced beam-driven field reversed configuration (FRC) plasmas are produced and sustained in steady state utilizing variable energy neutral beams, advanced divertors, end bias electrodes, and an active plasma control system. We present an interpretative tool to calculate the internal magnetic field, electric field, and fast ion population using experimentally measured quantities such as magnetic field and poloidal flux (measured near the wall), electron density and temperature, ion temperature, and neutral density. The internal plasma state is found through equilibrium reconstruction. Using Ampere's law, a 1-D radial profile of the magnetic field is calculated by evolving fast ions using a Kinetic Monte Carlo Simulation with measured thermal plasma profiles. An alternative model applies multi-ion species fluid equations to determine flux and ion surface equilibrium functions for the equilibrium reconstruction. Sustained by neutral beam injection, the growing fast ion population drives current and modifies the magnetic field. The steady state solution provides a plasma equilibrium with a significant fast ion population. The steady state equilibrium can be used further to estimate the electric field, neutrons production, and power balance in the new high-confinement operating regime. [1] H. Gota et al., Nucl. Fusion **59**, 112009 (2019).

S Gupta
Tri Alpha Energy, Inc.

Date submitted: 08 Jul 2019 Electronic form version 1.4