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Computing Challenges in Kinetic Modeling of FRC Stability and Transport CALVIN LAU, FRANCESCO CECCHERINI, SEAN DETTRICK, 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. Two particle-in-cell HPC codes are under development to support the main goals of TAEs research program: 1) the ANC kinetic micro-stability code to understand energy confinement and turbulence[2], and 2) the FPIC kinetic macro-stability code to model global stability and study plasma control methods that could be deployed on current and future devices. Using the computing resources of NERSC Cori and ALCF Theta, these two simulation codes are the most computationally demanding components of the integrated modeling project at TAE, dubbed the FRC Whole Device Model (WDM). The WDM is a hierarchy of models, which will use a global transport model as the framework to integrate microstability, macrostability, electron dynamics, neutral transport, and neutral beam and RF source terms to perform full system simulations.
[1] H. Gota et al., Nucl. Fusion 59, 112009 (2019).
[2] Lau, C. K., et al. Nucl. Fusion 59, 066018 (2019).

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