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UEDGE Simulations for Power and Particle Flow Analysis of FRC Rocket[1] FRED ZHENG, Princeton Univ, EUGENE S. EVANS, Princeton Plasma Physics Laboratory, NICK MCGREIVY, University of Pennsylvania, ALAN KAPTANOGLU, Stanford University, OLIVIER IZACARD, SAMUEL A. COHEN, Princeton Plasma Physics Laboratory — The field-reversed configuration (FRC) is under consideration for use in a direct fusion drive (DFD) rocket propulsion system for future space missions. To achieve a rocket configuration, the FRC is embedded within an asymmetric magnetic mirror, in which one end is closed and contains a gas box, and the other end is open and incorporates a magnetic nozzle. Neutral deuterium is injected into the gas box, and flows through the scrape-off layer (SOL) around the core plasma and out the magnetic nozzle, both cooling the core and serving as propellant. Previous studies have examined a range of operating conditions for the SOL of a DFD using UEDGE, a 2D fluid code; discrepancies on the order of $\sim$5% were found during the analysis of overall power balance. This work extends the analysis of the previously-studied SOL geometry by updating boundary conditions and conducting a detailed study of power and particle flows within the simulation with the goals of modeling electrical power generation instead of thrust and achieving higher specific impulse.

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Fred Zheng
Princeton Univ

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