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Self-consistent Equivalent Circuit Model of a Field-reversed Configuration Thruster JOSHUA WOODS, CHRISTOPHER SERCEL, BENJAMIN JORNS, Univ of Michigan - Ann Arbor — An equivalent circuit model is presented for the formation and propagation of a plasmoid in a rotating magnetic field field-reversed configuration thruster. The system consists of two rotating magnetic field (RMF) antennae that drive the azimuthal plasma current, an external coil that produces the necessary radial magnetic field, and the plasma itself. The plasma is treated as a conducting slug that translates downstream of the thruster due to an axial Lorentz force caused by the azimuthal plasma current and the external magnetic field. The mutual inductance terms vary with time as the slug changes position and are calculated by modeling the plasmoid in COMSOL. The plasmoid is moved to different axial positions along the centerline of the thruster to calculate and derive empirical expressions for the mutual inductances. The system of equations is solved numerically to calculate the impulse and efficiency of the thruster. The numerical model is compared to experimental performance data measured using the University of Michigan RMF thruster. The validity of the model and the observed trends of the results are discussed in the context of thruster performance.

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