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Results from a Pre-Ionization Study of a 30 kW RMF-FRC Experiment for Space Propulsion CARRIE HILL, NOLAN UCHIZONO, ERC, Inc (AFRL-Edwards), MICHAEL HOLMES, Air Force Research Laboratory — Field-Reversed-Configuration (FRC) plasma thrusters are an attractive concept for in-space propulsion. These thrusters operate in a quasi-steady manner by expelling successive bursts of FRC plasmoids on the order of the neutral-gas refill rate. Pre-ionization (PI) of the seed gas is a challenge for these repetitive systems as the starting mix is a combination of the hot remnants from the recently-departed FRC and the cold refill gas. Pre-ionization of this mixture is critical to the RMF current drive and energy coupling of the system and therefore must be optimized to maximize performance. An empirical PI study was conducted on a 30-kW RMF-FRC benchtop experiment to examine how coil geometry and initial plasma distribution affects the plasmoid formation and acceleration processes. Three different inductively-coupled PI coil geometries were investigated. Their effectiveness was monitored by recording the downstream plasma velocity distribution, density, and energy coupling to the RMF antennas. The initial seed plasma created by these sources was also mapped in limited regions to compare the starting conditions for the FRC plasmoid in each case.

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