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Performance characterization of a permanent-magnet helicon plasma thruster KAZUNORI TAKAHASHI, Iwate University, CHRISTINE CHARLES, ROD BOSWELL, The Australian National University — Helicon plasma thrusters operated at a few kWs of rf power is an active area of an international research. Recent experiments have clarified part of the thrust-generation mechanisms. Thrust components which have been identified include an electron pressure inside the source region and a Lorentz force due to an electron diamagnetic drift current and a radial component of the applied magnetic field. The use of permanent magnets (PMs) instead of solenoids is one of the solutions for improving the thruster efficiency because it does not require electricity for the magnetic nozzle formation. Here the thrust imparted from a permanent-magnet helicon plasma thruster is directly measured using a pendulum thrust balance. The source consists of permanent magnet (PM) arrays, a double turn rf loop antenna powered by a 13.56 MHz rf generator and a glass source tube. The PM arrays provide a magnetic nozzle near the open exit of the source and two configurations, which have maximum field strengths of about 100 and 270 G, are tested. A thrust of 15 mN, specific impulse of 2000 sec and a thrust efficiency of 8 percent are presently obtained for 2 kW of input power, 24 sccm flow rate of argon and the stronger magnetic field configuration.

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