Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

Results from the mini-Helicon Thruster Experiment OLEG BATISHCHEV, NAREG SINENIAN, MURAT CELIK, MANUEL MARTINEZ-SANCHEZ, MIT, Cambridge, MA 02139 — A mini-Helicon Thruster Experiment (mHTX) was designed to study possible space applications. High beam and gas utilization efficiencies are of major importance, as well as the compact design and system integration. We target gases with intermediate weight as diatomic nitrogen, monoatomic argon, and mixtures like air, operating at low <1kW 13.56MHz RF power. We find that higher magnetic fields ∼0.2-0.4T in a non-uniform configuration allow shortening the plasma source and achieving intensive collimated exhaust plume. Applied magnetic field is created by copper electromagnets and/or by permanent rare-earth magnets. Application brings other particularities to the design that will be mentioned. The mHTX gas discharge is characterized with UV-VIS spectroscopy using portable spectroscopic system. It shows high >90% gas-to-plasma utilization. High resolution ∼0.01A allows measuring Doppler shift of the plume, which appears to be on the order of 10-20km/s. To articulate ionic line shift boron impurity seed is attempted. Emission data are cross-correlated with direct measurements of plasma parameters using various plasma probes and direct thrust-balance data. Additional diagnostics include those for the matching network and wall heat fluxes to analyze the circuit, plasma resistance, RF-to-plasma coupling and power redistribution.

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Date submitted: 20 Jul 2007 Electronic form version 1.4