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The Effect of Modulation on the Magnetically Shielded Miniature (MaSMi) Hall Thruster's Performance and Plasma Properties[1] JACOB SIMMONDS, Princeton University, VERNON CHAPLIN, Jet Propulsion Laboratory, YEVGENY RAITSES, Princeton Plasma Physics Laboratory — Recent studies of cylindrical Hall thrusters have shown that by applying an oscillation to the anode voltage in resonance with the natural breathing modes, propellant utilization may be improved through increased plasma density in the ionization front [1]. Such an operating regime may increase performance of thrusters limited by incomplete ionization of the propellant. This approach was utilized with NASA JPL's Magnetically Shielded Miniature (MaSMi) Hall Thruster, using one-dimensional fluid/hybrid simulations from the LANDMARK project. Through semi-empirical mobility profiles, agreement between measurements – such as axial ion velocity profiles – was found between experiments, our 1d simulations, and 2d simulations from JPL's Hall2De code. Improvements in the propellant utilization were observed in the simulations at high amplitudes of modulation. Modulation appears to increase thrust due to the increased ion energy and ion current, however this is counteracted by increased discharge power. Large nonlinear oscillations in plasma density were observed during modulation, with similar phasing behavior between plasma parameters as in other modulated Hall thrusters. [1] Romadanov, I. et al., Plasma Sources Sci. Technol. 25, 011604 (2018)

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