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Operation of a cylindrical Hall thruster with externally driven breathing oscillations[1] JACOB SIMMONDS, Princeton University, YEVGENY RAITSES, Princeton Plasma Physics Laboratory, ANDREI SMOLYAKOV, OLEKSANDR CHAPURIN, University of Saskatchewan — We report results of experimental and numerical studies of the effect of externally-driven voltage modulations on the operation and performance of a low power 2.6cm cylindrical Hall thruster with permanent magnets. For simulations, a one-dimensional hybrid code HALLIS [1] is used. Both experiments and simulations demonstrate that the effect of voltage modulations on the thruster discharge has a resonant-kind behavior. For example, the discharge current and the ion current reach their maximum values when the frequency of modulations approaches the frequency of the breathing oscillations [2]. Thrust measurements revealed a frequency-dependent increase in thrust, with the maximum thrust occurring when modulating at the natural breathing frequency. It follows from plasma measurements in the thruster plume that this thrust increase is due to an increase in average ion energy, as the oscillations of ion energy and ion current were shown to be in phase at the resonance condition. Simulations show these improvements occur when the ionization wave is amplified through increased electron temperature, which were verified by experimental measurements. [1] J. P. Boeuf, J Appl. Phys. 121, 011101 (2017); [2] Romadanov, I. et al., Plasma Sources Sci. Technol. 25, 011604 (2018)

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Jacob Simmonds
Princeton University

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