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Experiments with Non-Self-Sustained Regimes of Hall Thruster Discharge[1] YEVGENY RAITSES, ARTEM SMIRNOV, ERIK GRANSTEDT, NATHANIEL J. FISCH, PPPL — In conventional Hall thrusters, a steady state cross-field discharge is sustained between the anode and a hollow cathode. The current density at the cathode thermionic emitter is usually large enough to provide sufficient heating for self-sustained operation. It is commonly accepted that the thruster discharge current is limited by ionization of the working gas, wall losses and electron cross-field transport, and not by the electron supply from the cathode. We report that with all thruster parameters unchanged, the discharge current can be increased over and above what is normally required for sustaining the steady state discharge by running an auxiliary discharge between the cathode and an additional electrode [1]. For the cylindrical Hall thruster geometry, such a non-self-sustained operation is characterized by improved plasma plume focusing and higher thrust [1, 2]. These results are analyzed and compared with a conventional annular geometry Hall thruster.

[1] Y. Raitses et al, Appl. Phys. Lett. 90 (2007) 221502
[2] A. Smirnov et al, Phys. Plasmas 14 (2007) 057106

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