

SPACE PROPULSION SYMPOSIUM (C4)
Electric Propulsion (4)

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PRELIMINARY MISSION CAPABILITIES ASSESSMENT OF A MAGNETICALLY SHIELDED
MINIATURE HALL THRUSTER**Abstract**

The recent proliferation of proposed NASA missions employing sub-200 kg spacecraft makes a high-efficiency, long-life, low-power Hall thruster an attractive candidate propulsion system. Magnetic shielding has been shown to dramatically extend the projected operational lifetime of Hall thrusters in the 6 kW power range and shows promise to achieve similar results on the miniature scale. This investigation aims to validate that the application of magnetic shielding on low power Hall thrusters results in a significant extension of operational lifetime. Additionally, the increase in efficiency and performance from the significant reduction in plasma-wall interaction losses, likely achieved through the unique magnetic field topology, will be explored. The 4 cm MaSMi (Magnetically Shielded Miniature) Hall thruster has been developed and has undergone initial performance testing using plume diagnostics, yielding a thrust of 19 mN and a specific impulse of 1870 s at a total efficiency of 43% (59% anode efficiency). The goal of this phase of the investigation is threefold: first, we aim to validate the efficiency, thrust, specific impulse, and extension of operational life of the MaSMi Hall thruster; second, we hope to develop a computational model of the plasma discharge inside the thruster channel to identify any unique plasma behaviors inside a miniature magnetically shielded Hall thruster; third, we hope to explore the spacecraft- and mission-enabling capabilities of the MaSMi Hall thruster.