Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

Optical Diagnostic Development of a Bismuth Hall Thruster
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— As the heaviest of all stable isotopes, bismuth is a uniquely efficient propellant option for certain plasma-based electric propulsion (E.P.) applications. In general, E.P. systems offer significant benefits over conventional chemical propulsion rockets; however, current E.P. technologies are still lacking in the efficiency and power handling required for feasible Nuclear-Electric Propulsion missions to the outer planets. One option to accommodate the requirements of such missions is an advanced bismuth-fueled Hall thruster. In preparation for development of an advanced Bi-fed Hall thruster, a laboratory-model Hall thruster has been modified to run on bismuth propellant and optical diagnostics have been developed for analyzing the bismuth plasma in the thruster exhaust. For ion velocity measurements, the Bi II 680.86 nm transition will be probed with a New Focus brand Velocity class TLB-6309 laser, and phase sensitive LIF collection will be recorded at 660.02 nm. The design of the laboratory thruster, as well as recordings of the emission and LIF signals from these transitions in the thruster, will be presented.

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Date submitted: 23 Jul 2007 Electronic form version 1.4