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**The X3: A 200 kW Class Nested Channel Hall Thruster<sup>1</sup>**

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Electric propulsion has seen rapid adoption in recent years for commercial, scientific, and exploratory space missions. The X3 is a three channel nested channel Hall thruster, designed to push the boundaries of high power electric propulsion for cargo transfer to Mars and large military assets. It has been operated at thermal steady state up to 30 kW of power. Thrust measurements were made on an inverted pendulum thrust stand, indicating over 2000 s specific impulse and 65 mN/kW thrust to power ratio. Detailed plume measurements were made with Faraday and Langmuir probes. The multiple concentric channels provide better performance than the sum of the individual channel operations due to superior propellant utilization from its compact design. Using a high speed camera, the breathing and spoke mode instabilities were captured in all three channels. Spoke and breathing instabilities couple between the channels, indicating that complex plasma and neutral interactions are at play. Electron transport, both cross field and in the cathode plume, are well suited to be explored in a thruster of this size.

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