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Hall Thruster Configurations for Nano/Micro-Satellite Propulsion

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A Hall thruster (HT) is a griddles positive ion accelerator used for spacecraft propulsion. First introduced in the mid-1960's, the HT has a long and successful flight history dating back to the early Soviet Meteor satellites in 1972. Over the past decades, HTs have been installed on board tens of commercial, institutional and military satellites. Their early role as station-keeping and attitude control systems is being expended to orbital transfer and main propulsion device. While kilowatt class thrusters for geostationary satellites are a mature technology, HTs operating at 200 W or below are considerably less developed. This work will present the impact of miniaturization of HT on their performance and new techniques investigated at ICARE to mitigate these effects. One such technique is the use of magnetic shielding type configuration that reduces the plasma/surface interactions and leads to lifespan extension. The concept of wall-less thruster also promises interesting advantages for low power applications. Experimental results comparing ICARE's 200 W shielded HT, a 200 W wall-less thruster and a 100 W traditional HT will be presented.

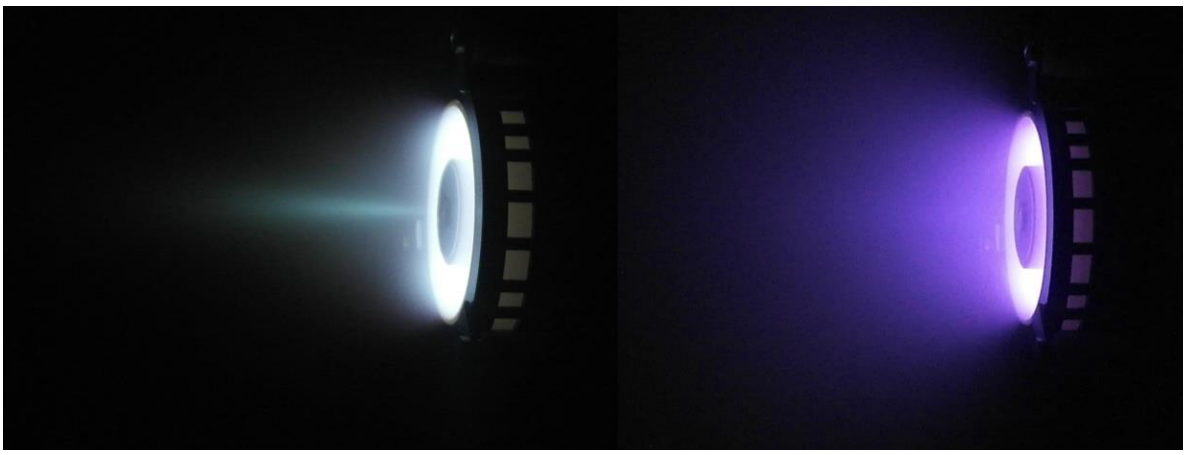

Figure 1. ICARE's 100 W ISCT100 Hall thruster firing with xenon (left) and krypton (right) propellant