

66th International Astronautical Congress 2015

SPACE PROPULSION SYMPOSIUM (C4)
Interactive Presentations (IP)

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THREE GRIDDED ION ENGINES FOR FUTURE HIGH POWER ELECTRIC PROPULSION
MISSIONS

Abstract

Conventional gridded ion engines have two grids to extract the ions from the discharge chamber. This ion extraction system is inherently limited to either high specific impulse and low thrust density or high thrust density and low specific impulse because of the physics of the ion extraction, which is governed by the Child Langmuir law. By adding a third grid, it is possible to achieve both high specific impulse and high thrust density. Such a thruster, designated DS3G can achieve thrust densities several times higher than two-gridded devices and specific impulses in excess of 10000 secs. The paper will present results on both analytic and numerical modelling of performance and lifetime of this type of thruster, which can be operated at power levels of 25kW but with a volume essentially the same as conventional thrusters at power levels of a few kW. The possibilities of dual mode operation, that is high thrust, low specific impulse and low thrust high specific impulse as well as some mission applications will also be examined.