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The Vacuum Arc Ion Thruster

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The Vacuum Arc Thruster (VAT) is a simple electric propulsion system for small satellites, providing low thrust at moderate specific impulse. In this work the VAT is investigated as a plasma source for a high performance ion thruster. Spacecraft figures of merit are presented and the relevant literature is reviewed. Several inductive energy storage arc circuits were built and their electrical performance characterised. The arc current pulse shape was adjusted from triangular to square in order to provide more uniform ion current density. Total ion currents were measured for planar and coaxial thruster designs, as well as for different cathode materials. A ballistic pendulum for individual arc pulse impulse bit measurements was built and its performance is discussed. The grid setup used to extract the ions into the beam as well as the extractor power supply design are presented. Attention is given to beam formation and neutralisation. Finally, the overall improvement in performance over the VAT is presented and the advantages and disadvantages of the ion thruster system are discussed.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

MSc

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