Paper ID: 77215
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30th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Joint Session between IAA and IAF for Small Satellite Propulsion Systems (5A-C4.8)

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QUALIFICATION CAMPAIGN FOR A CENTRE-TRIGGERED PULSED CATHODIC ARC THRUSTER

Abstract

Small spacecraft operators face an increasing need for on-board propulsion systems to achieve various mission critical outcomes. These outcomes range from manoeuvres supporting mission requirements such as constellation dispersion, orbital transfer, and station keeping, through to responsive space activities such as collision avoidance and end-of-life disposal. The latter are increasingly relevant as the Low Earth Orbit (LEO) environment is becoming more congested, coupled with ever-tighter national and international disposal regulations. Operator requirements drive a market need for propulsion systems that provide sufficient manoeuvre authority to small spacecraft, including CubeSats. In this work we report on the qualification tests performed on the first flight articles of Neumann Space's novel electric propulsion system.

The Neumann Drive is a centre-triggered pulsed cathodic arc thruster (CT-PCAT), which is an electric propulsion system that utilises a low voltage, high current, short duration plasma arc to evaporate, ionise, and accelerate metallic propellant, thereby producing thrust. The advantages of this technology in terms of integration and operation simplicity make it attractive to satellite manufacturers, integrators, and operators, with interest being expressed in the progress and results of the qualification test campaign. In collaboration with mission partners, the Neumann Space team has subjected qualification models of a nanosatellite class thruster to launch environment testing, pragmatic EMC testing, thermal vacuum testing, exhaust neutrality testing, radiated magnetic field testing, and logistical compatibility demonstrations.

This paper presents the methodology and results for the test campaign conducted on the first-generation Neumann Drive, scheduled for orbital launch in mid-2023.