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HEMPT – ELECTRIC PROPULSION FOR LEO/MEO CONSTELLATIONS

Abstract

The business line segment Electron Devices of Thales Deutschland started the development of a new propulsion technology, the HEMPT (Highly Efficient Multistage Plasma Thruster) at the end of the 90's. The first thruster model, 1.4kW-class HEMPT-3050, has been fully qualified including an unique and extended lifetime test; two HEMPT-3050 propulsion systems have been integrated on the German GEO satellite H2Sat, launched in July 2023, and successfully started with nominal performance. This represents the first in-orbit demonstration of the HEMPT propulsion technology.

Thales is currently qualifying a new HEMPT model, the 700W-class EV0 thruster for LEO/MEO constellations and small GEO satellites. The HEMPT technology provides great benefits to the constellation market due to its unique ability of using different propellants (Xenon, Krypton) without any design modification and also due to its cost-effective design. Furthermore, the HEMPT-EV0 thruster allows operation up to 700W with anode voltages ranging from 300V to 800V, enabling different operational modes suitable for orbit rising, NSSK attitude control in the final orbit and for the EOL debris disposal. The thruster can generate up to 33mN with Xenon and 27mN with Krypton in high-thrust mode (300V-700W). The thruster can also be operated at higher voltages in high-Isp mode; it reaches an Isp of more than 2000s with 800V-700W.

This paper will give an update on the development status of the HEMPT propulsion technology focusing on the EV0 thruster, including the qualification status, the ongoing lifetime test and the first commercial applications.