HEMPT – Innovative Electric Propulsion Technology for Commercial and Scientific Spacecraft

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ABSTRACT

Electric propulsion allows for much higher exhaust velocities than conventional chemical propulsion, resulting in a major reduction of the propellant mass for a certain space mission. This leads either to a significant decrease of the launch mass of a spacecraft or to larger payloads.
The business unit Electron Devices of Thales Deutschland started the development of a new electric propulsion technology, the HEMPT (**H**ighly **E**fficient **M**ultistage **P**lasma **T**hruster) at the end of the 90's. After having carried out several basic studies supported by DRL and ESA, Thales was able to achieve impressive results with its new technology. The first fully qualified thruster model, the 1.4kW-class HEMPT-3050, has been integrated on the German geostationary satellite H2Sat, launched in July 2023, and it is successfully operating with nominal performance. This represents the first in-orbit demonstration of the HEMPT propulsion technology.
Thales is currently qualifying a smaller HEMPT model, the 700W-class EV0 thruster for low/medium Earth orbit satellite constellations and small geostationary 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, its long lifetime thanks to a very limited thruster erosion, and 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 end-of-life debris disposal.
Thales is also developing an enlarged version of the EV0 thruster, the HEMPT-EV0+, adapted for a higher power range, up to 1.5kW. The thruster uses the same module design as the EV0, allowing the reuse of the processes already qualified for the EV0 module.
This paper will give an update on the development status of the HEMPT propulsion technology and the first commercial applications.

References

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