

The Power Supply and Control Unit for the HEMP Thruster

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This year, Astrium GmbH delivers several flight model electronics for Electric Propulsion systems or corresponding components. One of the elements is a Power Supply and Control Unit (PSCU) for the Thales development “High Efficiency Multistage Plasma Thruster” (HEMP-T) (see Figure 1). The first application is the S GEO Satellite (HISPASAT-1), where the In-Orbit Demonstration (IOD) of the HEMP Thruster system will prove the success of the product.

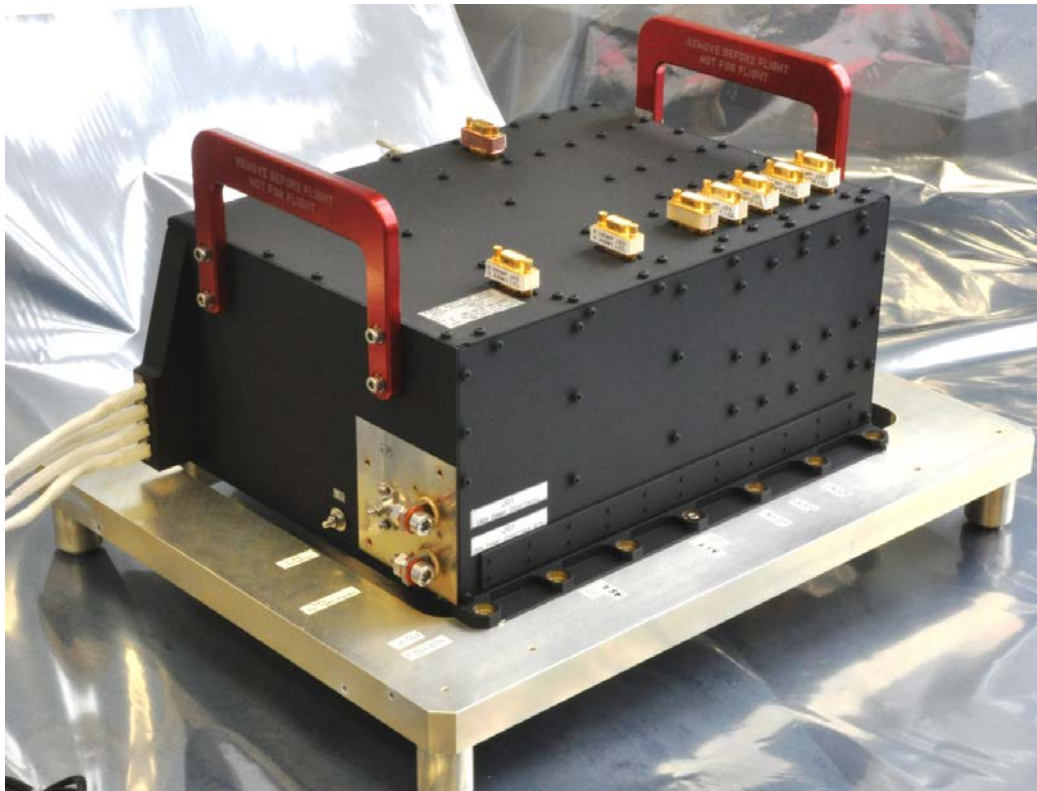


Figure 1: Engineering Qualification Model of the HEMP-T PSCU

Key elements of the HEMP-T PSCU are:

- Two high voltage power supplies in parallel for cold redundancy as main supplies for the thrusters, delivering 1000V / 1400W each.
- Digital control module, communicating with the on-board computer and controlling the functional blocks inside the PSCU.
- Four Multi-functional DC-DC converter modules, supplying the Neutralisers and the Flow Control Unit.
- Measurement module, sensing the currents on high voltage potential with high accuracy.
- Capability to operate the thruster and neutralizer with controlled floating ground system.

In the following, the top-level block diagram of the PSCU including the four thrusters, neutralizers and flow control units is shown.

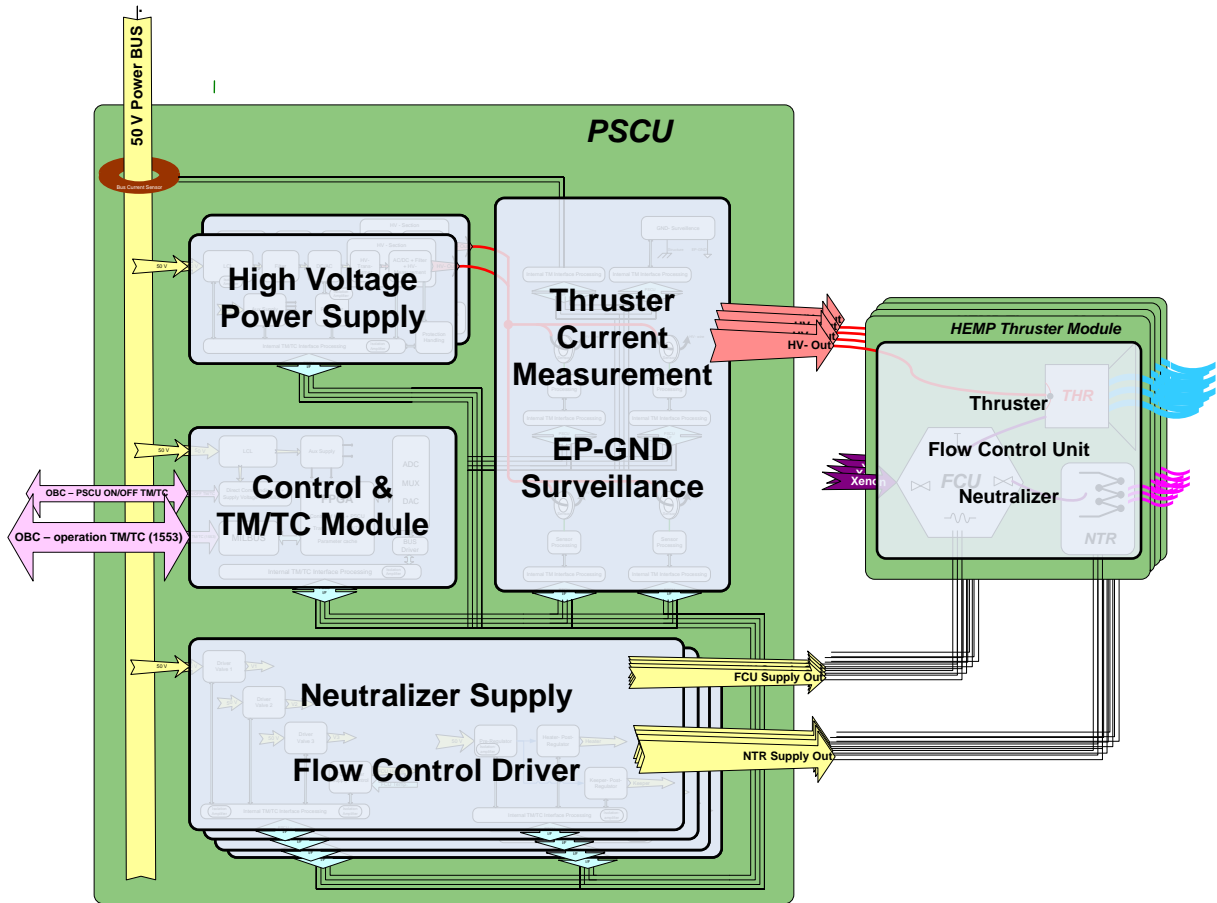


Figure 2: HEMP-T PSCU & thrusters block diagram

Astrium conducted a series of coupling tests during the PSCU development with the thruster, neutralizer and flow control unit. The results of these tests were used to refine the specification and adapt the PSCU drivers and control algorithms. Furthermore, the tests results gave Thales and Astrium the opportunity for a deep understanding of the interaction between the thruster physics and the electronics.

The development phase is finished, CDR is closed and the PSCU qualification tests are performed.

The paper will present an introduction into the PSCU topology and the key features. In addition to that, the paper will summarise the results of the PSCU qualification tests.