LMPI Key Features

Modular In-Orbit Langmuir-Probe System

Specifications	LMPI
Single System Dimension (WxLxH)	(30x50x15)mm³
Number of probe systems	4
Net weight	< 200g
Power Consumption	< 0.5W
Measured Density Range	10^{10} .... 10^{12} m^{-3}
Measured Parameters	Plasma Density, Plasma Temperature Plasma Voltage Spacecraft Voltage
Measurement Frequency	1 Hz, Adjustable
Acquired Data	Analysed or Raw
Data Interface	I2C
Power Interfaces	3.3V, 5V

About us

Our development team with expertise in plasma physics and aerospace engineering has many years of experience in the development and operation of electric propulsion systems and thrust balances. Ranging from electrothermal-, electrostatic-, electromagnetic thrusters to photonic force measurements with steady-state lasers in solar-sail applications. In our laboratories at the Institute of Aerospace Engineering at Technische Universität Dresden in Germany we continuously improve our devices in space-like environments.

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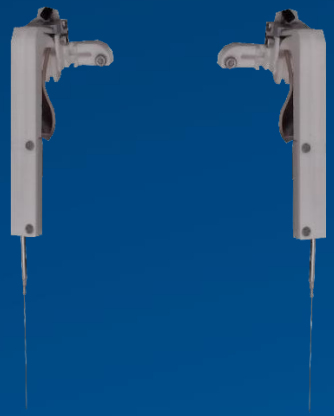
GWT Gesellschaft für Wissens- und Technologietransfer

TECHNISCHE UNIVERSITÄT DRESDEN



Langmuir Multiprobe Instrument

In-situ measurement of plasma density, temperature, and voltage

Institute of Aerospace Engineering

Langmuir Multiprobe Instrument

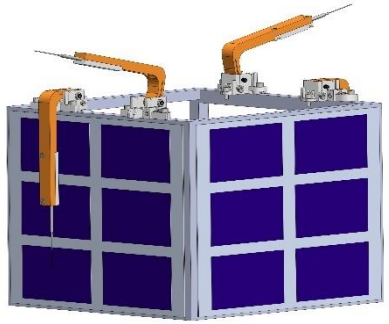
The Langmuir-Probe is a tried and tested method for determining various plasma parameters. We have developed a fully integrated measurement systems for the in-situ determination of those parameters in Orbit. Via the combination of a fixed-bias and variable-bias method, the system realizes high measurement resolution, and low power consumption.

At <0.5W power consumption, we offer a payload useable on many microsatellites (1-50kg), for precise determination of orbital plasma parameters, unlocking the scientific potential of many missions.

Key characteristics

- ✓ 4 individual probes
- ✓ 2 probes on variable voltage (from -10 to +10V)
- ✓ 2 probes on fixed bias (+15 and +20V)
- ✓ Low power consumption (< 0.5W)
- ✓ Fully integrated analog & digital electronics
- ✓ Returns raw, or analyzed data
- ✓ Only requires common +3.3, and 5V power busses
- ✓ Communication to OBC via I2C Bus
- ✓ Total system mass < 200g
- ✓ Independent deployment mechanism

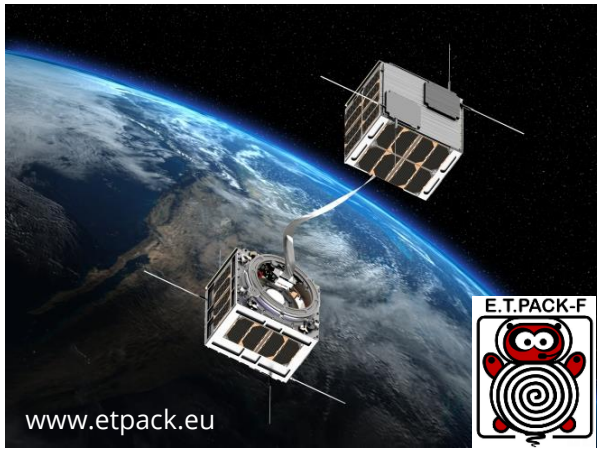
The system implements an independent deployment mechanism based on a burn-wire filament cutting a hold-down. This realizes strong hold-down forces in a lightweight polymer design.



In-Orbit Demonstration

The system was developed and designed for the E.T.Pack-F mission. The mission aims to demonstrate electrodynamic tether technology in-orbit in 2025. The mission will verify the capability of the Langmuir Multiprobe Instrument in-orbit.

With this demon-stration, the system achieves TRL 9 and can be adapted to other space mis-sions. Two of the booms can be seen mounted in the separation plane of the satellite on the right. The system features an extremely low footprint on the mounting plane, requiring only 35x50mm for each probe making it mountable on many common cubesat sizes.



Modular Design

For different plasma characteristic and spacecraft specifications, the system is adaptable via its modular design. By changing the attached probe tip and geometric parameters of the boom, the system can be adjusted for a wide variety of mission architectures. The bolt-on nature of the system offers itself to ready and quick adapation to other spacecraft. With its extremely small footprint on the satellite itself, and mounting as an overhang, almost any spacecraft can be adapted to mount the system without compromising area reserved for solar panels or communications equipment.

For special noisy environments, the noise filtering can be adjusted on both the analog and digital side of the electronic architecture. Our In-Orbit-Verification testing for the electrodynamic tether and plasma contactor make sure the system is ready for integration on your satellite too.

European Innovation Council

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