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ENVIRONMENT AND QUALIFICATION TEST RESULTS OF THE  
HIGHLY MINIATURIZED FEEP PROPULSION SYSTEM NANOFEEP

**Abstract**

NanoFEEP is a highly miniaturized Field Emission Electric Propulsion (FEEP) system which is currently under development at TU Dresden. It is designed to enable precise attitude and orbit control of pico- and nano-satellites, like CubeSats. The propulsion system consists of very compact thruster heads (volume of less than 3 cm and a weight of less than 6 grams each), a novel neutralizer chip (a cold electron source based on field emission using Carbon Nano Tubes) and the required high voltage electronics (self-developed board feasible to supply two thrusters and one neutralizer). The NanoFEEP propulsion system faces the strong limitation in space, power and mass of CubeSats with the very compact and power efficient design. Each thruster is capable of generating a continuously controllable thrust of 0 to 8  $\mu\text{N}$ .

The first planned in orbit mission will be on the 1U CubeSat platform UWE of the University Würzburg. It is planned to use four thruster heads to demonstrate orbit and two axes attitude control with the miniaturized electric propulsion system.

We will present the latest results of environment and qualification tests of the NanoFEEP propulsion system: We will show the results of direct thrust measurements, performed ion beam diagnostics and long-term operation tests. Moreover, we will present performance characteristics of the thrusters, the CNT neutralizer chip and the high voltage power processing unit.