

IAF SPACE PROPULSION SYMPOSIUM (C4)  
Electric Propulsion (2) (6)

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## RECENT ELECTRIC PROPULSION-RELATED ACTIVITIES AT DLR'S STG-ET FACILITY

**Abstract**

Over the last decade there has been a growing demand for electric propulsion (EP) systems providing a wide range of thrust and specific impulse levels. This extends to high power applications, previously unfeasible, as well as very low power operations for small satellites and cubesats. Development of efficient EP is necessary at both ends of this spectrum but each has its own challenges – especially with respect to system lifetime. New propulsion concepts seem to overcome at least some challenges but show an increasing complexity and require more sophisticated modelling approaches. Furthermore, a growing number of EP systems in development demands more large-scale experimental facilities for testing and qualification of these new EP concepts. Here the operational capabilities of DLR's "Simulationsanlage für Treibstrahlen Göttingen – Elektrische Triebwerke" (Simulation Facility for Thrusters Göttingen – Electric Propulsion, **STG-ET**) facility in Göttingen with respect to testing of EP under high vacuum conditions shall be presented. The large available volume of the facility enables testing complete (sub-) systems such as thrusters or satellite components under high vacuum conditions due to the extensive capabilities of the vacuum pump system. It especially allows the testing of high-power EP systems and has the capability to conduct long-term test campaigns within the scope of weeks or months, both having been proven successfully within previous experimental campaigns for industry customers. This operational experience is not only valuable for future test campaigns but also for future in-house development of EP systems at DLR. Further activities and facilities at DLR Göttingen related to electric propulsion and rarefied gas flows will be briefly discussed. Such activities are based on the analysis and review of existing EP concepts and identify development gaps filled by future research. A review of EP systems regarding TRL and feasibility with respect to challenges such as propellant selection, thruster lifetime and scaling has been performed and the results will be presented. One of these identified gaps in EP development is the missing step between TRLs 5 and 6. While a lot of systems exist as laboratory models or have been qualified, only few systems were actually used in space. Therefore, the setup and operation of additional facilities as well as more missions using new EP concepts are necessary.