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OVERVIEW OF BREAKTHROUGH PROPULSION RESEARCH AT TU DRESDEN

**Abstract**

Human exploration to the stars will require a breakthrough in propulsion. The current best option is photon rockets and high power lasers, which may only enable nano-spacecraft to reach the next star within a couple of decades. We therefore decided to establish a dedicated breakthrough propulsion group within our institute to investigate and test new ideas for propellantless propulsion. We can split our effort in three main areas: Theory and model assessments, development of test equipment and experimental tests. Recently, we focused on developing a cutting-edge suite of measurement devices including torsion thrust balances with nano-Newton resolution and a superconducting levitation thrust stand as well as a nano-gram weight balance. In addition to superior resolution, our balances are well characterized and built to be as little sensitive as possible to the environment like electromagnetic or thermal interactions. They even feature the possibility to have high voltage or even cryogenic temperature environments on the balance if necessary. Two thruster claims were tested in detail on different balances: The Mach-Effect thruster as well as the EMDrive. In addition to the usual EMDrive setups, we are also in the process of testing a superconducting EMDrive version as well as a laser-based variation. Several other experiments are being carried out to investigate complementary and fundamental theories such as claimed anomalous thrust of charged high-voltage capacitors, the influence of temperature on weight or consequences of scalar-tensor 5D gravity theories, which may lead to novel propulsion effects. This paper will review our current progress and summarize our activities in this exciting domain.