

IAF SPACE SYSTEMS SYMPOSIUM (D1)
Innovative and Visionary Space Systems (1)

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STMF - SATELLITE THERMAL MANAGEMENT WITH FERROFLUIDS

Abstract

Motivated by the need for low noise flexible satellite thermal control systems (TCS), the center of applied space technology and micro gravity (ZARM) at the university of Bremen develops a new TCS solution based on ferrofluids together with its SME partner ZARM Technik AG.

The first project phase aims at demonstrating the principles of a future COTS ferrofluid TCS solution which has been realized within the scope of the DLR Innospace challenge. The concept STMF (satellite thermal management with ferrofluids) employs a magnetic pumping scheme where mechanical vibrations are suppressed benefiting high precision space applications in the area of fundamental physics, geodesy and optical experiments. At the same time the technology offers controllable pumping rates allowing a broad range of thermal boundary conditions. This is particularly interesting for missions with electrical propulsion where a significant amount of excess power has to be radiated when the target position is reached leading to completely different thermal requirements for mission start and operations.

The development goal is a scale able modular technology approach which offers a tool kit for a smart ferrofluid TCS. We show details of the design and verification process for a demonstrator which is currently set up at ZARM. The planned step towards an available technology as well as our numerical approach for the design and optimization of the experimental setups and hardware are discussed.