



Contribution ID: 610

Type: **Invited Oral**

M1Or3E-01: [Invited] Superconductors as Enabling Technology for Space Transportation

Monday 10 July 2023 16:15 (20 minutes)

Various space-technology-related applications significantly benefit from the extended availability and capabilities of High-Temperature Superconductor (HTS) systems. This aspect accompanied by initial networking as well as research and development projects such as the Magneto-hydrodynamic Enhanced Entry System for Space Transportation (MEESST) activity leads to the qualification of critical subsystems such as HTS coils under simulated harsh environmental conditions encountered during atmospheric entry and by electric propulsion systems in operation.

The international consortium of the European Union project MEESST is currently preparing a plasma probe equipped with a HTS coil for the deflection of ionized entry flows to investigate heat flux mitigation and communication blackout mitigation. The consortium consists of the Katholieke Universiteit Leuven (KU) and the von Karman Institute for Fluid Dynamics (VKI) in Belgium, the University of Luxembourg (UL) in Luxembourg, the University of Southampton (US) in the United Kingdom, the Institute of Space Systems (IRS), Karlsruhe Institute of Technology (KIT), Theva Dünnschichttechnik GmbH, and Neutron Star System UG (NSS) in Germany, Absolut System (AS) in France, and Advanced Engineering Design Solutions Ltd. (AEDS) in Switzerland. Over a duration of 42 months, the project encompasses the experimental design and implementation, as well as an extension of computational modelling capabilities for characterizing plasma flows in presence of applied magnetic fields and accounting for radiation. The consortium's expertise, close collaboration between team members, and the mutual verification level of the experimental and computational tools deployed build a unique constellation with the potential to significantly expand the understanding of weakly ionized plasmas exposed to applied magnetic fields in various space technology applications.

The contribution will summarize the activities so far and in addition, it will highlight potential applications such as those mentioned for MEESST. Furthermore, it will cover other potential applications such as applied-field MPD thrusters, advanced MHD-based electric space propulsion, and radiation mitigation.

Author: Prof. HERDRICH, Georg (Institute of Space Systems (IRS), University of Stuttgart)

Co-authors: Dr PAGAN, Adam S. (Institute of Space Systems (IRS), University of Stuttgart); Dr VILADEGUT, Alan (Von Karman Institute for Fluid Dynamics); Dr BEHNKE, Alexander (Institute of Space Systems (IRS), University of Stuttgart); LANI, Andrea (Katholieke Universiteit Leuven); CASAGRANDE, Angelo (Advanced Engineering Design Solutions (AEDS) Ltd.); Dr SMARA, Anis (Theva Dünnschichttechnik GmbH); Dr HELBER, Bernd (Von Karman Institute for Fluid Dynamics); KAISER, Clemens (Institute of Space Systems (IRS), University of Stuttgart); Dr LUIS, Diana (Von Karman Institute for Fluid Dynamics); Mr BÖGEL, Elias (Neutron Star Systems UG); GUEVARA CEDEÑO, Eudys (Neutron Star Systems UG); Dr PREISS, Gregor (Theva Dünnschichttechnik GmbH); Dr THOEMEL, Jan (University of Luxembourg); Dr GOURIET, Jean-Baptiste (Von Karman Institute for Fluid Dynamics); Dr LAUR, Johannes (University of Luxembourg); OSWALD, Johannes W.; Dr MERLANO DUNCAN, Juan Carlos (University of Luxembourg); Dr LA ROSA BETANCOURT, Manuel (Neutron Star Systems UG); Dr COLLIER-WRIGHT, Marcus (Neutron Star Systems UG); Dr FERTIG, Markus (DLR Braunschweig); Dr DALBANCANASSY, Matthieu (Absolut System); Dr GAFFURI, Michele (Advanced Engineering Design Solutions (AEDS) Ltd.); Dr KIM, Min Kwan (University of Southampton); Dr CHAZOT, Oliver (Von Karman Institute for Fluid Dynamics); NIMER, Omar (Institute of Space Systems (IRS), University of Stuttgart); Dr LEYLAND, Penelope (Advanced Engineering Design Solutions (AEDS) Ltd.); Dr GEHRING, Rainer (Karlsruhe Institute of Technology); Dr

SCHLACHTER, Sonja (Karlsruhe Institute of Technology); Dr SHARMA, Vatsalya (Katholieke Universiteit Leuven); Dr GROSSE, Veit (Theva Dünnschichttechnik GmbH); Dr GIANGASPERO, Vincent F. (Katholieke Universiteit Leuven)

Presenter: Dr DALBAN-CANASSY, Matthieu (Absolut System)

Session Classification: M1Or3E: Superconductors in Space