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ELECTROMAGNETIC LEVITATION ONBOARD THE INTERNATIONAL SPACE STATION

Abstract

The Electromagnetic Levitator onboard the International Space Station (ISS) in the Columbus module is an ESA facility for material research under microgravity. Metallic or semi-conducting samples can be melted by inductive heating under vacuum or noble gas atmosphere without contact to any container. This allows for the measurement of thermophysical properties in a wide temperature range and observation of non-equilibrium solidification from the undercooled melt. EML is operated by the Microgravity User Support Center (MUSC) at DLR Cologne and serves as a research facility for an international science community. Since its installation in the Columbus Lab in 2014, EML has been in continuous use on orbit. Currently, the third batch of 18 samples is under investigation, whereby each sample is processed multiple times with different scientific objectives. The preparation of the experiment program in EML is performed at the Institute of Material Physics & MUSC in close coordination with the individual scientific teams. The scientific support at DLR starts with the so-called ground support program, which comprises the definition of experiment procedures and parameters and validation runs on the EML ground model. In the end this is followed then by the on-orbit performance of the experiment in the MUSC control room in Cologne and finally completed by the archiving and distribution of data by a dedicated archiving system accessible via internet after execution of the experiments. The present paper shall give an overview on the research facility and also on the science and maintenance operations on EML. A focus will be laid on the replacement of the Gas Circulation Pump of EML performed by Matthias Maurer during his Cosmic Kiss Mission in 2022. Moreover, an outlook to the planned operations for the upcoming years will be provided.