Paper ID: 39696
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MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Microgravity Experiments from Sub-Orbital to Orbital Platforms (3)

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THE MAIUS SOUNDING ROCKET MISSIONS – RECENT RESULTS, LESSONS LEARNED AND FUTURE ACTIVITIES

Abstract

The MAIUS-1 payload demonstrated the first Bose-Einstein Condensates in Space in the challenging environment aboard a two-staged VSB-30 sounding rocket on the 23rd of January 2017. In order to achieve this ambitious scientific goal the experiment used various sensitive instruments imposing strong requirements on the thermal and mechanical design of the scientific payload. One of these system is a vacuum system, which has to maintain a pressure of 1E-10 hPa during the sounding rocket flight.

To ensure a reliable operation of all payload systems and components a thermal control system was developed to guarantee a stable thermal environment inside the payload. Moreover a suitable sealing was implemented to maintain a stable pressure inside the scientific payload of 1200 hPa during the entire flight.

This paper gives a summary of the results from the MAIUS-1 maiden flight as well as from recent environmental tests. It focuses on the engineering aspects of the payload. Thus housekeeping data of the vacuum system, the thermal control system and the sealing of the payload are discussed.

Furthermore, important lessons learned from the MAIUS-1 mission and their impact on the MAIUS-2 payload design are presented. The paper closes with an outlook on future atom interferometry payloads on sounding rockets and beyond.