MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Facilities and Operations of Microgravity Experiments (5)

Author: Mr. Jens Grosse
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, Jens.Grosse@dlr.de

Mr. Stephan Tobias Seidel
Leibniz Universiät Hannover, Germany, s.seidel@iqo.uni-hannover.de
Mr. Markus Krutzik
Humboldt University of Berlin, Germany, markus.krutzik@physik.hu-berlin.de
Dr. Tim van Zoest
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany, Tim.Zoest@dlr.de
Dr. Ernst Maria Rasel
Leibniz Universiät Hannover, Germany, rasel@iqo.uni-hannover.de

FIRST THERMAL AND MECHANICAL DESIGN APPROACH OF THE QUANTUS-III EXPERIMENT

Abstract

The QUANTUS-III experiment is a high precision quantum optics experiment flying on a sounding rocket with the scientific objective to demonstrate the feasibility of creating Bose-Einstein Condensates in Space. To achieve this goal the experiment is using various sensitive instruments giving hard requirements to the thermal and mechanical design. Those are ultra high vacuum pumps operating in pressure ranges of 10^{-11} mbar, lasers which need to be temperature stablized on +- 1/10 K and a lot of fragile optics.

The rocket used to provide microgravity is the two staged unguided VSB-30 sounding rocket. In spite of the strict component requirements the sounding rocket environment is rough. Vibrational loads up to 13g and high thermal loads due to aerothermal heating effect the payload during ascent. Additionally the payload electronic is heating the air from inside with more than 500 Watts.

Within this paper a first thermal and mechanical design approach shall be presented, which is supposed to ensure the function of the components during the entire flight. Moreover an general overview on the payload shall be given, naming the used (commercial) components (such as vacuum pumps or sealing techniques) and presenting first results of the qualification test of these components.