

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

Author: Dr. Thorben Könemann
ZARM Fab GmbH, Germany

Mr. Ulrich Kaczmarczik
ZARM University of Bremen, Germany

Mr. Christian Eigenbrod
University of Bremen, Germany

Mr. Peter von Kampen
ZARM Fab GmbH, Germany

Prof. Claus Lämmerzahl
ZARM Fab GmbH, Germany

THE GRAVITOWER BREMEN - PROTOTYPE: A NOVEL ACTIVELY DRIVEN DROP TOWER
SYSTEM

Abstract

The Center of Applied Space Technology and Microgravity (ZARM) founded by Prof. Dr.-Ing. Hans J. Rath in 1985 is part of the Department of Production Engineering at the University of Bremen, Germany. ZARM is mainly concentrated on fundamental investigations of gravitational and space-related phenomena under conditions of weightlessness as well as questions and developments related to technologies for space. At ZARM about 100 scientists, engineers, and administrative staff as well as many students from different disciplines are employed. Today, ZARM is one of the largest and most important research center for space sciences and technologies in Europe.

With a height of 146 m the Bremen Drop Tower is the predominant facility of ZARM and also the only drop tower of its kind in Europe. ZARM's ground-based laboratory offers the opportunity for daily short-term experiments under conditions of high-quality weightlessness at a level of 10(-6) g - microgravity. Scientists may choose up to three times a day between a single drop experiment with 4.74 s in simple free fall and an experiment in ZARM's worldwide unique catapult system with 9.3 s in weightlessness. Since the start of operation of the drop tower facility in 1990, over 7500 drops or catapult launches of more than 200 different experiment types from various scientific fields like fundamental physics, combustion, fluid dynamics, planetary formation / astrophysics, biology and material sciences have been accomplished so far. In addition, more and more technology tests have been conducted under microgravity conditions at the Bremen Drop Tower in order to prepare appropriate space missions in advance.

Beside an introduction about ZARM and its various activities like ZARM's contributions to interesting programs/opportunities for Bachelor, Master and/or PhD students - (i) Drop Your Thesis! by the European Space Agency (ESA), (ii) DropTES (Drop Tower Experiment Series) by the United Nations Office for Outer Space Affairs (UNOOSA) and the German Aerospace Center (DLR), and (iii) the German-Swedish Student Program REXUS / BEXUS (Rocket / Balloon Experiments for University Students) by DLR and the Swedish National Space Board (SNSB) - a comprehensive insight into the technology and the development of the GraviTower Bremen - Prototype (GTB-Pro) will be presented. The GTB-Pro represents a novel class of drop tower systems, which are actively driven being capable to perform up to 100 microgravity experiments per day. Furthermore, it will be reported about upcoming drop tower activities related to the new commercial suborbital flight opportunities.