

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

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TOWARDS A NEXT-GENERATION DROP TOWER SYSTEM - THE NOVEL RAPID DROP TOWER  
BREMEN BY ZARM**Abstract**

The Center of Applied Space Technology and Microgravity (ZARM) headed by Prof. Dr.-Ing. Hans J. Rath is part of the Department of Production Engineering at the University of Bremen in Germany. With a height of 146 m the Drop Tower Bremen is the predominant facility of ZARM and also the only drop tower of its class in Europe. ZARM's ground-based microgravity laboratory offers the opportunity for daily short-term experiments under conditions of high-quality weightlessness at a level of pure  $10^{-6}$  g.

The ZARM Drop Tower Operation and Service Company (ZARM FAB mbH) managing, operating and maintaining the Drop Tower Bremen was established in 1990 along with the start of operation of the facility. Since then, ZARM FAB mbH has accomplished over 6000 launches of more than 150 different experiment types so far. For this, two different microgravity modes are available, the scientists can choose between a single drop experiment with a free-fall duration of 4.74 s and a catapult experiment with 9.3 s of weightlessness. This world-wide unique capsule catapult system developed by ZARM FAB mbH started its operation of catapult experiments in December 2004. Either in the drop or in the catapult operation routine the repetition rates of microgravity experiments at the Drop Tower Bremen are always the same, generally up to 3 times per day.

The demands of scientists for higher repetition rates per microgravity experiment have been increased since the last years enormously. Each generation of such space-based experiments is capable more and more to be automatically performed. In order to meet these demands ZARM FAB mbH started to develop a next-generation drop tower system called Rapid Drop Tower Bremen. This novel drop tower consists of a combination of ZARM's current catapult system and a guided linear accelerator drive. With such a combined system ZARM would have the feasibility to provide about 100 launches of short-term microgravity experiments per day. Moreover, an add-on called reduced gravity mode could be also available alternatively to the standard microgravity experiment operation. With this unique mode for ground-based facilities the gravity of e.g. Moon or Mars and many residual accelerations below 1 g respectively can be perfectly simulated in the planned Rapid Drop Tower Bremen.

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