Paper ID: 73733
student

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

Author: Mr. Davide Demartini
Luleå University of Technology, Sweden, davidedemartini99@gmail.com

Mr. Lasse Blana
Luleå University of Technology, Sweden, lasbla-1@student.ltu.se
Mrs. Samira Nair
Luleå University of Technology, Sweden, samnai-1@student.ltu.se
Mr. Simone Guietti
Luleå University of Technology, Sweden, simgui-1@student.ltu.se
Mr. Olle Persson
Luleå University of Technology, Sweden, olle.persson@ltu.se
Prof. Thomas Kuhn
Luleå University of Technology, Sweden, thomas.kuhn@ltu.se
Prof. Rene Laufer
Luleå University of Technology, Sweden, rene.laufer@ltu.se

BRINGING EXTRATERRESTRIAL GRAVITIES ON EARTH: STUDENTS' RESEARCH ON DROP TOWER DESIGN

Abstract

Replicating gravitational conditions other than those of the Earth is necessary for testing space hardware and conducting research. The creation of environments with a highly stable fraction of Earth's gravity requires careful design and implementation of a non-inertial reference system.
Depending on the project's needs, such as disturbance sensitivity, repetition rate, and simulation duration, it may be beneficial to carry out activities on board of platforms like the International Space Station or throughout parabolic flights. Drop towers can be a complementary tool to the aforementioned facilities as well as a preliminary qualification step for systems that require short simulation times and relatively high repetition rates.
The project Multi-Gravity Simulator (MGS) has been started at Luleå University of Technology (LTU), Sweden, with the goal to initially design and build a classroom-sized drop tower. Specifically, the project aims at designing a reliable platform for future students' projects to perform experiments in a high-quality microgravity environment at low cost and with high repetition rate. In order to accomplish such objectives, the process focuses on the design of an actively driven system for disturbance control and attenuation. In addition, the system is being designed to allow for simulating Lunar, Martian, and other gravity conditions. The MGS system currently under development will serve as a technology demonstrator in an iterative process that leads to a scaled-up drop tower which could be utilized for both academic and commercial purposes.
This paper will focus on the results of the preliminary design process. Identified trade-off requirements are presented, and the analysis of different design concepts will be elaborated.