

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

Author: Ms. Gaia Lucrezia Dalla Pria
Luleå University of Technology, Sweden

Mr. Eric Almqvist
Luleå University of Technology, Sweden

Mr. Luis Arancibia Parra
Luleå University of Technology, Sweden

Mr. Benjamin Åkerlund
Department of Space Engineering, Lulea University of Technology, Sweden

Mr. Adam Broström
Luleå University of Technology, Sweden

Mr. Vincent Brückner
Luleå University of Technology, Sweden

Ms. Claudia Buck
Luleå University of Technology, Sweden

Mr. Julian Gels
Luleå Technical University, Sweden

Mr. Alexander Hollmark
Luleå University of Technology, Sweden

Mr. Fredrik Höglund
Luleå University of Technology, Sweden

Mr. Andreas Jakobsson
Luleå University of Technology, Sweden

Mr. Arturs Korotkijs
Aalto University, Latvia

Mr. Albin Malmqvist
Luleå University of Technology, Sweden

Ms. Jenny Mårtensson
Luleå University of Technology, Sweden

Prof. Thomas Kuhn
Luleå University of Technology, Sweden

OPEN SOURCE SOUNDING ROCKET-BASED FREE-FALLING PLATFORM TO CONDUCT
REDUCED GRAVITY RESEARCH**Abstract**

FENRIR (Free fall Experiment uNit for Reduced-gravity Investigations and Research) is a student experiment based at the Kiruna Space Campus of Luleå University of Technology (LTU), which will fly on board one of the cycle 15 REXUS rockets in March 2025. It offers an easy-to-use platform for future free-falling experiments that need to be ejected from sounding rockets. A free-falling unit (FFU) will be ejected from the rocket just before its apogee (~ 70 km), ensuring about 70 seconds of reduced gravity.

To increase this condition, an attitude stabilisation system (ATSS) consisting of three reaction wheels will also be included in the FFU. Highschool and Bachelor students are foreseen as potential end-users: thanks to FENRIR's apparatus, they will have the opportunity to focus only on the mission's experiment and accompanied electronics, without having to design the entire structure from scratch. The platform will be designed in a modular way. To prove its feasibility, the FFU will host an experiment related to Phase Change Materials (PCMs) during the REXUS34 flight. It is expected that the behaviour of the PCM changes due to the absence of buoyancy convection in reduced gravity conditions. This is just one among many of the possible scientific investigations that can be performed on the platform. After participation in this programme, the whole project will be open source and the physical structure will be inherited by LTU and will be available to anyone who wants to utilise it. At the moment, through social media and international events, the visibility of FENRIR is increased as much as possible. So far, these activities have brought the team into contact with two organizations that aim to introduce space sciences and technologies to children and teenagers. In particular, KidsLab provides programming courses to young enthusiasts. Moreover, The Astronomisk Ungdom community organizes initiatives that have brought, for example, ideas of high school students to be part of the MAPHEUS-14 sounding rocket campaign, and several workshops and summer schools. Soon collaboration with these two entities will start for different aspects of the project, igniting the curiosity of the new generations and letting the team members be inspired by them. The paper will present how FENRIR has developed and how internal and external stakeholders and partners did drive the design and realisation process. More in detail, we aim to present the synergies created between the project team and the young space enthusiasts.