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Author: Ms. Akshata Raut
Luleå University of Technology, Sweden

Prof. Rene Laufer
Luleå University of Technology, Sweden
Prof. Thomas Kuhn
Luleå University of Technology, Sweden
Dr. Cristóbal Nieto Peroy
Luleå University of Technology, Sweden
Mr. Johannes Ora
Luleå University of Technology, Sweden
Mr. Lasse Blana
Luleå University of Technology, Sweden
Mr. Gabriel Hillertz
Luleå University of Technology, Sweden
Mr. Christopher Wulff
Department of Space Engineering, Lulea University of Technology, Sweden
Mr. Adam Qvirist
Luleå University of Technology, Sweden

INTEGRATION AND TESTING OF THE FIRST STUDENT-LED AUTOMATED AND ADAPTABLE GROUND STATION IN ARCTIC SWEDEN

Abstract

Members of project A.P.T.A.S are developing the first student-built, fully functional, automated ground station in the Arctic region of northern Sweden. This facility, located at the Space Campus of the Luleå University of Technology in Kiruna, Sweden, will be used to operate the CubeSat which is also developed by students within the project, and lays the foundation for future nanosatellite projects at the university. The location of the ground station brings unique challenges and advantages; A latitude of 67°N allows for an increased number of passes per day and higher signal-to-noise ratios compared to ground stations at lower latitudes. However, the arctic environment poses unique constraints on electronic components which need to withstand the extreme cold. The ground station is currently in its final phase of development. It comprises the deployment and adaptation of existing test procedures in order to ensure the functionality of components and to analyze their performance. In accordance with the ground station design, it is getting relocated within the university to minimize line losses from the antenna. This will also increase accessibility in case components need to be replaced or exchanged, and allow for future upgrades. Furthermore, this paper sheds light on software development for the ground station and how it was changed to adapt commercial software that would handle decoding and error correction of incoming telemetry. The ground system under development provides great learning opportunities because it lets students work on all aspects of a space satellite project, from payload to attitude determination to communications and operations. It is part of what makes the A.P.T.A.S. project interesting. It lays the groundwork for sophisticated satellite operations and hopefully many future student CubeSats from LTU and beyond.