28th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Small Satellite Operations (3)

Author: Mr. Martin Elfvelin
Luleå University of Technology, Sweden, marelf-5@student.ltu.se

Mr. Gabriel Lorentzson
Luleå University of Technology, Sweden, gablor-6@student.ltu.se
Mr. Gabriel Sánchez
Luleå University of Technology, Sweden, gabsan-0@student.ltu.se
Mr. Cristóbal Nieto Peroy
Luleå University of Technology, Sweden, chris.nieto@ltu.se
Mr. Aris Golemis
Luleå University of Technology, Sweden, aris.golemis@ltu.se
Prof. Jaap van de Beek
Luleå University of Technology, Sweden, jaap.vandebeek@ltu.se
Prof. Rene Laufer
Luleå University of Technology, Sweden, rene.laufer@ltu.se
Dr. Carl-Fredrik Enell
Sweden, carl-fredrik.enell@eiscat.se
Mr. Moses Mwakyanjala
Luleå University of Technology, Sweden, moses.browne.mwakyanjala@ltu.se

A FLEXIBLE GROUND SEGMENT FOR SMALL SATELLITE OPERATIONS

Abstract

In the era of CubeSats an institution like a university is capable of launching several satellites over the course of a few years. This creates a need to keep the ground segment development for each added satellite low. One possible solution is outsourcing the ground segment but this comes at a substantial expense for smaller institutions. Relying on an external network of non-profit ground stations can be ideal but for a university with a campus north of the arctic circle and a prime location for tracking polar orbiting satellites it would mean both missing an educational opportunity as well as accepting fewer passes per orbit than with a local ground station. The remaining solution is developing an in-house ground segment.

This paper presents the ground segment concept, specifically the ground station and Mission Operations Center, developed by students and staff at the Luleå University of Technology Kiruna Space Campus. Currently two CubeSat projects are ongoing: APTAS and KvarkenSat. The university thus has a pressing need for a ground segment that can support multiple small satellites concurrently. The purpose of the presented ground segment is a flexible solution that enables rapid development of several missions. The ground station uses Software Defined Radios to enable support for missions utilizing different frequency bands and communications protocols. Furthermore the mission control software allows adding new spacecraft with minimal customization. Finally the network architecture allows the ground station to be integrated into a network of distributed ground stations, allowing cooperation with other institutions.