

Aalto-1 satellite first months in orbit

J. Praks¹, P. Niemelä¹, A. Kestilä¹, A. Näsilä², T. Tikka⁴, B. Riwanto¹, N. Jovanovic¹, H. Leppinen¹, R. Vainio³, N. Silva¹, J. Finnholm¹, P. Janhunen⁵

¹*Aalto University, Finland*

²*VTT Technical Research Centre of Finland, Finland*

³*University of Turku, Finland*

⁴*Reaktor Space Lab, Finland*

⁵*Finnish Meteorological Institute, Finland*

INTRODUCTION

Aalto-1 is the first nanosatellite built in Finland and a first satellite launched by a Finnish consortium. The satellite project started in 2010 as a student project, supported by a group of Universities and institutes from Finland. The satellite flight model was finalized in spring 2016 and was launched to space on 23.6.2017 by Indian PSLV rocket. By now, the satellite has been in space for several months and has already delivered substantial amount of data about its subsystems and their performance. Among others, the main payload has been successfully operated and the satellite has sent down first images from space. This presentation intends to give an overview of the mission status and the first results on in-orbit experiments.

THE SATELLITE

The Aalto-1 satellite is a 3U CubeSat standard satellite. Mass of the satellite is 4 kg and it carries three different payloads, each designed specifically for this mission. The payloads are provided by project consortium partners. VTT Technical Research Centre of Finland built AaSI hyperspectral imager, Finnish Meteorological Institute provided Plasma Brake and University of Turku and University of Helsinki built RADMON radiation monitor for the mission. Each of the payload has its own mission goals therefore, the satellite has rather complex design and mission arrangement. The satellite platform features 3-axis attitude stabilization, two channel radio link using a fully redundant TT&C radio, S-band radio for science data downlink, GPS-based navigation system, and cold-redundant On Board Computer that runs Linux operation system. The mission of the satellite is mainly technology demonstration related to the payloads and the satellite platform.

FIRST IN-ORBIT RESULTS

By now, all instruments on-board of the satellite are commissioned and noted functional. Housekeeping data has been collected from all sensors; including temperature sensors, magnetometers, solar cells, sun sensors and also from subsystems, such as redundant Linux-based on-board computer, communication systems, power subsystem and attitude system. The first non-critical subsystem to be commissioned was the GPS subsystem, which provided an orbit state vector that was delivered to NORAD; which promptly identified the correct TLE orbital element set for Aalto-1 among several satellites in near identical orbits. The first scientific measurements were performed with spectral camera and radiation monitor RADMON. The first picture by the satellite was taken by AaSI spectral camera secondary VIS camera. The picture showed coastline of Denmark and Norway. First spectral images were taken over Finland. The RADMON was operated first time over South Atlantic. In order to minimize risks, first experiments were made without attitude stabilization and all data was down-linked over slow UHF communication channel. By now, the satellite has achieved already many mission goals and demonstrated functionality of payloads and subsystems. The first results are presented in more detail at the conference.