26th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Small Earth Observation Missions (4)

Author: Mr. Isai Fajardo
Kyushu Institue of Technology, Japan

Mr. Aleksander Lidtke
University of Southampton, United Kingdom
Dr. Dmytro Faizullin
Kyushu Institute of Technology, Japan
Mr. RIGOBERTO REYES MORALES
Kyushu Institute of Technology, Japan
Mr. Jesus Gonzalez
Kyushu Institute of Technology, Japan
Mr. Rafael Armando Rodriguez Leon
Kyushu Institute of Technology, Japan
Dr. Sidi Ahmed Bendoukha
Kyushu Institute of Technology, Japan
Dr. Premkumar Saganti
Prairie View A&M University, United States
Prof. Tsvetan Dachev
Space Research and Technology Institute, Bulgarian Academy of Sciences, Bulgaria
Prof. Kei-ichi Okuyama
Japan

TEN-KOH A SMALL SATELLITE MISSION TO OBSERVE THE LEO ENVIRONMENT IN THE PRESENCE OF A DECREASING SOLAR CYCLE

Abstract

Small satellite missions are disrupting the satellite industry in the recent years, by following a non-traditional-space approach with low cost, fast delivery, and innovation through the application of commercial electronics and materials revolution into space systems. However, there are still challenges that make the path for accessing space via a successful mission development difficult. In most of the cases a combination of the satellite's design, risk adoption and the space environment effects and qualification of the systems, impact the mission requirements, the satellite development schedule, and costs, as well as the operations. The space environment around the Earth remains a major concern as well as a dynamic field of study by itself, which requires a better understanding with a focus on space environment-to-satellite interaction process. Its comprehensive knowledge requires different input data, in order to provide a complete model of the small satellite systems behavior when operating in orbit. To provide such data for future missions, Kyushu Institute of Technology in partnership with Prairie View Texas A&M University and the Space Research & Technology Institute of the Bulgarian Academy of Sciences developed a small satellite mission called Ten-Koh, with the purpose, on one hand, to perform near-Earth science in a fast and low cost mission, and on the other to act as a testbed for space technology development. Ten-Koh satellite was launched into space onboard an H-2A rocket on October 29th, 2018, as a piggyback payload of the GOAT-2 launch from the Tanegashima space center in Japan. Ten-Koh satellite operates among its different payloads, a double Langmuir probe (DLP) system for plasma sheath characterization around

a spinning spacecraft, with a settable bias voltage between -10 [V] to 10 [V] and a current capability measurement from 100 [pA] to 1 [uA]; a small 3-axis magnetometer instrument for measuring the Earth's magnetic field variations in the range from -0.2 to 0.2 [mT], with a resolution of 7.63 [nT]; a charged particle detector (CPD) intended for observing electrons, protons and ions in the MeV range; a set of 3 new material samples made of LATS and CFRP for measuring the change in their mechanical properties when exposed to the space environment. The design, tests, preliminary results and lessons learned from the mission are presented.