



Contribution ID: 26

Type: **Talk**

AcubeSAT: A lab-on-a-chip CubeSat mission from the Aristotle University of Thessaloniki

Wednesday, 16 October 2019 10:00 (20 minutes)

Plans for the return of humans to the Moon and the imminent manned exploration of Mars drive an increased need for research in the fields of space physiology and biology. This need can be fulfilled with low cost solutions such as CubeSats, by obtaining results from experiments which were previously possible only on crewed spacecraft such as the International Space Station and required maintenance from astronauts on-board.

The Aristotle Space & Aeronautics Team (A.S.A.T) is designing and building a 3U CubeSat to perform a biological experiment, probing the dynamic regulation of gene expression of eukaryotic cells in Low Earth Orbit (LEO), utilizing advances in Synthetic Biology and MEMS (micro-electro-mechanical systems). We aim to investigate the molecular mechanisms that are affected by space conditions and enable future high-throughput studies and easily scalable lab-on-a-chip applications, to assess the effects of spaceflight on living organisms.

Based at the Aristotle University of Thessaloniki in Greece, the team is composed of 40 students with the goal of participating in ESA Academy's Fly Your Satellite! programme. Given the special requirements of the mission, including a pressurized compartment, a miniaturized optical microscope and a high amount of data to be downlinked, our team has come up with different solutions and approaches to system integration.

In this talk we will discuss the aforementioned design of the satellite, with an emphasis on our scientific payload, the challenges our team has faced so far and our contribution to the open source community.

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Session Classification: Talks

Track Classification: CubeSat Missions and Systems