

29th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)  
Small Satellite Operations (3)

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FIRST IN-ORBIT OPERATIONS FOR THE WILDTRACKCUBE-SIMBA AND LEDSAT 1U  
CUBESATS

## Abstract

In 2021, the S5Lab (Sapienza Space Systems and Space Surveillance Laboratory) launched two CubeSats in orbit: WildTrackCube-SIMBA and LEDSAT. WildTrackCube-SIMBA is a 1U CubeSat was developed in collaboration with Machakos University and the University of Nairobi. The idea of the CubeSat was born in 2019 and was proposed at the IAC 2019 where it won the free launch opportunity supported by the IAF (International Aeronautical Federation) and GK Launch Services. The satellite was developed and tested between 2019 and the end of 2020, and was finally launched on March 21st, 2021. The main objectives of WildTrackCube-SIMBA are to test experimental techniques for remote wild-life tracking using radiofrequency in the National Parks of Kenya. The system uses new spread-spectrum techniques for long range communication which is tolerant to interferences. The CubeSat also contains two other types of payloads – two cameras with different field of views to take color pictures of the Earth and two LED boards that are used to test early-flight orbit determination. Experiments are on-going to test the main payload and its capability to receive signals emitted from ground-based COTS transmitters. LEDSAT is also a 1U CubeSat, whose development started in 2018 with the deployment in August 17th, 2021. The mission concept was developed in collaboration with the University of Michigan and the main objectives include the determination of the orbit and the attitude from ground by observation of on-board LEDs, which are distributed on all its faces with the colors red, blue and green in pair of opposite faces. The satellite was developed within the Fly Your Satellite! Programme of ESA education. Both projects are part of the IKUNS programme supported by the Italian Space Agency (ASI) and have been working nominally since deployment. The satellites are managed using previous developed experience on the 1KUNS-PF nanosatellite, but the presence of both satellite in orbit at once poses some challenges on the operations and ground management. In particular, the satellites are both in SSO orbits with opposite LTAN (10:30 LTAN for WildTrackCube-SIMBA and 22:30 LTAN for LEDSAT, with little oscillations) which means that often part of the passages overlap. The paper will detail the operations of both spacecraft since launch and future expected activities. In addition, it will cover the design changes of the ground segment in order to cope with managing two CubeSats at once, from telemetry management and the stations scheduling.