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Silicon Photomultiplier characterization on board a satellite in Low Earth Orbit

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The LabOSat collaboration (acronym for “Laboratory On a Satellite”) aims to increase the Technology Readiness Level (TRL) of electronic devices and components for space-borne applications. We have developed a single-board electronic platform which is able to operate in space conditions. This board harbors Devices Under Test and performs electric experiments on them. Since 2014, we have participated in six satellite missions (Satellogic small satellites) in Low Earth Orbits, in which we studied the performance of electronic devices such as resistive switching memories and dosimeters based on field-effect transistors.

In this work we present our efforts to increase the TRL of Silicon Photomultipliers (SiPMs). In early 2019 we have integrated four 6-mm SiPMs into a 40-kg satellite to study their performance in space. Each SiPM was encapsulated into individual light-tight aluminum housings, which included LEDs for excitation. The SiPMs and the LEDs are operated in DC current mode. Besides the SiPMs current and voltage measurements, the experiment also collects telemetry parameters like temperature, timestamp and orbital position.

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