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IMPLEMENTATION, TESTS AND CHARACTERIZATION RESULTS FOR CUBESAT ADCS

Abstract

CubeSats and Nano Satellites offer good opportunities for testing, and developing new ADCS techniques or technologies, however, most of the ADCS systems for these small platforms cannot be tested completely before launch due to schedule pressures or lack of resources. . This increases total risk of Cubesat mission, which already quite high due to use of COTS technologies and non space qualfied components. This paper describesthe implementation and the tests done on ADCS of the next CubeSat designed in collaboration between EPF Lausanne and ETH Zurich and Swiss Universities of Applied Sciences, having particular emphasis on the issues encountered and the solutions found or taken into account for the next developments. Employing specific test setups, we were able to address the following issues: thermal drift on ADCS sensors tested in a Thermal Vacuum Chamber (TVC), Sensor Calibration for Extended Kalman Filter (EKF) with rotation table and magnetic measurements, Sun Sensors Calibrations (analog and digital sensors), Bdot Validation on a Ball Bearing (with Helmotz Cage) for a Hardware in the Loop, TRIAD preliminary validations in the same Ball Bearing - Helmotz Cage Hardware in the Loop and Magnetotorquers characterization with a test setup for dipole measurements. Thanks to more than five years of data from SwissCube, the issues encountered during its development and the lessons learned, the team has developed a strong knowledge of the tests necessary for a CubeSat's ADCS.