

19th SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Generic Technologies for Nano/Pico Platforms (6B)

Author: Dr. Stefano Redi
SSBV, United Kingdom, sre@ssbv.com

Mr. Vincenzo Capuano
University of Rome "La Sapienza", Italy, vincenzo_capuano@tiscali.it

Mr. Samir A. Rawashdeh
University of Kentucky, United States, sar@ieee.org

Mr. Alexander Finch
SSBV, United Kingdom, a.finch@ssbv.com

Dr. Massimiliano Pastena
SSBV, United Kingdom, M.Pastena@ssbv.com

Mr. James Barrington-Brown
SSBV, United Kingdom, J.Barrington-Brown@ssbv.com

HIGHLY INTEGRATED, LOW VOLUME AND MASS ADCS SUBSYSTEM FOR PICOSATELLITES

Abstract

This paper introduces the recent activities at SSBV Space and Ground Systems in the field of attitude determination and control (ADCS) for picosatellites. In particular the paper focuses on the design and development of an ADCS subsystem suitable for cubesat missions from 1U to 6U. The design presented integrates 1 magnetometer, 6 sun sensors, GPS, three metal core Torquerods, 3 axes MEMS gyros, momentum wheel and a stellar gyro in order to provide a complete solution for high accuracy 3 axis pointing. The system also integrates an autonomous intelligence which implements the attitude determination and control laws reducing the computational effort required by the main computer that is only responsible for the choice of a specific spacecraft attitude to be reached or maintained. The modular design is extremely compact allowing a very small size. The whole subsystem fits in the volume of two PC 104 employed as a standard for CubeSat applications, significantly reducing the overall mass. The extensive use of off the shelf components and sensors previously developed at SSBV also contribute to the reduction of the power consumption. Furthermore the paper introduces the results obtained from the test campaign currently under development at SSBV. The results obtained show that for cubesats up to 3U the pointing accuracy that can be achieved is better than 1 deg while for 4U and 6U cubesats the pointing accuracy is around 2.8 deg. The ADCS design is one of the latest products developed at SSBV, and it constitutes the most recent result of the activities of this company in the field of small satellites, which since beginning of operations in 2008 has been providing attitude control sub-systems for customers in USA, Europe, India, Taiwan and Indonesia. The ADCS board is due to fly in the next Techdemosat mission scheduled for the last quarter of 2012.