Paper ID: 10068
oral

62nd International Astronautical Congress 2011

15th SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Generic Technologies for Nano/Pico Platforms (6B)

Author: Mr. Ronnie Nader
Ecuadorian Civilian Space Agency (EXA), Guayaquil, Ecuador, rnader@exa.ec

Mr. Manuel Uriguen
Ecuadorian Civilian Space Agency (EXA), Guayaquil, Ecuador, ingenieria@exa.ec

HIGH ENERGY DENSITY MULTI CELL BATTERY ARRAY FOR NANOSATELLITES

Abstract

During the development of our first satellite, the NEE-01 PEGASUS, once mission objectives and payload design was complete, the power budget calculations indicated that we will need a modest amount of energy from our battery banks, however, our system design guidelines mandate that such power matrix should be very sturdy and would need a backup system in order to ensure a continuous operation over the longest period of time possible, and taking into account that our solar arrays were composed of solar cells with an efficiency of only 19

So we needed basically a power supply of 450mAh that we came to solve with the use of 8 battery cells providing 900mAh each, for a total of 7.200mAh per bank, and as per our system safety design guidelines the power matrix turned into 4 of this banks, giving a total of 28.800mAh, the challenge was to pack this much power into an space reduced enough to fit into a 1U structure.

The benefits of having this much power available for the spacecraft became obvious as we calculated the expect life of the power matrix and simulated the sun-eclipse, charge-discharge periods, thus reducing the strain on each cell and maximizing the expected battery life, each array will be composed of 16 cells each, and the spacecraft has 2 of this arrays on board, also each array uses the waste heat of the spacecraft electronics to warm itself by the use of a carbon nanotubes based thermal transfer system and a micro MLI layer that allows the arrays to avoid radiating this heat back into the neighboring internal electronics