

SPACE POWER SYMPOSIUM (C3)
Space Power Technologies and Techniques (2)

Author: Dr. Fabrizio Piergentili
University of Rome "La Sapienza", Italy

Dr. Maria Libera Battagliere
University of Rome "La Sapienza", Italy
Prof. Filippo Graziani
Sapienza University of Rome, Italy

EDUSAT POWER SYSTEM

Abstract

This paper deals with the power system of the EduSAT microsatellite. EduSAT (Educational Satellite) has been designed and manufactured by the Group of Astrodynamics of the University of Roma "La Sapienza" (GAUSS). GAUSS achieved long experience in the field of university microsatellite building thanks to the UNISAT missions (four satellites launched from 2000). The EduSAT Project is funded and coordinated by Italian Space Agency with the aim to promote space education among high school students and to support the qualification and scientific careers of young people (university students, PhD students and young researchers). This purpose is persecuted by developing a small space mission for low cost scientific experiments and technological tests in orbit. The launch of the EduSAT microsatellite is scheduled in December 2010: this is a cluster launch in Low Earth Orbit, performed by Russian-Ukrainian DNEPR Launch Vehicle. The paper is focused on the EduSAT power system since power generation on board microsatellites is a critical issue, due to the fact that surface size for solar arrays is typically limited and that deployable solar panels solution often cannot be implemented. An accurate mission analysis was firstly required, keeping into account orbital and attitude motion, to evaluate solar exposure of the microsatellite. On the basis of mission analysis results a number of possible technological solutions have been investigated in order to make the costs affordable for university budget. This approach is in line with the EduSAT aim about the opportunity to test in orbit commercial off-the-shelf and industrial components. The selected solar cells are commercial, not space rated, triple junction solar cells: they have been selected through a trade-off procedure among costs, satellite power requirements and expected performances in orbit, also considering the results achieved with different kinds of solar cells on board the UNISAT-3 microsatellite, launched in 2004 from Baikonour Cosmodrome. The solar arrays assembling procedure is based on the same techniques used for Unisat-3 and Unisat-4 microsatellites; but, since the solar cells are slightly different, it was necessary to introduce some new technological solutions. In the paper the power system of the EduSAT microsatellite is detailed, starting from the power budget, showing the results of the solar cells characterization, panelization procedure and the qualification to the launch of solar panels together with the satellite through vibration tests. Power regulation and selection criteria for the batteries are also described in the paper.