65th International Astronautical Congress 2014

44th STUDENT CONFERENCE (E2)
Educational Pico and Nano Satellites (4)

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TECHNOLOGY DEMONSTRATION OF AN EXTREME-UV SOLAR IMAGING TELESCOPE ON-BOARD AZAD-1: STUDENT NANOSATELLITE PROJECT

Abstract

board Azad-1 Student Nanosatellite

In the past few years, Cubesats and Nano-satellites have been established as low-cost and efficient platforms for technology demonstration with significantly lesser development cycle-time than conventional satellite missions. Azad-1, student satellite project, being developed by Maulana Azad National Institute of Technology (MANIT-Bhopal, India), is an initiative to demonstrate concept of a Miniaturized Extreme-UV (EUV) Solar imaging telescope as payload on a 6U Nanosatellite platform.

The proposed payload will observe the sun at 17.1 nm wavelength (with a 1nm band pass) in the EUV region, corresponding to a Fe IX emission line from the solar corona, using a Ritchey-Chrétien telescope. The satellite will be placed in a Sun-Synchronous Low Earth Orbit to take high resolution images which will depict morphology of the coronal plasma at approximately 106 K. The concept is to use a combination of Commercially-of-the-Shelf (COTS) items and custom developed components to create a short term scientific mission in a highly constrained development cycle. This paper discusses the progress of payload design and various supporting subsystems including technology challenges that are being resolved by students in a holistic Research and Development Environment. Innovative solutions like CMOS Sensors and Multilayer optics for EUV Imaging, Attitude Control System for High precision pointing etc., that are being developed to match the scientific requirements are also discussed.

The project team comprises of undergraduate students from various engineering disciplines under an administrative framework including faculty and experts in collaboration with various research facilities across the country. The most important assertion in this project is to provide the students with a hands-on experience of the development cycle of a space mission- from conceptualization to final assembly and testing. Azad-1 will also provide the students with the unique opportunity of collaboration with various national and international research institutes. The project aims to seek support from Indian Space Research Organisation (ISRO) to provide launch services and technical support under its vision to support such student initiatives.