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MISSION ANALYSIS AND DESIGN OF MYSAT - A 1U CUBESAT FOR ELECTRON-DENSITY
MEASUREMENT**Abstract**

The Earth's ionosphere and magnetosphere consists of partially ionized plasma extracted in the ionosphere regions and immersed into Earth's magnetic field. Over decades, a few techniques have been proposed to study, monitoring, and investigating the Earth's ionosphere and geomagnetic field. Large nuclear explosion, large volcanic eruption, earthquake with 7.0 and more magnitude in the Richter scale as well as rocket launcher are found to excite atmospheric waves, reaching the ionospheric layers and coupling between neutral atmosphere and ionized plasma resulted in the variations of electron density. In recent years, there were studies to observe and investigate ionospheric perturbation that caused by instability of electron density. Reports about anomalous in electromagnetic wave occurred prior to major earthquake were founded. This so-called seismo-electromagnetic phenomenon was reported as a change in vertical ground electric field that penetrate into ionosphere when reached spatial scale (approximately 100 km and above) which creates instabilities and anomalies on electron density and concentration in ionosphere within 200 km in earthquake preparation zone.

The needs of unmanned and autonomous platform for ionosphere study led to development of small satellite. Universiti Sains Malaysia is developing a 1U CubeSat called MYSat. The CubeSat have primary objective of measuring the electron density in Ionosphere E layer for validation of electromagnetic model for natural disaster management developed by Universiti Sains Malaysia while at the same time developing university capabilities in building a Nano-satellite. The project is also to inspire and prepare future space-professionals by providing university students with practical experience in all aspects of a real space project and to enhance their motivation to work in the fields of space technology and science, thus helping to ensure the availability of a suitable and talented workforce in the future. The CubeSat will be equipped with multi-needle Langmuir probe for the measuring the electron density and will be developed solely by university students in collaboration with industries and Malaysia space agency. The orbit simulation is done using AGI's System Toolkit (STK) software and the results of the mission design include orbital lifetime, ground track accessibility, and lighting times are presented here. Using those results, each subsystem such as thermal, structure, power, communication, and attitude control, preliminary design can now be done. MYSat main design features together with the preliminary results are presented in this paper.