30th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Interactive Presentations - 30th IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS (IP)

Author: Ms. Amel Alhammadi
Sharjah Academy for Astronomy, Space Sciences and Technology (SAASST), United Arab Emirates, amel.alhammadi@sharjah.ac.ae

Mrs. Maryam Alansaari
Sharjah Academy for Astronomy, Space Sciences and Technology (SAASST), United Arab Emirates, maryam.alansaari@sharjah.ac.ae
Mrs. Fatima Alketbi
Sharjah Academy for Astronomy, Space Sciences and Technology (SAASST), United Arab Emirates, falketbi@sharjah.ac.ae
Mr. Yousuf Faroukh
Sharjah Academy for Astronomy, Space Sciences and Technology (SAASST), United Arab Emirates, yfaroukh@sharjah.ac.ae
Mr. Abdulrahman Sulaiman
Sharjah Academy for Astronomy, Space Sciences, and Technology (SAASST), United Arab Emirates, asulaiman@sharjah.ac.ae
Mr. Ahmed Altunaiji
Sharjah Academy for Astronomy, Space Sciences and Technology (SAASST), United Arab Emirates, aaltunaiji@sharjah.ac.ae
Ms. Tarifa AlKaabi
Sharjah Academy for Astronomy, Space Sciences and Technology (SAASST), United Arab Emirates, talkaabi@sharjah.ac.ae
Prof. Ilias Fernini
Sharjah Academy for Astronomy, Space Sciences and Technology (SAASST), United Arab Emirates, ifernini@sharjah.ac.ae
Prof. Hamid Al Naimiy
Sharjah Academy for Astronomy, Space Sciences, and Technology (SAASST), United Arab Emirates, alnaimiy@sharjah.ac.ae

SHARJAH-SAT-3 MISSION DESIGN ANALYSIS WITH STK SOFTWARE: ORBIT DETERMINATION, LIFETIME ANALYSIS, AND POWER GENERATION

Abstract

The Sharjah Academy for Astronomy, Space Sciences, Technology (SAASST) is currently developing a new 6U low-cost CubeSat, Sharjah-Sat-3, a space weather satellite to monitor the daily behavior of the ionosphere layer due to the activity of the Sun. This is part of the "Space Weather" program the United Arab Emirates is pursuing to preserve its space assets. Sharjah-Sat-3's main payload is a solar particle detector (SPD) to measure the charged particles' density of electrons, protons, and ions in the energy range of 0.1 - 100 MeV. This range is the expected energies of these particles at the LEO level.

When designing such a complex space mission, many factors must be considered before implementing, selecting, and procuring the components. This consideration could be performed by simulating and modeling the scenario of the system. In this paper, a simulation analysis for the proposed mission design

will be conducted using system tool kit (STK) software in three different approaches. The first one is estimating the optimal orbit in terms of the ground-space telecommunication side. The second is the lifetime analysis, which shows how often our satellite will pass over the ground station. The last approach is determining the generated power by the selected solar panel configuration and evaluating the results according to each subsystem's requirements.

In addition, this paper will highlight the theoretical part of the SPD payload and its efficiency in measuring the different particle densities in our ionosphere. A solar eruption is an intense source of extreme ultraviolet radiation. This changes the ionospheric ionization and produces electrons, protons, and ions that interact chemically with the atmospheric element before reaching the ground level. The most energetic solar activity happens in the polar ionosphere region. This is why we plan to include the polar orbit region in the analysis. Our determinations will aid decision-making through practical trade-off analysis and assist in setting policies towards adverse space weather effects while advising the aviation authority on space weather hazards.