

IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Interactive Presentations - IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (IP)

Author: Mr. Ibrahim Alsabt

Sharjah Academy for Astronomy, Space Sciences and Technology (SAASST), United Arab Emirates,
ialsabt@sharjah.ac.ae

Mr. Yousuf Faroukh

Sharjah Academy for Astronomy, Space Sciences and Technology (SAASST), United Arab Emirates,
yfaroukh@sharjah.ac.ae

Ms. Amel Alhammadi

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

Ms. Tarifa AlKaabi

Sharjah Academy for Astronomy, Space Sciences and Technology (SAASST), United Arab Emirates,
talkaabi@sharjah.ac.ae

Mrs. Fatima Alketbi

Sharjah Academy for Astronomy, Space Sciences and Technology (SAASST), United Arab Emirates,
falketbi@sharjah.ac.ae

Mrs. Maryam Alansaari

Sharjah Academy for Astronomy, Space Sciences and Technology (SAASST), United Arab Emirates,
maryam.alansaari@sharjah.ac.ae

Mr. Mohamed BinAshour

Sharjah Academy for Astronomy, Space Sciences and Technology (SAASST), United Arab Emirates,
mbinashour@sharjah.ac.ae

Prof. Ilias Fernini

Sharjah Academy for Astronomy, Space Sciences and Technology (SAASST), United Arab Emirates,
ifernini@sharjah.ac.ae

Mr. Emirhan Eser Gül

Istanbul Technical University, Turkey, emirhaneser@hotmail.com

Mr. Bogac Karabulut

Istanbul Technical University, Turkey, bogackarabulut@gmail.com

Prof.Dr. Alim Rustem Aslan

Istanbul Technical University, Turkey, aslanr@itu.edu.tr

Prof. Emrah Kalemci

Sabancı University, Turkey, ekalemci@sabanciuniv.edu

Prof. Hamid M.K. Al-Naimiy

University of Sharjah, United Arab Emirates, alnaimiy@sharjah.ac.ae

SHARJAH-SAT-1 SPACE-TO-GROUND TELECOMMUNICATION OPERATIONS

Abstract

Sharjah-Sat-1 is a collaborative research project by the Sharjah Academy for Astronomy, Space Science, and Technology (SAASST), University of Sharjah (UoS), Istanbul Technical University Space Sys-

tems Design and Test Laboratory (ITU-SSDTL), and Sabanci University (SU). The 3U+ CubeSat will host an improved X-ray Detector (iXRD) as the primary payload and a dual optical camera system's secondary payload system. The X-ray detector's objective is to detect hard X-rays from very bright X-ray sources, and to study the solar coronal holes, whereas the camera system will provide a low-resolution remote sensing application. Although Sharjah-Sat-1 would be the first CubeSat mission developed by SAASST and UoS, it aims to extend the experience for the following CubeSat missions. The anticipated launch date of the CubeSat is by the second half of 2022.

Many parameters such as emission patterns, data rates, modulation schemes, and the satellites' dynamics could affect the completion of the communication links between the CubeSat and the ground station. Thus, it is important to consider all major and minor parameters while designing and performing the operations of telecommunication. Sharjah-Sat-1 hosts an S band transmitter and and VHF/UHF transceiver and relevant antennas to communicate the data from the payloads and telemetry through relevant frequency bands. To do this operation, SAASST's ground station has been equipped with an S-Band and full-duplex UHF/VHF antennas and two Software Defined Radio (SDR) transceivers, spanning the whole frequency range. Furthermore, a custom-console software was developed to control Sharjah-Sat-1 while it is in orbit by sending commands to execute different operations that will directly affect the practicality of mission objectives.

This paper describes the Sharjah-Sat-1 communication subsystem design regarding the ground station and the different applications used to communicate with the CubeSat fully. In addition, the custom-console-made software that aids the mission's operations to formulate a comprehensive End-to-End communication operations process will also be discussed.