19th SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Small Space Science Missions (2)

Author: Mr. Seyoung Yoon
Kyung Hee University, Korea, Republic of, zerosp@khu.ac.kr

Mr. Yongho Kim
Kyung Hee University, Korea, Republic of, gemblerz@khu.ac.kr
Ms. Jiwon Yun
Kyung Hee University, Korea, Republic of, jwyun@khu.ac.kr
Prof. Jongho Seon
Kyung Hee University, Korea, Republic of, jhseon@khu.ac.kr
Prof. Ho Jin
Kyung Hee University, Korea, Republic of, benho@khu.ac.kr
Dr. Kyu-Sung Chae
Kyung Hee University, Korea, Republic of, kschae@khu.ac.kr
Prof. Dong-Hun Lee
Kyung Hee University, Korea, Republic of, dhlee@khu.ac.kr
Prof. Robert P. Lin
University of California, United States, rlin@ssl.berkeley.edu
Mr. John Sample
University of California, United States, jsample@ssl.berkeley.edu
Dr. Thomas Immel
University of California, United States, immel@ssl.berkeley.edu
Mr. Jerry Kim
University of California, United States, jakim@ssl.berkeley.edu
Prof. Timothy S. Horbury
Imperial College London, United Kingdom, t.horbury@imperial.ac.uk
Mr. Patrick Brown
Imperial College London, United Kingdom, patrick.brown@imperial.ac.uk

OPERATIONS FOR TWO SPACECRAFT OF TRIPLE-CUBESAT MISSION TRIO-CINEMA WITH A SINGLE RF CHAIN

Abstract

TRiplet Ionospheric Observatory – Cubesat for Ion, Neutral, Electron and MAgnetic fields (TRIO-CINEMA) mission consists of three identical 3U cubesats for scientific observation. The TRIO-CINEMA mission will provide high sensitivity mapping and high cadence measurements of ring current Energetic Neutral Atom (ENA) in the range of 4 200 keV with 1 keV FWHM energy resolution in Low Earth Orbit (LEO). Each spacecraft is equipped with a SupraThermal Electrons, Ions, Neutrals (STEIN) instrument and a MAGnetometer Imperial College (MAGIC) instrument. STEIN instrument is improved from those in SupraThermal Electron (STE) instrument flown on NASA's STEREO spacecraft and is capable of identifying electrons, positive ions and neutrals through the application of an electric field in the entrance aperture. MAGIC is dual 3-axis magnetoresistive sensor for attitude control and scientific measurement. First spacecraft of TRIO-CINEMA is developed and will be operated by Space Science Laboratory of

University of California, Berkeley (UCB). Another two spacecraft are developed by Kyung Hee University (KHU) in Republic of Korea. TRIO-CINEMA is expected to provide stereo imaging of ENAs and multi-point measurements of ions, electrons and Earth magnetic fields. It is also expected that the TRIO-CINEMA measurements will complement the measurements with NASA's Radiation Belt Storm Probes (RBSP) mission by stereo imaging of the ring current through ENA measurements at low altitudes. TRIO-CINEMA data will be transmitted at 1 Mbps via S-band, whereas a UHF receiver is used for uplink communication. UCB will operate the mission via Mission Operations Center (MOC) and Berkeley Ground Station (BGS) of SSL. KHU has constructed a new ground station with one UHF RF system for uplink. The two KHU's spacecraft will be initially contiguous with each other deployed from the same launcher. Because the ground S-band antenna can provide only one contact at a time for the two contiguous spacecraft, the ground station and operational plan should be carefully designed in order to minimize loss of contact opportunities for each satellite. In this research, we present efficient operational scenario and the rehearsal for two spacecraft of TRIO-CINEMA with a single RF chain of uplink and downlink.