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Author: Dr. Alessandra Babuscia
Jet Propulsion Laboratory - California Institute of Technology, United States,
Alessandra.Babuscia@jpl.nasa.gov

Ms. Krisjani Angkasa
Jet Propulsion Laboratory - California Institute of Technology, United States,
Krisjani.S.Angkasa@jpl.nasa.gov
Prof. Benjamin Malphrus
Morehead State University, United States, b.malphrus@moreheadstate.edu

DEVELOPMENT OF TELECOMMUNICATION SYSTEMS AND GROUND SUPPORT FOR EM-1
INTERPLANETARY CUBESATS MISSIONS: LUNAR ICECUBE AND LUNAH-MAP

Abstract

CubeSats are now providing an innovative way to explore space: they can be built by smaller teams in academic environments, and they generally require smaller budget than traditional missions. For this reason, a new trend has emerged in the last five years: interplanetary CubeSats. Interplanetary CubeSats take advantage of the CubeSat paradigm and of the availability of commercial components developed for Low Earth Orbit (LEO) missions, but they are specifically designed to explore deep space. As a result, interplanetary CubeSats are essentially very different from Low Earth Orbit CubeSats in at least three technological areas: propulsion, radiation tolerance and telecommunication. This paper is focused on telecommunication issues for interplanetary CubeSats which face harsher environments, longer path distances and have more navigation needs than the LEO CubeSats. For this reason, the design of telecommunication systems for interplanetary missions is extremely challenging and significant development is currently ongoing in the areas of radio design, antenna design and the design of ground support architectures. This presentation focuses on the design of the telecommunication and ground support systems for two of the interplanetary CubeSats missions that will be launched on NASA's Space Launch System (SLS) Exploration Mission-1 (EM-1): Lunar IceCube and LunaH-Map. Given the commonalities between these missions, an effort is underway at JPL to develop a common set of telecommunication hardware systems to fit the envelope of the two missions' goals. Additionally, Lunar IceCube and LunaH-Map will also share the use of the Deep Space Network antennas and of the Morehead State University 21 m station, which is currently being upgraded especially for this purpose. This presentation will provide a quick overview of the missions (including goals and telecommunication requirements), and it will also focus on the development of the telecommunication systems design with a focus on the current upgrades planned to the Morehead State University ground station.

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