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Author: Prof. LAN-SUN-LUK JEAN DANIEL
University of La Réunion, La Reunion, Jean-Daniel.Lan-Sun-Luk@univ-reunion.fr

Dr. Guy Pignolet
Reunion Island Space Initiative (RISI), La Reunion, guy.pignolet@science-sainte-rose.net
Mr. Xavier Nicolay
University of La Réunion, La Reunion, xavier.nicolay@univ-reunion.fr
Mrs. Judi Sandrock
Reunion Island Space Initiative (RISI), South Africa, judi@judisandrock.com
Mrs. Erika Velio
PIKALI, La Reunion, erika.velio@gmail.com

LORA COMMUNICATION SYSTEM FOR THE SOLAR SAILCRAFT PAYANKEU AND THE EARTH-MOON CHALLENGE

Abstract

The University of La Reunion and the U3P Association for the Promotion of Photonic Propulsion have started, with global partnerships, the development of a "Payankeu" solar sailcraft of the CubeSat 4-U class for the Earth-Moon Challenge,based on the New Space CubeSat architectures.The solar sailcraft will have to sail for about a year and a half between a departure orbit at 50,000 km and the distance from the Moon at 400,000 km or more.It seems that LoRa technology can be used for this Earth-Moon mission and the question arises about the advantages and disadvantages of using this system, from an energy point of view, the budget link and also its potential use for future applications in expanding Earth-Moon operations.Components are available at accessible costs, possiblyusing the revolutionary modular Xinabox hardware.The LoRa (Long Range) technology offers a very good reception sensitivity, and standards already exist worldwide.The drawback of very low throughput does not seem to be a problem in the context of the Earth-Moon Challenge and can positively contribute to reducing the need for energy for data transmission.The proprietary LoRa technology is based on the spectrum spread modulation technique.It was developed with the aim of reducing the consumption of sensor network nodes and is experiencing a strong development in the field of Internet objects (IoT). In low orbit, many functional or deployed nanosats projects use LoRa technology. A compromise will be sought between consumption and the link balance in the different phases of the mission. In the vicinity of the Earth, the existence ofLoRatelecommunication networks in orbit (Lacuna Space, Swarm Technologies,...), offers the opportunity to test reception without need for tracking from the ground station. At greater distance, the ground monitoring station will be the reference unit. From the spread of the spectrum of communication signals, physical information and low-throughput data can be implemented and adapted for the specific Moon mission, and new hybrid modules have to be developed to interface with optical systems, cameras and star sensors, service module that will take the sailcraft to the start orbit, mechanical devices for the deployment sequence, control of liquid crystal surfaces, and interplanetary science payloads. Here we propose a presentation of the state of the art and potential to use LoRa for the Payankeu solar sailcraft and other missions in the Earth-Moon environment, in the goal to reduce costs.