CONTENT SUBMISSION

CONCEPT SUBMISSION FORM

- Registration ID:
- Team Name: **Luni Psi**
- Concept Name: **Luni Psi**
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- Twitter Account: https://twitter.com/luni_psi
- Video link: https://www.youtube.com/watch?v=gNbSrQxQQ10

1 EXPERIMENT DESCRIPTION

Luni Ψ is a biological experiment designed to test and monitor the growth of the disease-related bacteria *Escherichia coli* (ATCC 25922) and *Pseudomonas aeruginosa* (ATCC 27853) in an environment of fractional gravity as is the case for the Moon (0.16 G). Some pathogenic bacteria have been grown in microgravity aboard the ISS showing features that would make them more dangerous than in Earth. These bacteria have never been tested in fractionated gravity, but some experiments have shown that plants behave different between simulated fractional gravity and microgravity. Knowledge about how these bacteria grow in lunar gravity will help human exploration of the Solar System, and will help in the understanding of the mechanisms these bacteria adapt to different environments which will be helpful for medicine in general.

In our experiment, we will send recently inoculated petri dishes with the microorganisms inside a sealed capsule. These dishes will stay between -2 and 5°C until it arrives to the Moon, once there the temperature will rise to 37 ± 1°C allowing the bacteria to grow. The capsule will be isolated from the exterior, having an internal controlled environment with air and pressure similar to those on Earth, so that the only variable will be the lunar gravity. The petri dishes will be monitored using a camera that will take a picture every 6 hours, and the capsule will stay inside of the lander to avoid effects due to the movements of the rover or the exposition to radiation. A similar capsule will be monitored on Earth to compare and identify differences.

2 CONDUCT OF EXPERIMENT

Mission Class: **Class 6C (Stand-alone experiment)**
Commissioning Type: **Type 4: Deploy onto lunar surface - Passive**

2.1 Electrical Requirement:

The monitoring system from capsule will be based on a Raspberry Pi Zero specifications. The system will consume between 0.5 - 0.7W and it can works with an USB 5V as power supply. Camera, LEDs and some sensors will be activated every 6 hours so they don't need much energy. Temperature sensor and resistance are the only components that will be active all time. We have an extra power source which will help us if we have an emergency situation.

2.2 Thermal Requirement:

The capsule will work independent from the locations. This kind of canister will be made of Carbon fiber and Aluminum, which have been used for aerospace applications. The model has vibration isolation between canister and petri dish and air space. No power required for keeping the temperature at 4°C (+/-1°C) for 5 days over the trip to the Moon, thanks to cooler system (canister's materials and gas exchange). Our proposal is based on BRIC (Biological Research in Canisters) models. When the capsule arrives to the Moon, a resistance will be activated to keep the temperature at 37°C (+/-1°C). The petri dish cage will be heated and the monitoring system is going to follow the growing of bacterias. The monitoring system only gets temperature readings from inside the capsule.

2.3 Data Requirement:

The monitoring system will be autonomous. It will work with data from different sensors in the capsule. The microcontroller will be programmed in the Earth for tracking the behaviour of internal environment. We expect at the final stage that the system send a report to ISRO Earth station through Lander Computer.

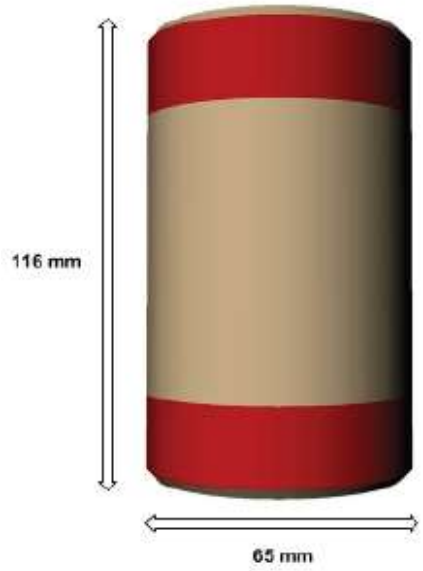
2.4 Imaging Requirement:

The monitoring system has its own camera and an storage for the images. The system will take pics of the petri dish at regular intervals (every 6 hours) to follow the growing of microorganisms. It will send these pictures back to ISRO Earth station through Lander Computer. We will transmit the images through RS485 connection that we will adapt on the board.

2.5 Testing Requirement

We will test extreme levels of temperatures. We are planning a rigorous testing in a thermo-vacuum chamber. We are looking for support by aeroespacial laboratories in Peru to simulate the different stages. We are gonna build a basic microgravity machine for one of our controls of the experiment on Earth. We make sure that the payload has the required standards for travelling.

2.6 Sketch with dimensions



2.7 Field of View Requirements

The experiment is inside the canister so we don't need field of view.