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CUBESAT BIOLAB – INVESTIGATION OF RADIATION INFLUENCE TO BACTERIA IN MEO

Abstract

Deep space exploration is one of the greatest goals humanity strives for, but its obstacles are many and not thoroughly studied. The information on the vast and important subject of the influence of space radiation on living organisms is incomplete and patchy. Interplanetary transfer of biological samples is possible and that risk should be carefully studied. Possible effects are: polluting other planets with our bio culture or mutated Earth microorganisms being in space comes back.

There is some evidence, shown in a number of Russian IMBP experiments such as "Biorisk", that bacteria can live and proliferate inside and an outer surface of spacecraft, exhibiting faster mutation rate, development of antibiotics resistance, damage to the materials and communications. That can potentially be hazardous for humans in space or, upon return, here on Earth, there is also a risk of contamination of interplanetary equipment.

We don't know much about biological influence of space radiation on different orbital altitudes, most experiments, Biorisk included, were conducted on low earth orbit of ISS. No doubt, that radiation level on ISS is much higher relative Earth surface, but still lowers then values, which should survive organisms if they fly away from Earth, or coming from Deep Space. The behaviour of biological samples in Van Allen belts should be investigated to get more information about possible effects.

Developing and launching a satellite in the old and traditional way is very expensive and covers a few missions inside. To make an experiment happened you need to find other problems and tasks on orbits you are going. For example, the Institute of Biomedical Problems has an open call for a mission on their BION-M2, and they can't launch the craft until they find more willing groups to join.

We propose to design and build a CubeSat to study the survivability of consequently exposed bacteria samples on different altitudes, culminating on about 4000 km above the surface, where radiation density of Van Allen inner belt is the highest. The launch could take place with from ISS station or as a secondary payload. After separating CubeSat will use its own thrusters.

During exposing, samples will be constantly checked and resistance to several antibiotics can be evaluated. This experiment can bring us much-needed data and also test the platform on which different organisms, such as yeast, can be studied later.