Abstract for 11th Low Cost Planetary Missions Conference
June 9-11, 2015, Berlin, Germany

Multipurpose satellite platform for astrobiological investigation

Schultz Ch., Institute of Optical Sensor Systems, DLR, Berlin, Germany;
Böttger U., Institute of Optical Sensor Systems, DLR, Berlin, Germany;
de Vera J.-P., Institute of Planetary Research, DLR, Berlin, Germany;
Bärwald W., Institute of Optical Sensor Systems, DLR, Berlin, Germany;
Halle W., Institute of Optical Sensor Systems, DLR, Berlin, Germany;
Pavlov S., Institute of Optical Sensor Systems, DLR, Berlin, Germany;
Schröder S., Institute of Optical Sensor Systems, DLR, Berlin, Germany;
Hübers H.-W., Institute of Optical Sensor Systems, DLR, Berlin, Germany

In recent years NASA, ESA and other space agencies focus as well on life detection and the reconnaissance of habitable environments on other planets and their satellites. Recent and future missions like Curiosity, ExoMars and JUICE will continue this endeavor. In this highly significant and challenging field of research, astrobiological projects will address relevant topics, produce substantial insights and provide supplemental knowledge to support our search for life in the universe. To realize this project, we suggest a multipurpose satellite platform for astrobiological investigation that is able to expose samples to space vacuum and space radiation, but also to provide gas supply and selected planetary radiation environments over a long time. Furthermore, the opportunity of in-situ monitoring of the astrobiological experiments with methods like fluorescence microscopy, Raman-, UV-, VIS-, and IR-spectroscopy should be given. The multipurpose satellite platform for astrobiology is designed to achieve two central objectives: 1) to analyze the extent to which selected organisms and (micro-) fossils from planetary analog field sites can survive/ outlast the conditions of space exposure but also of particular planetary analog environments which are most suitably simulated in space exposure experiments (referring to the design and the results of precursor experiments such as LIFE, BIOMEX and BIOSIGN); 2) to analyze new sets of bio-molecules (other than previously tested in precursor experiments) on their stability as well as on their products and mechanisms of degradation.
So the multipurpose satellite platform for astrobiological investigation is developed to support future planetary exploration missions to Mars, Enceladus, Europa or Titan by a set of science experiments performed on it. To maximize the scientific output, these space-operated experiments will be connected to the results obtained from recent and up-coming planetary analog field studies and planetary simulation facilities on the ISS. The main advantage of the multipurpose satellite platform for astrobiology compared to the existing platforms and experiments is the in-situ monitoring capability with fluorescence microscopy, Raman-, UV-, VIS-, or IR-spectroscopy and of the environmental parameters like UV radiation, ionizing radiation, low atmospheric pressure to vacuum, total desiccation and extreme temperature regimes. This allows to follow the alteration or transformation of the investigated samples with time and to better understand the observed behavior in relation to these environmental parameters.
Experience and designs from the existing DLR satellite platform technologies will be used as a basis for the multipurpose satellite platform for astrobiology. The technological knowledge was gained by DLR during the BIRD mission 2001 to 2004. Based on BIRD design the TET Satellite BUS (technology-testing platform) was developed. This TET platform was designed to carry various kinds of payloads for multipurpose scientific tasks. The bus technology has a flexible and high performance in: attitude control with possible obit control, power regimes and control, onboard computing

performance and overall system redundancy. The TET-1 satellite bus will be adapted to the astrobiological experimental payload including the above mentioned in-situ monitoring capabilities.