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EXPANSION OF THE EUROPEAN PHYSIOLOGY MODULES FACILITY TO A MULTIPLE SCIENCE DISCIPLINE FACILITY

Abstract

The European Physiology Modules (EPM) is one of the major research facilities inside the ESA Columbus laboratory onboard of the International Space Station (ISS). EPM has been developed as ESA's research facility for human physiology experiments with the aim to study the effects of short and long duration space flight on the human body. Since its commissioning in 2008 EPM has supported eleven different human physiology experiments in more than 100 inflight sessions.

Already in 2009 the research fields of the EPM were expanded to physics as well. This was possible due to the EPM design philosophy, which is based on high modularity and flexibility, both for the facility infrastructure and for rack mounted or externally connected experiment units. From 2009 to 2011 the long term radiation dose monitoring experiment DOSIS was connected to EPM. From 2012 until today the follow-up experiment DOSIS 3D is being supported by EPM.

Currently the integration of the fundamental physics experiment Plasma Kristall - 4 (PK-4) takes place. The aim of PK-4 is the investigation of complex low-temperature plasmas, i.e. ionized gases, containing micro-particles of a few micrometers size under microgravity conditions. The PK-4 hardware will be uploaded in autumn 2014. The first PK-4 experiment run shall be executed early 2015. The integration of PK-4 in EPM differs from the originally planned integration of 4 panel unit EPM standard Science Modules in many aspects. The PK-4 containers will occupy seven of the twelve available flexible rack locations. The PK-4 Experiment Apparatus, which accommodates the experiment chamber, has a height of 20 Panel Units and occupies alone five container locations. Furthermore PK-4 requires the connection to the COLUMBUS ventline interface, which is not included in the EPM infrastructure. For the integration of PK-4 the EPM integration and verification approach had to be adopted. Also in the new configuration with PK-4, the EPM facility can still be used for human physiology experiments. Another large fundamental physics experiment is planned to be accommodated in EPM in future. Its purpose is the study of dust particles agglomeration in microgravity

The paper will provide a technical description of the EPM Facility. It will describe the expansion of the EPM facility from a human physiology experiment facility to a Multiple Science Discipline Facility by the extension of the integration and verification approach. Finally an overview of the non human physiology related EPM experiments will be provided.