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10 YEARS UTILIZATION OF THE EPM FACILITY IN COLUMBUS – FROM HUMAN
PHYSIOLOGY TO COMMERCIAL EXPERIMENTS

Abstract

The European Physiology Modules (EPM) is one of the major research facilities of the Columbus laboratory on the International Space Station (ISS). A defining characteristic of the EPM is its high modularity. The EPM Carrier infrastructure provides via standardized interfaces the mechanical accommodation, electrical power, data links and thermal control for the exchangeable Science Modules, which are specialized devices for specific experiments.

The EPM was commissioned in February 2008 after its launch with the Columbus module. Since then, EPM has been intensively used and has supported a total of 16 different scientific experiments. Most of them were physiological experiments investigating the effects of long duration space flight on the human body. Examples include Neurospat, Passages, Solo, and Card.

The flexible design of EPM has allowed expanding the research fields also to other disciplines. As the first physical science experiment DOSIS with two active Dosimetry Telescopes was added in 2009. Since then via EPM downlinks the DOSIS measurement data is periodically transmitted to ground. The biggest new EPM Science Module is the Plasma Kristall-4 experiment (PK-4) performing research in the field of Complex Plasmas. PK-4 was integrated 2014 in a major rack reconfiguration activity and occupies more than half of the EPM rack space.

In 2017 GRIP was operated the first time via EPM as a new human physiology experiment that studies the long-duration spaceflight effects on the abilities of human subjects to regulate grip force.

In the most recent evolution, EPM provides accommodation and resources for the ICE Cubes facility, which is being integrated in 2018. ICE Cubes is a commercial facility that can accommodate up to 20 small experiment cubes from various fields of science. In support of ICE Cubes EPM will be operated 24/7 from 2018 onwards. The EPM rack supported these operations over the first 10 years with high reliability and is planned to be widely use in the future as well.

The evolution of the facility from the EPM-1 configuration (as launched 2008) to EPM-3 (with ICE Cubes, 2018) will be presented, an overview of the performed experiments and maintenance activities will be provided, including selected scientific results as well as an outlook for the future EPM experiments.