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Microgravity Sciences Onboard the International Space Station and Beyond - Part 2 (7)

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COMPLEX PLASMA FACILITIES AND EXPERIMENTS ONBOARD THE INTERNATIONAL
SPACE STATION

Abstract

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PLASMA FACILITIES AND EXPERIMENTS ONBOARD THE INTERNATIONAL SPACE STATION

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Abstract

Complex plasma research under microgravity conditions is one key research topic in fundamental
physics and material science on the International Space Station (ISS). Experiments started with PKE-
Nefedov, launched with PROGRESS as early as February 2001. PKE-Nefedov was a joint scientific
experiment between the Max-Planck-Institute for Extraterrestrial Physics (MPE) in Garching/Munich
and the Joint Institute for High Temperatures of the Russian Academy of Science (JIHT) in Moscow.
The facility was developed and built by MPE, JIHT, RSC Energia and Kayser-Threde with national
German funding (by DLR). Russia was responsible for funding launch, operations and training of PKE-
Nefedov. The facility was operational from 2001 until 2005 and accommodated in the Russian segment
of the ISS.

Next in the Plasma Crystal family was PK-3 Plus which is an improved version of PKE-Nefedov.
PK-3 Plus was launched in December 2005 and has been in operation on the ISS from December 2005 to
July 2011. Twentyone (21) successful missions have been performed, until the facility was switched-off.
Teaming, funding and responsibilities have been shared as for PKE-Nefedov.

The most recent development is PK-4 which is a much more complex facility. PK-4 primarily uses high
voltage DC for plasma control, possesses a rather large experimental chamber with wide gas parameter
variations, particle manipulators and a sophisticated video observation system. PK-4 is part of the
European EPM rack accommodated in the Columbus module of the ISS. The phase C/D of PK-4 has
been initiated in spring 2008. Launch with PROGRESS is scheduled for September this year (2014).
From a programmatic point of view PK-4 is a joint Russian / European project, with Russia providing
upload, download and crew resources.

The paper will present some selected results from recent PK-3 Plus sessions on the ISS and summarize
the status of PK-4.