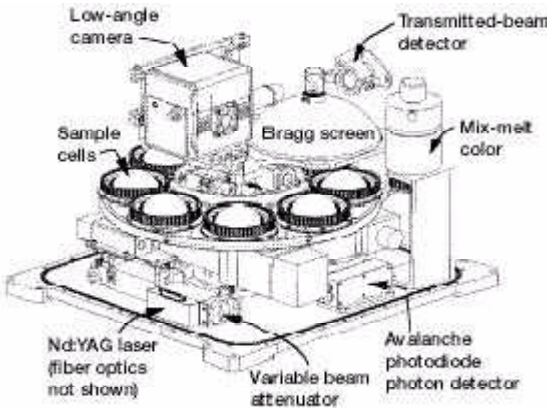
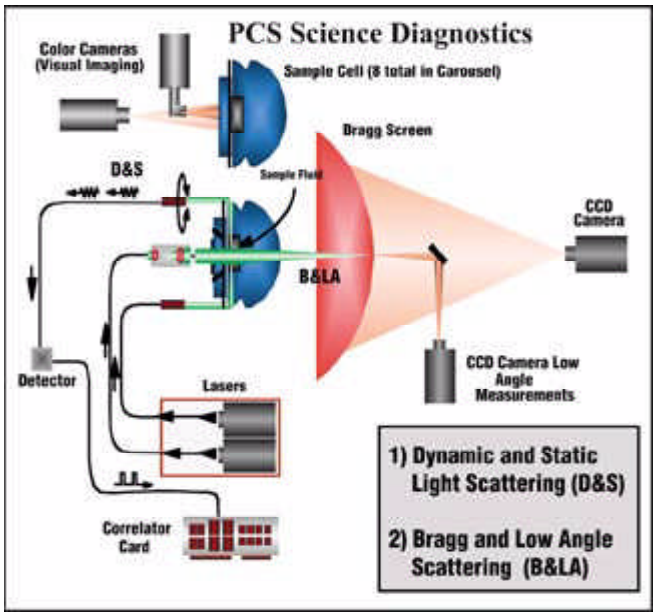
Physics of Colloids in Space (PCS) Flight Hardware Developed

The Physics of Colloids in Space (PCS) experiment is a Microgravity Fluids Physics investigation that will be located in an Expedite the Process of Experiments to Space Station (EXPRESS) Rack. The investigation will be conducted in the International Space Station U.S. laboratory, Destiny, over a period of approximately 10 months during the station assembly period from flight 6A through flight UF-2. This experiment will gather data on the basic physical properties of colloids by studying three different colloid systems with the objective of understanding how they grow and what structures they form. A colloidal suspension consists of fine particles (micrometer to submicrometer) suspended in a fluidfor example, paints, milk, salad dressings, and aerosols. The long-term goal of this investigation is to learn how to steer the growth of colloidal suspensions to create new materials and new structures. This experiment is part of a two-stage investigation conceived by Professor David Weitz of Harvard University along with Professor Peter Pusey of the University of Edinburgh. The experiment hardware was developed by the NASA Glenn Research Center through contracts with Dynacs, Inc., and ZIN Technologies.



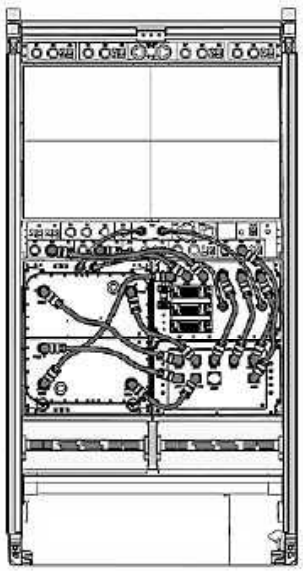
PCS Test Section internal assembly.

The PCS experiment hardware is composed of an Avionics Section unit and a Test Section unit, each approximately 47 by 50 by 56 cm. The Test Section and Avionics Section are accommodated side by side in an EXPRESS Rack occupying four Middeck Locker equivalents (the equivalent volume of a standard Middeck Locker). The PCS hardware uses the EXPRESS Rack utilities of power, air-cooling, water-cooling, and communication for data and commanding telemetry. The Avionics Section provides the power distribution, the data acquisition and processing, and the command and data communication. The Test Section contains eight colloid samples and all the diagnostic instrumentation.



PCS science diagnostics.

The Avionics Section, which is a two-drawer assembly, has been assembled, verified, and delivered to the NASA Kennedy Space Center for integration into the flight EXPRESS Rack. The Test Section has been assembled and also has completed verification testing. The Test Section, which contains the science diagnostics, has been subjected to rigorous performance testing by the project and principal investigator's team. These diagnostics are based primarily on light-scattering instrumentation, which was in majority developed under a previous flight experiment, the Physics of Hard Spheres Experiment (PHaSE). Dynamic and static light scattering is provided via a 532-nm Nd-Yag laser and fiber-coupled avalanche photodiode. Two detection fibers cover scattering angles from 11° to 169° and 191° to 349°, respectively. Bragg scattering over the range of 10° to 60° uses a second Nd-Yag laser and an optical screen and digital camera to image the scattered Bragg rings from the colloid samples. Additional optics and another digital camera capture the laser light scattered at low angles of 0.3° to 6.0°. Via the electronics and data processing provided by the Avionics Section, both static and dynamic data are obtained from the small scattering angle optics/camera.



PCS in EXPRESS Rack.

The Test Section and Avionics Section have been installed in the flight EXPRESS Rack at Kennedy and have undergone interface verification testing. The Test Section returned to Glenn for final sample processing and installation, and final performance and interface verification. It then will be delivered to Kennedy for integration into the space shuttle Middeck for launch on 6A.

Find out more about this research:
Physics of Colloids in Space (http://exploration.grc.nasa.gov/6712/multiph.html)
Experimental Soft Condensed Matter Group
(http://www.deas.harvard.edu/projects/weitzlab/)

Glenn contact: John M. Koudelka, 216-433-2852, John.M.Koudelka@grc.nasa.gov
National Center for Microgravity Research contact: Dr. Rafat R. Ansari, 216-433-5008, Rafat.R.Ansari@grc.nasa.gov
Author: John M. Koudelka
Headquarters program office: OBPR
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