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E-USOC AND THE SODI DCMIX-2 EXPERIMENT OPERATIONS PREPARATION

Abstract

E-USOC is the Spanish User Support and Operations Centre, one of the nine similar centers distributed all across Europe. These centers perform the operations of European experiments on-board the Columbus Module , the main contribution from the European Space Agency to the International Space Station (ISS).

SODI was launched on 28th August 2009 in Shuttle Discovery and mounted inside NASA's Microgravity Science GloveBox (MSG). By the end of year 2012 E-USOC started to work on the preparation and upgrade of the necessary products to operate the third experiment in the frame of the SODI payload, SODI-DCMIX-2 (Diffusion Coefficients measurements in ternary MIXtures), using the knowledge acquired in the previous SODI experiments (IVIDIL and COLLOID).The basic principle of SODI design is to have a modular instrument equipped with various optical diagnostics, such as Mach-Zehnder Interferometer, Particle Image Velocimetry and Near Field Scattering.

The SODI-DCMIX-2 experiment studies the isothermal and thermal diffusion in ternary mixtures, controlling temperature gradient and relaxation times, in a reduced gravity environment. Researchers plan to accurately determine the isothermal and thermal diffusion coefficients in a microgravity environment.

DCMIX-2, uplinked with 52P, will be installed in MSG by ISS crew during summer 2013. Starting with an optical checkout aimed at optimizing the images quality, the experiment will be conducted during 9 weeks from E-USOC premises, where operators will monitor and control the facility. For a successful experiment operation, E-USOC coordinates the DCMIX-2 preparation with the MSG operations team at NASA's Payload Operations Integration Center (POIC). Due to lifetime limitations of the experiment samples, the on-orbit planning needs to be as efficient and flexible as possible, and a near real time coordination with the Principal Investigators will be needed to assess eventual priority changes to maximize science return.

A grand total of 20 scientific runs will be performed, generating around 460GB of scientific data for around 600 hours of experiment. The disks containing the stored scientific data will be returned to ground after the mission. Compression algorithms will be used on-orbit in order to maximize usage of onboard resources at minimum cost.

This paper presents a brief summary of the principles of the DCMIX-2 experiment and its preparation, with particular emphasis on the complex optical checkout that will be performed onboard before starting science operations. It also shows how lessons learned from previous SODI operations have been implemented in DCMIX-2 preparation and operation.