

The Fast Alternative Cryogenic Experiment Testbed

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One of the challenges in the area of cryogenics for space exploration in the next millennium is providing the capability for inexpensive, frequent, access to space. Faced with this challenge during the International Space Station (ISS) build era, when other Space Shuttle manifesting opportunities are unavailable, a "proof of concept" cryostat has been developed to demonstrate the ability to accommodate low temperature science investigations within the constraints of the Hitchhiker siderail carrier. The Hitchhiker siderail carrier is available on a "mass available" basis during the ISS build era. In fact, several hitchhiker payloads flew with the deployment of the Unity module. Hitchhiker siderail carrier payloads have historically flown an average of about four times a year.

A hybrid Solid Neon - Superfluid Helium cryostat has been developed with Janis Research Company to accommodate instruments of 16.5 cm diameter and 30 cm length. This hybrid approach was taken in part to provide adequate on-orbit lifetime for instruments with high (conducted) heat loads from the instrumentation wiring. Mass, volume, lifetime and the launch hold scenario were all design drivers.

In addition, with Ball Aerospace and Technologies Corporation, a multi-channel VME architecture Germanium Resistance Thermometer (GRT) readout and heater control servo system has been developed. In a flight system, the cryostat and electronics payloads would be umbilically attached in a paired Hitchhiker siderail mount, and permit on-orbit command and telemetry capability.

The results of performance tests of both the cryostat, and a helium sample instrument will be presented. The instrument features a self contained, miniaturized, nano-Kelvin resolution High Resolution Thermometer (HRT). This high level of thermal resolution is achieved through the utilization of a dc Superconducting Quantum Interference Device (SQUID).

Although developed for the Low Temperature Microgravity Fundamental Physics investigator community, many design features are applicable in fields such as infrared and x-ray astronomy.

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