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HIGH MICROGRAVITY LEVEL RESEARCH RACK IN CHINA SPACE STATION AND PRESENT EXPERIMENT

Abstract

China initiated the launches of the China Space Station since April 29th, 2021, when the core module "Tianhe" was launched to orbit. "Tianhe" module carries two scientificapplication racks. One of them is the High Microgravity Level Research Rack (HMLR). The major objective of HMLR is to create a 1e-7g level (at low frequency) micro-gravity environment for conducting frontier experiments which requires strict micro-gravity level. The first scientific payload of HMLR is the Cold Atom Interferometers in Space, which aims to perform frontier researches on relativity theories.

The HMLR facility has a high precision accelerometer and two MEMS IMU to record the microgravity information during tests and experiments. It has a two-layer structure, where the outer layer is intended to isolate disturbances such as air flow, thus the inner layer assures disturbance-free motion. The motion of the inner layer can be controlled through a set of electromagnetic actuators, while the outer layer is controlled through air thrusters. In this way, the HMLR can provide both 1e-6g level microgravity in the rack and 1e-7g level microgravity outside of the rack but within the "Tianhe" module.

This paper at first introduces the HMLR facility, including the specifications, the mechanism of the facility, and how it works in space. Then fundamental results are presented, which illustrate the performances of the experiment facility. The accelerometer data during important events is investigated.