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AUTOMATIC ROTATABLE VIBROPROTECTIVE PLATFORM FOR MICROGRAVITY RESEARCH ONBOARD THE RS ISS

Abstract

Residual microacceleration is a major obstacle on a way to obtaining successful results in microgravity experiments like crystal growth onboard a spacecraft.

At present only passive or active vibroprotective platforms are used for the insulation of gravity-sensitive scientific equipment from the dynamic microforces onboard spacecrafts. Such platforms allow to block residual onboard microacceleration, that has frequencies from 0.5 to 300 Hz.

However it is known that the quasi-static component of microacceleration in the range of 0.0001 - 0.01 Hz gives a negative effect on the course of the heat-mass exchange experiments onboard a spacecraft during orbital flight. Also it was found that the absolute value of the quasi-static microacceleration vector has less effect on the heat-mass exchange process than the direction of the vector relative to the typical parameters of the process, such as gradient of temperature, concentration, etc.

This paper presents Automatic Rotatable Vibroprotective Platform (ARVP) that provides a protection of scientific equipment from the vibrations as well as tracking the direction of quasi-static microacceleration vector. This platform will be mounted on the Russian segment of the International Space Station.

ARPV consists of two functional elements: vibroprotective platform and automatic rotatable platform (ARP). Each functional element has a specific target: vibroprotective platform isolate a payload from vibration, rotatable platform stabilize a payload in direction of a quasi-static microacceleration vector.

The structure of ARPV and a block diagram of its control system are presented. Results of ARVP functional modeling are analyzed.