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AUTOMATIC ROTATABLE VIBROPROTECTIVE PLATFORM FOR MICROGRAVITY RESEARCHE ON BOARD THE RS ISS

Abstract

During last 40 years there were made a lot of microgravity experiments onboard manned spacecrafts like "Salute", "Mir", International Space Station and automatic spacecrafts like "Photon" etc. A major part of this experiments shows that the residual onboard microacceleration is a significant obstacle on a way to get successful results in microgravity research like crystal growth and similar.

Residual onboard microacceleration has a continuous frequency spectrum that can be conditionally divided into two components: vibrational component with frequencies higher than 0.01 Hz and quasistatic component with frequencies lower than 0.01 Hz.

At present only passive or active vibroprotective platforms are used for the insulation of a gravity-sensitive scientific equipment from the dynamic microforces onboard the spacecrafts. Such platforms provide quality blocking of the vibrational component of microacceleration.

However it is known that the quasistatic component of microacceleration in the range of 0.0001 – 0.01 Hz gives a negative effect on the course of heat-mass exchange experiments onboard a spacecraft during orbital flight. Also it was found that the absolute value of the quasistatic microacceleration vector has less effect on the heat-mass exchange process than the difference in angular direction between the quasistatic microacceleration vector and typical vector parameters of the process, such as the direction of crystallization, the direction of the temperature or concentration gradients in the experimental installation etc.

This paper presents the Automatic Rotatable Vibroprotective Platform (ARVP) that provides a protection of a scientific equipment from the vibrations as well as tracking the direction of the 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 its specific target: vibroprotective platform isolates a payload from vibrations, rotatable platform stabilizes a payload in the direction of the quasi-static microacceleration vector.

ARVP configuration and a concept of the ARVP control system organization based on independent microacceleration measurements are presented. Computer simulation results of the ARVP functioning are

submitted.