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MICROGRAVITY SCIENCES AND PROCESSES (A2)
Microgravity Experiments from Sub-orbital to Orbital Platforms (3)

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THE PLATFORM FOR ACQUISITION OF ACCELERATION DATA II (PAANDA II) – AN INSTRUMENT TO MONITOR RESIDUAL ACCELERATIONS IN MICROGRAVITY ENVIRONMENTS

Abstract

The Brazilian Space Agency (AEB) periodically provides to research institutions and universities an opportunity to embark scientific experiments into rocket launched sub-orbital platforms to expose them to an ambient that simulates null gravity. In practice, these platforms, even in a space environment, are submitted to residual accelerations on the order of 1 μg due to perturbations, creating a microgravity ambient to the experiments. For this reason, monitoring this ambient is fundamental for the analysis of the results obtained by the experiments carried aboard, because this data could be correlated to the observed residual accelerations. The Platform for Acquisition of Acceleration Data II (PAANDA II) was developed to measure, record and transmit the accelerations during all flight, specially the microgravity period. This instrument is composed by four Q-Flex type accelerometers disposed in a frame to form a regular tetrahedral base, providing redundancy to the acceleration measurements. Data acquisition electronics, data processing and interfaces are also allocated inside this frame to allow easy calibration procedures and integration into vehicle. The instrument is capable to automatically switch between two acceleration scales: a 18 g full scale for monitoring lift-off and reentry periods and a 1 g full scale for the microgravity period and calibration procedures. The instrument can reach a resolution of 1 μg. This article discusses the PAANDA II architecture, describing: the techniques to enhance the instrument's precision, the redundancy algorithm, the calibration method and all support apparatus and logistics to provide to the experiment the necessary autonomy, mobility and connectivity including the pre-flight and post-flight events. The article also shows the instrument's performance results obtained in laboratory, including the resolution, accuracy and thermal stability analysis.