Contribution ID: **255** Type: **Poster Presentation (120m)**

Heat Dissipation induced by Microvibrations in Low Temperature Systems

Thursday 25 July 2024 14:00 (2 hours)

Low temperature detectors operating at sub-Kelvin temperatures and in the FIR or X-ray wavelengths, are a key feature of space missions addressing the science of the universe. The thermal stability of the coldest cooling stage to which they are thermally coupled is crucial to their performance. This performance could significantly be compromised however, by the fluctuations of the thermal dissipation due to microvibrations. These low-level mechanical vibrations may originate from the cryocoolers of the cryogenic chain that generates said needed sub-Kelvin temperatures, but also from spacecraft-level systems such as reaction wheels (RW) and solar array drive mechanisms (SADM) to name a few. The coldest cooling stage of said instruments, typically an adiabatic demagnetization refrigerator (ADR), is often only able to provide a few microwatts of cooling power. It is therefore crucial to minimize the heat load (and its variations) to the coldest stage well below the microwatt level.

The study discussed in this article explores dissipation induced by microvibrations in a gas-gap heat switch, a common elementary device in space cryogenics and ubiquitous in sub-Kelvin applications, with a special focus given to the low-level measurement methodology. The heat switch is studied in a 1.2 K to 4.2 K helium-bath environment and excited by means of an external mechanical shaker. Findings show that heat dissipation is induced by microvibrations in the heat switch, as well as in its associated instrumentation and wiring, of the order of several microwatts for several millig of mechanical excitation.

Submitters Country

France

Author: ADAM, Thomas (Univ. Grenoble Alpes, CEA, IRIG-DSBT)

Co-authors: Dr CHARLES, Ivan (Univ. Grenoble Alpes, CEA, IRIG-DSBT); Dr DUVAL, Jean-Marc (Univ. Grenoble Alpes, CEA, IRIG-DSBT)

Presenter: ADAM, Thomas (Univ. Grenoble Alpes, CEA, IRIG-DSBT)

Session Classification: Thu-Po-3.1

Track Classification: Tracks ICEC 29 Geneva 2024: ICEC 05: Cryogenic applications: aerospace