Contribution ID: **158** Type: **Poster**

A SQUID controller unit for space-based applications: design and first performance tests

Thursday, 30 May 2024 15:35 (1 minute)

The LiteBIRD mission, to be launched in 2032, will map the polarization of the Cosmic Microwave Background (CMB) with unprecedented resolution, to search for the tiny imprints of cosmological inflation. Its sensitivity corresponds to exploring energy scales up to 10^{16} GeV, linking the physics of inflation with that of Grand Unification of elementary forces.
To accomplish this task, LiteBIRD will use more than 4000 transition-edge sensors (TESs) destributed over three telescopes. Those cryogenic devices, living at 120 mK, will be multiplexed in frequency-domain, each group of 60s read out by a single SQUID placed at a sub-Kelvin stage.
This work presents the design and tests of the SQUID controller unit (SCU), to be used in this space mission, which fall under the responsibility of INFN groups. The unit is made of 8 boards and each board can condition four SQUID array amplifiers. The electronics boards (SCA) are designed to host space qualified components and encompass a redundancy circuitery as well as a lightweight communication protocol. The boards are hosted in a custom designed crate, providing mechanical support, EMI shielding and thermal interface to dissipate the electronics heat.
An advanced version of the board has been coupled to a dilution fridge at McGill University (Canada) and tested with a SQUID reading out a representative cryogenic electronic chain, comprised of resistors coupled to custom LC filters. Its noise performance has been measured to be compatible with the mission requirements and consistent with previous generation used in ground-based CMB telescope readout.
We will present the tests performed and those that are foreseen for its flight qualification, together with thermo-mechanical simulations.

Collaboration

Role of Submitter

The presenter will be selected later by the Collaboration

Primary authors: LIMONTA, Andrea; MOGGI, Andrea (Istituto Nazionale di Fisica Nucleare); TARTARI, Andrea (Istituto Nazionale di Fisica Nucleare); DI GIORGI, Eugenia (Istituto Nazionale di Fisica Nucleare); COPPI, Gabriele (Istituto Nazionale di Fisica Nucleare); SIGNORELLI, Giovanni; CONENNA, Giulia; SMECHER, Graeme (Three.-speed logic); CLICHE, Jean-Francois (McGill); MONTGOMERY, Joshua (McGill); LEONOVA, Kateryna (INFN Pisa); DE LUCIA, Mario; ZANNONI, Mario (Istituto Nazionale di Fisica Nucleare); DOBBS, Matt (McGill); MASSA, Maurizio (Istituto Nazionale di Fisica Nucleare); PINCHERA, Michele (Istituto Nazionale di Fisica Nucleare); DAL BO, Paolo (Università di Pisa / INFN); DELLA TORRE, Stefano (Istituto Nazionale di Fisica Nucleare); LARI, Tommaso (INFN Pisa)

Presenter: DAL BO, Paolo (Università di Pisa / INFN)

Session Classification: Low Temperature, Quantum and Emerging Technologies - Poster Session

Track Classification: T9 - Low Temperature, Quantum and Emerging Technologies