Contribution ID: **267** Type: **Poster**

Development and testing of the FDM readout of the TES arrays aboard the LSPE/SWIPE balloon-borne experiment

Thursday, 25 July 2019 18:45 (15 minutes)

The design and experimental demonstration of a 16-channel frequency-domain multiplexing (FDM) readout for transition-edge sensor (TES) bolometers is presented. This MUX electronics is intended to readout the 326 spiderweb bolometers of the LSPE/SWIPE balloon-borne experiment, which aims at the detection of the B-mode polarization of the cosmic microwave background (CMB) at large angular scales. The cryogenic part of our 16-channel FDM readout chain features LC resonators composed of custom Nb superconducting inductors and SMD capacitors mounted on boards next to the detector wafers, at 300 mK, while the SQUID board is at 1.6 K. The warm section is based on a modular solution, with mezzanine plug-ins for DAC (comb generation), ADC (demodulation) and a SoC (based on Altera Cyclone V FPGA) for data reduction. The warm electronics, which must operate in the harsh conditions of an Arctic winter-night flight, handles the generation of the FDM tones, the de-multiplexing and the digital signal analysis including, e.g., cosmic-ray glitches removal. Here we recall its specifications, we address noise considerations, and finally we present the latest results obtained using flight models of our custom-designed boards.

Less than 5 years of experience since completion of Ph.D

N

Student (Ph.D., M.Sc. or B.Sc.)

N

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Session Classification: Poster session

Track Classification: Detector readout, signal processing, and related technologies