Contribution ID: **293** Type: **Poster**

A cross-talk mitigation technique for FDM readout system in the SAFARI instrument

Tuesday, 23 July 2019 18:45 (15 minutes)

The SAFARI instrument is a diffraction grating and FTS spectrometer on board the SPICA space observatory, designed to achieve the highest-ever sensitivity for line emission in a wide far-infrared band. It will employ sensitive TES (Transition Edge Sensor) bolometer arrays with nearly 4000 pixels with an NEP of 0.2 aW/√Hz.

Frequency Division Multiplexing (FDM) will be used to read out these bolometers. Under FDM each TES is in series with an LC resonator and then in parallel with other pixels. The detectors share a bias line and are readout by a single SQUID amplifier. Each detector is biased at a particular frequency equal to the resonance frequency of the LC it is in series with. The signal at the TES modulates the amplitude of the carrier signal, which is retrieved when demodulated.

We are currently optimizing our FDM by looking into all the subsystems including bolometer arrays, LC resonators, SQUID amplifier and room temperature electronics. The current baseline is to have multiple FDM readout channels, each capable of reading out around 160 pixels with bias frequency range between 1-4 MHz and 16 kHz spacing. This frequency spacing causes substantial electrical cross talk under high optical loading of the detectors. Under these operating conditions the resistance of the detectors is high, thereby broadening the electrical bandwidth. As a result the amount of the current that leaks into the neighboring pixels is not negligible and in order to determine the optical power on each pixel the resistances of the neighboring pixels and their corresponding bias currents need to be considered at the same time.

Here we discuss carrier leakage and quantify its impact on the readout system in the context of the SAFARI instrument. We also present a fast algorithm to calculate the resistance and the current of each pixel in the whole array, despite large carrier leakage and determine the optical load on each individual pixel.

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

N

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

N

Primary author: Dr KHOSROPANAH, Pourya (SRON)

Co-authors: VAN DER KUUR, Jan (Netherlands Institute for Space Research); WANG, Qian (Mr.); Dr AUDLEY, Damain; Dr AMINAEI, Amin (SRON); Dr DE LANGE, Gert (SRON Netherlands Institute for Space Research)

Presenter: Dr KHOSROPANAH, Pourya (SRON)

Session Classification: Poster session

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