Contribution ID: **134** Type: **Poster**

# High impedance NbSi TES for very large arrays in X-Ray astronomy.

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

Large spectro-imagers for X-ray astronomy are highly needed. Consisting in micro-calorimeter arrays, technologies used for thermometers are based either on superconductor (TES) or metal-insulator (MIS, or Si-doped sensors) transitions. MIS are a good choice for their easy operability with classical electronics. TES allow high sensibilities detectors for the price of a complex multiplexing readout.
CSNSM (Orsay, France) has developed high impedance TES in NbSi. They combine the advantage of a great sensibility with a high impedance adapted to the standard microelectronics that facilitate the readout of very large matrices. Unfortunately, they suffer of an electron-phonon decoupling that induces a signal loss with classical readout schematics because the electrical signal depends on the electron temperature, while the incident photons modifies the phonon temperature.
Our experimental results with a new readout schematic demonstrate that phonons and electrons remain coupled, with the additional advantages of a great widening of the acceptable energy range without loss of sensibility, a complete stabilization of the thermal operating point, and the ability to set it arbitrarily according to optimization criteria.
This new schematic uses an active electro-thermal feedback : a heating device thermally coupled to the sensor sets the pixel temperature. When photon heat up the pixel, heating decreases in proportion so that pixel temperature remains almost constant. Measured quantity is no more the pixel temperature change, but the change of the heat dissipated by the heating.
Numerous tests on suspended pixels have been performed at 100 mK, proving the concept. A cobalt 57 source produces the signal. Experimental results and electro-thermal simulations are crosschecked. We developed an analytical model, based on block diagram analysis, to explain every parameter's influence. It shows that high resistivity TES are good candidates for very high sensibility spectro-imagers.

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

Y

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

Y

**Primary authors:** Mr JEGO, Galahad (CEA - Saclay); Dr DE LA BROÏSE, Xavier (CEA - Saclay); Dr SAUVAGEOT, Jean-Luc (CEA-Saclay); Mr COPPOLANI, Xavier (CEA-Saclay); NAVICK, Xavier-François (CEA-Saclay); Dr MARNIEROS, Stefanos (CSNSM-Orsay)

**Presenter:** Mr JEGO, Galahad (CEA - Saclay)

**Session Classification:** Poster session

**Track Classification:** Low Temperature Detector Development and Physics