Contribution ID: **81** Type: **Poster**

Thermal crosstalk measurements and simulations for X-ray microcalorimeter array

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

We have been developing superconducting transition-edge sensor (TES) microcalorimeters for a variety of potential astrophysics missions, including Athena. The X-ray Integral Field Unit (X-IFU) instrument on this mission includes a high density pixel array on a 0.275 mm pitch. This configuration induces electrical and thermal cross-talk between near-by pixels which need to be assessed. The mission requires a level of electrical cross-talk amplitude lower than 0.005 and thermal cross-talk amplitude lower than 1e-3 (first neighbor), 4e-4 (diagonal neighbor) and 8e-5 (second neighbor). In this work we describe models and measurements of thermal cross-talk in several TES arrays of different geometries. This includes studying the impact of variations in muntin width between pixels as well as geometric variations in the TES.

We have determined the thermal cross-talk levels between two pixels in various geometries by measuring the receiver TES signal triggered by 6 keV X-rays on the source TES. In order to remove the system wide electrical cross-talk from the experimental set-up, the receiver TES is measured twice, once with a positive source TES bias and once with a negative source bias. These signals are averaged over thousands of X-ray events. By comparing the cross-talk signal to the amplitude of a 6 keV pulse on the receiver TES we can determine the cross-talk fraction. Our initial measurements in recent arrays with back-side heat-sinking have shown a cross-talk fraction of 3e-4 for the first neighbor and 7e-6 for the second neighbor, a factor 3 and 10 lower than measurements on previous arrays and significantly lower than the X-IFU thermal cross-talk requirements. We have developed a 2D thermal model for the different geometries that can be used to predict thermal behavior of large scale arrays. We have compared the thermal cross-talk measure to that predicted by our 2-D thermal model.

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

Y

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

N

Primary author: Dr MINIUSSI, Antoine, R (NASA/GSFC - UMBC)

Co-authors: Dr ADAMS, Joseph S. (NASA-GSFC / UMBC); Dr BANDLER, Simon, R. (NASA-GSFC); Ms BEAUMONT, Sophie (NASA-GSFC / UMBC); CHANG, Meng-Ping (NASA GSFC / SSAI); Dr CHERVENAK, James, A.; Dr FINKBEINER, Fred, M. (NASA-GSFC / Sigma Space Corp.); HA, Jong Yoon (NASA GSFC/ SB Microsystems); Dr HUMMATOV, Ruslan (NASA-GSFC / UMBC); Dr KELLEY, Richard, L (NASA-GSFC); Dr KILBOURNE, Caroline (NASA-GSFC); Dr PORTER, Frederick, S. (NASA-GSFC); Dr SADLEIR, John, E. (NASA-GSFC); Dr SAKAI, Kazuhiro (NASA-GSFC / UMBC); Dr SMITH, Stephen, J. (NASA-GSFC / UMBC); Dr WAKEHAM, Nicholas, A. (NASA-GSFC / UMBC); Dr WASSELL, Edward, J. (NASA-GSFC / SSAI)

Presenter: Dr MINIUSSI, Antoine, R (NASA/GSFC - UMBC)

Session Classification: Poster session

Track Classification: Low Temperature Detector Development and Physics