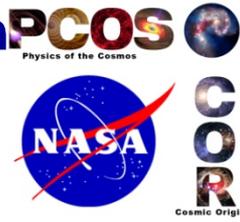


Demonstrating Enabling Technologies for the High-Resolution Imaging Spectrometer of the Next NASA X-ray Mission



PI: Caroline Kilbourne NASA/GSFC



Objectives and Key Challenges:

- Developing large-format arrays of X-ray microcalorimeters & read-out, enabling next generation of high-resolution X-ray imaging spectrometers for astrophysics.
- Advance TRL of the key components of an X-ray microcalorimeter imaging spectrometer from TRL-4 to TRL-5, and to advance a number of important related technologies to at least TRL-4.

Significance of Work:

- Demonstrate multiplexed (3 columns x 32 rows) read-out of 96 different flight-like pixels on a 0.25 mm pitch in a 32x32 (or greater) array with > 95% of pixels achieving better than 3-eV resolution at 6 keV.

Approach:

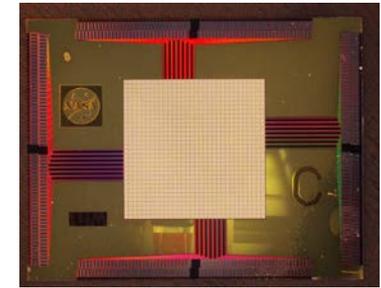
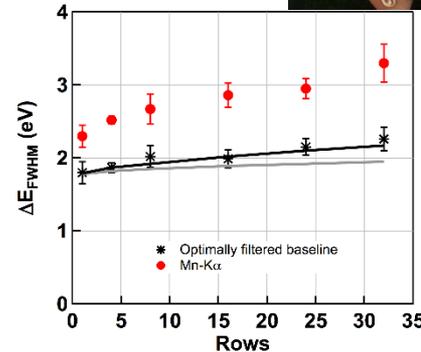
- Mo/Au TES thermometers with close-packed Bi/ Au thermalizing x-ray absorbers on a 0.25 mm pitch. Time-division multiplexed read-out.
- For point source array, fine-pitch (0.075 mm) pixels with Au absorbers.

Key Collaborators:

- Joel Ullom, Randy Doriese, Carl Reintsema – NIST
- Kent Irwin – Stanford
- Joseph Adams, Simon Bandler, Richard Kelley, Scott Porter, Stephen Smith - GSFC

Current Funded Period of Performance:

- October 1, 2012 – September 30, 2015
 - Program initially funded as 2-year program, rescheduled as 3-year program due to key participants' involvement with Astro-H



Energy resolution at 6 keV in 32 x 32 array with TDM multiplexed read-out of different numbers of rows.

Recent Accomplishments:

- High-resolution spectroscopic capability demonstrated when reading out kilo-pixel array with two multiplexed columns from the array, each of which is multiplexing the read-out of 16 pixels (2/2014).
- Increased speed of read-out amplifier and digital feedback electronics, close to fulfilling the target specifications (12/2014).

Next Milestones:

- Will demonstrate 3x32 multiplexed read-out of standard pixels, and also multiplexed read-out of Hydras and small-pitch pixels (3/2015 – 9/2015).

Application:

- Potential contribution to the X-ray Integral Field Unit Instrument on ATHENA (Advanced Telescope for High Energy Astrophysics)
- Japanese mission such as DIOS, or X-ray mission as follow-on to ASTRO-H.

TRL_{in} = 4 TRL_{current est. by PI} = 4.5 TRL_{target} = 5