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TES pixel optimization for the ATHENA X-IFU instrument

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The Advanced Telescope for High ENergy Astrophysics (ATHENA) will include the X-ray Integral Field Unit instrument (X-IFU). This instrument is baselined with an array of 3,168 transition-edge sensor (TES) pixels made with Mo/Au bilayers that will be AC biased and Frequency-Division Mutliplexed (FDM). Over the last few years, there has been intense effort at NASA/GSFC and SRON to better understand and optimize the pixel design to meet the requirements of X-IFU. This has included investigation of the effect of TES design on transition shape and uniformity, noise, eddy-current losses, AC Josephson effects, and spectral resolution over a broad range of incident energy. Through this understanding we have been able to achieve ground-breaking performance under AC bias. In this presentation, we will discuss the important physical effects in the TES, and describe how they are driving the choice of TES parameters (size, aspect ratio, thermal conductance, resistance, heat capacity etc.) that are being considered for X-IFU. We will also discuss the latest measurements of NASA TES devices and how they are further improving our understanding of the relevant physics in the TES. This will include our advances in modeling the TES as multiple thermal bodies, and how the design of X-ray absorber attachments may influence TES performance.

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

N

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

N

Primary authors: Dr WAKEHAM, Nicholas, A. (NASA-GSFC / UMBC); Dr ADAMS, Joseph S. (NASA-GSFC / UMBC); AKAMATSU, Hiroki (Netherlands Institute for Space Research); Dr BANDLER, Simon, R. (NASA-GSFC); BEAUMONT, Sophie (NASA Goddard Space Flight Center / UMBC); CHANG, Meng-Ping (NASA GSFC / SSAI); Dr CHERVENAK, James, A.; DATESMAN, Aaron (NASA Goddard space flight center / Science Systems and Applications, Inc.); ECKART, Megan (Lawrence Livermore National Laboratory); Dr FINKBEINER, Fred, M. (NASA-GSFC / Sigma Space Corp.); GOTTARDI, Luciano (SRON - Netherlands Institute for Space Research); HA, Jong Yoon (NASA GSFC/ SB Microsystems); Dr HUMMATOV, Ruslan (NASA-GSFC / UMBC); JACKSON, Brian (Netherlands Institute for Space Research); Dr KELLEY, Richard, L (NASA-GSFC); Dr KILBOURNE, Caroline (NASA-GSFC); VAN DER KUUR, Jan (Netherlands Institute for Space Research); Dr MINIUSSI, Antoine, R (NASA/GSFC - UMBC); Dr PORTER, Frederick, S. (NASA-GSFC); Dr SADLEIR, John, E. (NASA-GSFC); SAKAI, Kazuhiro (NASA/GSFC); SMITH, Stephen (NASA GSFC / UMBC); Dr WASSELL, Edward, J. (NASA-GSFC / SSAI)

Presenter: Dr WAKEHAM, Nicholas, A. (NASA-GSFC / UMBC)

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