

Image analysis and correction for Soft X-ray Telescopes and Ground Instrumentation

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Description:

Soft X-rays are a crucial tool for studying our universe, whether observing gamma ray bursts or excitations in a high temperature superconductor. One instrument harnessing this range of the electromagnetic spectrum is the Soft X-ray Imager (SXI) instrument to be launched on the joint European Space Agency and Chinese Academy of Sciences SMILE spacecraft [1]. SXI will monitor soft X-rays (200 eV to 2 keV) emitted by the interaction of solar particles with the Earth's magnetosphere to study the dynamic effects of solar weather. The detectors for SXI are the largest area Charge-Coupled Devices ever to be launched on an X-ray focal plane (larger than 8 cm x 8 cm each!) [2], and have been optimised for their life in the harsh radiation environment of space.

At the Open University in the Centre for Electronic Imaging, we are calibrating the SXI detectors ready for launch, testing them to understand how their performance will degrade whilst in space, and optimising algorithms that will process their image data on-board and on-ground. During this PhD, the successful candidate will work alongside the local SMILE team and receive training to design experiments and operate devices in our labs and external test facilities. This PhD's research area will focus on developing and testing algorithms to better extract information about each X-ray photon detected, and to study methods that will be applied to correct for damage caused by radiation in space. The research will be applicable to SMILE SXI, as well as other soft X-ray instruments operating on the ground or in space.

The successful candidate will join a multidisciplinary research group in the Space Instrumentation discipline at The Open University. The Centre for Electronic Imaging (www.open.ac.uk/cei) is a research centre with a 15 year history of collaboration with the world-leading scientific imaging company Teledyne-e2v. We work in international collaborations on the next generation of imaging sensors for upcoming space missions, and specialise in optimising their performance in the space environment, having worked with ESA and NASA on sensors for Gaia, JUICE, Euclid and the Roman Space Telescope.

References:

1. W. Raab, et al., "SMILE: a joint ESA/CAS mission to investigate the interaction between the solar wind and Earth's magnetosphere," (2016), Proc. SPIE, 990502, <https://doi.org/10.1117/12.2231984>.
2. M.R. Soman, et al., "The SMILE Soft X-ray Imager (SXI) CCD design and development," (2018), JINST, 13, C01022, <https://doi.org/10.1088/1748-0221/13/01/C01022>.

Qualifications required: A first class or upper second class MSc/BSc degree in a STEM degree is required (e.g. Physics, Electronic Engineering, Data Science).