**STFC funded PhD Project**

**Reference:** STFC-Lapington

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**Project Title:** Construction and Characterization of the SST Camera for the Cherenkov Telescope Array Gamma Ray Observatory

**Project Description**

Some of the most energetic phenomena and enigmatic objects in the universe, including active galactic nuclei, black holes, pulsars, binary systems or supernovae, can produce very high energy (VHE) gamma rays that carry unique information about their sources. Astronomy at these extreme gamma ray energies in the TeV range has only been possible within the last 25 years owing to the development of imaging air Cherenkov telescopes such as HESS, MAGIC and VERITAS. The successor to these instruments, currently under construction, is the Cherenkov Telescope Array (CTA). CTA, with its vast arrays of more than one hundred 4m to 23m telescopes on two sites in the Canary Islands and Chile respectively, will improve the sensitivity and energy coverage by over an order of magnitude compared with existing instruments and the small-sized telescope (SST) array will provide the first ever view of the sky above 100 TeV. CTA will also provide enhanced angular and energy resolution, yielding unparalleled imaging capability at very high energies.

The University of Leicester leads the UK CTA consortium which also comprises the Universities of Durham, Liverpool and Oxford, as well as the Armagh Observatory and Planetarium. The UK group has been responsible for developing the prototype of the photon-counting focal plane camera for the SST, a 32x 32cm2 array of 2048 silicon photomultipliers able to detect and accurately measure the faint but very fast Cherenkov light flash produced from a very high energy gamma interacting in the atmosphere, many kilometres above the ground.

The production phase of the SST programme, beginning in 2022, and will involve the manufacture, assembly, and verification of the 30+ SST cameras across 2 sites: the Max Planck Institute for Nuclear Physics in Heidelberg and the Space research Centre at the University of Leicester.

For this project you will work within the camera development team. Your research will involve characterising the SST camera detector and electronics subsystems, developing analysis and control software, and will progress towards optimising the production version camera. You will help to develop and refine techniques for the assembly, test and verification of camera and all subsystems. Working closely with our European partners on both laboratory and on-telescope verification campaigns you will develop the necessary expertise ready for the installation and commissioning of the first SST cameras at CTA-South.

This project will give you an excellent grounding and a wealth of experience in state-of-the-art instrumentation for a major international gamma-ray astronomy facility. The first-light data from the instrument will also provide you with the opportunity to be involved in the delivery of early science results from CTA.

**References**

* The Cherenkov Telescope Array, <https://www.cta-observatory.org/>
* Science with the Cherenkov Telescope Array, <https://arxiv.org/abs/1709.07997>
* CHEC-S Camera Achieves First Light on the ASTRI-Horn Telescope,
<https://www.cta-observatory.org/chec-achieves-first-light-on-astri/>
* The Small-Sized Telescopes for the Southern Site of the Cherenkov Telescope Array, <https://pos.sissa.it/395/728/pdf>
* CHEC: a Compact High Energy Camera for the Cherenkov Telescope Array, <https://iopscience.iop.org/article/10.1088/1748-0221/12/12/C12059/pdf>