**University of Leicester**

**Future 50 PhD Scholarship**

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| **Project Reference** | PHYS O’Brien |

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| **First Supervisor** | Prof. Paul O’Brien | | |
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| **Additional Supervisor** | Dr. Phil Evans |

**Section 2 – *Project Information***

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| **Project Title** | The physics of Gamma-Ray Bursts and multi-messenger sources unveiled by the SVOM and Einstein Probe satellites | |
| **Project Highlights:** | 1. | Unique UK access to two new space missions, SVOM and Einstein Probe, due for launch in 2023. |
| 2. | Identify and characterise a new sample of Gamma-ray Bursts |
| 3. | Identify electromagnetic counterparts to multi-messenger sources |
| **Project Summary** | | |
| Gamma-Ray Bursts are the most powerful sources of electromagnetic energy known in the universe. They are also related to other transients, most notably as potential counterparts of gravitational wave sources. The electromagnetic discovery space is about to expand dramatically thanks to the availability of two new powerful space missions called SVOM and Einstein Probe. These missions are both due for launch in the second half of 2023, at the start of the PhD. Professor Paul O’Brien, the first supervisor of this PhD, has unique UK investigator status on both missions, with full data rights to the proprietary surveys (he is a Co-investigator on SVOM and the ESA appointed scientist on Einstein Probe). The student will have access to these data and to complementary data from other facilities.  This PhD is to exploit observational data from SVOM and Einstein Probe, and multiple related facilities, to constrain the multi-wavelength properties of GRBs and to investigate the properties of multi-messenger sources. In particular, this PhD project will exploit the power of the missions to: (a) probe the early emission from GRBs, constraining the emission process, the production of flares and the relation between the observed emission and the central engine; and (b) search for counterparts to gravitational-wave sources using the extremely wide-field soft X-ray survey capability of Einstein Probe and the multi-wavelength capability of SVOM.  At Leicester we strive to characterize the transient universe by undertaking coordinated searches for electromagnetic counterparts to new transient events by using many ground and space observatories observing across the entire electromagnetic spectrum. Although primarily an observational project, there will be ample scope during the PhD to fit theoretical models to the data. The students will also the opportunity to interact with the mission teams, who conduct the real-time operations. The ability to work with people who designed and built the observing facilities, developed the data processing software, construct theoretical models and interpret the results provides the ideal environment for rapid progress. | | |