Timing studies of potential ARIEL targets

Supervision team:

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Description:

The ESA M4 mission ARIEL, due for launch in 2029, will conduct the first chemical survey of a large and representative sample of exoplanets, to investigate what exoplanets are made of, how planets and planetary systems form, and how planets and their atmospheres evolve over time (Tinetti et al 2018, Puig et al 2018). Preparatory work to select ARIEL's Tier 1 sample of about 1000 targets from the large number of known transiting exoplanets is under way (Edwards et al 2019) and will intensify over the next years. This includes the long-term monitoring of known exoplanet systems to establish precise ephemerides and transit timing variations, and study the photometric behaviour of the host star. This large effort is shared across the globe and coordinated by the ExoClock project (Kokori et al 2020; https://www.exoclock.space/). Small-aperture robotic telescopes play a vital role in progressing the sample characterisation, and this PhD project is designed to further develop the Open University's OpenScience Observatories (Kolb 2018, Salisbury et al 2021) and place it at the forefront of this campaign. The Open University has recently invested in a hardware upgrade of its Tenerife observatory, with the new 24 inch optical tube assembly already on site awaiting installation. The facility will be transformed into a state-of-the art twin robotic system with a 24 inch and 17 inch telescope for high-precision photometry.

The PhD student will contribute to the commissioning of the 24 inch facility for high-precision photometry, adapt the existing Python-base photometric pipeline to the exoplanet context, following the approach taken by Salisbury et al (2020), and engage with ExoClock to optimise target selection and characterization efforts.

References:

1. Edwards, B., Mugnai, L., Tinetti, G., Pascale, E., Sarkar, S. 2019. An Updated Study of Potential Targets for Ariel. The Astronomical Journal 157. doi:10.3847/1538-3881/ab1cb9
2. Kolb, U., Brodeur, M., Braithwaite, N., Minocha, S. 2018. A robotic telescope for university-level distance teaching. Robotic Telescope, Student Research and Education Proceedings 1, 127–136.
3. Kokori A, et al 2020, presentation at EPSC 2020, https://www.exoclock.space/epsc2020_splinter
4. Puig, L. and 17 colleagues 2018. The Phase A study of the ESA M4 mission candidate ARIEL. Experimental Astronomy 46, 211–239. doi:10.1007/s10686-018-9604-3

5. Salisbury, M.A., Kolb, U.C., Norton, A.J., Haswell, C.A. 2021. Monitoring of transiting exoplanets and their host stars with small aperture telescopes. New Astronomy 83. doi:10.1016/j.newast.2020.101477
6. Tinetti, G. and 243 colleagues 2018. A chemical survey of exoplanets with ARIEL. Experimental Astronomy 46, 135–209. doi:10.1007/s10686-018-9598-x

Qualifications required:

A first class or upper second class BSc or MPhys/MSci degree in physics or astrophysics. Experience and competence with computer programming (including with Python) and photometry in observational astronomy will be advantageous.