

Title: Modelling of the Performance of the exo-planet characterising satellite ARIEL.

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Estimated start date: October 2020

Duration: 3.5 Years

Proposed research.

To date there are in excess of three thousand confirmed exoplanets and two thousand more awaiting confirmation, with many more to come thanks to ongoing (TESS, CHEOPS) and upcoming (PLATO) missions. To truly understand and characterize these planets, ARIEL, another satellite due to launch in 2028, will perform transit spectroscopy of a set of such planets to establish their atmospheric composition.

This ESA mission combines two instruments ranging from the visible to mid-infrared wavelengths, with the shorter wavelengths also having the dual purpose of aiding in fine tuning the spacecraft pointing. Its operation in the Sun-Earth second lagrangian point combined with low temperature operation and stable pointing requirements provide a set of challenges for a spectrometer. These are being addressed by an international consortium of 17 countries, producing a design for a satellite payload which will perform spectroscopy of approximately 1000 exoplanets in a four year mission. Even so, detailed modelling of the payload performance and its relation to the spacecraft pointing will be key to make sure that maximum information and efficiency can be extracted from the ARIEL data once it is launched.

The project proposed here is centred on the detailed optical modelling (with a good understanding of the underlying thermal aspects) of the satellite and its relation to the expected pointing performance of the spacecraft and how these affect the scientific output of ARIEL instruments throughout the mission.

Depending on the interest of the student and their capabilities, the project will engage (and is not restrictive to) a number of the following activities:

- **Build of simulation tools to predicted the behaviour of specific hardware elements**
- **Optical (and/or) thermal modelling of instrument**
- **Analysis of the satellite AOCS expected performance in relation to payload**
- **Instrument performance modelling**

and in case, be prepared to take part in hardware testing activities.