Searching for Fast Radio Burst counterparts with the Transiting Exoplanet Survey Satellite (TESS)

Research Field
Radio Astronomy

Project Suitability

Honours or 3rd Year project or short term intern or vacation student

Project Supervisor
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Co-Supervisors

Fast Radio Bursts (FRBs) are very short timescale and powerful bursts of radio emission that originate from distant galaxies. Thousands occur per day, but they occur randomly on the sky. Therefore, very wide field and sensitive radio telescopes are required to detect them and localise the radio emission to a particular galaxy. The CIRA FRB group is leading the world in this research, using the ASKAP radio telescope.

The project offered here is motivated by the need to localise FRBs and, in a stretch goal, examine their emission at wavelengths other than radio. This represents a huge challenge in that one requires a second telescope to observe the same patch of sky at the same time as a radio telescope doing an FRB search when it finds an FRB. This very rarely happens.

However, the Transiting Exoplanet Survey Satellite (TESS), which is designed to detect exoplanet eclipses, has optical cameras that cover a very large fraction of the celestial sphere. This means that when radio telescopes detect FRBs, there is a reasonable chance that TESS was looking in the right direction at the right time.

In this project, we will utilise the ensemble of historical FRB detections and TESS data to search for the simultaneous optical counterparts for FRBs, aiming to put the very first constraints on simultaneous optical and radio emission from FRBs and perhaps localising previously unlocalised FRBs, identifying their host galaxies.

Aims of project:

(i) Analyse the historical FRB database and identify FRBs for which simultaneous TESS data exist;

(ii) Obtain TESS data from the archive, process the data, and perform a search for optical emission coincident with the FRB (in time and position on the sky);

(iii) Write a short paper with the results for publication in an international journal.

The Transiting Exoplanet Survey Satellite (TESS), whose data will be used for this project.