

Novel imaging over wide fields at high cadence: searching for the optical emission from Fast Radio Bursts

Fast Radio Bursts (FRBs) have emerged over the last decade as one of the most enigmatic and interesting discoveries in astrophysics. The millisecond bursts of radio emission have been detected from cosmological distances. An international race between radio telescopes is on in earnest to uncover the physics driving FRBs, as well as to utilise them as probes of cosmology and the Intergalactic Medium (IGM).

FRBs occur at random times and locations on the celestial sphere, so they are challenging to detect and localise, requiring very sensitive and very wide field of view radio telescopes operating at sub-millisecond time resolution. At CIRA, researchers using ASKAP and the MWA are at the forefront of this research.

However, one of the keys to understanding the physics behind FRBs lies in characterising their emission at wavelengths other than radio. Multi-wavelength observations of FRBs will likely provide fundamental insights into their nature, including at optical wavelengths. However, catching an FRB at optical wavelengths is orders of magnitude more difficult than at radio wavelengths, due to the characteristic limitations involved in wide field optical imaging at very high cadence.

This project will develop a novel approach to high cadence, wide field imaging at optical wavelengths, utilising inexpensive off the shelf hardware, in order to undertake a large area survey for any optical emission associated with FRBs.

The aims of the project are:

- (i) Examine the details of the technical approach, in terms of sky coverage, time resolution, sensitivity, and other parameters, in order to optimise a hardware design for astrophysical performance;
- (ii) Develop prototype hardware with which to execute a pilot survey for optical emission from FRBs;
- (iii) Analyse and publish the results from the pilot survey before finalising the design of a full system and executing a full survey;
- (iv) Analyse and publish the results of the full survey.

Research Field

Multi-wavelength astronomy
and instrumentation

Project Suitability

PhD or Masters
Honours (as appropriate)

Project Supervisor

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