

EoR foreground mitigation with the CRAM

Bright radio galaxies near to the horizon imprint contaminating structure in datasets for the Epoch of Reionisation experiment with the Murchison Widefield Array (MWA). The EoR experiment aims to measure fluctuations in the neutral hydrogen brightness temperature from the first billion years of the Universe. This exceptionally weak signal is masked by foreground radio galaxies and Milky Way Galaxy, which are orders of magnitude brighter.

The CRAM-tile (Central Redundant Array Mega-tile) is a new large MWA tile (8x8 dipoles) that sits within the centre of one of the redundant sub-arrays of the MWA (4x4 dipoles). Its size means that it measures the sky with a smaller primary beam size compared with the normal MWA tiles. This project will use data from the CRAM to help develop foreground removal techniques for the MWA EoR program, using simultaneous data acquisition on redundant MWA-MWA and MWA-CRAM baselines.

Research Field

Radio Astronomy/Engineering

Project Suitability

Masters/PhD

Honours

Project Supervisor

A/Prof Cathryn Trott

Co-Supervisors

A/Prof Randall Wayth

Dr Jack Line

Aims of project (dependent on length of program)

- (i) Characterise the CRAM tile primary beam response
- (ii) Compare observations from redundant MWA-MWA and MWA-CRAM baselines
- (iii) design and test methods for using the datasets to remove contaminating signal from the MWA EoR data.

This project can be tailored for single year (Honours) to three-year (PhD) programs, and would suit a student with interest in signal processing, data analysis and computing.

CRAM tile, installed in 2018-2019 at the Murchison Radio-astronomy Observatory (credit: A. McPhail)

