Advances in Antenna Array Theory

The Square Kilometre Array (SKA) project is an international effort to build the world's largest radio telescope, with eventually over a square kilometre (one million square metres) of collecting area. SKA-LOW, the low frequency component of the Square Kilometre Array radio telescopes, will be deployed on the Murchison Radio-astronomy Observatory (MRO) in Western Australia. Our engineering team is currently working on the analysis and simulation of this pioneering system. It will consist of a large array of essentially dipole-like radiators, clustered into "stations" of 256 antennas.

Research Field
Engineering

Project Suitability
PhD

Project Supervisor
Prof David Davidson
david.davidson@curtin.edu.au

Co-Supervisors
Dr Adrian Sutinjo (TBC)

Contemporary array theory leverages computational electromagnetic simulation, in particular generating embedded element patterns, from which key system parameters can be evaluated, determining the efficacy of the system. Additionally, these patterns may be required for regular system calibration. The accuracy of the computation of these patterns has never been comprehensively investigated, and this is a key component of this research project, with a particular focus on the impact thereof on radio telescopes comprising aperture arrays.

The key aim of this project is to advance methods for evaluating and ensuring the accuracy and reliability of CEM simulations, in particular for array simulations and SKA-Low. This will be achieved through a combination of numerical experimentation, mathematical analysis and experimental validation.

Figure 1: The AAVS1 prototype on the MRO. (Photo: DB Davidson).