Metasurfaces for radio telescopes

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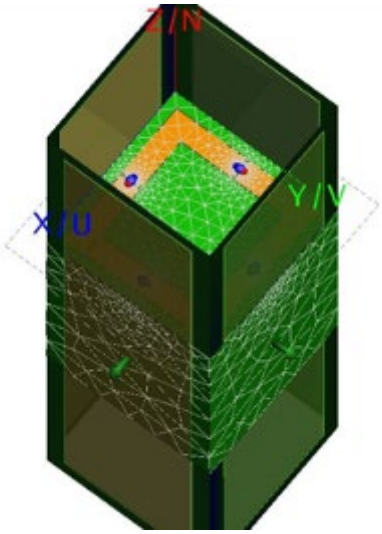
Description:
Current and planned low-frequency radio telescopes, such as the Square Kilometre Array-Low, consist of arrays of wideband dipole antennas, packed in quite close proximity to one another. This results in strong mutual coupling between elements, which complicates analysis and design and potentially degrades telescope performance.

Metamaterials are artificially engineered materials which provide novel electromagnetic characteristics. Metasurfaces are two-dimensional implementations of metamaterials. The aim of this project is to investigate the use of metasurfaces to form effective screens between antennas in an array, reducing this inter-antenna coupling and thus enhancing performance of low-frequency radio telescopes. The project will leverage computational electromagnetic simulation tools and optimisation methods to design optimal screens.

The project is best suited to students with a background in electrical/electronic engineering, and an interest in antenna theory. Beyond radio astronomy, arrays are widely used in telecommunications, 5G and 6G, defence and space applications, and the student will master a wide variety of industry-related skills.



Caption: A metasurface simulation. (Credit: Maria Kovaleva/Liam Ryan, Curtin).

Subgroup: E2