

Section A: Overview of the Research Project Proposal

1. Academic level of research project

Masters

2. Broad field of research

Engineering

3. Title of the research project

Two Element Interferometer Demonstrator

4. Full Names of Supervisor and Co-Supervisor

Dirk Izak Leon de Villiers

5. University where postgraduate student would be registered

Stellenbosch University

Section B: Research Project Proposal

1. Scientific merit:

As this is a Masters level project, it is not expected that any new research questions be addressed. Rather, the project will be used as an opportunity to train the candidate in several important aspects of the design of radio interferometers. Given the current status of the MeerKAT and SKA projects in South Africa, it is important that engineers be trained who understand the details of how radio interferometers work – from the antennas, through the radio receivers, to the digital signal processing required to extract information from the received signals. This project will address all these aspects, since the candidate will be required to design, implement, and test the full chain of hardware and back-end software of the instrument.

2. Feasibility:

The project will follow a standard engineering design methodology, where a set of specifications will be provided, and the candidate must plan the project timeline to deliver the required system. It is foreseen that the first semester will be spent on taking advanced courses in microwave and antenna engineering, and doing a background literature study. The second semester will be broadly spent on initial design, of the system. The third semester should be used for detailed design, implementation, and initial testing, while the final semester should be spent testing the system and writing the thesis. All the required expertise in microwave and antenna system design is available in the department from the supervisor and various members of the academic staff and post-graduate students, while a full suite of testing and measurement equipment is also available in house (antenna measurement chamber, network and spectrum analysers, digital oscilloscopes and logic analysers, etc.). Furthermore, software required for the design, including a range of CEM tools, are all available in the department.

I don't foresee any difficulty in hosting the project, and expect a high probability of success.

3. SARAQ research priority area:

- Radio astronomy antennas and receiver systems (including digitisation) associated with supported and hosted instruments.

The project will not contribute to any new insight into the above priority area, but will train a student to become proficient in basic radio astronomy antenna and receiver engineering.

4. Qualifications, academic abilities, skills and/or experience required:

The successful candidate for this project needs a Bachelors (or equivalent) degree in electronic engineering, with some high level courses in microwave and antenna engineering preferred.