

South African Square Kilometre Array Project Postgraduate Bursary Programme MEng Research Project Proposal to be considered for Bursary Funding to Commence in 2019

1. Title of Research Project: EMC Compliant Electric Fence Alternatives

2. Academic Level: M Eng

3. Supervisor's Title and Full Name: Dr Pieter Gideon Wiid

4. Co-supervisor's title and full name: Dr Johannes Matthias Straus

5. Supervisor's University: Stellenbosch University

6. Overview and Aims of the Research Project:

The aim of this research project is to investigate and propose an alternative EMC compliant solution for electric fences as used on farms around the SKA site. The final solution should provide an alternative smart animal sensing architecture, with a very low-frequency-content shock-pulse only conducted on the fence wire when a disturbance is detected.

7. Relevance of the research proposed to the priority areas of MeerKAT / SKA:

The need for all equipment RFI to comply with the SARAS and SKA Threshold levels are imperative to the project. Electric fences are a contentious issue, and alternative technologies which comply with these levels will benefit all parties. This falls in priority area 5 - Instrumentation and data analysis for Radio Frequency Interference (RFI) detection, analysis and archival.

8. Research work breakdown:

- a. Year 1: The student will conduct an in-depth literature study in the first semester of current electric fence technologies, as well as alternative technologies which could be utilised for animal sensing, including optical fibre. The second semester will include the evaluation and measurement of shock-pulse RFI and investigation into alternative solutions for the pulse generator. This semester would also involve the design of prototype alternative sensing techniques and smart system architecture.
- b. Year 2: The first semester of the year 2 will include construction and testing of proposed system designs, where the best option will be selected and further optimised for possible site testing on a Karoo farm (off the SKA main site). Measurements can then be done to determine the levels and frequency content of the RFI from the final proposed system. The dissertation writing will be done during this time as well, where the second semester will be used for the final analysis and completing the dissertation.

9. Availability of required data / access to required equipment /availability of research facilities and other resources required:

The Stellenbosch University has a shielded reverberation chamber and Rohde and Schwartz network analyser. A transient analyser system like the SKA RTA3 will be required for time domain testing as well. A 3D-printer is available at the E&E Department, if prototype parts are required. Electronic components can easily be sourced through the university as well.

10. Signature and Date



Dr Pieter Gideon Wiid

2018/08/28

Date