

## South African Radio Astronomy Observatory

### Research Project Proposals for Masters and Doctoral Research in 2020

1. All research project proposals must be submitted by a primary supervisor (see the definition of a primary supervisor in Section 1 of the Application Guide). In the case where the primary supervisor is not the research supervisor, the details of the co-supervisor, who will be responsible for supervising the research, must also be provided (as requested below).
2. Please provide the information requested below, in the order requested, and please use the same numbering, and “headings”, as below.
3. As requested in the online application form, upload Sections A to D as a single PDF document.

#### Information Required

##### 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  
**Development of a drone based signal strength verification system**
4. Full names of supervisor and co-supervisor  
**Dr Riaan Wolhuter**
5. University where postgraduate student would be registered  
**Stellenbosch University**

##### Section B: Research Project Proposal

**Maximum of three A4 pages, written for a professional who is not necessarily an expert in the relevant subfield**

1. Scientific merit: describe the objectives of the research project, placing them in the context of the current key questions and understanding of the field.  
**The accurate prediction of received signal levels for both carrier- and out of band emissions, are important for on-site SKA operations and RFI mitigation. These predictions are typically not very accurate, due to terrain variations and lack of resolution in the underlying Digital Elevation Models (DEM's). The verification and calibration of these predictions by actual measurement, have proved to be a tedious and time consuming, but very important requirement. It is proposed that a drone based system be developed to automatically measure and record the levels as received from a central repeater transmitter, along sections of road or terrain of interest. To this end, it is proposed that a VHF Low band receiver be developed using COTS components as far as possible and by applying SDR techniques to minimise actual hardware RF design. This will also allow the receiver to be compatible with the proposed SKA DMR mobile radio network and easily adaptable as far as carrier frequencies are concerned. This will be a very convenient and important tool for the SKA site operations and RFI groups.**
2. Feasibility: outline the methods that will be used to achieve the objectives. Provide details on the availability of required data / access to required equipment / availability of research facilities and other resources required. Include any relevant expected intermediate milestones and associated timeframes towards attaining the overall objectives of the project.  
**The proposed methods will entail the development of hardware and embedded software to design a small lightweight receiver for signal strength measurements. All lab and test facilities are available to achieve the objective, within the normal 2 year Masters timeframe.**
3. Link the proposed project to one or more of the SARAO research priority areas for 2020 (refer to Section 4 of the Application Guide), and explain in some detail how the proposed research will contribute to the priority area(s).  
**This mobile verification tool will increase confidence in prediction of received signal strength measurements from emissions in the general SKA area. This in turn, will enhance the predictions of RFI interference, thereby increasing statistical reliability in interpreting scientific data**
4. If relevant, describe any particular qualifications, academic abilities, skills and/or experience that a student should have in order to successfully deliver on the objectives of the research proposed.

**Good analytical and software skills, with a very competent RF hardware design capabilities.**