

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
VLBI Mobile radio RFI source modelling by means of ray tracing
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 mitigation of mobile radio sourced RFI by establishment of safe zones around existing SKA telescopes, has proved to be a very non-exact process in practice. One of the problems is to accurately model the signal propagation of the out of band harmonic mobile emissions. This is currently done using a Digital Elevation Model (DEM) of the terrain and accepted over-terrain propagation models. These do not, inter alia, take possible signal conjunction due to reflection into account and are generally not very accurate. This creates uncertainties regarding the interference cancellation techniques employed with VLBI. The objective would be the increase of the accuracy of these prediction relationships between individual telescope receivers.
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 include the use of computational platform based radio propagation tools to predict relative interference levels between telescopes, to establish a baseline. This would be refined by to be developed ray tracing techniques and subsequently verified by measurement.
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).
Reduction in 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 full understanding of EM principles as far as signal propagation is concerned