

### **Section A: Overview of the Research Project**

1. Title of the research project: Very low loss integrated notch filter antenna horn feeds
2. Broad area of research (Engineering or Science): Engineering
3. Academic level of research project (Masters or Doctoral): Master's
4. Abstract of research project: A highly integrated, very low loss, switchable notch filter is proposed for wideband horn feeds. The structure will allow for single, selectable, frequency bands to be attenuated strongly, while adding very low loss outside the notch.
5. Primary supervisor's details:
  - a. Full name of primary supervisor: Prof P Meyer
  - b. Primary supervisor's email address (please note that if this project is approved, this email address will be made available to students to contact the primary supervisor) pmeyer@sun.ac.za
  - c. University where primary supervisor is employed: Stellenbosch University
6. Co-supervisor/Research supervisor's details (if relevant):
  - a. Full name of co-supervisor/research supervisor:
  - b. University where co-supervisor/research supervisor is employed:

### **Section B: Details of Research Project**

1. Scientific/Engineering merit: describe the objectives of the research project, placing them in the context of the current key questions and understanding of the field.

With the increase in commercial spectral activity in the low GHz range, wideband radio astronomy systems are set to require mitigation solutions to reject strong commercial signals which fall within the band of the antenna. Such rejection solutions must be able to reject a selectable band of frequencies, while inserting very low loss in the bands outside of the rejection band. For the low GHz range, where wideband feed horns are a good solution, this project proposes a highly integrated, switchable, notch filter solution, with very low loss. Switchable technology will be used instead of varactor based analog tuning, as the latter typically have very high losses.

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 feasibility of switchable, very low loss notch filters, have been proven recently in a current project at Stellenbosch University, in the low VHF range. The project will require good computer infra-structure, state-of-the-art electromagnetic analysis tools, and antenna measurement facilities, all of which are available at Stellenbosch. The project will take place in two stages, each roughly 10 months in length, and a final 4 months to complete the thesis and papers. Stage 1 will be the development of a switched solution in the low GHz range, stage 2 the integration with a quad-ridge horn feed, manufacturing, and testing.

3. Link the proposed project to one or more of the SARAO research priority areas for 2021 (refer to Section 5 of the Application Guide), and explain in some detail how the proposed research will contribute to the priority area(s).

Wideband feed horn systems. Currently, selectable notch filter architectures in these bands are much too lossy to use in radio astronomy applications.

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 microwave and antenna knowledge.