University of Pretoria students support the MeerKAT/SKA initiative

The Carl and Emily Fuchs Institute for Microelectronics (CEFIM) in the University of Pretoria's Department of Electrical, Electronic and Computer (EEC) Engineering has pioneered microelectronics research (both at electron device level and at circuits/systems level) in South Africa over the past 30 years. It is the home of the Electronics and Microelectronics Research Group, where radio frequency (RF) and mm-Wave integrated circuit (IC) design has emerged prominently as a research focus area over the past 10 years.

Students in electrical, electronic and computer engineering, supported through SKA scholarships, pay a visit to the site of the MeerKAT telescope.

SKA scholarships

A project team from the University's Department of EEC Engineering is involved in research relating to technologies and systems for the MeerKAT telescope, which forms part of the Square Kilometre Array (SKA) Project. Seven undergraduate and postgraduate students are supported through SKA scholarships. A PhD project seeks to integrate a differential low-noise amplifier, using an SiGe technology node, which is aimed at delivering for sensitive SKA receivers. These projects of the Electronics and Microelectronics Research Group are under the leadership of Prof Saurabh Sinha, Director of CEFIM.

Because the telescope that is being developed as part of this project will be a radio telescope, making pictures from radio waves instead of light waves, the research conducted will be able to make an important contribution to this world-class project.

Providing a cost-effective solution

Due to the number of front-end receiver arrays anticipated for the SKA Project, the research team aims to develop an IC-based solution, which will be cost-effective. It is envisaged that the SKA Project will require tens of thousands of focal-plane arrays, where the total number of front-end receiver chipsets could range from hundreds to thousands. This calls for an integrated solution, which will reduce the cost of each receiver array. To validate the research findings, CEFIM is also equipped with on-wafer measurement capabilities, supported by vector network analysis capabilities up to 110 GHz.

The research team therefore aims to address a number of innovative concepts relating to IC receivers in the nominal mid-band SKA RF range, such as ultra low-noise amplifier development, variable gain control, improved I/Q phase and amplitude mismatch, instrumentation or mixed-signal IC design and the identification of model parameters that influence circuit performance.