Level of the project: MSc
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Co-Supervisor: Nadeem Oozeer
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Institution: South African Radio Astronomy Observatory (SARAO)
Project Title: *Multi-wavelength Investigation of a Giant Radio Galaxy with a peculiar Outflow*

Project Description:
Giant radio galaxies (GRGs) are some of the most energetic and spectacular phenomena in the universe. They are extreme cases of extended radio emission, with projected linear sizes > 0.7 Mpc. The largest GRG ever discovered has a projected linear size of 7 Mpc, which exceeds the suggested growth limit of about 5 Mpc for GRGs. The reason why these objects can grow to be this large remains a mystery.

One of the hypotheses that has been proposed to explain the exceptionally large sizes of GRGs is that these objects could be very old radio galaxies (RGs) which have had sufficient time to expand over large distances (Subrahmanyan et al. 1996). To test this hypothesis, studies to investigate the age of the emitting electrons, which are not numerous for these sources, have to be done.

The student who takes up this project will carry out a multi-wavelength investigation to reveal the spectral properties and age of the GRG. They will also investigate the origin of a perculiar outflow that is observed in this source. The student will work with the radio data of the GRG which were obtained using the Giant Metre Radio Telescope (GMRT) at two radio frequencies which are 325 MHz and 610 MHz. They will also analyse the MeerKAT (and possibly ALMA) and archival data of this source to unveil the mystery around the outflow that is observed in the low resolution GMRT image data.

Some of the specific tasks the student will perform include:

➢ synthesis imaging: production of high quality radio images at 325 MHz, 610 MHz and 1280 MHz.

➢ producing a spectrum to characterise the radio source and doing spectral analysis.

➢ determining the spectral age of the GRG.

Required Skills:

➢ Good Python programming skill

➢ Computing experience in the Unix/Linux environment

➢ Some exposure to software and analysis tools (e.g. ds9, CASA etc.) would be an added advantage.