

Search for non-thermal radio emission in planetary nebulae

Planetary Nebulae are one of the final stages of the evolution of stars similar to the Sun. They are characterized by photoionization of their circumstellar material by a hot central star. The ionized gas emits thermal free-free radiation at radio wavelengths, with a characteristic brightness distribution as a function of frequency (they tend to be brighter at high frequency). In other types of astronomical objects (e.g., active galactic nuclei), energetic physical processes and magnetic fields result in non-thermal radio emission, which tends to be brighter at low frequency. So far, there is no unambiguous detection of non-thermal radio emission reported in planetary nebulae, although it is expected to exist.

The goal for this project is to search for evidences of this emission in planetary nebulae.

The student will carry out the following tasks:

1. Bibliographic search, to identify candidate planetary nebulae that may host non-thermal emission.
2. Search in archives of leading radio interferometers, for public-access data that include the candidate sources within their field of view.
3. Downloading, quality assessment, calibration, and imaging of these data, using standard radio astronomical software for radio interferometry (AIPS, Miriad)
5. Optionally: redo data reduction in point #3 for some selected sources, but using the new CASA software. Compare the results and assess the most efficient way to carry out data reduction, with possible automatization by developing CASA scripts specially tailored for these data.
4. Detailed analysis of the resulting images at different frequencies and epochs, to determine the presence of non-thermal emission.

This work may result in a journal publication and/or the submission of an observing proposal for a radio telescope.