Contribution ID: **65** Type: **Contributed Talk**

Multi-wavelength Study of Radio Galaxies in MeerKAT fields

Tuesday 11 October 2022 12:45 (15 minutes)

Radio galaxies are galaxies with an active nucleus (AGN = active galactic nucleus), harboring a super-massive black hole, powering relativistic beams (jets) of particles that extend over thousands of light years into intergalactic space (see, e.g., Boettcher, Harris & Krawczynski, 2012, for an introductory text book). While bright radio emission produced in the jets and their termination regions is the defining signature of radio galaxies, the jets are known to emit across the electromagnetic spectrum, including X-rays and gamma-rays, with a handful of them even detected at very-high-energy (VHE, > 100 GeV) gamma-rays by ground-based atmospheric Cherenkov Telescopes (e.g., Cen A: H.ES.S. Collaboration 2009, 2018; M87: VERITAS Collaboration 2008, 2012). A comprehensive multi-wavelength approach is therefore necessary to understand the physics of these jets and their interaction with the intergalactic medium.

Most gamma-ray detected AGN belong to the sub-class of blazars, in which one of the jets points close to the line of sight towards Earth, leading to relativistic Doppler boosting. In such a configuration, it is usually impossible to spatially resolve the inner jet region to identify the dominant site(s) of particle acceleration. Radio galaxies, on the other hand, offer a side-on view of the jet, where a spatially resolved study is much more feasible. The proposed project therefore aims at identifying well resolved radio galaxy jets in MeerKAT images and probing spatially resolved multi-wavelength spectral features.

MeerKAT has observed a number of fields in some PI projects, and with the field of view of 2.7 deg2 corresponding to about 9 full moons arranged in a 3 x 3 grid, a large number of sources (outside the primary targets of the PIs), including many radio galaxies, are covered. Among these sources are radio galaxies showing interesting morphologies. With the ultra-high sensitivity of MeerKAT, new detections of faint radio galaxies abound in these fields.

The aim will be to (a) identify potentially interesting objects within the available MeerKAT fields for further study, based primarily on their radio morphology; (b) assemble available archival multi-wavelength data, including infrared, optical, and X-ray surveys as well as data from the Fermi Gamma-Ray Space Telescope; (c) build multi-wavelengths spectral energy distributions for those sources for which sufficient multi-wavelength coverage exists; and (d) interpret them in the framework of AGN jet emission models to diagnose the physical properties of the jets and their environments.

Track

AGN

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Session Classification: Plenary 4