

Non-thermal filamentary emission in radio galaxies

Abstract

High spatial resolution and sensitivity observations of radio galaxies with new-generation radio telescopes begin to reveal complex filamentary structures in their surroundings, with Nest200047 possibly being the most striking case. The origin and underlying physical mechanism producing this filamentary emission are still unknown. Filaments could be produced by the interaction of the magnetic fields of the radio lobes with the magneto-ionic intracluster medium, or by plasma escaping from jets due to Kelvin-Helmholtz instabilities, or finally represent regions where old AGN remnant plasma gets compressed under the influence of cluster weather. To understand the properties and origin of these newly-detected features it is essential now to study them in more detail.

Here, we propose 51h of MeerKAT time in U and L band to study a representative sample of five radio galaxies all showing evidence of surrounding filamentary emission. With our proposed observations we will: (1) obtain continuum radio maps to study the filament morphology and probe the presence of surrounding diffuse emission, (2) constrain their spectral properties by detailed spectral index and curvature mapping, (3) search for polarised emission and probe the magnetic field properties via Faraday analysis. Overall, this will be the first targeted high-frequency, high-resolution study of filamentary structures associated to radio galaxies and will be of great importance to confront competing models currently proposed for their origin.