

Using MeerKAT UHF to Bridge the Gap in Abell 2443

Abstract

Galaxy cluster mergers drive shocks and turbulence into the intracluster medium (ICM) and are thought to accelerate or re-accelerate relativistic particles and compress magnetic fields in the ICM. Merging clusters are often host to large diffuse central radio halos or peripheral radio relics and a handful host ultra steep spectrum ($\alpha < -1.5$) radio relics. While the connection of these regions of diffuse radio emission to clusters undergoing mergers is clear, the acceleration mechanism, particularly for the USS relics, is still uncertain and may require a seed population of relativistic particles for re-acceleration. We propose MeerKAT UHF observations of a dynamically complex, merging cluster hosting an USS relic with the goal of bridging the gap between spectral studies of young and old particle populations. The proposed observations of this target will enable one of the first studies of diffuse cluster emission with nearly continuous frequency coverage at roughly matched spatial resolution from 1.0 GHz down to 240 MHz. These data will open the window to an unprecedented study of the particle energy distribution across this cluster tracing the spatial distribution not only of the spectral index but also of the curvature given the multiple data sets available with the goal of identifying re-acceleration processes at work and their connection to seed populations of relativistic particles.