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# Investigating Diffuse Radio Emissions in Low-Mass Clusters with Advanced uGMRT Imaging

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The hierarchical structure formation model proposes that cosmic structures evolve through the accretion of matter and mergers, ultimately forming galaxy clusters. To comprehend the evolution of the universe, it's vital to study the formation and evolution of these clusters. When a galaxy cluster with a mass of 10^{14}solar masses undergoes merging, it dissipates potential energy through various mechanisms, including heating the intracluster medium (ICM), generating shock waves, inducing turbulence, and gas sloshing. These shock waves and turbulence can accelerate or re-accelerate electrons and protons, which then emit radio waves via synchrotron radiation when interacting with magnetic fields, exhibiting steep spectra ($\alpha<-1$). Such emissions can be observed in the MHz to sub-GHz range ( [1, 2]) and manifest as radio halos and relics in disturbed clusters, and as mini-halos in relaxed clusters. Comparing these emissions aids in understanding the evolution of magnetic fields and the particle acceleration mechanisms during mergers. The main theories for the acceleration of cosmic particles responsible for synchrotron radiation are turbulent and shock acceleration mechanisms or the hadronic origin of secondary particles. Increasing the number of observed halos and relics will enhance the statistical robustness of these theories.

In the past, research has primarily focused on high-mass clusters (M>5*10^{14}solar mass) due to the limitations of earlier instruments. However, the uGMRT, with its extensive coverage area, offers exceptional sensitivity and resolution. Studies [3] and [4] visually inspected 22 clusters in the GaLactic and Extragalactic All Sky MWA (GLEAM) survey and analyzed them using MWA, TGSS, and ASKAP data. From this survey, we selected 7 clusters identified as potential hosts of halos, relics, and mini-halos. Six of these clusters are low-mass clusters(M<5*10^{14} solar mass) . We observed them using uGMRT's Band-3 and Band-4. I am utilizing this data from uGMRT to synthesize images and analyze diffuse emissions from the clusters in this survey. I will discuss the characteristics of these diffuse emissions in this conference .

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