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Clusters of galaxies as seen in the sub-GHz band

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Radio astronomy provides us with a unique picture of the universe. The radio emissions complement the thermal emissions and reflect the processes that result in non-thermal synchrotron radiation. Galaxy clusters host large-scale radio structures in the forms of radio halo, minihalo, relic, and phoenix [1]. These structures lack necessary optical or X-ray counterparts and can not be identified at other wavelengths. Modern-day Radio telescopes have been successful in delivering detailed information about diffuse radio structures. Many fascinating features confined within galaxy clusters have been uncovered thanks to the high sensitivity and high-resolution interferometry images [2, 3]. The spectral age, cluster merger dynamics, magnetic field, and particle acceleration process can be estimated by studying these diffuse cluster sources in detail in the radio band [1, 4].

In the presence of μ G order cluster magnetic field, the diffuse radio emissions often show steep spectra ($\alpha < -1$) and thus radiate brighter in the sub-GHz frequencies [1]. GMRT has been an excellent telescope to study the radio universe. It offers multiple sub-GHz frequency bands and sky coverage that reaches nearly 90% of the sky [5]. GMRT also has an overlapping sky area with radio telescopes like VLA, MeerKAT, LOFAR.

We will report science outcome from GMRT/uGMRT observations of galaxy clusters. We will also talk about our spectral analysis of those clusters, including observations from the GMRT/uGMRT, VLA, and MeerKAT. Using these radio findings and Chandra X-ray analysis, we will review the cluster merging scenario and particle acceleration process.

References

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