



Search for diffuse radio emission in cool core clusters

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Here we present few of the cool core cluster radio observational results in search for diffuse radio emission.

Giant radio halos are Mpc scale diffuse radio synchrotron emission found mostly in the merging galaxy clusters. Their Mpc scale size indicates (re)acceleration of *in situ* electron population in the presence of large scale magnetic field. Whereas, radio mini-halos are similar to that of giant halos but are found in some relaxed, cool-core clusters with typical size of $\sim 100\text{--}500$ kpc. The origin of these emissions is not well understood yet but one of the popular theory is (re)acceleration via turbulence induced by gas sloshing generated from minor merger events (see for review Feretti et al. 2012).

Here we present a small sample of galaxy clusters from the South Pole Telescope (SPT) Sunyaev–Zel’dovich survey. We have analyzed multi-frequency radio data from VLA and GMRT. Data analysis was done by Common Astronomy Software Applications (CASA) developed by NRAO and Astronomical Image Processing System (AIPS) based semi-automated calibration pipeline Source Peeling and Atmospheric Modeling (SPAM) (Intema 2009). First, data was analyzed for Radio Frequency Interference (RFI) and excised by statistical outlier flagging tools. After RFI removal data sets were calibrated according to standard calibration procedures. Flux calibration was done according to the scale described in Perley & Butler 2013. Calibration followed by outlier flagging was done several times. After splitting the calibrated uvdata imaging was done using CASA task "clean". High resolution imaging, to model the point sources, was done removing shorter baselines and using Briggs weighting scheme with robust parameter equal to 0. And for low resolution image we tapered down the baselines longer than 5 kilo-lambda and using Briggs weighting scheme with robust parameter equal to 0.5.

We found some amount of diffuse radio emission in few galaxy clusters whereas others don't show any sign of diffuse synchrotron emission. We also present some standard correlation that is followed by radio astronomers for cluster diffuse emission like $L_X - P_{1.4}$ to categorize the structures as Giant Radio Halos or mini-Halos. We also present power spectrum of diffuse radio emission with the available data. We have added high fidelity X-ray temperature map of some of the galaxy clusters with available *Chandra* archival data which have sufficient exposure.

References

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