

# Mining Mini-Halos with MeerKAT at UHF

## Abstract

Mini-halos are faint, diffuse synchrotron radio sources found at the centres of massive, relaxed, cool-core galaxy clusters, and only a few dozen of them have been discovered so far. The origin of their synchrotron-emitting electrons is still not well understood. To conduct a high-resolution spectral index analysis, we request 30 hours of UHF-band observations to observe a sample of 5 mini-halos clusters. Not only will these new observations allow us to better understand the electron population dynamics within the selected mini-halos, they will also allow us to understand the correlations between the thermal and non-thermal emissions of the intra-cluster medium using X-ray data. This may give some evidence towards or against any of the hypothesized mini-halo formation theories. In a previous call, we obtained 16 hours of MeerKAT L-band observations for this sample to evaluate the potential of MeerKAT in studying these faint sources. We have successfully generated continuum and in-band spectral index maps of all the sample clusters and detected 4 out of 5 central mini-halos. We discovered a new mini-halo in our cluster sample. We used a combination of standard spectral mapping and tomographic imaging to extract the L-band spectral indices of diffuse radio sources. Combining the UHF and L band data, we can characterise the nature of these sources over a ~ 1 GHz range.