



SuperMIGHTEE: Exploring the Deep GHz Universe with GMRT and MeerKAT

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The MeerKAT [1] International GHz Tiered Extragalactic Exploration (MIGHTEE, [2]) is one of eight approved Large Survey Projects on the MeerKAT Square Kilometre Array (SKA) precursor telescope. It has devoted nearly 2000 hours of MeerKAT time over several years to secure deep imaging at 2 micro-Jy sensitivity covering 20 sq. deg. over a bandwidth of 0.9-1.6 GHz. Alongside, the upgraded Giant Metrewave Radio Telescope (GMRT, [3]) SKA pathfinder telescope has baselines almost four times larger than those of MeerKAT, and offers the similar imaging angular resolution and sensitivity between 250-850 MHz as MeerKAT MIGHTEE.

Thus, we have developed a technical and scientific collaboration to expand MIGHTEE to a joint MeerKAT and upgraded GMRT project. This project named superMIGHTEE is providing complete spectral coverage from 150 MHz to nearly 3 GHz and has created a unique deep and ultra-wideband data set of the MHz to GHz sky.

The scientific output of it will have a profound impact on our understanding of several science drivers, e.g., (i) the evolution of active galactic nuclei and star-forming galaxies over cosmic time as functions of stellar mass and environment; (ii) the evolution of neutral hydrogen; (iii) the evolution of cosmic magnetic fields in galaxies, groups of galaxies and clusters of galaxies.

This ultra-broad data from two major facilities not only has tremendous scientific potential, it provides extraordinary opportunities to study and characterize the deep radio sky, but also presents us with several technical challenges that must be addressed wide-band surveys with the Square Kilometre Array (SKA). The superMIGHTEE project is thus an exemplar of the emerging era of big data in radio astronomy and serves not only as a science pathfinder for the SKA, but also foreshadows the data and software systems that will be needed for the SKA key science combining SKA-mid and SKA-low.

References

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- [3] Y. Gupta, B. Ajithkumar, et al., “The upgraded GMRT: opening new windows on the radio Universe,” *Current Science* 113, pp. 707-714, doi: 10.18520/cs/v113/i04/707-714.