

Title:

A high resolution, high sensitivity, low radio frequency view for several legacy diffuse, low-surface brightness targets, including Coma cluster using upgraded GMRT and the role of SKA

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Abstract:

The GMRT upgrade, an SKA pathfinder instrument is nearing completion and has begun operations. The upgraded facility will complement several other observatories as essential tool for discovery in several areas of astrophysics. Currently JVLA users are successfully demonstrating the capabilities of wide field, wide band imaging at GHz frequencies; whereas for the low-frequencies, around several 100s of MHz, we still have to demonstrate this to fully exploit the scientific value of data. The upgraded GMRT serves as a testbed to demonstrate wide band, wide field-of-view imaging at these low frequencies. We conducted several test studies using phase II release of the uGMRT, and focus on understanding data quality, fidelity of new GMRT wide-band backend and challenges in uGMRT data reduction and analysis. These understandings, in particular imaging results for several of these diffuse, low-surface brightness targets from the test uGMRT observations will be presented.

Among several of these test studies, we would also present the detailed understanding of low radio

frequency imaging with the GMRT of the Coma cluster, an important 'laboratory' to study the role of cluster environment on the properties of the radio sources in the cluster that can be determined via their flux densities or their spectra. The images have angular resolutions ranging from 5 arcsec to 20 arcsec, and rms ranging from 0.2 mJy to 10 mJy, at radio frequencies ranging from 610 MHz to 150 MHz, respectively. These images detected more than 100 sources within a circular region of diameter 2.9 deg at 150 MHz and identify numerous AGNs. We summarise statistics of the radio properties of these radio sources centred on the Coma cluster of galaxies and show spatially resolved spectral structure results for several radio galaxies. Additionally, we present wide-field broadband (200 MHz bandwidth) imaging (test) results with the upgraded GMRT at 250–500 MHz band. We discuss the importance of multi-wavelength radio imaging and the improvements that will be possible due to upgraded GMRT and the role of SKA.