

Deep Multi-frequency Full-Stokes Radio Imaging of ELAIS N1

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Abstract

The polarisation of radio emission is one of the most powerful probes of cosmic magnetic fields. To explore magnetism in galaxies to high redshifts deep polarisation observations to μJy levels and below will be required. New broad-band capabilities of large radio interferometers such as the GMRT and JVLA allow for long-integration mosaic imaging observations to create ultra-deep full-polarization images of the sky over wide frequency ranges. These observations sample the radio source population at flux densities well below the regime dominated by classical radio galaxies and Active Galactic Nuclei. We present initial results from radio sources revealed with deep polarization mosaicking observations of ELAIS N1 with the GMRT and JVLA at 0.61 and 5 GHz, and evidence that the μJy sensitivity level marks the transition to detection of polarized emission from a population of sources dominated by emission from magnetic fields in the disks of starburst and normal galaxies. Extrapolation and simulations imply that next generation instruments such as MeerKAT and the SKA will have the sensitivity and imaging speed to probe the emergence and evolution of magnetic fields in galaxies over cosmic history.