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Wideband Faraday Synthesis of Abell 3395

Abstract

Propagation of a linearly polarized signal through a magnetized thermal plasma will rotate the polarization angle in a very characteristic way with wavelength, evpa ~ lambda^2 as a function of the electron density and the component of the magnetic field along the line of sight. Faraday synthesis is a technique for inferring the properties of such a medium in front of the emitting region. When the emitting and Faraday rotating regions are mixed, the derived Faraday spectrum reflects this complexity. In more complex cases, a very wide observed bandwidth is required to properly define the Faraday spectrum.

Clusters of galaxies frequently show evidence of interactions between synchrotron emitting relativistic plasma and X-ray emitting thermal plasma. Faraday synthesis can be used to explore this interaction. The cluster Abell 3395 which was observed at L band with MeerKAT in the MGCLS survey shows strong evidence of such an interaction. Unfortunately, with only the frequency coverage of L band, we cannot distinguish between a Faraday screen with structure on scales smaller than the synthesized beam and extensive interaction between the relativistic and thermal plasma. The proposed observations at UHF and S band should provide sufficient additional bandwidth to resolve this ambiguity.