

Uncovering the origin of giant steep spectrum radio relics

Abstract

Merging galaxy clusters host Mpc-scale, highly polarized radio relics, illuminated by relativistic electrons accelerated at shock fronts. The origin of these energetic electrons and the high degree of polarization is still unclear. There is convincing evidence that radio relics trace merger induced shock waves. However, the apparently very high acceleration efficiency indicate that our understanding of the origin of radio relics is only sketchy. To advance our understanding of relics, we propose the dedicated MeerKAT observations of 4 clusters which host giant (above 1 Mpc) steep spectrum relics. Our main goals are to (1) uncover the origin of steep spectrum relics, may be formed under specific physical conditions or merger configurations, which can provide a clue for the formation model of relics, (2) measure the polarized emission below 1 GHz and constrain the magnetic field radial decline by studying radio galaxies inside/behind the clusters, and (3) study the spatial distribution of magnetic fields and relativistic particles with respect to the thermal gas.