

Resolving the 400 kpc long polarized radio filaments in galaxy cluster A514

Abstract

The exceptional sensitivity and resolution of MeerKAT have revealed a new class of radio filament in galaxy clusters. However, its origin is yet unclear due to the lack of samples. Here, we introduce the nearby ($z=0.07$) merging cluster Abell 514 as an ideal case to study radio filaments. Abell 514 presents radio filaments, which are long (~ 400 kpc), thin (~ 5 kpc), bright (~ 30 - 120 $\mu\text{Jy}/\text{arcsec}^2$), and highly polarized ($\sim 60\%$). We propose 4 hours of MeerKAT L-band observation to understand the polarized nature of these radio filaments. With the in-band spectral analysis, we will also track the evolution of non-thermal plasma and understand the energy transfer between the radio filaments and the X-ray cold front. The proposed MeerKAT observation on Abell 514 will be an important example for studying the nature of radio filaments in a massive cluster.