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Probing magnetic fields in the cosmic web with a novel RM synthesis technique

Abstract

Bridges between galaxy clusters form in the course of a merger and represent an environment with unique astrophysical conditions. Bridges have been detected in SZ (Planck Collaboration 2013), X-ray (Werner et al. 2008) and, in only two cases, also in the radio (Govoni et al. 2019, Botteon et al. 2020) band. However, many of their properties, such as the local magnetic field strength, have not been measured directly (Carretti et al. 2022). The detection of the large-scale magnetic structure in bridges would be the first step towards the exploration of magnetic fields in the cosmic web outside of galaxy clusters, with fundamental consequences on our understanding of cosmic magneto-genesis. We propose to measure the magnetic field strength in a pre-merger bridge connecting Abell 3391 and Abell 3395 via the rotation measure (RM) of radio sources located behind and within the bridge. In addition, we will search for diffuse radio emission associated with the bridge. To achieve our goals, we request 22.5 hrs, including overhead, of MeerKAT L-band data in full-polarisation.