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Stacking of inter-cluster filaments with LOFAR and eROSITA data

Duy Hoang

We present our search for thermal and non-thermal diffuse emission from inter-cluster regions of 106 paired clusters of galaxies. We stack the 0.6 − 2.3 keV X-ray and 144 MHz radio data obtained with the eROSITA and LOFAR, respectively. Due to the low surface brightness of the inter-cluster filaments, the stacked data do not show the presence of X-ray and radio diffuse emission in the inter-cluster regions. We assume a constant radio emissivity in the filaments and find that the mean radio emissivity is not higher than 1.2 × 10−44 erg s−1 cm−3 Hz−1. Under equipartition conditions, our upper limit on the mean emissivity translates to an upper limit of ∼ 75 nG for the mean magnetic field strength in the filaments, depending on the spectral index and the minimum energy cutoff. We discuss the constraint for the magnetic field strength in the context of the models for the formation of magnetic fields in cosmic filaments.