

Constraints on Dark Matter Annihilation in Clusters of Galaxies from Diffuse Radio Emission

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Annihilation of dark matter can result in the production of stable Standard Model particles including electrons and positrons that, in the presence of magnetic fields, lose energy via synchrotron radiation, observable as radio emission. Galaxy clusters are excellent targets to search for or to constrain the rate of dark matter annihilation, as they are both massive and dark matter dominated. We place limits on dark matter annihilation in a sample of nearby clusters using upper limits on the diffuse radio emission, low levels of observed diffuse emission, or detections of radio mini-haloes. We find that the strongest limits on the annihilation cross section are better than limits derived from the non-detection of clusters in the gamma-ray band by a factor of about 3 or more when the same annihilation channel and substructure model, but different best-case clusters, are compared. We discuss uncertainties due to the limited available data on the magnetic field structure of individual clusters.

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