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Annihilating Dark Matter Search with 12 Years of Fermi LAT Data in Nearby Galaxy Clusters

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Galaxy clusters are the largest virialised objects in the Universe and, as such, have high dark matter (DM) concentrations. This abundance of dark matter makes them promising targets for indirect DM searches. Here we report the details of a search, utilising almost 12 years of Fermi/LAT data, for gamma ray signatures from the pair annihilation of WIMP dark matter in the GeV energy band. From this, we present the constraints on the annihilation cross-section for the $b\bar{b}$, W^+W^- and $\gamma\gamma$ channels, derived from the non-detection of a characteristic signal from five nearby, high galactic latitude, galaxy clusters (Centaurus, Coma, Virgo, Perseus and Fornax). We discuss the potential of a boost to the signal due to the presence of substructures in the DM halos of selected objects, as well as the impact of uncertainties in DM profiles on the presented results. We assert that the obtained limits are, within a small factor, comparable to the best available limits of those based on Fermi/LAT observations of dwarf spheroidal galaxies.

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