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Magnetic Field Modelling Virgo Cluster

Axions are hypothetical pseudo Nabu-Goldstone bosons which arise from spontaneous symmetry breaking in the Peccei Quinn Symmetry, which in turn is a solution to the strong CP problem. Axions and Axion Like Particles (ALPs) are Dark Matter candidates considring their weak gravitational interactions and weak coupling with the Standard Model. By virtue of this coupling, theory predicts the observation of the photon-ALP oscillation phenomenon which occurs in the presence of magnetic fields. Active Galactic Nucluei in large galaxy clusters are good candidates to attempt observation of these oscillations. This is due to their strong cluster magnetic fields. Here, we attempt to use M87 in the Virgo cluster, due to the observed strong central magnetic field of Virgo (~40 μG). To model the magnetic field, we utilize the open source gammaALPs package framework to create a random magnetic field model with Gaussian turbulence. We fine tune the model parameters by simulating Faraday Rotation Measures for various random realizations of the turbulent field. This model will be used to search for photon-ALP oscillations in M87 using HESS and MAGIC telescope data obtained from periods of observed flaring in the source. This model may also be utilized for various other studies.

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