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Faraday rotation constraints on large scale Halo model

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The global structure of the magnetic field inside the disk of our Galaxy is quite well described by dynamo action and constrained by Faraday rotation measurements. The Halo, on the other hand, is much more of an enigma. Other face-on spiral galaxies show spiral magnetic structures in their disk, like the Milky Way, showing that our magnetic field is a rather typical feature for such class of galaxies. Furthermore, RM-synthesis of CHANGE-ES observations shows an increasing number of edge-on spiral galaxies presenting X-shaped structures surrounding the disk and extending orderly to distances of up to tens of kpc. Although the 4-dimensional topology of those magnetized halos and their physical nature is still unclear, they hint to the strong possibility that our galaxy also has a large and well organized magnetized Halo. Current models for the Milky Way's magnetic field extend very little out of the galactic plane and do not consider an extended, topologically well-organized field in the Halo. In this work, conceptually motivated by the possible existence of a Parker type galactic outflow, we propose a simple Archimedean-like field, for an extended Halo magnetic field. We add this component to a simple disk magnetic field, in order to model the Faraday rotation signal of extragalactic sources as observed on Earth and compare the results to published maps of Faraday rotation. We show that an extended magnetic field in the Halo is not only compatible with the observed Faraday rotation measurements, but it is actually favored by them.

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