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Investigation of magnetized plasmas in Maxwell-Carroll-Field-Jackiw electrodynamics

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The present work discusses elements of Appleton's model for magnetized plasmas in the context of the Maxwell-Carroll-Field-Jackiw (MCFJ) theory, endowed with a fixed 4-vector of Lorentz symmetry violation. We begin by reviewing the essential aspects of electromagnetic (EM) wave propagation in plasmas, analyzing scattering relations, refractive index, propagation modes, and the birefringence effect. In the sequel, we revisit some basic aspects of Carroll, Field, and Jackiw's electrodynamics, such as the derivation of the modified Maxwell equations and extended scattering relations, which leads to birefringence in vacuum. Finally, we study Appleton's model in the context of MCFJ electrodynamics in order to verify the effects of the CPT-odd term on the propagating modes. Using the same procedure, we find the relations of scattering, refractive index, propagating modes, and the birefringence effect. We highlight how the CFJ term alters the propagation indices and alters the propagating modes.

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