Plenária PL1

ELECTRODYNAMICS IN CONTINUOUS MEDIA AND ASSOCIATED OPTICAL EFFECTS

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Abstract:

We begin revising basic aspects of electromagnetic wave propagation in continuous media, including constitutive relations, anisotropy and crystal birefringence. We discuss the Maxwell-Carroll-Field-Jackiw (MCFJ) electrodynamics in matter [1], for which the Maxwell equations, permittivity tensor and dispersion relations are obtained. The refractive indices are achieved in terms of the frequency and the Lorentz-violating background. For a purely timelike background, the refractive indices are real, having associated circularly polarized modes that undergo birefringence, with rotatory power determined. One of the interesting properties of the MCFJ model is that the timelike background plays the role of the magnetic conductivity, opening the connection with "Chiral magnetic effect", much investigated in the literature. We then apply the classical formalism to examine a dielectric medium supporting magnetic current ruled by a general magnetic conductivity tensor [2]. The refractive indices and propagating modes are carried out, revealing the presence of anisotropy and birefringence. The same method may be used to examine the behavior of bi-isotropic and bi-anisotropic media [3] and chiral cold plasmas [4], between other systems.

References:

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