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Faraday Effect in 3D and 2D systems: Applications

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The aim of this work is to study Faraday rotation in the quantum relativistic limit. Starting from the polarization operator in 3D in the presence of a constant magnetic field the rotation of the polarization vector of a plane electromagnetic wave which travels along a gas electron-positron is studied. Then, its possible applications in astrophysics are discussed. The particular case of propagation along the magnetic field is considered. The massless relativistic 2D fermion limit in QED is derived using the compactification along the dimension parallel to the magnetic field. The particular case of zero temperature limit is also studied.

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