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# Fermion self-energy and effective mass in a noisy magnetic background

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In this work[1], we consider the propagation of QED fermions in the presence of a classical background magnetic field with white-noise stochastic fluctuations. The effects of the magnetic field fluctuations are incorporated into the fermion and photon propagators[3] in a quasiparticle picture, which we developed in previous works [2] using the replica trick. In the very strong-field limit, we explicitly calculate the fermion self-energy involving radiative contributions at first order in α, in order to obtain the noise-averaged mass of the fermion propagating in the fluctuating magnetized medium. Our analytical results reveal a leading double-logarithmic contribution ~ ln (eB/m2) to the mass, with an imaginary part representing a spectral broadening proportional to the magnetic noise autocorrelation Δ. While a uniform magnetic field already breaks Lorentz invariance, inducing the usual separation into two orthogonal subspaces (perpendicular and parallel with respect to the field), the presence of magnetic noise further breaks the remaining symmetry, thus leading to distinct spectral widths associated with fermion and antifermion, and their spin projection in the quasiparticle picture.

References:
[1] J.D. Castano-Yepes and E. Munoz, Phys. Rev. D 110, 056003 (2024)
[2] J.D. Castano-Yepes, M. Loewe, E. Munoz, J.C. Rojas and R. Zamora, Phys. Rev. D 107, 096014 (2023)
[3] J.D. Castano-Yepes and E. Munoz, Phys. Rev. D 109, 056007 (2024)

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