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THE ANOMALOUS MAGNETIC MOMENT OF A PHOTON PROPAGATING IN A MAGNETIC FIELD

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Abstract:
We analyze the spectrum of the Hamiltonian of a photon propagating in a strong magnetic field $B \sim B_{\rm cr}$, where $B_{\rm cr} = \frac{m^2}{e} \simeq 4.4 \times 10^{13}$ Gauss is the Schwinger critical field .
We show that the expected value of the Hamiltonian of a quantized photon for a perpendicular mode is a concave function of the magnetic field B. We show by a partially analytic and numerical method that the anomalous magnetic moment of a photon in the one loop approximation is a non - decreasing function of the magnetic field B in the range $0 \leq B \leq 30\, B_{\rm cr}$ We provide a numerical representation of the expression for the anomalous magnetic moment in terms of special functions. We find that the anomalous magnetic moment μ_γ of a photon for $B = 30\, B_{\rm cr}$ is $8/3$ of the anomalous magnetic moment of a photon for $B = 1/2\, B_{\rm cr}$.

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