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Pion properties under strong magnetic fields in the NJL model

In the presence of an external uniform magnetic field B, we show that new axial and vector decay constants appear for pions. A general expression for the weak decay $\pi^- \to l^- \bar{\nu}_l$ is also obtained. We calculate these decay constants within the Nambu-Jona–Lasinio (NJL) model, obtaining an enhancement of the total decay rate up to $\sim 10^3$ for eB = 1 GeV^2, as well as some anisotropy in the angular distribution of outgoing antineutrinos for large B. For this purpose, pion masses also have to be calculated. Charged pions have to be carefully treated. Since its Schwinger phases do not cancel, it is expanded in the Ritus momentum basis. We find that while the ^{0} mass shows a slight decrease with B, the magnetic-field dependent mass of π^- steadily increases.

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