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Anomalous pion to photon decay under strong magnetic fields in the NJL model

Strong magnetic fields of order $B \sim 10^{20}$ G can be produced in heavy ion collisions and are also theoretically estimated to be formed in the core of magnetars.
We study the anomalous $\pi^0 \to \gamma\gamma$ decay under an external uniform magnetic field in the framework of a two-flavor Nambu-Jona-Lasinio model. It is seen that the full decay width gets strongly reduced with the external field, and that the differential width is almost independent of the direction of the outgoing photons. We also find that the result for the total width can be very well approximated by a simple expression obtained at the lowest order in the chiral limit, which is just a direct extension to finite magnetic field of the well known $B = 0$ result that follows from the anomalous Wess-Zumino-Witten action. As a result, the magnetic suppression of the width can be understood in terms of the evolution of both the neutral pion mass and decay constant with the magnetic field.

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