Axion production in strongly magnetized plasmas

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Axions are hypothetical particles, proposed as an extension of the Standard Model in an attempt to solve the strong CP problem in QCD. The Peccei-Quinn mechanism restores the CP symmetry by promoting the CP angle to a dynamical field - the axion - which is a pseudo-scalar field coupling to the theory. Because of their very long decay time (which is a consequence of the smallness of the CP angle), axions interact very weakly with electromagnetic fields. For that reason, axions are also very good candidates for dark matter, an issue that has attracted a great deal of attention recently. Experimental searches of axion and axion-like particles (ALPs) are based on the conversion between axions and photons. In vacuum, the amplitude of this process is extremely small, rendering detection schemes extremely ineffective. We argue that, in plasmas, the conversion probability increases by several orders of magnitude, as a consequence of the resonance in the axion-plasmon propagator [1,2]. This fact makes enables the design of experimental configurations with projected sensitivities for a wide range of parameters. We also discuss some interesting in axion phenomenology in astrophysical and cosmological situations [3].

REFERENCES

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