

Title: Spectral Signatures of Photon-Axion Oscillations from Compact Astrophysical Sources

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Abstract

We give detailed predictions for the spectral signatures arising from photon-particle oscillations in astrophysical objects. The calculations include quantum electrodynamic effects as well as those due to active relativistic plasma. We show that, by studying the spectra of compact sources, it may be possible to directly detect (pseudo-)scalar particles, such as the axion, with much greater sensitivity, by roughly three orders of magnitude, than is currently achievable by other methods. In particular, if such particles exist with masses $m_a < 0.01$ [eV] and coupling constant to the electromagnetic field, $g > 1e-13$ [1/GeV], then their oscillation signatures are likely to be lurking in the spectra of magnetars, pulsars, and quasars.