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ALP-driven magnetogenesis and photon-ALP-dark photon oscillations

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String theory suggests the existence of multiple axion-like particles (ALPs) as well as hidden sector gauge bosons. Some of those ALPs and hidden U(1) gauge bosons (dark photons) might be light enough to result in interesting astrophysical and/or cosmological consequences. As an example of such possibility, we examine ALP-driven late time magnetogenesis generating the cosmic magnetic field via the generation of dark photon field. We also study the photon-ALP-dark photon oscillations in the presence of background dark photon field, and examine if such oscillations can explain the recently noticed gamma-ray spectral modulations of some galactic pulsars and supernova remnants.

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