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# Anomalous character of the axion-photon coupling in a magnetic field distorted by a pp-wave gravitational background

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## Abstract

We study the problem of axion-photon coupling in the magnetic field influenced by gravitational radiation. We focus on exact solutions to the equations for axion electrodynamics in the pp-wave gravitational background for two models with initially constant magnetic field. The first model describes the response of an initially constant magnetic field in a gravitational-wave vacuum with unit refraction index; the second model is characterized by a non-unit refraction index prescribed to the presence of ordinary and/or dark matter. We show that both models demonstrate anomalous behavior of the electromagnetic field generated by the axion-photon coupling in the presence of magnetic field, evolving in the gravitational wave background. The role of axionic dark matter in the formation of the anomalous response of this electrodynamic system is discussed. © 2014 IOP Publishing Ltd.

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## Keywords

axion electrodynamics, critical behavior, gravitational waves