

Theory of inverse Faraday effect in disordered metal in the THz regime

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Photo-induced magnetization induced by a circularly polarized light (inverse Faraday effect) has been studied since the 1960s^{1, 2}. Recently, the induced effective magnetic field is shown to be as strong as a few Tesla due to the development of laser technology³. So far the mechanism of the inverse Faraday effect was considered in the case of optical light. In this paper, we calculate the magnetization dynamics induced by the inverse Faraday effect in a disordered metal in a THz regime by using the diagrammatical method. We show that the induced magnetization is proportional to the frequency of light and that the induced effective magnetic field reaches 10 Tesla in a strong spin-orbit coupling material.

¹L. P. Pitaevskii, Sov. Phys JETP. **12**, 1008 (1961).

²J. P. van der Ziel, P. S. Pershan, and L. D. Malmstrom, Phys. Rev. Lett. **15**, 190 (1965).

³A. V. Kimel et al., Nature (London) **435**, 655 (2005).