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# Absorption of spin from an electromagnetic wave

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We demonstrate the transfer of momentum, energy, and spin from a plane circularly polarized electromagnetic wave into an absorber. Lorentz transformations are used for the flux densities because a moving absorber is considered. The given calculations show that spin is the same natural property of a plane electromagnetic wave, as energy and momentum.

**Key Words:** classical spin; circular polarization; spin tensor

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## 1. Introduction

It was suggested as early as 1899 by Sadowsky [1] and as 1909 by Poynting [2], that any circularly polarized light carries angular momentum volume *density*, which is proportional to the energy volume density. That is the angular momentum density and the angular momentum flux density are present in any point of the light.

**J.H. Poynting:** If we put  $E$  for the energy in unit volume and  $G$  for the torque per unit area, we have  $G = E\lambda / 2\pi$  [2].

Accordingly, some textbooks point that an infinite plane circularly polarized electromagnetic wave carries energy, momentum, and angular momentum:

**F.S. Crawford, Jr.:** "A circularly polarized travelling plane wave carries angular momentum" [3, p. 365].

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