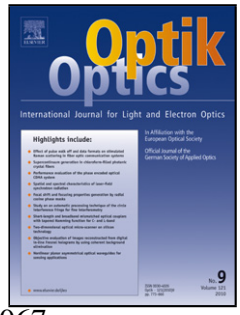

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Quantized Maxwell's equations

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Abstract. - A set of quantized Modified Maxwell's equations in charge-free medium has been derived. The quantized electrodynamics is found to be associated with massive Lorenz gauge condition. A massive gauge transformation is introduced under which the quantized electrodynamics is invariant. The resulting wave equations are that of the undistorted telegraph equation type. They represent damped oscillatory waves propagating to the left and right with the speed of light. Special solutions with vanishing magnetic field are shown to give rise to longitudinal waves accompanying a scalar magnetic field, parallel and antiparallel to the electric field direction. Moreover, an electric energy is found to be lost by the traveling wave in the medium in which it is propagating. A static electric field produces huge amounts of magnetic scalar gradients with negative potential. Additional huge current and voltage are generated that are not accounted by the Maxwell's theory.

Introduction. – Maxwell's equations have been known to account for electromagnetic phenomena. Light is shown by Maxwell to be a manifestation of an electromagnetic field. Maxwell theory is found to be successful in explaining several phenomena occurring in the solid material as well. Maxwell showed that light is an electromagnetic field. In quantum mechanics light consists of photons having zero mass. This is dictated by the gauge invariance of the electromagnetic theory. The full theory of photons are handled by the quantum electrodynamic theory. The massless photon acquired a mass via the Higgs mechanics.

Bear in mind that Maxwell's equations are classical equations. Maxwell's equations are expected to describe all electromagnetic phenomena occurring in different applications. Of these phenomena are the Hall effect, Casimir effect, Hawking radiation, Josephson junction, superconductivity. The effects are now known to be macroscopic quantum phenomena. The material nature of a particle is described by a complex wavefunction. The electromagnetic nature of the photon is described by Maxwell's equations. We merge here the two descriptions for the photon when deemed to have a mass.

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