

Rest Mass and Light Effects

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ABSTRACT: One has analyzed the situations in which the rest mass of different particles appears or disappears. The annihilation of particles and antiparticles and the refraction of light are these phenomena. Once more the problem of phase velocity and group velocity has been discussed. The Mössbauer effect has been analyzed once more. Next, the complex quantities proving the existence of eight dimensions and characterizing the solid body have been presented.

At the entry from vacuum to another medium a photon changes its velocity $v_1 = c$ (assuming that $m_{\text{photon}} \neq 0$) for $v_2 = \frac{c}{n}$ and then $m'_{\text{photon}} \neq 0$.

It implicates that the Feynman conception that a photon interacting with complex mass particles obtains alternately the velocity $v > c$ and $v < c$, is totally justified.

One may say that the photon enters then into another medium in which there isn't perfect superconductivity or perfect superfluidity like in vacuum. As the consequence the interaction of the photon with the medium appears and the rest mass of the photon changes.

The annihilation particle – hole or electron – positron (if we use the convention $m_- > 0$, $m_+ < 0$ and $e_- < 0$, $e_+ > 0$, although the quotient $\frac{e}{m}$ is valid) means the emission of two photons with the rest mass equal zero.

Then we have an opposite process to the entry of the photon to the medium with $n \neq 1$, where the rest mass equal zero changed for the nonzero one. Here the nonzero rest mass changes for the zero rest mass.

The process of obtaining the rest mass by the photon coming into the medium with the refraction coefficient n or interacting with the tachyons (machyons) is analogical to the clothing the Goldstone bosons just in the mass.

We have:

$$v_f \cdot v_g = c^2$$

If $v_g = \frac{c}{n}$, then $v_f = cn$ ($n > 1$).

Both the phase velocity and the group velocity correspond to velocity of certain objects.

In both cases (of these particles corresponding to each of these waves) their rest masses differ from zero.

So as in the case of the creation of the particle-antiparticle pairs the change of the objects with the rest mass equal zero for the objects with the rest mass different than zero, the refraction follows.

The addition of the kinetic energy of the source of photon to the energy of photon ($h\nu$) and the effect connected with this, - the change of the frequency of photon (because its velocity can't increase) - is another example of the "transformation" of energy. Negative dielectric constant means the value vector whose values are expressed by a complex number. This means next that the electromagnetic wave is attenuated in this medium or increases at infinity to infinity. The latter possibility can't be rejected.

Really, the complex wave vector means that the wave increases or fades.

The complex dielectric constant is a proof of the existence of at least eight dimensions and of the complex conductivity:

$$\sigma = n e v .$$