

Once More about Special Relativity and Quantum Physics

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ABSTRACT: It has been stated that the thesis that for the time smaller than $t < 10^{-41}$ s after the Big Bang the principles of physics hadn't been valid, is a perfect nonsense. Simply, then the time was expressed by a complex number and according to the Special Relativity there had been $v > c$.

One has presented that an interaction of tachyons with a particle with real rest mass is intermediated by machyons with totally complex mass. (Both the real and complex components are different than zero.)

It has been shown that the existence of the complex solutions of the oscillations of an electron cloud in a crystal testifies to the existence of the 8-dimensional structure of the crystal.

In the end, one has stated that, although neutrinos have the rest mass different than zero, the Weyl equation is still valid, because there are particles with the rest mass $m_0 = 0$.

1. The fact that till 10^{-41} s after the Big Bang our Universe expanded with the velocity $v > c$, because the time was expressed by the complex number then [1], doesn't mean, that then the principles of physics weren't valid; but it means that the laws of physics don't forbid the motion with the velocity v bigger than the limit velocity c ($v > c$).
The theory of inflation supports the expectations both of Relativity which doesn't forbid the motion with such velocities and the quantum mechanics, which doesn't forbid it either.
2. The direct interaction of a particle with the real mass with a particle with the purely complex mass isn't possible. It is implicated by the principles of conservation of energy and momentum.

We have:

$$p_r + ip_u = p'_r + ip'_u$$

$$E_r + iE_u = E'_r + iE'_u$$

P_r, E_r, p_u, E_u – the values of real and complex momenta and energies.

Such an interaction is possible, but only with intermediation of machyons (it means the particles whose real and complex components of mass are different than zero).

The principles of conservation have now the shape:

$$p_r + p_m + ip_u = p'_r + p'_m + ip'_u$$

$$E_r + E_m + iE_u = E'_r + E'_m + iE'_u$$

and

$$v_m = v_1 + iv_2$$

$$p_m = (m_1 + im_2)(v_1 + iv_2) \quad (*)$$

$$E_m = (m_{10} + im_{20})c^2 + \frac{(m_{10} + im_{20})c^2}{\sqrt{1 - \frac{(v_1 + iv_2)^2}{c^2}}} \quad (**)$$

Both the real and complex parts of E_m and p_m depend on v_1 and v_2 .

This mixing means that the change of the complex component of velocity implicates the changes of the real components of energy and momentum and vice versa.

So an interaction is possible. This interaction has a character of at least three-particles-interaction. It means that one can't observe the shock wave connected with passing the limit velocity without taking under consideration the interactions occurring in this process (minimally one real mass particle with machyon and tachyon).

The machyons acting in eight dimensions carry the interaction between the particles acting in four dimensions and the particles acting in four purely complex dimensions.

3. The equation of motion of the n-th electron cloud in the crystal is:

$$m\ddot{\xi}_n = -k\xi_n + L(\xi_{n+1} + \xi_{n-1} - 2\xi_n)$$

$$\xi_n = A e^{i(ka_n - \omega_k t)}$$

The existence of the complex solutions testifies to the fact that the oscillations in the crystal proceed in eight dimensions (four are complex) according to the principle that the rejected solutions are most valuable.

4. Although the Weyl equation [2] – a version of the Dirac equation for $m_0 = 0$ – isn't valid for neutrinos, but it is correct in the case of other particles with mass equal zero, for example the Goldstone bosons [3].
5. The perfect coherency of the laser radiation testifies to the fact that not all is a subject to the Heisenberg uncertainty principle.

References:

- [1] S. W. Hawking, R. Laflamme, Physics Letters B, vol. 209, no. 1; 28. July 1988
- [2] J. D. Björken, S. D. Drell, „Relativistic Quantum Mechanics“
- [3] E. Leader, E. Predazzi, “Introduction to Gauge Theories and «the New Physics»”