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ON THE POSSIBILITY OF CONSTRUCTING A SPATIAL DIAGRAM OF FEYNMAN.

Brief article.

In this brief article I would like to draw readers' attention to the following circumstance. Richard Feynman in his famous lectures on physics and popular 4 lectures on quantum electrodynamics (QED), use arrows of different lengths rotating in the plane. With these arrows he convincingly explains the processes of reflection, refraction, interference, diffraction and quantum mechanics. However, these arrows are behaving as exactly as complex numbers in their addition and multiplication, and which can be conveniently represented as follows: $r\exp(i\theta)$, where $r-$the module of a complex number, $\theta-$ the argument is that the number and $i-$the imaginary unit. By the way, in these lectures, he made curious remark that by **using these arrows you can justify any areas of physics, including quantum mechanics, with the exception of the theory of relativity**.
By the way, recently the possibility of compatibility of quantum mechanics and relativity theory has once again been questioned [1].
I have already mentioned that all these processes are described on the plane, but actually they come in 3-dimensional space. But in this case, the complex numbers are not suitable and should probably use quaternion. However, I never found anything like it in literature, although the answer seems to be lying on the surface. Therefore limit is very short notes, which might lead someone or to interesting results.
In the 8th volume Feynman lectures on physics in the analysis of the scattering of identical particles, the author makes the following remark: "In fact, the scattering direction must, of course, be described by two angles: the polar angle φ and azimuth θ. Then I would have to say that the oxygen scattering in direction (θ,φ) means that the particle α moves in a direction $(\pi-\theta,\varphi+\pi)$, however, for the Coulomb scattering (and many other cases) the scattering amplitude does not depend on φ. Then the amplitude of the fact that oxygen is flown at an angle θ, coincides with amplitude that the particle α flew at an angle $(\pi-\theta)$. "That is usually seen in the amplitude of the transition within the plane, and it is a complex number $p/\hbar\,(x+iy)=\frac{p\,r}{\hbar}(\cos(\theta)+i\,\sin(\theta))=$

$=\frac{p\,r}{\hbar}\exp(i\theta)$. Here $i-$ the imaginary unit, $p-$the momentum of the particle, $p-$the linear dimension, $\hbar-$modified Planck's constant (often referred to simply as its permanent Planck). For the case of the spatial amplitude of the transition will be, as noted above, depend on two corners and it can be written as:

$$\frac{p\,r}{\hbar}\exp(i\theta+j\varphi)=\frac{p\,r}{\hbar}\exp(i\theta)\times\exp(j\varphi)=\frac{p\,r}{\hbar}(\cos(\theta)+i\,\sin(\theta))\times(\cos(\varphi)+j\sin(\varphi))=$$

$$=\frac{p\,r}{\hbar}(\cos(\theta)\cos(\varphi)+i\sin(\theta)\cos(\varphi)+j\cos(\theta)\sin(\varphi)+k\sin(\theta)\sin(\varphi)).$$

If we denote $\frac{p\,r}{\hbar}\cos(\theta)\cos(\varphi) = a$; $\frac{p\,r}{\hbar}\sin(\theta)\cos(\varphi) = b$; $\frac{p\,r}{\hbar}\cos(\theta)\sin(\varphi) = c$; $\frac{p\,r}{\hbar}\sin(\theta)\sin(\varphi) = d$, then we get the well-known expression for the quaternion.

$w = a + ib + jc + kd,$ where $i^2 = j^2 = k^2 = -1;\ i\,j = k;\ j\,i = -k;\ i\,k = -j;$ $ki = j;\ j\,k = i;\ kj = -i;\ i\,j\,k = -1.$ Thus, if a transition in the planar case amplitude is a complex number, in case the amplitude of the spatial transition represents quaternion.

Quaternion's square module is: $|w|^2 = a^2 + b^2 + c^2 + d^2 = (\frac{p\,r}{\hbar})^2$.

At the same time I would like to finish, in the hope that someone interested in this idea.

Reference.

1. Hiroki Matsui, Yoshio Matsumoto.
Gravitational relaxation of electroweak hierarchy problem.
http://arxiv.org/abs/1608.08838.