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Space Rotation

Andrey V. NOVIKOV-BORODIN

Institute for Nuclear Research of RAS, 7a 60-th Oct. Anniv. Ave., 117312 Moscow, Russia
E-mail: *novikov@inr.troitsk.ru,* URL: *http://www.inr.troitsk.ru/∼novikov*

An attempt to create a system of the physical reality description applied to the space rotations is undertaken. This approach extends the concept of the space symmetry for the $\mathcal{O}(3)$ space rotation groups on basis of the evolution of the ideas of relativity and on the suggestion of the space rotation equivalence. The basic space-time properties and the physical object description from this point of view are considered. Stable space rotation objects are found, which correlate with the quantum physics models of the elementary particles, quarks and even nuclei. It is shown that the quantification is an essential part of space rotation objects. The introduced ω-invariance hypothesis connects the space rotation methodology with the quantum physics approach. In the framework of the proposed space rotation approach, it is possible to get basic quantum mechanics equations, to interpret basic postulates of quantum physics. It looks like postulates and limitations of quantum physics are coming from the introduced Space rotation theory that can be a foundation of the Unification theory.

1 Physical reality description

If we consider two rotating related to each other frames of reference in “empty”, “mathematical” space, they seem to be equivalent and connected only to the observer. Otherwise, we need to declare some *absolute, initial* frame of reference. From the other point of view, it is known that physical laws are not invariant related to space rotations. Today, there are no known proven contradictions to the relativity principle from the experiment. As far as we would like to stay at the relativity principle, we need to extend this principle to space rotations. To overcome these contradictions, we need to review the system of physical reality description (PhRS). We will consider that the PhRS consists of four interconnected components. There are the physical laws, physical objects, reference frames and space-time properties.

Indeed, some attempts to extend the relativity principle to the non-inertial reference frames were made before [1]. Also the physical object in one references frame can be interpreted as another physical object in other frame. For example, the plane electromagnetic wave may be represented in the rotation frame as a set of the spherical waves [2]. So, some physical laws will be valid in both frames, but it will be *different* physical laws for *different* physical objects.

2 Space rotation equivalence and metrics

We will consider three types of space rotations: the axis space rotation (ASR), the multiple space rotation (MSR) and the sum space rotation (SSR).

We will call the space rotation (SR) of the K' reference frame related to K in time t with the frequency ω about some fixed space axis as an *axis* space rotation (ASR). We will also use notations: $\tau = ct$, $\Omega = \omega/c$, where c is a speed of light. Space coordinates in K' will be primed as $(x', y', z') = X'$. The coordinate transformation between the “initial” frame K and rotating one K' will be written as:

$$X' = X \cdot \left(A_z^{\mathrm{ASR}}\right)^{\pm}, \qquad \left(A_z^{\mathrm{ASR}}\right)^{\pm} = \begin{pmatrix} \cos(\omega\, t) & \mp \sin(\omega\, t) & 0 \\ \pm \sin(\omega\, t) & \cos(\omega\, t) & 0 \\ 0 & 0 & 1 \end{pmatrix}. \tag{1}$$

Here $(A_z^{\mathrm{ASR}})^{\pm}$ is a transformation matrix of the ASR about z-axis in space (without loosing the generality). At any time the functional determinant of the ASR transformation matrix is equal to unit ($\det A = 1$).

We will call the combination of ASR rotations with transformation matrices $A_1, A_2, \ldots, A_n$ by definition as a *multiple* space rotation (MSR) and a *sum* space rotation (SSR), if the general transformation matrices of these rotations A^{MSR} and A^{SSR} are expressed as:

$$A^{\mathrm{MSR}} = \prod_{k=1}^{n} A_k, \qquad A^{\mathrm{SSR}} = \sum_{k=1}^{n} A_k. \tag{2}$$

Let the K frame rotate with respect to K' with the transformation matrix A_1 and K'' frame rotates related to K' with the transformation matrix A_2. The transformation between K'' and K will be expressed by the transformation matrix $A^{\mathrm{MSR}} = \{a_{ij}\} = A_1 \cdot A_2 = \sum\limits_{k=1}^{n} a^1_{ik} a^2_{kj}$. The SRs in SSR are considered from the K reference frame.

The ASR is a particular case of the MSR. The MSR transformations is forming the rotation group like $\mathcal{O}(3)$, where time t looks like some parameter. Let us denote this group as an extended rotation group $\widehat{\mathcal{O}}(3)$.

Due to matrix properties, one can conclude that the transformation matrix of *any space rotation* may be represented as a sum of products of the ASR transformation matrices:

$$X' = X \cdot A^{\mathrm{SR}} = X \cdot \left\{ \sum_i A_i^{\mathrm{MSR}} \right\}. \tag{3}$$

Metrics. Standing on the position of relativity, we need to declare the equivalence of the SR frames. It means that, for example, metrics can be introduced in any SR frame. For some space rotation with the transformation matrix A between K and K' we will analyse the expression for "interval" in the form:

$$ds'^2 = c^2 dt^2 - \|dX'\|^2, \tag{4}$$

where dX' is defined as $dX' = d(XA) = dXA + XdA$ and $\|dX'\|^2 = dX' \cdot dX'^T$. So, for (4) we will get:

$$\left(ds'_{\mathrm{SR}}\right)^2 = c^2 dt^2 - XdAdA^T X^T - dXAA^T dX^T - \left\{ dXAdA^T X^T + XdAA^T dX^T \right\}. \tag{5}$$

Metrics in rotation point. If we consider the interval (4) from the rotation point $X'_{rp} = X_{rp} = (0, 0, 0)$ (the same in K and K'), we will get for any time t:

$$\|\Delta X'\|^2 = X' \cdot X'^T = X \cdot A^{\mathrm{MSR}}(t) \left[A^{\mathrm{MSR}}(t)\right]^T \cdot X^T = X \cdot X^T = \|\Delta X\|^2.$$

It means, according to (4), that K and K' are invariant in rotation point and this invariance has a local (or even point) character. The situation with points differed from the rotation one is another.

The ASR metrics. Let us consider the transformation matrix $\left(A_z^{\mathrm{ASR}}\right)^{\pm}$ from (1) without loosing the generality. From (5), we will get the expression:

$$\left(ds'_{\mathrm{ASR}}\right)^2 = \left[c^2 - \omega^2 \left(x^2 + y^2\right)\right] dt^2 \mp 2\, \left(ydx - xdy\right) \omega dt - \left(dx^2 + dy^2 + dz^2\right), \tag{6}$$

that in cylindrical coordinates (ρ, ϕ, z) will be:

$$\left(ds'_{\mathrm{ASR}}\right)^2 = \left(c^2 - \omega^2 \rho^2\right) dt^2 \pm 2\rho^2 \omega \, d\phi \, dt - \rho^2 \, d\phi^2 - d\rho^2 - dz^2. \tag{7}$$

The metric tensor corresponding to the ASR interval has nondiagonal elements and, so, is immeasurable. Physically, it is clear that on some distance from the rotation axis, the motionless in K' object will have the speed in K equal to speed of light. It means that if we are moving radially in K ($d\phi = 0$), the term in braces at dt^2 in (7) is positive when $\rho^2 < c^2/\omega^2$ and negative when $\rho^2 > c^2/\omega^2$. So the surface, defined by the equation $\rho^2 = c^2/\omega^2$, divides the space into the *internal* and *external* regions correspondingly. This equation with different frequencies ω defines a set of cylindroids about the z-axis.

The physical object in K' from K will be observed as an object, localized in the internal region, stable on its edge and freely movable along with the rotation axis. As far as the rotation frequency with the same value may have two directions of rotation (may have positive or negative sign), it may be two different types of these objects. One can say that this object will have an additional characteristics from the K point of view. This characteristics looks like *spin* that, within this approach, may be directed along or opposite the rotation axis. In elementary particle physics, this model of the ASR physical object has some correspondence with *neutrino*, the possibly massless particle with spin.

The MSR metrics. Let us consider the MSR $A^{\mathrm{MSR}} = A_z^{\mathrm{ASR}}(\omega_1)\, A_x^{\mathrm{ASR}}(\omega_2)\, A_y^{\mathrm{ASR}}(\omega_3)$, where ω_1, ω_2 and ω_3 are rotation frequencies. We will analyze the interval, averaged in time, from the point of view of the observer in K and will consider that the period of time of the observation is much longer than the period of any rotation included in the MSR. We will use the following expression for "averaging":

$$\langle f \rangle_t = \lim_{t \to \infty} \frac{1}{2t} \int_{-t}^{+t} f(t) \, dt.$$

On this way, for the MSR interval one can get:

$$\begin{aligned}\langle \left(ds'_{\mathrm{MSR}}\right)^2 \rangle_t = \Bigg\{ c^2 - \Bigg[\left(x^2 + y^2\right) \omega_1^2 + \left(\frac{1}{2}x^2 + \frac{1}{2}\, y^2 + z^2\right) \omega_2^2 \\ + \left(\frac{3}{4}x^2 + \frac{3}{4}y^2 + \frac{1}{2}z^2\right) \omega_3^2 \Bigg] \Bigg\} dt^2 - 2\left(y dx - x dy\right) \omega_1 dt - dx^2 - dy^2 - dz^2.\end{aligned} \tag{8}$$

On the analogy of the ASR analysis, we can conclude that there are some regions localized in space, defined by the equation $g_{00} = 0$, where the physical object will be stable in time from the K point of view. In spherical coordinates (r, θ, ϕ), these stable regions will satisfy the equation:

$$r^2 = \left[\left(\frac{\omega_1}{c}\right)^2 \sin^2(\theta) + \left(\frac{\omega_2}{c}\right)^2 \left(1 - \frac{1}{2}\sin^2(\theta)\right) + \frac{1}{2}\left(\frac{\omega_3}{c}\right)^2 \left(1 + \frac{1}{2}\sin^2(\theta)\right) \right]^{-1}. \tag{9}$$

This equation for different frequencies describes ellipsoids in space. The conclusion about the existence of the MSR stable regions is an additional characteristic to the "mathematical" model, the "physical" aspect of the extended rotation group $\widehat{\mathcal{O}}(3)$.

Comparing expression (8) with (6), (7), one can see that although the MSR consists of a few orthogonal ASRs, the MSR object, localized in space, anyway has some axis, picked out in space. Note that it is some pseudo-axis, because it is some "averaged in time" axis. We can suppose, as before, during the ASR object analysis, that it means that the MSR object also needs to have the physical "spin"-characteristic. Here no limitations are seen to the spin direction related to the direction of the particle movement (in contrast to the ASR object). That also corresponds to the experimental data for the massive particles with spin. Such SR objects are similar to *fermions*.

The SSR metrics. We will consider the SSR with $A^{\mathrm{SSR}} = A_z^{\mathrm{ASR}}(\omega_1) + A_x^{\mathrm{ASR}}(\omega_2) + A_y^{\mathrm{ASR}}(\omega_3)$. For the SSR, we need to use the expression (5). For the SSR interval with "averaging", one can get:

$$\langle\left(ds'_{\mathrm{SSR}}\right)^2\rangle_t = \left\{c^2 - \left[\left(x^2+y^2\right)\omega_1^2 + \left(y^2+z^2\right)\omega_2^2 + \left(x^2+z^2\right)\omega_3^2\right]\right\}dt^2 \tag{10}$$
$$-\,2\left[\left(ydx - xdy\right)\omega_1 - \left(ydz - zdy\right)\omega_2 + \left(zdx - xdz\right)\omega_3\right]dt - 3\left(dx^2+dy^2+dz^2\right).$$

The SSR object is localized in space and, also, like the MSR object, has an ellipsoidal structure. It is also possible to separate the space into the internal and external parts. The SSR objects localized in space, apparently, are massive. But, generally, it is impossible to pick out any space axis (even averaged) for the SSR object "as a whole". SSR objects may be "complex", i.e. consisted of a few ASR or MSR objects, but their characteristics "as a whole" differ from the characteristics of the included SR objects. For the SSR objects $\|X'\|^2 \neq \|X\|^2$ (with "averaging" some additional coefficients will appear). It looks like due to the SSR metrics changing the intensity of the "interaction" between the included ASRs is increasing, that, may be, will correspond to electroweak and strong forces. The analogies with objects of chromodynamics (QCD) arise. Within this approach, if we will continue the analogies between SR objects and particles, it is possible to find some correspondence of the SSR objects with models of the particles consisted of *quarks* (the SSR of ASR objects) and even with the *nuclei* (the SSR of MSR objects).

3 Quantum SR objects

If the SR object in K' exists, it needs to be a source of some "influence" in K, otherwise we would not know about it. We consider, that this "influence" is well known in K (we do not mean quantum physics here). Furthermore, this influence cannot be an energy source in K or it has to be localized in space, overwise, the SR object would be a permanent power source or it would be unstable.

We will analyze the stable and localized SR object. Let us assume that it is a source of some influence $u(X,t)$ in K. The source function $\rho(X,t)$, corresponding to SR object, describing some its property, will be equal to zero in external region and non-zero in its internal region $\mathcal{G}$ in K. The wave-like influence $u(X,t)$ needs to satisfy the wave equation:

$$\nabla^2 u(X,t) - \frac{1}{v^2}\frac{\partial^2}{\partial t^2}u(X,t) = -\rho(X,t). \tag{11}$$

Here v is a speed of the influence wave, δ is the Dirac delta function, θ is the Heaviside staircase function. Considering the SR object as a source of the wave-like influence with the frequency, corresponding to the rotation frequency ω, and supposing $k = \omega/v$ (with $v = c$, $k = \Omega$), $\rho(X,t) = \mathcal{P}(X)\exp(\pm\imath\omega t)$, $u(X,t) = U(X)\exp(\pm\imath\omega t)$ ($\imath$ is an imaginary unit), for $U(X)$ we will have the Helmholtz equation with corresponding fundamental solutions [3]:

$$\nabla^2 U(X) + k^2 U(X) = -\mathcal{P}(X), \tag{12}$$
$$\mathcal{E}_1(X) = \pm\frac{1}{2\imath k}e^{\pm\imath k|X|}, \qquad \mathcal{E}_2(X) = \mp\frac{\imath}{4}H_0^{(1),(2)}(k|X|), \qquad \mathcal{E}_3(X) = -\frac{1}{4\pi|X|}e^{\pm\imath\, k|X|}.$$

Note that this equation gives the steady-state solutions. The question of the source function expression that we have used, is quite serious, it needs the ω-invariance hypothesis, which is introduced and considered in the next Section 4.

The 1D case. In the one-dimensional case, with $\mathcal{P}(x) = \delta(x-a) \pm \delta(x+a)$, the solution of the equation (12) can be represented as:

$$U(x) = \pm\left(e^{\pm\imath k|x+a|} \pm e^{\pm\imath k|x-a|}\right)/(2\imath k).$$

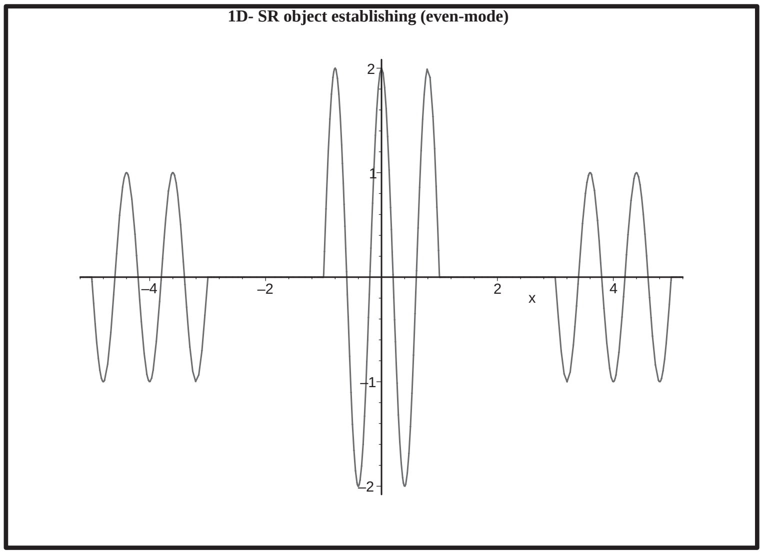

Figure 1. The 1D SR object establishing (even-mode).

In the “internal” $(-a < x < a)$ and the “external” regions $(x < -a)$ and $(x > a)$ these solutions can be represented by even and odd modes:

$$U^{\text{in}}_{\text{even}}(x) = \pm\frac{1}{\imath k}e^{\pm\imath ka}\cos(kx), \qquad U^{\text{in}}_{\text{odd}}(x) = \pm\frac{1}{k}e^{\pm\imath ka}\sin(kx),$$
$$U^{\text{ex}}_{\text{even}}(x) = \pm\frac{1}{\imath k}e^{\mp\imath kx}\cos(ka), \qquad U^{\text{ex}}_{\text{odd}}(x) = \pm\frac{1}{k}e^{\mp\imath kx}\sin(ka).$$

It follows from here that with $ka = -\pi/2 + \pi n$ for even and with $ka = \pi n$ for odd modes, where n is natural, the SR object influence in “external” regions will be equal to zero at any time, while it will not be zero in the “internal” region. The analysis of the establishing of the found study-states of the SR object by equation (11) shows (see Fig. 1) that there exist objects spreading out the SR object with the speed of influence waves. These additional objects represent the wave trains. The number of trains corresponds to the respective train number of the steady-state object. So one can tell about the “families” or “classes” of the steady-state SR objects and corresponding moving objects. Analogies with the neutrino families are very transparent.

The 3D case. In the three-dimensional case, with $\mathcal{P}(x) = \delta(r-a)$, it is possible to get the steady-state solution of the equation (12) that can be represented as (where $k = \pi n/a$, $n \in \mathcal{N}$):

$$U(r) = \frac{a}{kr}\sin[k(r-a)].$$

So, we have found that the SR object needs to satisfy to some *quantification conditions*. We will call it as a *Quantification principle*. Remarkable, that the quantification takes place without any “external” force field. See also [5].

DeBroglie wave. The SR object influence, taking into account the *quantification condition* $k_n = \omega_n/v$, may be represented as:

$$u(X,t) = \sum_n U(\omega_n, X)\exp(\imath\omega_n t). \tag{13}$$

This expression looks like *Fourier expansion* of the $u(X,t)$. So, the following Fourier expansion properties are valid for influence of the SR object:

$$U(\omega_n, X) = \frac{\omega_0}{2\pi}\int_{-\pi/\omega_0}^{\pi/\omega_0} u(X,t)e^{\imath\omega_n t}dt, \qquad \left\langle u^2(X,t)\right\rangle_t = \sum_n |U(\omega_n, X)|^2.$$

We can consider the expression (13) in an inertial to K reference frame K^L, using the Lorentz coordinate transformation (without losing the generality $X^L = (x, y, z^L)$, $\gamma = 1/\sqrt{1-\beta^2}$, $\beta = V/c$), that leads to:

$$u^L\big(X^L, t^L\big) = \sum_n \mathcal{B}(\omega_n, X^L) e^{\imath\omega_n[\gamma(t^L - \beta z^L) - t^L]}, \tag{14}$$

where $\mathcal{B} = U(\omega_n, X^L)e^{\imath\omega_n t^L}$ and (14) looks like the *de Broglie* wave, corresponding to particle. Together with the observed Fourier expansion properties, it may have the probabilistic interpretation. Note, that in (14) influence of the part $e^{\imath\omega_n t^L}$ on the particle behavior is neglected.

4 Description of SR frames

Let us consider the normalized MSR with the periodical rotation matrix $A^{\mathrm{MSR}} = A(t) = A(t + 2\pi n/\omega)$, where n is integer, and fix two events (t_1, X_1) and (t_2, X_2). For corresponding space points X_2' and X_1' in K', one can get by the SR definition:

$$\Delta X'_{|2\pi n/\omega} = X_2' - X_1' = X_2 A(t_2) - X_1 A(t_1) = \Delta X \cdot A_{|2\pi n/\omega}. \tag{15}$$

If the SR matrix is normalized ($\det A = 1$), the distance between two space points in K and K' is found to be equal to each other:

$$\|\Delta X'\|^2_{|2\pi n/\omega} = \|\Delta X\|^2. \tag{16}$$

For any fixed frequency ω, the time points $t_2 = t_1 + 2\pi n/\omega$ create the numerable infinite aggregate $\Lambda : \{t_0 + 2\pi n/\omega\}_{n=0}^{\infty}$ on the t-axis. The rotation frequency ω is the initial parameter of this aggregation. On Λ the equality (16) is true, and, consequently, the interval (4), as it was defined in Minkowski space, is invariant in K and K'. We will call by definition that rotating frames K and K' are ω-*invariant*. It means that SR frames on this infinite aggregate look like Lorentz-invariant and so, we will consider, that they are *measurable* on Λ. The frequency ω defines the *scale* between two reference frames K and K'. On this approach, this parameter seems and needs to be very important in the physical object description in these frames.

Further, let us a physical object (some of its property) is described in K' by the function $\psi'(X', \tau)$ and in K by function $\psi(X, \tau)$. On Λ these functions are measurable, because the interval (4), as it was defined in Minkowski space, is invariant in K and K', and one can write the condition expression, connecting these functions:

$$\psi(X, \tau)_{|2\pi n/\omega} = \sum_l \left[\psi_l'(X', \tau) \prod_{m_l} \exp(\pm\imath m_l \Omega\tau)\right], \tag{17}$$

because for any natural l and integer m_l, $\exp(\pm\imath m_l\Omega\tau)_{|2\pi n/\omega} = 1$, where $\psi'(X', \tau) = \sum_l \psi_l'(X', \tau)$, and in these points $X'_{|2\pi n/\omega} = X$.

Furthermore, we will replace Λ by the real t-axis. It means that we are also replacing the discrete set on X and X', so that $X = X'$. Finally, we have got the expression, connecting functions ψ in K and ψ' in K' on Λ:

$$\psi(X, \tau) = \sum_l \left[\psi_l'(X, \tau) \prod_{m_l} \exp(\pm\imath m_l \Omega\tau)\right]. \tag{18}$$

At any, even very high values of ω, this approximation may be quite accurate, but always not complete.

Following these assumptions, we can conclude that the introduced extended $\widehat{\mathcal{O}}(3)$ group due to ω-invariance hypothesis transforms to the usual $\mathcal{O}(3)$ group and also the Minkowski space metrics is valid for this object. This is already enough to get the basic quantum mechanics equations such as Klein–Gordon–Fock, Schrödinger and Dirac in the fashion standard in quantum theory [4].

The SR theory can explain a lot of difficulties and postulates of the quantum theory. We will illustrate it by obtaining the Klein–Gordon–Fock equation for a scalar particle without spin in the "SR theory fashion style".

KGF equation. For simplicity, we will analyze the case l, $m_l = 1$ of expression (18):

$$\psi(X,\tau) = \psi'(X,\tau)\exp(\pm\imath\Omega\tau). \tag{19}$$

Here we have got the expression (19), we have already used in Section 3 for source function. So, it has a meaning of the SR frames function transformation.

Remind that on $\Lambda\, X = X'$ and we can consider $\nabla_X = \nabla_{X'}$. So, the Lorentz invariant second-order differential operator, called the d'Alembertian operator, will be invariant in frames K and K':

$$\Box = \frac{\partial^2}{\partial\tau^2} - \nabla_X^2 = \frac{\partial^2}{\partial\tau^2} - \nabla_{X'}^2 = \Box'.$$

We are able to apply the d'Alembertian operator to both parts of the Equation (19). It will lead to equation:

$$\frac{1}{\psi(X,\tau)}\Box\psi(X,\tau) = \frac{1}{\psi'(X',\tau)}\Box'\psi'(X',\tau) - \Omega^2 + 2\imath\Omega\frac{1}{\psi'(X',\tau)}\frac{\partial\psi'(X',\tau)}{\partial\tau}. \tag{20}$$

The third term in the right-hand side may be neglected in comparison with the second one in case of the stable particle, stable, at least, in comparison with the period of rotation $T = 2\pi/\omega$: $\Omega \gg \left|\frac{1}{\psi'}\frac{\partial\psi'}{\partial\tau}\right|$. If the physical object in K' (it may be, for example, an electromagnetic wave) satisfies the equation $\Box'\psi'(X,\tau) = 0$, then supposing $\Omega = mc/\hbar$, one can get from (20) the *Klein–Gordon–Fock equation*:

$$\frac{\Box\psi}{\psi} + \frac{m^2c^2}{\hbar^2} = 0. \tag{21}$$

The equation (21) is valid for any inertial to K reference frames due to the Lorentz invariance of the d'Alembertian operator, that was directly shown in [5]. Obtaining of the Schrödinger equation was also shown in these papers, which is the non-relativistic approximation to the Klein-Gordon equation. As far as the ω-invariance gives the necessary symmetries, it is possible to obtain the Dirac equation by the usual way [4]. Note that (16) is not satisfied for SSR, so equations, created for SSR, apparently, will correspond to the QCD, QFT equations.

From the SR point of view, the equation (21) contains a new idea – an idea of connecting the physical object properties in different rotating reference frames. It is a consequence of the declared SR equivalence principle.

The "Einstein's formula" for the SR. The invariant $E^2/c^2 - \vec{p}\cdot\vec{p} = m^2c^2$ given by the energy-momentum 4-vector of a particle $p^\mu = (E/c,\vec{p})$ in Quantum mechanics corresponds to the KGF equation. An electromagnetic wave in K' gives for this invariant $E'^2/c^2 - \vec{p}\,'\cdot\vec{p}\,' = 0$. For the stable and localized object in K ($\vec{p} = \vec{0}$) this invariant will be $E^2/c^2 = m^2c^2$, so from (20) we can get the well-known Einstein's formula:

$$E^2/c^2 = C(\Omega) = m^2(\Omega)c^2. \tag{22}$$

Note that the "influence" of the SR object (Section 3) may be interpreted as an additional mass to (22), but it has another origin and can be "separated" from the real rest mass.

5 Space rotation theory

It seems that the attempt to create the system of the physical reality description, undertaken in this paper, was quite successful and we may declare the result as a Space rotation theory. The SR theory is based on the SR equivalence, the quantification principle and the ω-invariance hypothesis.

The SR equivalence principle is based on the evolution of the ideas of relativity and on the suggestion of the space rotation equivalence, extends the conception of the space symmetry of the $\mathcal{O}(3)$ space rotation groups. This extended rotation group $\widehat{\mathcal{O}}(3)$ adds some very important physical characteristics to space-time and SR object descriptions. The stable-state objects, correlated with known quantum physics objects, are found.

The quantification principle is based on the usual energy conservation law for found SR objects. It does not need any additional postulates to explain the quantum properties of existing particles and fields.

The ω-invariance hypothesis makes SR frames measurable, but, of course, with some limitations. These limitations are coming from the SR theory; they are not postulated or introduced. They are in a good agreement with the quantum physics postulates and paradoxes.

From the SR theory point of view, the Quantum physics is an effort of the approximate description of the immeasurable SR systems, because in quantum physics the numerable infinite aggregate on t-axis is replaced by the continuous t-axis. At any, even very high values of ω, this approximation may be quite accurate, but always not complete. On this approach, it becomes clear, that the ω-invariance is the reason of the *uncertainties* in quantum physics, its incompleteness and formalism [6]. M. Gell-Mann [7] characterized the quantum physics as a discipline "... full of mysteries and paradoxes, that we do not completely understand, but are able to use. As we know, it perfectly operates in the physics reality description, but as sociologists would say, it is an anti-intuitive discipline. The quantum physics is not a theory, but limits, in which, as we suppose, any correct theory needs to be included". Now, we can clearly see it from SR theory point of view.

All these facts make us declare the "initial", basic origin of the SR theory in comparison with the quantum physics. We may suppose, that "new" interactions, declared in quantum physics, such as strong or electroweak, are reflections of the "usual" forces, existing in rotating frames, to the observer frame and also "influence" of the SR objects in our frame. This is a way to the Unification of these forces.

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