

Consequences for Structure of Electrons out of that of Photons

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Abstract

Nieke inferred the structure of photons as electromagnetic vortex-pairs from Newton's diffraction experiments and from the statement for structure of photons by Heisenberg. The possibility of pair-formation and positron annihilation demands an electromagnetic vortex-twin for the structure of electrons; it gives the right symmetry of electron. So positrons have the same structure, only the direction of rotation of vortices is opposite. Pauli's principle is commented to be corrected: + and - is valid for direction of rotation and not for antiparallel direction of electrons. So the β -emission could be described in a new way.

I. Introduction

Nieke [1] reported about papers which indicate to the work-hypothesis of structure of photon as an electromagnetic vertex-pair. A vortex-pair consists of two vortices side by side with equal strength and opposite sense of rotation. Nieke [2] discussed the possibility for emission of photons with structure and field. This structure should give hints at interaction by pair-creation and positron-annihilation to the structure of electrons. This shall be examined in this paper.

II. Pair-creation and a model of electron

In the hitherto conception the pair-creation and positron-annihilation resulted in the simplest form without farther interactions:

$$1 \text{ positron} + 1 \text{ electron} \iff 2 \text{ gamma-quanta} \quad (1)$$

The possibilities of statements are exhausted with the application of conservation-laws of charge, energy and momentum with the vortex-hypothesis this equation has to be written as:

$$1 \text{ positron} + 1 \text{ electron} \iff 2 \text{ vortex-pairs} \quad (2)$$

Except to use the laws of conservation now it is to seek for origin and whereabouts of the vortices. The simplest acceptance would be: Two vortices of equal sense of rotation, in one as right (r) in the other as left (l), are existing in every electron and positron.

$$1 \text{ vortex-r-twin} + 1 \text{ vortex-l-twin} \iff 2 \text{ vortex-pairs} \quad (3)$$

According to vortex-dynamics two vortices of equal sense of rotation form a vortex-twin. The vortices in a vortex-twin rotate themselves around their centre of gravity which lies here between both vortices (confer for example Sommerfeld [3]). The sense of this additional rotation is corresponding to sense of the single vortices. These both themselves rotating electromagnetic vortices of equal sense of rotation must have the quality of charge and magnetic moment. It has to be stable with the elementary charge and Bohr's magneton. But why the vortex-twins only are stable at the elementary-charge, for that the established model of electron with structure of vortex-twin gives hitherto no new aspects. It is to suppose that elementary-charge results as stability-condition in the association of electro- and vortex-dynamics.

An argumentation as here used for example Winter [4] for formal interpretation of β -decay (translated): „... that laws of nature assume the same form if we transform particle-pairs, which couple together by exchange of W-particle, into one another ('turn' into one another): ...“

The case (3) will happen if electron and positron hit each other without kinetic energy. Schopper [5] and Genz [6] shot the particles on each other with great kinetic energy, and there are to expect further appearances, designated as fire-ball of energy or mini-big-bang.

Numerical in equation (1) are standing on one side two spin-1/2-particles and on the other side two spin-1-particles. Here is to doubt about spin-preservation. The consideration of vortex-elements with sign in equation (3) yields on both sides four vortex-elements (always two on the right and two on the left). Here the preservation of vortices is fulfilled.

The correspondence of photon – electron and vortex-pair – vortex-twin is remarkable: The photon runs with velocity of light, in rest it is not existable, in linear polarized light the propagation-direction is a two-fold polar axis – the vortex-pair runs (they reciprocal drive

forward) with great velocity perpendicular to the tie-line of both centres of gravity, in rest the vortex-pair is instable. The propagation-vector is a polar two-fold symmetry-axis.

The electron and vortex-twin are stable in rest. In the vortex-twin both vortices of equal sense drive themselves round another in the same sense of rotation, and yield so the symmetry of electron with a polar symmetry-axis.

Between photon and electron an essential difference (what is herewith not explained) is existing: The photon is stable with different energy if only frequency fits; after diffraction by Nieke [7] frequency could be diminished. On the contrary the electron is known stable only with the elementary-charge and constant magnetic moment.

The behaviour is different in polarization. By photons the polarization-plane lay constant in space. Nieke [2] gave a comparison of vortex-pair and simple double gyro-compass. Single or isolated electrons show moderately this stability of symmetry-axis in space. Information about quality of one isolated electron was sought in electron-traps, Penning-traps or geonomium, which were reported by Dehmelt [8]. There the gyrometric ratio is found by 2 with only a difference smaller than 110^{-11} . The direction of spin changed easily and frequently in resonance-experiments.

III. Pauli's principle

Pauli [9] accepted for the magnetic- or spin-quantum number the size $m_s = + 1/2$ or $m_s = - 1/2$, at which two electrons with else equal quantum-numbers adjust anti-parallel so that the magnetic-moments compensate (Pauli's exclusion-principle) and the charge sum up. A turning of the electron 180° perpendicular to spin-axis changes the spin-quantum number from $+ 1/2$ to $- 1/2$ without change of rotation-direction.

Pauli [9] wrote (translated): „Already in my original paper I had emphasized the circumstance that it is impossible for me to declare a logical motive for the exclusion-principle or to derive it out of general assumptions. I had always the feeling, and have it still today, that this is a deficiency.“

With this distinction of direction of electron with $+$ or $-$, Pauli excluded a distinction of direction of rotation; spin and charge are not connected for him. This ensued from his conviction of indescriptness in quantum-processes; he would not give the spin a descriptness like Uhlenbeck a. Goudsmith [10] after discovery of magnetic moment of electron in 1925, who supposed rotation. At this time Pauli could not know the positron, because it was discovered in 1932. Supplementary a correction would be possible but this did not ensue; then the sign of spin would be that of charge. This omission had far reaching consequences; than electron, positron, proton and neutron obtained the spin $1/2$ and were denoted as spin- $1/2$ -particles.

It is to remark that out of a right-screw does not become a left-screw by 180° turning perpendicular to the longitudinal axis. This turning to distinguish with a $+$ and $-$ sign was a devious designation.

Indeed, Pauli was right as he refused a simple rotation by Goudsmith a. Uhlenbeck, because all physical phenomena of electrons and atoms spoke against. But here are offered arguments for structure of photons and electrons not as simple rotation but as vortex-pair and vortex-twin. That would be also the structure of spin. This is the simplest physical possibility with which particles are independently fit for survival, natural, it can be more complicate.

It is a general appearance, that founder of a theory knows better the weakness of their theory than their pupils or followers, these consider this for truth and do not doubt here in turning of sign.

As alteration is offered to couple the sign of spin with the sign of charge and to introduce the direction of magnetic moment (confer Frenkel [11] and formula (3)) as direction of spin. Then electrons are spin $|-\rangle$ particles, positrons and protons spin $|+\rangle$ particles, and neutrons spin $|+-\rangle$ particles, for they have no resultant charge but a magnetic moment (Landé's g-factor).

The β -decay yields in the simplest form as decay of neutron with the spin-statement:

$$\text{Neutron } |+-| \iff \text{proton } |+\rangle \text{ electron } |-\rangle \quad (4)$$

with that the neutrino is superfluous, which was introduced only to correct the failure of spin-definition. The neutrino is sought with great expenditure and only announced as found by calculation out of ten power higher disturbance. With respect of direction of rotation these doubtful calculations are no more necessary. A new denotation or marking of spin-direction is to found.

Here in formula (4) is included the neutron and proton. From them is known symmetry and physical facts but not their real structure. This does not justify the neutrino because the designation of

spin-quantum-numbers by Pauli are not justified and demand an alteration. It is to demonstrate that both particles are pure electromagnetic nature.

At radioactive beta-decay were only found electrons with left-twist and positrons with right-twist. This could be connected with the hypothetical structure of electrons and positrons as right resp. left vortex-twins. Pauli [12] reported the literature on that. Schopper [13] found already circular polarized photons in β -decay with stimulated nuclei. Keßler [14] reported summarily about the connection of polarization or spin of photon and photon-electron in light-electrical effect. He wrote (translated): „A spin-orientation of photon-electrons is not the exception but the rule.“

Scheck [15] reported the problems in neutrino physics. He wrote: „On the theoretical side we need new input and a fresh attempt at understanding the nature of neutrinos.“

IV. Mechanical model

Nieke [2] illustrated the model of photons as electromagnetic vortex-pair on the rotating-disk, where two peg-tops are brought simultaneously in opposite rotation without caused rotation of turntable. The formula (3) and (4) is then similar demonstrable on the rotating-disk with ever two peg-tops with equal rotation-direction and the systems in opposite direction of rotation. The put into practice is more complicate for simultaneous to generate ever two rotations in opposite direction; formula (4) demanded to arrange four vortices. It is possible to execute this so that the turning-moments compensate each other so that the rotating-disk remains in rest.

That is valid only for the spin as rotation, for more accurate calculations is to respect that the originated particles have different mass and different magnetic moments. Therefore it is to expect that kinetic energy, twist (rotation of whole particle), stimulation or resonance remains in β -emission.

But the electron is not only a mechanical particle, it was marked hypothetical as electromagnetic vortex-twin. For electro-magnetic Maxwell's equations are authoritative. According the temporal alteration of one magnitude of field shall be equal, respectively opposite equal, the rotor of the other magnitude of field.

In technique a perpetuum mobile is impossible, but in nature this has not to be valid in stable elementary-particles.

V. Literature to structure and spin of electron

Lorentz [16] has described the properties of motion of electrons as they are still to find in every text-book of physics. He mentioned the deformable electron where in spite of deformation the angular-moment remains constant.

Already since 1907 Stark [17] has advocated the point of view that electrons have a ring-formed axial structure. Electromagnetic energy streams once circle-formed around an axis, and then as cylindrical current around this vortex-filament. This was geometrical known by Hicks [18] as Hick's vortices without relation to electron. This ring lies in case of hydrogen around the positive nucleus, the diameter of the ring is variable over energy-level. As is well known, after Bohr the electron revolves around the nucleus. For Bohr considered the electron on principle not localizable but as smeared charge, so both conceptions are so different not at all.

At carbon by Stark the four valence-electrons are ordered tetrahedral to the nucleus, where the centres are stationary. The rings lie outside the nucleus and outside the two inner electrons. With Bohr's model the tetrahedral bond is not explicable to describe. Kossel [19] confirmed the descriptness of Stark's acceptance but pointed out that every acceptance of resting electrons demands additional strange forces which admitted arbitrariness.

Uhlenbeck a. Goudsmith [10] introduced the spin as mechanical angular-momentum. With the model of electron as electromagnetic vortex-twin as deformable medium this should be calculated new.

Thereby the spin of electron needs and dares no more to be a formal quantum-number.

Dirac [20] found by linearization the relativistic Schrödinger-equation in his theory of magnetic electron a wave-equation with four components, at which he attaches those with negative sign to the positron.

Wiener [21] concluded out of his cinematic basis-law (in which he united translation and turning) a screw-vortex the 'archon' as monomeric unit. For formation of elementary-particles right and left screwed archons are associated. Broglie [22] used such a compose as 'méthode de fusion'. Born a. Peng [23] called the monomeric unit appeiron. Related models advocated Jehle [24] with

electron and quark as superpositions of elementary loop-forms, Pekeris [25] with a hydromechanical model with stationary circulations, Dahl [26] with the rotating electron as rotor model of two elements, and Hughston [27] with two twistor-elements.

By Mack a. Petkova [28] the quark-model is describable with condensed vortices. The inner motion of rotation by Hönl [29] and the trembling-motion (Zitterbewegung) by Schrödinger [30] results automatically by the hypothesis of vortex-twins. Hönl accented the electron as 'pol-dipol particle'. Bopp [31] gathered from the interaction of light-quanta with matter that light-quanta can not be consisting out of electron pairs which divided by collision. Harai [32] discussed the 'richon' as monomeric unit of elementary-particles. There the complete energy of an electron has to be smaller than its building-elements, Harari inferred that an electron can not have a composed structure. But this is possible with the structure of vortex-twins for both vortices turn around another in the same sense of rotation. There three movements are resulting. For spin 1/2-particles are discussed analogous three quarks. In the photon as vortex-pair results the third movement as velocity in propagation-direction.

Pavsic, a. o. [33] started from Cifford's 4 x 4 matrix and interpreted their results as point-like charge which trajectory describes a cylindrical spiral-line. By Hautot [34] charge and angular-moment are two entities of self-structure, spherical are matter and charge, axial are angular- and magnetic-moment.

Wassermann [35] gave as model of electron a Möbius' band cut asymmetrically where two linked loops are resulted: a Möbius' band and linked a threefold twisted Möbius' band. He attached twist to spin and link to charge.

It is to establish that numerous theories about photon and electron are consisting of two monomeric units. Out of this consideration in this paper follows a special obvious and experimentally based model on the foundation of vortex-dynamics.

VI. Further applications

The here developed models of photon and electron allow and requires a completion of interpretation of many physical appearances with electrons and photons.

It is presupposed as known that super-conductivity and super-fluidity can be successfully described with vortex-dynamics.

Thomson [36] and Heaviside [37] attempted to interpret the inertia of charged particles with self-induction according Lenz's principle. With the field of charge that conducted to no positive result. With the field of the charges and magnetic moments producing fields this could be attempted again. Opposite to Thomson and Heaviside, this principle is also to transfer to altogether uncharged particles.

Then the behaviour according to the theory of special relativity could be based on changed returning movements of the charge producing fields by interaction of particles with itself, that is with its field. Einstein [38] asked (translated): „Should not be the basis-quality of matter, the inertia, be to interpret field-theoretically?“

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