
To the Theory of Everything. Phenomenology

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Anomalies of annihilation of β^+ -decay positrons in the system “ ^{22}Na -gaseous neon of natural isotopic composition ($\sim 9\% \text{ }^{22}\text{Ne}$)” and precedent of the theory of the complete degeneracy for para- and ortho-superpositronium in the supersymmetric $N = 2$ QED give grounds to represent alongside with Dirac fermions (QED) also phenomenology of a true neutral Majorana fermions (electroweak interaction/EWI and the Theory of Everything/TOE) as additional low-energy aspect of the supersymmetry (β^+ -supersymmetry).

For the first time, the prospect of analog formalization of the status of a physical observer in General Relativity and Quantum Field Theory is designated (β^+ -orthopositronium formed in substance in the final state of β^+ -decay type $\Delta J^\pi = 1^\pi$). Lack of this is the reason for the stagnation of the modern Standard Model.

Key words: system “ ^{22}Na -gaseous neon”, quantum electrodynamics, Dirac fermions, electroweak interactions, Majorana fermions, supersymmetry, additional β^+ -supersymmetry, Theory of Everything.

This is detailed abstract of the cycle of publications in the Electronic scientific & practical journal “Researches in Science” (15) and Electronic scientific & practical journal “Modern scientific researches and innovations” (17), which discuss the extension of the modern Standard Model/SM, dictated by a cycle experiments of observing the anomalies of the lifetime spectra of β^+ -decay positrons (Y_n -“start” — Y_a -“stop”; Y_n — nuclear gamma-quantum, Y_a — annihilation gamma-quantum) in the system of “ ^{22}Na -gaseous neon of natural isotopic composition ($\sim 9\% \text{ }^{22}\text{Ne}$)”.

To stimulate the development of SM on the designated experimental base (USA/1956, 1965; Russia/1967-1987; England/1975; Canada/1975) and reasonable phenomenology (Russia/1977-2008) is a difficult task because the world community did not notice in the mentioned experiments the paradoxical correlation “ ^{22}Na -gaseous neon”.

The hypothesis was confirmed by implementing critical comparative experiments with a decrease in the fraction of the ^{22}Ne isotope in gas (1985-1987) [1] and phenomenology developed on this basis [2]. There is no other possibility to explain the Mössbauer effect for the “start” Y_n -quantum ($E_{Y_n} \cong 1.274\text{MeV}$) in the neon gas phase as manifestation (involving orthopositronium/ ^oPs formed in gas in the final state of β^+ -decay) a macroscopic vacuum two-sign spacelike structure — atom of long-range action/ALRA of Planck mass (alternative to counterproductive phenomenology “tachyon”).

With each act of the β^+ -decay of the type $\Delta J^\pi = 1^\pi$ (^{22}Na , ^{64}Cu , ^{68}Ga , etc.) in space-time of complete relativity [3] the macroscopic mass $2|M_P|$ is realized.

The SM in a state of stagnation since beginning of the search for the physical realization of the mathematical structure of supersymmetry (mid-1970s). Now that the phenomenology of the Project of a new (additional) Gh/ck -physics “outside” the light cone/Project [4] has been formulated, the essence of the problem can be briefly stated.

When physicists discuss the appearance of virtual e^+e^- -pairs ($E_{e^+e^-} \cong 2m_e c^2$, $\Delta t \cong \hbar/2m_e c^2$)

in quantum Dirac vacuum does not comment on the question of the spin state of the pair. All quantum numbers of the physical vacuum are zero. Therefore, a virtual e^+e^- -pair can be born only in the singlet state (the total spin of the pair $S = 0$), i.e. in the SM/QED the birth of a virtual e^+e^- -pair in the bound state of triplet positronium (${}^3\text{Ps}$, spin $S = 1$) is excluded. This state of positronium is of particular interest for explaining the anomaly in the “ ${}^{22}\text{Na}$ -gaseous neon” system, since virtual single-quantum annihilation is present in the dynamics of the ${}^3\text{Ps}$ annihilation. This means orthopositronium oscillations in “the looking glass”, where from the standpoint of a physical observer the signs of the action and speed of light are negative and $\pm M_{\text{PL}} = \pm\sqrt{(\pm\hbar) \cdot (\pm c)/G}$. The binding energy of the ground state Ps is $W \cong 6.8\text{eV}$, the hyperfine splitting of triplet and singlet positronium energy in QED $\Delta W = {}^3W - {}^1W \cong 8.4 \cdot 10^{-4}\text{eV}$.

In supersymmetric quantum electrodynamics/SQED the virtual vacuum state of orthopositronium is possible. Precedent is presented in [5]: “... in the case of supersymmetric $N = 2$ QED we find complete degeneracy for para- and ortho-superpositronium”. That is opens for physical observer the space-time “outside” the light cone, if we assume topological quantum transition/TQT in the final state β^+ -decay type $\Delta J^\pi = 1^\pi$, and ${}^3\text{Ps}$ represents the analog formalization of a physical observer who (what) “sees” the two-sign spacelike ALRA-structure (“local” causality [2, 4]).

The expected implementation of the Project will mean that the positronium atoms generated by a positron in the final state of β^+ -decay β^+ -Ps (TQT) — ortho- ${}^3(e^+e^-)_1$ and para- ${}^1(e^+e^-)_0$ — are different from QED-Ps ${}^3(e^+e^-)_1 \setminus {}^1(e^+e^-)_0$, and the mathematical structure of supersymmetry within Hamiltonian dynamics must be complemented by the concept β^+ -supersymmetry that go back to the problems of the Hamiltonian graph and the traveling salesman problem.

In this regard, a new and low-energy limit of combining QED and weak interaction is revealed — electroweak interaction/EWI. Consideration of the EWI in the framework of the alternative E. Majorana [6] (true neutral fermions) becomes a strong argument of β^+ -supersymmetry [7].

The fundamental unification of physical interactions (Theory of Everything) is achieved by filling each of the nodes of the Hamiltonian graph ($N^{(3)} \cong 1.3 \cdot 10^{19}$ with allotment ALRA core $\bar{n} \cong 5.3 \cdot 10^4$ in dark matter — on Earth and in a gravity field of sufficient strength) by the masses by all stable particles of matter (m_p, m_e, m_{ν_s}). The compensating structure of ALRA in “the looking glass” contains these masses with negative sign [2, 4].

This is a worthy occasion to discuss the unified nature of dark matter/dark energy [4].

The program of a decisive experiment was proposed [8].

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