R theory of electron-positron collision: severe self inconsistency of the standard model.

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Abstract.

It is shown straightforwardly that the standard theory of electron positron collision is severely self-inconsistent on the classical relativistic level, and at all levels such as semi classical and in quantum field theory. The methods used to demonstrate this self inconsistency are based on a correct consideration of the de Broglie theory of 1922 to 1924 and de Broglie Einstein equations. The major self inconsistencies can be addressed only with general relativity, for example through the use of the covariant mass or *R* theory recently developed in UFT 158 onwards of this series.

Keywords: Electron positron collision, *R* theory, ECE theory.

1. Introduction.

In UFT 158 to 166 of this series (www.aias.us) of 171 papers to date [1–10] severe self inconsistencies emerged throughout the standard model of physics. They were found through correct consideration in various contexts of the de Broglie postulates of 1922 - 1924 [11, 12] which give the basics of wave particle dualism in complete form. The duality of wave and particle is a cornerstone of the standard model of physics, so when this type of theory is found to be severely self-inconsistent the standard model essentially collapses. It was replaced in UFT 158 to 166 (www.aias.us) by a theory of general relativity based on ECE theory. This generally covariant approach is developed in terms of the covariant mass parameter R which is defined directly from the most fundamental equation of Cartan geometry, the tetrad postulate. In one sense, R measures the extent to which the mass in special relativity departs from constancy. The standard model in physics is wildly self inconsistent because the data from experiments such as scattering and absorption indicate a given mass that is not constant if the de Broglie postulates are rigorously taken into account. So the standard model is basically self contradictory, the mass is constant according to theory, but at the same time varies with frequency, can be complex valued or pure imaginary if the de Broglie postulates are implemented rigorously as in UFT 158 to UFT 166, i.e. if wave particle dualism is rigorously and fully taken into account. It is emphasized that this self inconsistency occurs on the relativistic classical level, and therefore occurs on the quantum level. Second quantization as in quantum field theory, or perturbation theory as in quantum electrodynamics do not cure the problem.

In Section 2 it is shown straightforwardly that the theory of electron-positron scattering is wildly self inconsistent on the classical relativistic level. The methods used to show this are a simple variation on those of UFT 160 where a particle of given mass collides with a particle of another mass initially at rest. If the masses are assumed to be constant at the beginning of the calculation, they are not so at the end, a disaster for the standard model. Whatever the latter´s claims to precision in a given context, such as relativity or quantum mechanics, these claims do not stand up to scrutiny when de Broglie postulates are used correctly. Astonishingly, after a hundred years of the standard model, the de Broglie postulates were used correctly for the first time in UFT 158 onwards. As is well known, the de Broglie postulates equate the most basic concepts of special relativity and quantum mechanics. There is no way out of them, so they must be used whenever the standard model is used, and they must be used fully and correctly. The resulting severe problems in the standard model were addressed in UFT 158 to UFT 166 of ECE theory by introduction of the covariant mass parameter R as described. Therefore this parameter must be used to develop the theory behind LEP for example, the well known large electron positron collider, or the heavy hadron collider at CERN. Otherwise the LEP and CERN data of any kind will suffer from the same drastic self inconsistencies as in UFT 158 to UFT 166. These self inconsistencies bring in to doubt all the claims made to date about the LEP data unless these data are interpreted with ECE theory.

2. Electron positron collisions in classical special relativity.

The theory given in this section is given in full detail in UFT 160, so only a summary will be given here. This theory applies whether or not the electron and positron annihilate, and is valid on the classical relativistic level for all products of annihilation. It is also valid if the electron and positron scatter as in Compton scattering. The two basic equations are those of conservation of total energy and conservation of total momentum. Consider a particle of assumed constant mass m_1 travelling with velocity v colliding with an initially static particle of assumed constant mass m_2 . Conservation of total energy implies:

$$\gamma\, m_1\, c^2 + m_2\, c^2 = \gamma'\, m_1\, c^2 + \gamma''\, m_2\, c^2 \tag{1}$$

where the Lorentz factors of special relativity are defined by:

$$\gamma = \left(1 - \frac{v^2}{c^2}\right)^{-1/2} \quad , \quad \gamma' = \left(1 - \frac{v'^2}{c^2}\right)^{-1/2} \quad , \quad \gamma'' = \left(1 - \frac{v''^2}{c^2}\right)^{-1/2} \; . \tag{2}$$

Conservation of total momentum means that:

$$\boldsymbol{p} = \boldsymbol{p}' + \boldsymbol{p}'' \tag{3}$$

where $\boldsymbol{p}$ is the sum of initial momenta balanced by the sum of final momenta on the right hand side. These equations are true on the classical relativistic level both for scattering and annihilation. In scattering the right hand sides of Eqs. (1) and (3) represent the electron and positron, in annihilation they represent the various products of annihilation such as gamma rays and other particles.

As shown in UFT 160 Eqs. (1) and (3) must be solved simultaneously with correct consideration of the de Broglie postulates. This procedure leads to the result:

$$x_2 = \frac{\omega\omega'}{\omega - \omega'} - \left(\frac{x_1{}^2}{\omega - \omega'} + \frac{1}{\omega - \omega'} (\omega^2 - x_1{}^2)^{1/2} (\omega'^2 - x_1{}^2)^{1/2} \cos\theta \right) \tag{4}$$

where:

$$x_1 = \frac{m_1 c^2}{\hbar} \quad , \quad x_2 = \frac{m_2 c^2}{\hbar} \quad . \tag{5}$$

Here ω is the angular frequency of the incoming electron wave, and ω' is the angular frequency of the scattered electron wave. In annihilation the electron is transmuted into other particles, but for each particle the de Broglie postulate must hold if wave particle dualism is to hold as a theory. For each particle there must be a wave and so there must be a wave angular frequency. In Eq. (4), θ is the scattering angle defined in UFT 160. Again if there is annihilation there must be a scattering angle for each product of annihilation. If there are many products of annihilation Eq. (4) becomes more complicated, but its basic structure is unaffected on the classical relativistic level. Clearly, if the theory is going to be correct, its basic classical level must be correct. In Eqs. (5), $\hbar$ is the reduced Planck constant and *c* the constant of the standards laboratories known as "the vacuum speed of light".

For ninety degree scattering:

$$\cos\theta = 0 \tag{6}$$

and Eq. (4) simplifies to:

$$x_2 (\omega - \omega') = \omega\omega' - x_1{}^2. \tag{7}$$

The mass of the electron is the same as that of its anti particle, the positron, so:

$$m = m_1 = m_2 \tag{8}$$

Denote:

$$x = \frac{mc^2}{\hbar} \tag{9}$$

and Eq. (7) becomes:

$$x^2 + (\omega - \omega')\, x - \omega\omega' = 0 \tag{10}$$

whose solutions are:

$$x = -\omega \quad \text{or} \quad x = \omega' \tag{11}$$

This result is obviously self inconsistent, because the mass *m* is not constant as was initially assumed. In UFT 160 the algebra was checked by computer, so there are no human errors and no errors of concept. If for the sake of argument, the mass is interpreted as having to be positive valued, the result is still completely wrong, *m* is proportional to the initial frequency of the electron wave, so *m* is not constant as assumed initially. Using the de Broglie postulates:

$$\hbar\,\omega = \gamma\, mc^2 \quad , \quad \hbar\,\omega' = \gamma' m\, c^2 \tag{12}$$

Eqs. (11) and (12) lead to the internally contradictory results:

$$\gamma = -1 \quad , \quad \gamma' = 1 \quad . \tag{13}$$

The second of these means that the outgoing particle must be static, while the electron was initially assumed to move with a given velocity. This means that a collision never occurs, another absurdity.

In the *R* theory [1–10] the mass is defined by the equation of general relativity:

$$R = \left(\frac{mc}{\hbar}\right)^2 \tag{14}$$

and *R* is made up both of spacetime torsion and curvature. Therefore the collision of an electron and positron is interpreted as producing two results, two different possible *R* values:

$$R = \left(\frac{\omega}{c}\right)^2 \quad \text{or} \quad \left(\frac{\omega'}{c}\right)^2 \quad . \tag{15}$$

This is consistent with the well known experimental fact of standards laboratories that the electron has a precisely defined and constant mass which does not change. This mass, denoted m_0 , defines the rest value of *R*, denoted R_0 , the value of *R* for an isolated particle at rest:

$$R_0 = \left(\frac{m_0 c}{\hbar}\right)^2 \quad . \tag{16}$$

In general, when θ is not 90º then *x* is given by solving Eq. (4) to give a quartic:

$$a\, x^4 + b\, x^3 + c' x^2 + dx + e = 0 \tag{17}$$

where

$$a = 1 - \cos^2\theta \quad ,$$

$$b = 2\,(\omega - \omega') \quad ,$$

$$c' = (\omega - \omega')^2 - 2\,\omega\omega' + (\omega^2 + \omega'^2)\cos^2\theta \quad ,$$

$$d = -2\,\omega\omega'(\omega - \omega') \quad ,$$

$$e = \omega^2\,\omega'^2\,(1 - \cos^2\theta) \quad . \tag{18}$$

This equation was checked by computer algebra and in general gives four roots dependent on scattering angle. There is no way in which m can remain constant at the end of the calculation. Some properties of *x* are discussed in Section 3, where the quartic (17) is solved numerically.

3. Numerical solution of Eq. (17) and discussion.

A further inspection of Eq. (4), respectively Eq. (17), by computer algebra reveals that this equation can be factorized to the form

$$(x-\omega')^2(x+\omega)^2 = \cos(\theta)^2(x-\omega')(x+\omega')(x-\omega)(x+\omega). \tag{19}$$

This means that the two special solutions of Eq. (11) are general solutions, independent of θ:

$$x_1 = -\omega,\ x_2 = \omega'. \tag{20}$$

The other two solutions of the quartic equation are

$$x_{3,4} = \frac{\pm[(\omega^2+2\omega\omega'+\omega'^2)\cos(\theta)^4+(2\omega^2-12\omega\omega'+2\omega'^2)\cos(\theta)^2+\omega^2+2\omega\omega'+\omega'^2]^{1/2}+(\omega-\omega')\cos(\theta)^2+\omega-\omega'}{2(\cos(\theta)^2-1)}. \tag{21}$$

These two additional solutions are depending on θ. In this paper we made the assumption

$$m_1 = m_2 = m. \tag{22}$$

The fact that we obtain several solutions being different from the input mass leads to the known contradiction as discussed in section 2.

To show the characteristics of solutions x_3 and x_4 they have been plotted as surface plots in Figs. 1 and 2 for ω = 1 (i.e. a normalized electron mass). From Fig. 1 it can be seen that the normalized mass x_3 is positive for all frequencies of the outgoing positron. For $\omega' < \omega$ it results $x_3 < 1$ which seems to be realistic. For $\omega' > \omega$ the mass diverges for scattering angles of 0 and 180 degrees.

Fig. 2 proves that mass solution x_4 is negative in the whole parameter range and therefore is unrealistic. In case $\omega' < \omega$ the mass diverges to negative values for scattering angles of 0 and 180 degrees.

We have investigated the solution x_3 more detailed in the range $\omega' < \omega$ which seems to be the only realistic case. In Fig. 3 the curve is shown for two angles of θ. For $\theta = \pi/2$, x_3 rises nearly linear with ω´. For $\theta = \pi/8$, the rising is very non-linear.

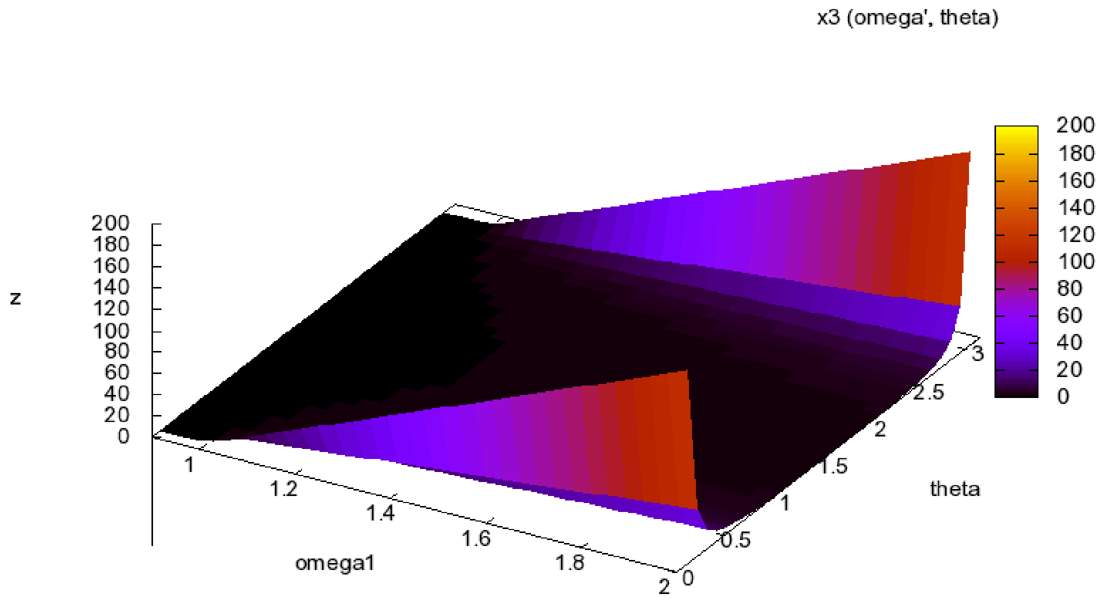

Fig. 1. Surface plot of $x_3(\omega', \theta)$ for normalized input frequency $\omega = 1$.

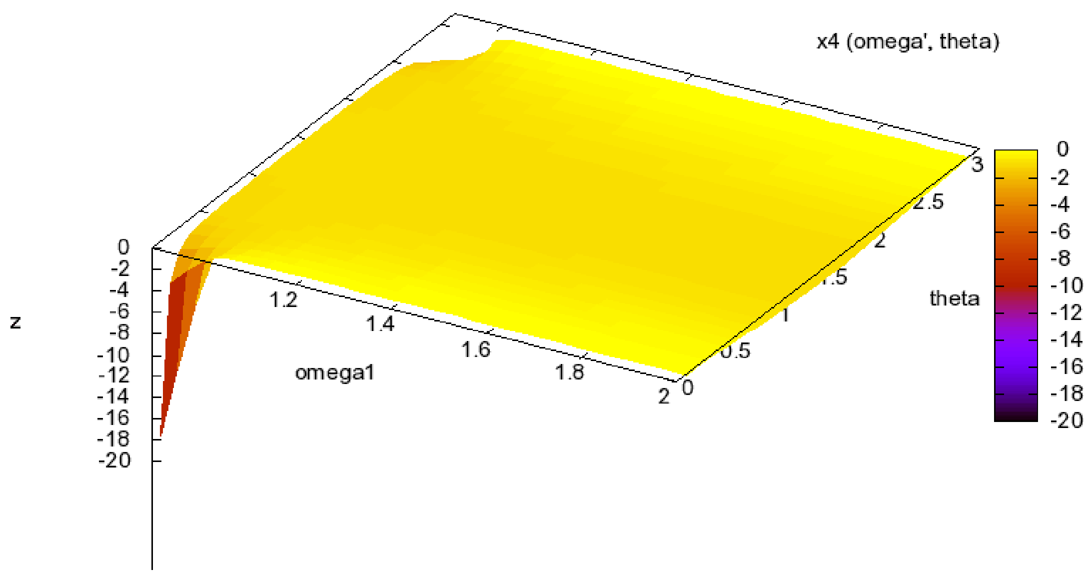

Fig. 2. Surface plot of $x_4(\omega', \theta)$ for normalized input frequency $\omega = 1$.

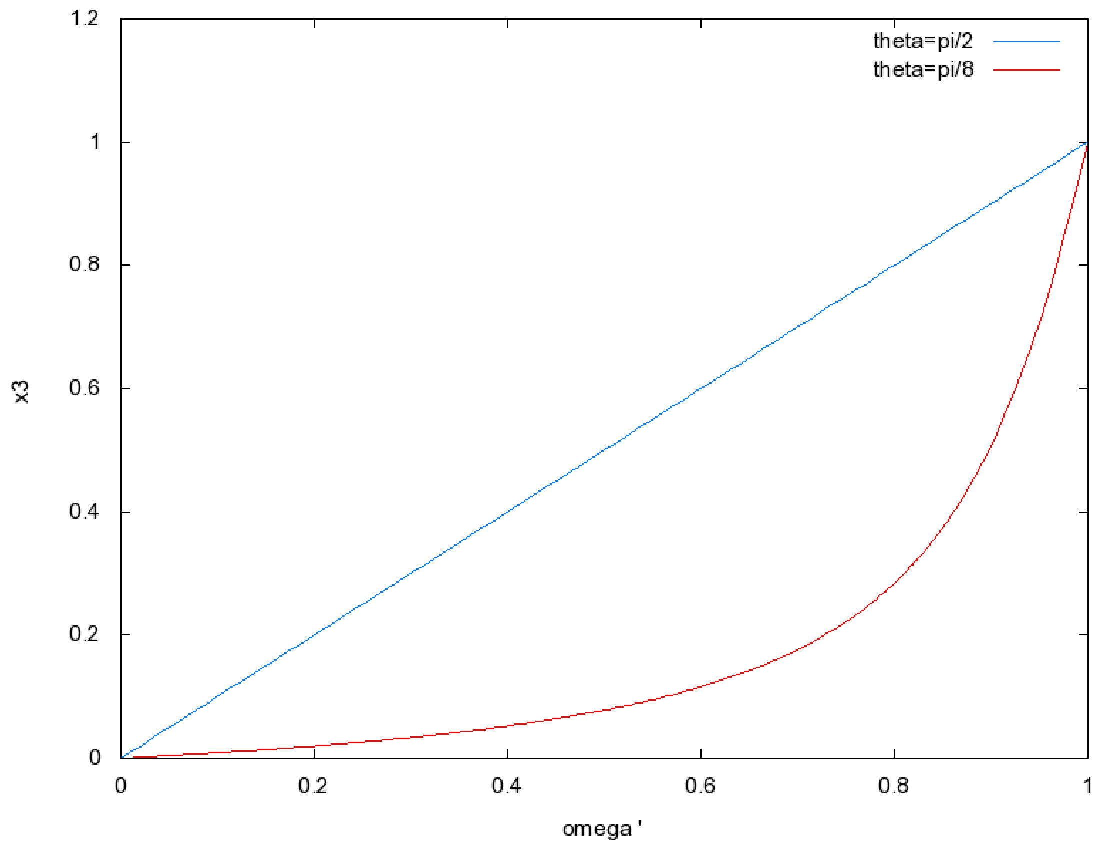

Fig. 3. Dependency of $x_3(\omega')$ for two scattering angles θ in the range $\omega' < \omega$.

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