The Projection Theory Part I, Supplement 2:

The mystery of the electron size

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Abstract

The size of the electron is still mysterious.

Quantum electrodynamics (QED) requires a radius of 0,[1] projection theory gives a radius of $0.66943\ 10^{-16}$ m and the classical electron radius calculated via the electron's self-energy is given in the[5] literature as $2.82794\ 10^{-15}$ m. The main subject of this work was a decided analysis of the equation system for the calculation of the classical electron radius.

The following important points could be worked out:

a) The factor f_{42}, which was derived in the context of the projection theory, appears in a system of equations from the established physics.
b) The classical electron radius is not $2.82794\ 10^{-15}$m but $1.3214098\ 10^{-15}$m (= λ_{CP} = s_{min}), and this finding finds a simple explanation in the projection theory.

c) The equations for the calculation of the classical electron radius or for the calculation of the Compton wavelength are, after minor transformations, completely congruent with the formulae developed in projection theory for the calculation of the electrostatic field constant ε_0 or Planck's quantum of action h.

These new findings clearly show that the projection theory is not an abstruse idea resp. exotic physics, but is already inherent in the existing equations of established physics and these only have to be reinterpreted to recognize the true core of our physical reality.

Introduction

The radius of the electron reveals almost the whole dilemma of present theoretical physics, which is obviously characterized by great contradictions.
On the one hand, quantum electrodynamics (QED), which generally describes and calculates the interaction between particles and photons, requires a point-like electron, on the other hand, for experimental physics, i.e., essentially for the calculation of effective cross sections in scattering experiments on and with electrons, one needs a real radius which is clearly above 0. This is derived from the so-called self-energy of the electron and is called the "classical" electron radius. It is with $2.8179\ 10^{-15}$ m (CODATA)[5] still clearly above the radius of the proton, which is given with $0.841\ 10^{-15}$ m according to the current state of the research. Also, this is a little bit astonishing, one assumes intuitively that a body, which is approx. 2000 times lighter than another one, should also be correspondingly smaller. Exactly this idea of a constant elementary particle density has led us in the projection theory[1] to the formally already astonishing electron radius of

$$r_e = \sqrt[3]{3\cdot\left(10^{-7}\right)^7}$$

from which we could derive all relevant quantities and which we therefore regard as the actual radius.
Even more astonishing than the large “classical” radius is the point-like "particle" of QED. Because a construct without extension does not exist in a three-dimensional world and can neither enter interactions there nor develop other effects. Such a construct is a priori nonsensical.
If, in addition, one inserts the radius 0 into the equation for the self-energy, with which one calculates the "classical" electron radius, one obtains an infinitely large mass. This problem is solved by a mathematical operation called renormalization. An operation which A. Unzicker calls in his book "Einsteins Albtraum"[4] a "mathematical sleight of hand".
To juggle with infinite masses or even negative infinite masses is as nonsensical as the existence of point-like "particles" in a three-dimensional world.
The whole QED is based on such a very questionable foundation and no less a person than Paul Dirac then also passes a damning judgment on this theory:

[4]*Quantum electrodynamics is a final farewell to logic. It changes the character of a theory, instead of logical conclusions one simply establishes some rules.*

But not criticism of QED is the subject of this work, but a decided consideration and modification of the equation for the calculation of the self-energy and the resulting gain of knowledge for the projection theory.

The factor f_{D42}

Before we deal with the derivation of the classical electron radius, we want to look again briefly at the factor f_{D4}, which was derived in the main part of the projection theory[1] and supplement it, since it still plays an important role in the first part of this work.

$$f_{D4} = \sqrt{1 - \left(\frac{1}{4}\right)^2}$$

The factor fD4 reduces the gravitational or electrostatic force, which is evenly distributed on four dimensions, to the one dimension in which the force action between two bodies takes place. Parallel lines of force emanating from plane surfaces are the prerequisite for this factor.

$$f_{geo} = 1 - \frac{r_e^2}{(s_{\min} - r_e)^2}$$

$$f_{D42} = \sqrt{1 - \left(\frac{f_{geo}}{4}\right)^2}$$

The factor f_{D42} accounts for the reduced force transfer when the field lines emanate from spherical surfaces, such as the electron, and are consequently not parallel.

With the relation derived in the first supplement[2] of the projection theory

$$s_{\min} = 2\pi^2 r_e$$

f_{D42} can now be represented exclusively with integers and the mathematical constant π so important for our entire physical reality.

$$f_{D42} = \sqrt{1 - \left(\frac{1 - (2\pi^2 - 1)^{-2}}{4} \right)^2} = 0,9684293766$$

$$\frac{1}{f_{D42}} = 1,03259982 \qquad \frac{1}{f_{D42}{}^2} = 1,066262388$$

The self-energy of the electron

The self-energy can be understood as the potential energy of an electron on a spherical surface at the distance r_x of a second, field-generating electron. The calculation is done according to the classical rules of electrostatics. Related to **one** electron, this value must be divided in half and we obtain:

$$E_{e_S} = \frac{e^2}{8\pi\varepsilon_0 r_x}$$

An important basic idea is that this energy cannot exceed the maximum possible energy of the system, i.e., the rest energy of the electron, and consequently a minimum distance cannot be fallen short of.

$$E_{e_{S\max}} = \frac{e^2}{8\pi\varepsilon_0 r_{\min}}$$

$$E_{e_R} = m_e c^2$$

We therefore expect the following equation to be valid for the minimum distance s_{min}:

$$\frac{E_{e_S \max}}{E_{e_R}} = 1$$

If we put into the above equation, on a trial basis, the Compton wavelength for the proton, which, as is well known, has been experimentally determined from scattering experiments of high-energy photons on protons, we obtain, however, not 1, but the factor f_{D42} calculated in the previous section, in the form $1/f_{D42}^2$

$$\frac{E_{e_S \max}}{E_{e_R}} = \frac{e^2}{m_e c^2 8\pi\varepsilon_0 \lambda_{CP}} = 1,066262805$$

$$\frac{1}{f_{D42_{cal}}{}^2} = 1,066262388$$

If we correct the self-energy by means of f_{D42}^2, we obtain the expected value 1 for the quotient of the above equation with a relative deviation of only 3.9 10^{-7}.

$$\frac{E_{e_S} f_{D42}{}^2}{E_{e_R}} = 1,00000039$$

In our opinion, such an excellent agreement cannot be by chance, so that this "classical derivation" can be taken as a confirmation for the actual existence and enormous importance of the factor fD42.
This factor was to be expected in principle, since we have contrasted here on one side the rest energy as intrinsic maximum energy, completely independent of direction factors and geometry of the particles, with the self-energy as potential energy of a spherically symmetrical electric field, which contains all elements, which we have taken as a basis for the derivation of the factor f_{D42}.

Consequently, this calculation presented above confirms not only the existence of the factor f_{D42}, but also the assumption that λ_{CP} is the minimum length limiting the projection system downward, which we have already derived in a different way in themain part[1] and the recent publication[3] on “The Heisenberg uncertainty principle”.

The "classical" electron radius

In the literature, the classical electron radius is usually calculated somewhat differently than we did in the previous section, using - for whatever reason - twice the self-energy, so that the literature[5] usually gives the value shown below.

$$r_{\mathrm{e_{clas}}} = \frac{e^2}{4\pi\varepsilon_0 m_{\mathrm{e}} c^2} = 2{,}8179403262(13)\cdot 10^{-15}\,\mathrm{m}$$

The connection with s_{min} is now not only in the factor f_{D42} but also still in the factor 2, so that holds:

$$r_{\mathrm{e_{clas}}} \frac{f_{D42}}{2} = s_{\min}$$

resp.

$$\frac{e^2}{4\pi\varepsilon_0 m_{\mathrm{e}} c^2} \frac{f_{D42}{}^2}{2} = s_{\min}$$

At this point it is useful to recapitulate the definition equations for ε_0, μ_0 and α worked out in Part I of Projection Theory[1].

$$\frac{e^2}{4\pi s_{\min} m_e c^2} \frac{f_{D42}{}^2}{2} = \varepsilon_0$$

$$\frac{4\pi s_{\min} m_e}{e^2} \frac{2}{f_{D42}{}^2} = \mu_0$$

$$\frac{2\pi}{k_{Pe}} \frac{2}{f_{D42}{}^2} = \alpha$$

The correction factor shown in blue appears directly or in its reciprocal form in all equations.

$\frac{e^2}{4\pi\varepsilon_0 m_{\mathrm{e}} c^2} \frac{f_{D42}{}^2}{2} = s_{\min}$	$\frac{e^2}{4\pi s_{\min} m_e c^2} \frac{f_{D42}{}^2}{2} = \varepsilon_0$	$\frac{e^2 t_{\min}{}^2}{4\pi s_{\min}{}^3 m_{\mathrm{e}}} \frac{f_{D42}{}^2}{2} = \varepsilon_0$
A	A´	A´´

$$\frac{h}{m_P c} = \lambda_{CP} \qquad \frac{h}{m_P c} = s_{\min} \qquad \frac{s_{\min}{}^2 m_P}{t_{\min}} = h$$

B B´ B´´

Particularly interesting is the realization that Eq. A and Eq. A' are completely identical, only once resolved to s_{min} and once to ε_0, although they were derived very differently.

There are with B and B' two further equations, which must be identical except for different symbols for the result. However, this different symbolism on the right side already shows that also in this case the derivation of the equations is very different.
Let us first turn to equation B, which is necessary for the calculations of momentum transfer in scattering experiments of γ-rays on elementary particles such as electrons or protons, respectively. Thus, we are concerned here with experimental physics and the calculation of a wavelength shift. Momentum transfers by elastic collision are angle dependent, i.e., the above formula is a shortened form of the actual equation:

$$\Delta\lambda = \frac{h}{m_p c}(1 - \cos\beta)$$

Only for the right-angled collision between proton and photon the following equation is valid and the wavelength shift in this special case is called Compton wavelength.

$$\Delta\lambda = \lambda_{CP} = \frac{h}{m_p c}$$

for

$$\beta = 90° \Rightarrow \cos\beta = 0$$

Also, the development of the equation **A** comes from experimental physics, because a radius 0, as determined by the QED for the electron is nonsensical when calculating an effective cross section, e.g., in scattering experiments on or with electrons.
The quite decisive difference between the equations **A** resp. **B** and **A'** resp. **B'** consists, however, in the fact that for the classically derivation of the equations **A** and **B** in each case the natural constants ε_0 resp. h must be known and, in both cases, also the knowledge of the famous Einstein's formula E=mc2 is an inevitable condition for the derivations of the equations.
This is not the case with the formulas **A'** and **B'** derived from the projection theory, because they represent the definition equations, i.e., the calculation formulas for the mentioned natural constants, where exclusively the elementary basic quantities minimum length s_{min} and time t_{min} must be known, which becomes clear from the formulas **A''** and **B''**.
Also, the mass-energy-equivalence formula does not appear in the projection theory, because it is here no independent formula, but a system-immanent matter of course. However, in the new theory the equivalence of mass and energy must be interpreted in a slightly modified way. For this, we refer to the main part of the projection theory[1]

Summary

The combined equation of self-energy and rest-energy of the electron were decisively considered. Thereby the astonishing finding arose that the factor f_{D42}, which was developed at that time from the projection theory, can be calculated from this "classical" energy equation by inserting the experimentally determined Compton wavelength of the proton. This factor consequently is not

specific for the projection theory, but also a systemic component of the established physics.
A slight modification of the calculation equation for the "classical" electron radius given in the literature led to the initially surprising finding that this corresponds to the edge length of the cubic proton.
This is easy to understand from the point of view of the projection theory, because every particle which is smaller than the spatial resolution of our projective world, i.e., is smaller than a spatial pixel or smaller than the cubic proton can represent itself minimally only in the extension of a pixel. This leads moreover compellingly to the conclusion that we will never be able to measure the electron radius. For a better understanding of these facts, the analogy to the digital photography already given in the main part of the projection theory[1] is listed again below*.

Finally, it could be stated that the equations derived from experimental physics for the calculation of the classical electron radius and the Compton wavelength, respectively, can be converted without any problems into the definition equations for ε_0 and h derived from the projection theory, which means that the projection theory is not a strange idea resp. exotic physics, but is already included in the existing equations of the established physics and these only have to be reinterpreted in order to recognize the true kernel of our physical reality.
Exactly this was also the central statement in the critical discussion of the “Heisenberg uncertainty principle” which was recently published[3] on this platform.

**For clarification we will once again use digital photography. Of course, there are countless objects in our world that lie below the resolution of our light sensor chips. Let's assume that such a particle is stationary in the light of the camera for the chosen exposure time. It causes a more or less large shading for one pixel. Unaware of the limited resolving power of our camera, we would equate the particle size with the pixel size. If we notice, however, that all particles below a certain size always seem to have the same extension and that we cannot observe any internal structure or individual characteristics, we can also start from the idea that these particles have no extension at all but only an effect (in this case a shadowing effect). Both considerations are valid for the electron. On the one hand, for some calculations the classical electron radius is used, which with 2,8 . 10^{-15} m leads to a volume in the order of magnitude of our pixels. On the other hand, today more than ever, we assume a point-like particle that is only characterized by its effect (charge). Both ideas are wrong according to the above explanations.*

References

[1] **viXra:2104.0093**

[2] **viXra:2112.0016**

[3] **viXra:2301.0137**

[4] A. Unzicker Einsteins Albtraum Westend-Verlag GmbH Frankfurt/Main 2022
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[5] CODATA Recommended Values. National Institute of Standards and Technology, 20. Mai 2019, Klassischer Elektronenradius

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5 *CODATA Recommended Values.* National Institute of Standards and Technology, 20. Mai 2019, Klassischer Elektronenradius

6 Yong-Hui Lin, Hans-Werner Hammer, and Ulf-G. Meißner