Calculating the Size of any Stable Particle

by

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Abstract:

This article builds upon my first paper, "Relation of the Internal Structure of the Photon with Field and Charge" (https://vixra.org/abs/2301.0148), and assumes that one has read that first; any references involving that paper will be referred to as "my first paper". Using the theories presented therein, this paper will determine a formula that can be used to calculate the radius of any given stable particle; i.e., protons and electrons, with the currently known radius of the proton to be used as a comparison. Following that will be provided an estimate as to the maximum number of photons that a particle can hold before its radius would expand. Finally, a fallout from all this will be the realization of a probable geometric origin for 'e', much like we have one for π.

Introduction

The formula I will derive in this paper makes use of the theories presented in my first paper to present a precise calculation of the radius of any given particle. While it is designed to provide a value for the stable particles of proton and electron, it can be used for other particles as well given enough of the proper information about said particles. However, it should be noted in light of my first paper that of the myriad of other ephemeral particles whose lives last little more than a millionth of second or far less, anything that short lived is not really a particle but a chance meeting of photons on the detector, but moving on.

I start with a couple of things. First, the resonant frequencies I calculated for the proton and electron photons, though perhaps "Entanglement Frequency" is a better term. Since the proton's is the only particle with a consistently measured radius (but as yet, never calculated), and the electron's has only been calculated but never confirmed with measurements, then it is the proton's radius that I shall run the numbers for once my new formula is established. So, our goalpost is then:

$R_+ = 8.31 \times 10^{-16}$ meters classical radius for the proton.

The proton radius has had a range of values over the years, going from 8.4 to 8.6 x 10^{-16} meters, but has been consistently lowering, with 8.31 being the latest most reliable measurement, so that is the one that I shall use.

The Derivation

We begin with some very basic assumptions. Knowing now that all particles are comprised of photons locked together in the same frequency spinning around a common center, we can simply apply some basic geometric principles by imagining what exactly is happening. At the minimum internal configuration of a particle you have 3 photons chasing each other, their attraction for one another balanced out by their speed and momentum. At any given instant of time, those three photons could be anywhere about the spherical shape they prescribe. Two might be in the same equatorial circular plane while the third one is running over a polar arc. Then later all three might be in the same circular plane.

This presents some interesting difficulties. First, for cases when only two of them are in the same circular slice of the sphere, the radius of the sphere will be smaller than when all three are in the same circular slice. This is because the radius of their circle is defined by the lengths of the photons involved; two photons of the same given length wrapped end-to-end will define a smaller circle than three photons wrapped end-to-end. This means that the exact radius of any given particle will be constantly fluctuating, but within a defined range of values: the larger radius will be for when all three photons are in the same circular plane, while the smaller radius will be when only two of them are in the same circular plane.

Which then is the 'true' radius of a particle? The maximum radius, where all three photons are in the same circular plane, is the maximum particle radius possible and hence our most optimal definition for a particle's radius. Just understand that when measuring such a thing that fluctuation of the exact size and shape of a given particle at any instant of time is inherent in the fact of being comprised of a group of photons constantly in motion about one another. At any rate, this is the assumption that we will use (though if you wish to compute the minimum radius, an easy substitution could be made).

We start then, with the simple formula for the circumference of a sphere:

$$C=2\pi r,$$

where 'r' is the radius that we seek.

This circle will be comprised of the combined lengths of those three photons, or:

$$C = N\lambda,$$

where N is the number of photons, and λ is the entanglement wavelength of the particle in question. Here N=3 as previously stated in my first paper, but we shall leave it in symbol form for now (if you wish to calculate the minimum radius as it fluctuates, then you can simply use N=2). However, this is still incomplete.

Remember that a photon is the concentration of the force that gives rise to it, squeezed down into what we know of as energy, but its ends still expand out into a surrounding field of force that will interact with whatever it passes– like the other photons it's entangled with. For life within the particle there will be a practical limit as to the range of this that we need to worry about, but basically it means that the lengths we have to worry about shall include some as-yet unknown length added onto the length of each photon being considered. To account for this, we know write this:

$$C = N\lambda X,$$

where 'X' is our unknown length multiplier.

Equating our two circumference formulas we now get the following:

$$2\pi r = N\lambda X.$$

Solving for 'r' then yields,

$$r = N\lambda X/(2\pi).$$

We do not yet know what 'X' is, but let's put in what we do know and see how far off we currently are from the measured value. Using N=3, and the entanglement wavelength for a photon of 6.352906×10^{-16} meters that I previously calculated for protons, we have,

$r = 3\,(6.352906 \times 10^{-16})\, X/(2\pi) = 3.033289 \times 10^{-16}$ meters times whatever 'X' is.

Comparing this to the measured value of 8.31×10^{-16}, we see that we are off by a factor of about 2.7396. It took me a few moments of staring at that number to realize what was going on and what 'X' is, for compare this to 2.71828 and you'll realize that our 'X' is within 0.78% of e. This means that our full formula should be,

1) $\mathbf{r = N\lambda e/(2\pi).}$

Let's then input e for our 'X' and see how things come out.

2) $r = 3\,(6.352906 \times 10^{-16})e/(2\pi) = 3(6.352906\times10^{-16})(2.7182818)/(2\pi) = 8.2453348549\times10^{-16}$ meters.

Comparing to the measured value for the proton radius, we are off by only 0.7782%, and I'm willing to bet money that even that little error lies in the experimental measurement itself, given how it's still being refined.

Explaining 'e'

However, now we need to explain the presence of that 'e' in there. Given that 'e' appears in my derivation of c^2 from my Gravitational Field Density, it's not too surprising that it would appear here, but why simply e^1? The obvious supposition is that it is not simply a 1 in the exponent, but a ratio of two items that happen to be equal and cancel out to one. Thus, our formula is technically,

$$r = N\lambda e^{u/v}/(2\pi).$$

Making a good educated guess as to the values of u and v is not too difficult now, given that on this scale we have so few things to work with, chief amongst them being the force field radiating out from the photon.

The field emanating from the photon would tend to be shaped by its geometry; assuming the photon to be longer than it is wide, then its field would be longer at the ends than it protrudes from the sides. This gives us just the two force components that really matter; the axial force (along its length) and the radial force (radiating out from the photon's width). Remembering that the base force is all-attractive (and the reason we have photons in the first place), we can picture the radial force as trying to squeeze in towards the center which, like squeezing a tube of toothpaste, would cause it to expand out along its axial length past its front and rear ends.

However, the axial force is also self-attracting and pulling things back into the core of the photon. These two forces would have to be exactly equal to one another, since if they were not then the photon would keep on shrinking in upon itself until they were. Thus u=v and $e^{u/v} = e^{x/x} = e^1$, and the actual total length we're working with for our calculation is actually 'λe'

One problem down, now about 'e' itself. As I said before, since 'e' is key to deriving c^2 from my Gravitational Field Density we can probably make a very good case for that being the reason why we find it here, but I think there's something a lot deeper going on here. For there is another reason why 'e' could be present.

What if 'e' is actually a ratio?

We've already figured in the ratio of the forces involved with our u=v, so what might be left that could figure in to our simple little calculation? Basic geometry. Specifically, the physical length of the photon compared to its breadth. The length of course is its wavelength, λ, but its breadth could either be the radius of the photon or its diameter. Two argument in favor of the breadth being the radius: First the symmetry of how a photon is built. But also if we substitute 'λ/x' in for 'e' to our circumference formulas, we see that in

$$2\pi r = N\lambda(\lambda/x),$$

that 'x' and 'r' are completely linear with one another and straightforwardly interchangeable, implying that if 'r' is a radius then so too must be our 'x'. This means that 'e' is actually the ratio of the photon's wavelength divided by its radius.

$$e = \lambda/(\text{photon radius})$$

Considering how universal that 'e' is, there is no way that this relationship would apply only for photons entrapped in the form of particles; it would have to apply to *all* photons. Thus we have a geometric origin of 'e' that ties into our study of the humble photon.

e = (wavelength of a photon)/(radius of a photon)

This means that 'e' is to the photon what π is to the circle! It also means that to know the radius of a photon, all you have to do is divide its wavelength by 'e'.

Radius of the Electron

Getting back to calculating particle radii now, we have done it for the proton, now let's plug in the numbers for an electron. Using the calculated value for the wavelength of photons within an electron, we get,

3) $R_- = 3\ (1.1665\text{x}10^{-12}\text{ meters})\ (2.7182818)/(2\pi) = 1.51398165\text{x}10^{-12}$ meters.

And from before

4) $R_+ = 8.2453348549 \text{ x } 10^{-16}$ meters for the proton.

This shows that, while a proton is much more massive than an electron, the electron is the physically larger particle. The reason for this should be intuitively obvious by now, for while an electron has a far lesser energy-mass than a proton, being constructed of photons means that this lower energy yields longer wavelengths, and hence a larger particle radius.

How Many Photons can a Particle Hold?

We have now the general formula for calculating the radius of any given particle, calculated values for the proton and electron, and a geometric revelation for 'e', but there is still one more question that we can ask. How *many* such photons can a particle hold without expanding its radius? Since, after all, if you add in more than the minimum of three, additional photons could simply find a new circular plane of that same sphere to orbit around in without the need to expand the particle radius. It would also mean that with more particles filling it out, the radius of a particle would more stable and subject to less and less variation.

This too is a straightforward calculation, at least now that we know how to calculate the width of a photon.

Begin with the surface area of a sphere. At its maximum radius you have three photons all in the same circular slice of that sphere, so the question then becomes how many of these circular slices can you draw on a sphere before running out of room?

Since all photons within a given particle are entangled at the same wavelength, the length of each such circular slice is simply the circumference of the sphere, the width of a slice then being twice the radius of the photons in question. Thus we have these two equations:

Area of sphere = $4\pi r^2$

Area of one strip = $(2\pi r) * [2* (\lambda/e)]$

The number of such strips is then the area of the sphere divided by the area of one strip.

strips = $4\pi r^2/\{(2\pi r) * [2* (\lambda/e)]\} = 4\pi r^2/(4\pi r\lambda/e) = re/\lambda$.

But we know 'r' to be $N\lambda e/(2\pi)$, so

5) $re/\lambda = \{N\lambda e/(2\pi)\} * e/\lambda = Ne^2/(2\pi)$.

The number of such strips is thus independent of the wavelength of the photons involved, as long as they all are of the same such wavelength (which inside a particle they would be). At this point we do not yet have to worry about fractions, since a fraction of a strip can still hold 1 or 2 photons.

Next, keeping N=3, and remembering that there are 3 photons per strip, we can now calculate the maximum number of photons allowable in a particle of a given radius.

6) # photons = $3 * \{3e^2/(2\pi)\} = 9e^2/(2\pi) = 10.58$

Since we cannot have a fraction of a photo pushing in there, then we truncate the number and get:

Max number of photons allowable in a particle = 10.

Recall from my other work that the number of photons in a particle increases with speed according to Einstein's Gamma, then we can quickly work out the speed of a particle with 10 photons within it as

$N = 10 = 3\{1/(1-v^2/c^2)^{1/2}\}$, solving for 'v',

7) $v = (1- (9/100))^{1/2}\ c = 0.95394\ c$.

This means that a particle would have to be going pretty close to the speed of light before we have to worry about it deforming.

So, what happens when one more photon, of the same entangled wavelength, beyond the particle's maximum tries to enter in? One of two results. First, the next photon could result in the particle's radius increasing to accommodate. The other option is that being so crowded, one of the photons within the particle would finally break the equilibrium and physically interact with another photon, combining to yield a new photon of twice the energy and hence twice the frequency. This latter result would mean that the new photon is no longer at the particle's entanglement frequency and is immediately ejected from the particle in the form of a gamma ray. Of course another option is that in the process of the entangled photons expanding their mutual orbits to accommodate the new arrival, one or more of the photons could simply shoot away at a tangent, perhaps taking a few others of the entangled photons with it, resulting in the original proton disintegrating into multiple lower-energy protons.

Conclusion

At the start of this paper I attempted to compute a formula that would describe the radius of any given particle in terms of the entanglement frequency of its constituent photons. We now have that, a computed value for the proton that matches up with experimental results, a new geometrical interpretation of 'e', the width of any given photon (which has been a question in my head since my first paper), and a calculation of the maximum number of photons that a particle can have before physically deforming in some way.

With these values, we seem to now have a compete picture of the photon and the particles they comprise.