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Concerning the Shape of the QTE Fourier Transform Wavenumber Spectrum, an Analysis of the Evolution of Our Ideas on the Matter, Starting with the Toth-Maatian Review Papers, 1990-93

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Abstract

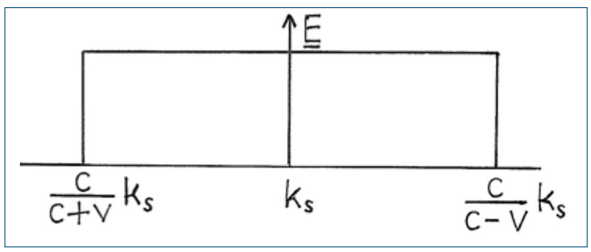
We start with the rectangular spectrum. What you get, from putting the spectral area = constant, is a relationship E(v). The question becomes, why is this relationship not reflected in the spectrum itself – instead, apparently, we just have a "flat top" spectrum, where the amplitude E does not vary with the wavenumber k(k_S, v). All the way back, right in the beginning, 1988, we consulted a book on Fourier Transforms and deduced a modification of the rectangular spectrum to a "dual triangular" spectrum. And that, without a lot of mathematical or physical justification, just "common sense", was the form of our spectrum in the Toth-Maatian Review papers, 1990-93. It only became evident very recently that the spectrum has an electronic component and a positronic component, each contributes one half of the spectrum, the one fermion contributes a line of positive slope in the E-k profile, the other, a line of negative slope. You start out with the Toth-Maatian Review profile, dual triangular, see Figure 4 below. The electron and positron in phase, the photonic wavepacket you accelerate onto contributes both the fermion and the anti-fermionic ghost, in-phase, in the calculation. Then you displace the two spectral lines such that the two lines of wavenumber dependency "overlap". This is now an out-of-phase association, (figures 5, 6 below), this time you are comparing the fermion with the anti-fermion, not the anti-fermionic ghost. And this time, the two wavenumber profiles, add together to get that constant spectral height that we started with! So comparing entities between two individual photons, the positronic one and the negative one, these are out-of-phase, in accordance with the Maxwellian wave, $\psi = \psi_0 \times \exp j(kx - \omega t) = \psi = \psi_0 \times [\cos(kx - \omega t) + j\sin(kx - \omega t)]$. Astoundingly, the E(k) algebra is the same, whether we are considering fermion + anti-fermionic ghost within an individual photon, or considering the fermion versus anti-fermion content between two separate photons – not concerned with the ghosts, in this equivalent description.

Keywords: Fourier Transform, Wavenumber Spectrum, Dirac Delta-Function, Physical (relativistic) Space, Electron Wave-Space, Out-of-Phase, in-Phase.

Introduction

Back to the Beginning – the QTE Wavenumber Spectrum, 1988, and the Toth – Maatian Publications, 1990 – 93

This is how it started, 1988, following the "Scientific American revelation", 1987 [1].



So, putting the spectral area constant gives you a relationship between |E| → |**E**| and v. In particular:

(i) As E → 0, v → *c*, and:
(ii) As E → 1/v = ∞, Fl/λ → E^2.

As soon as this result appeared, knew we were onto something, have obviously made it the mission of my life to account for this result. Well, a problem occurs to you soon enough, we have E = E(v), explicitly, but when you analyse what is going on inside the wavenumber spectrum, you see v is being varied, but E is a constant! How would we reconcile this discrepancy? The way ahead appears to allow for an improvement in the shape of the spectrum, such that its area is still a constant, but there is a variation of E with v, within the wavenumber spectrum, and that this variation agrees with the variation that is obtained by putting the spectral area = constant.

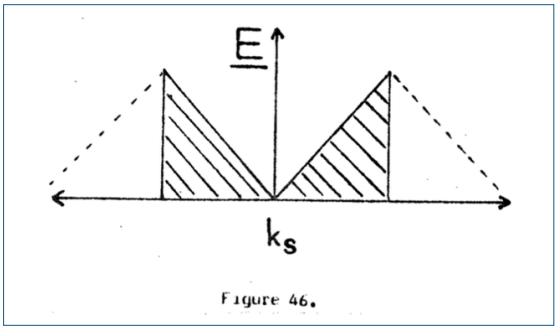


Figure 2: Original Spectral Dependency Figure, Toth-Maatian Review. We See Later that this is the Frame of the Reverse Higgs Boson.

The first thing to note is that if this is to be a simple algebraic proportionality, we are going to require "$k_s = 0$", then you have a simple proportionality each side of the "origin", $E \propto k$, and then the internal dependency of the wavenumber spectrum matches the dependency obtained by putting the spectral area = constant.

Let us persevere. Don't worry about "ks = 0", just "pretend" it is zero. There are few options to get it right here, and we must seize upon any possibility that eventuates. So at this point, one might pick up a book on the Fourier transform, with the purpose of investigating non "trivial" spectral shapes, i.e. wavenumber spectra that are not rectangular in shape. And here is our result, from the book on Fourier transforms.

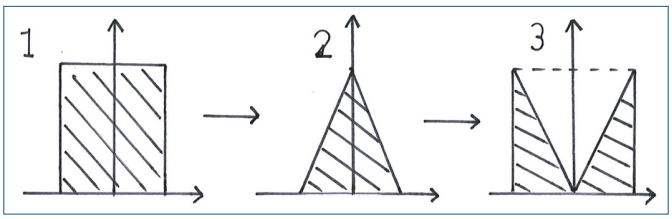


Figure 3: We Ascertain that a Triangular Spectrum "2" Will do Just as well as a Rectangular One, "1", and by Symmetry we Extend this to Something that Looks More Likely to be the Solution to our Dilemma, the Spectrum "3".

According to this proposition, our spectral analysis, "Area = constant", is going to be as follows.

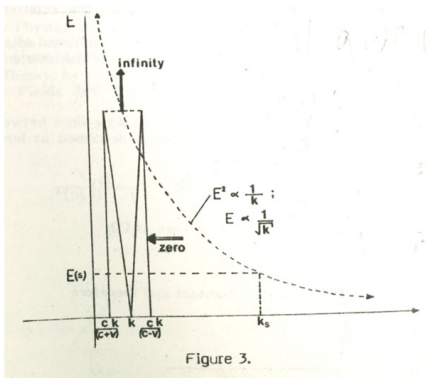


Figure 4: This is the Constant area Wavenumber Spectrum, Toth-Maatian Review.

However, this spectrum may be the ultimate truth of the situation, but there appears to be no manner in which we can connect an algebraic analysis with the geometry we observe here, quite simply, because $k \neq 0$, $k = k_s$. So at this point, the approach became to simply employ the rectangular spectrum, to have any hope of getting an algebraic solution, and just accept that for one reason or another, the algebra "inside" the spectrum does not match the algebra "outside" the spectrum. And to just proceed regardless, employ a rectangular spectrum. Indeed, this is the correct approach, as we shall deduce, below.

For quite a while, we proceeded on the basis that the spectrum 3 in Figure 3 above was going to be acquired with two proportionality vectors corresponding to the electronic versus the positronic photonic components. For a long while, we clung to the hope that this would be the solution to our dilemma. This was around the time I was in Ashburn Hall psychiatric hospital in Dunedin, 1988-89, depended on this to be the solution to the problem. Now, all these years later, the solution to the problem is almost trivial. If you add the two fermionic wavenumber vectors, electronic versus positronic, the result is not the wavenumber spectrum of Figures 3 and 4 above, the result is a *horizontal line!*

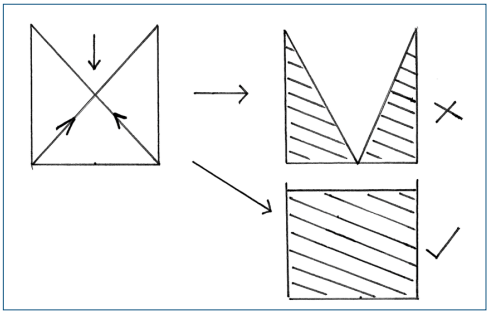


Figure 5: If You Add the Electronic and Positronic Wavenumber "Vectors", You Don't Get the "Spectrum 3" Above that We Have Been Discussing, You Get Rather a Flat Horizontal Line, the Rectangular Spectrum.

What did it take to come to this realization? It took the QTE terrestrial circuit analysis. If electrical currents have constant currents throughout an extended electromagnetic flux tube, yet the fermions are radiating out of the circuit, then why do the currents stay constant, when fermions are leaving the circuit as photons, in say a light bulb? If it was just one current carrier, the electron, in one direction, then the current downstream would decrease, because fermions have left the circuit and radiated. The solution is that the electronic component of current is decreasing in one direction, while the positronic component is decreasing in the other direction, such that the total current is a constant.

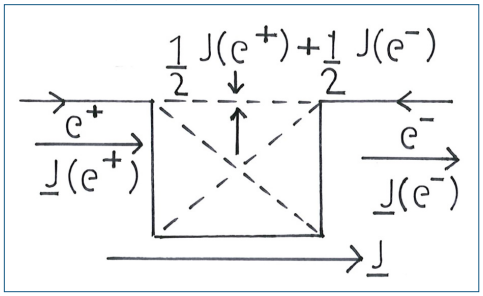


Figure 6: By Analogy With What Happens with Currents in Electrical Circuits, We See that the Electronic and the Positronic Photonic Components of the Wavenumber

Spectrum Add to Give a Horizontal line. The Rectangular Wavenumber Spectrum. So it Was a Good Idea to Proceed with the Rectangular Spectrum in our Analysis, because the Nonvariance of E with V Within the Spectrum is But an Illusion.

Literature Review – The Dirac δ-Function

Dirac used his famous δ-function to model point charges. It is a rectangle of constant area, becoming infinitely tall and thin. Surely this is nothing other than our photon spectrum in QTE!

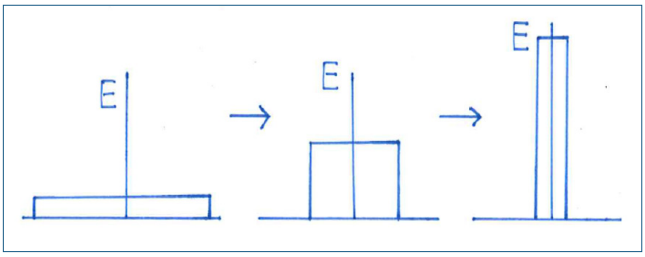


Figure 7: QTE spectrum? Or Dirac's δ-Function.

There are two extremes for our QTE spectrum ←→ Dirac δ-function. The first is E→ ∞, v → 0, which is used to count photons, (determine the intensity). It is a mathematical process, it is not possible to do this physically. It is possible, theoretically, to do what Einstein pondered upon, to pursue the photon, catch up to it and observe the field lines, E, to be stationary.

At the other extreme, we have E → 0, v → *c*. This is the (similarly impossible) process of infinite conductivity. Ultimately, you are not going to have enough lattice points in their gravitational (spherical metallic photon) state to hold the lattice together, as current density increases without bound. Simultaneously, the tension of the helical field lines at the surface, which holds the lattice together against its tendency to dissociate due to too many lattice points in their fermionic state gets to its maximum, the field line snaps, and the lattice blows apart, (your fuse blows). When you bend a metal, and the surface membrane simultaneously snaps, the lattice doesn't blow apart because there is no current.

How do we reconcile E → ∞ with Dirac's "point particle"? Consider the de Broglie expression.

$$m \times v \times \lambda = h \qquad (1)$$

$$\nearrow \quad \uparrow \quad \nwarrow$$

$$\infty \qquad c \qquad 0$$

So m ←→ E → **|E|** → ∞, λ → 0. Recall a fermion propagating on an electromagnetic wave. The radius of the fermion is in proportion to the electromagnetic wavelength. So here, we have a "point charge", Dirac's point charge!

(★★) The Known Laws of Physics Apply to "Physical Space", not Electron Wave-Space

For example, $E^2 \propto$ rate of energy transfer in the electromagnetic wave does not apply to electron wave-space, i.e. in electron wave-space the rate of energy transfer ∝ **|E|** instead

In (electron) wave-space, defined by "λ = constant", and in the energy conservation limit

v → 0, (the necessary limit for a physical measurement), we have:

mvλ = constant, implying m = ∞, (0 × ∞ = constant),

and so we see that de Broglie does not apply to wave-space either. We have rather the alternative result that in electron wave-space the rate of energy transfer is given by

m ←→ $|\mathbf{E}|$.

But *to get into wave-space*, we start with de Broglie in "physical space", not electron wave-space, and m = constant, whereupon we in due course arrive at the completed QTE, (→ m = constant, λ variable).

The rate of energy transfer in "physical space" is variable, ∝ $\mathbf{E}^2$. Now consider "real space", but λ constant (*outside* electron wave-space), and m variable.

→ de Broglie, mvλ = constant

→ double m ←→ halve v,

such that the rate of energy transfer is invariable.

So, in physical space:

m = constant, λ variable → rate of energy transfer is variable ∝ $\mathbf{E}^2$,

and what we have is a *space-time curvature*, as opposed to:

m = variable, λ constant → rate of energy transfer invariable → *no space-time curvature.*

In such a manner, we unify Einstein's General Relativity, with its space-time curvature, and the electromagnetic force.

Physical Space Versus Electron Wave-Space

So, we have discussed the fact that in electron wave-space, the normal laws of physics do not hold.

***Firstly*:** We must use "ordinary" Doppler shift in electron wave-space, not relativistic Doppler shift.

***Secondly*:** In electron wave-space, electric field lines do not get closer together, (Lorentz contraction), as the speed of the observer increases from 0 to *c*. So the height of the wavepacket spectrum is a constant, as we have assumed.

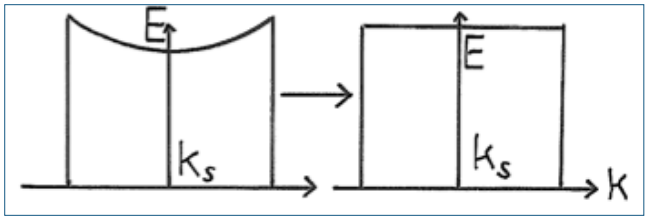


Figure 8: If We Took a Relativistic Doppler Shift Spectrum and then Transformed into Electron Wave-Space, we Might Expect Something Like This.

Thirdly: In electron wave-space, the rate of energy transfer is in proportion to the spatial density of electric field lines, $|\mathbf{E}|$, not $\mathbf{E}^2$. The electromagnetic intensity is a description of the rate of

energy transfer in physical space. Further, the de Broglie relation $p = h/\lambda$ does not apply to electron wave-space, either.

Note that there is nothing in classical electromagnetic theory in its analysis leading to the rate of transfer of energy $\mathbf{P} = \mathbf{E} \times \mathbf{B}$ or $\mathbf{E} \times \mathbf{H}$; $|\mathbf{P}| \propto \mathbf{E}^2$, that depends on the speed of the wave. It is an analysis only of the electric fields themselves, not in any way related to the aspects of Maxwell's equations that predict what speed the wave travels at. Certainly the rate of energy transfer will increase if the speed of the wave increases, but special relativity does not come into it. We could hypothetically increase the speed of the wave, thereby increasing the Poynting flux in proportion.

The Wavenumber Spectrum in Electron Wave-Space and in Physical Space

Supposing we take the wavenumber spectrum in electron wave-space and seek to convert to physical space. We must first make an adjustment to the "physical" spectrum. Choosing an acceptable zero for the system, i.e. choosing an "earth", we apply the following transformation.

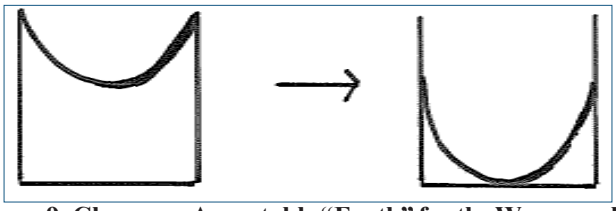


Figure 9: Choose an Acceptable "Earth" for the Wavenumber Spectrum in Physical Space.

Now we are in a position to convert the wavenumber spectrum.

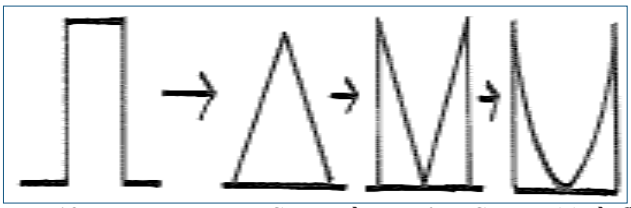


Figure 10: Electron Wave-Space → Physical Space, (a) → (b) → (c) → (d)

The conversion (a) → (b) , above, one will find in any book of Fourier analysis. The subsequent conversion (b) → (c) is a logical extension of this. It was used in "A quantum theory of electrodynamics", by Russell Farmer, the Toth-Maatian Review, Lubbock, Texas, Editor Harold Willis Milnes, 1990 – 1993, [7]. At this time it was not however appreciated that this (c) was, or would lead to, a wavenumber spectrum in *physical* space. So, having chosen a suitable "earth" for the system, we now consider the transformation (c) → (d) above. Since we are now in "physical" space, note that the Doppler shift in question is r*elativistic* Doppler shift, not the non-relativistic Doppler shift we use in the electron wave-space.

Now in physical space, why should (c) and not (d) work? There is no reason for it. If we choose "physical space", there is no reason why we should not make the conversion (c) → (d), given that we are now using the *relativistic* Doppler shift. The *symmetry* dictates the outcome. The algebra is the same, so long as there is this symmetry.

The Dirac-Delta Function

What is this Dirac-delta function? It has the following requirement:

Area = constant.

Then surely the Dirac-delta function is none other than the wavepacket spectrum in *electron wave-space*. The Dirac-delta function is not the wavepacket spectrum in "physical" space – consider (d) above: owing to the non-linearity of this spectrum, it is unlikely that we can find anything useful by declaring the area of spectrum (d) to be a constant. By contrast, owing to the "trigonal symmetry" there is no problem in declaring spectra (a), (b), (c) to have constant areas.

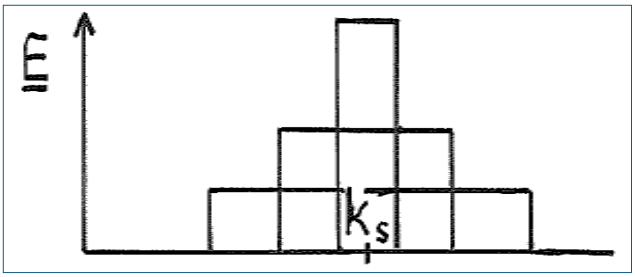


Figure 11: The Dirac-Delta Function is the Wavenumber Spectrum in Electron Wave-Space, not Physical Space.

Consider then the wavenumber in electron wave-space. It is clear that we must use the non-relativistic Doppler shift formula here. What happens for low intensities, (low amplitudes, **E**). That is, what happens as $\mathbf{E} \rightarrow 0$? We know that for $E \rightarrow 0$, then $v \rightarrow c$. This is one of the first deductions we made from our wavenumber spectrum in electron wave-space. So for $E \rightarrow 0$, $v \rightarrow c$, and we find the extremities of this spectrum. The left (small wavenumber) extremity of the spectrum $c/(c + v) \times k_s \rightarrow \frac{1}{2} k_s$, and the right (large wavenumber) extremity of the spectrum, $c/(c - v) \times k_s \rightarrow \infty$.

So for $v \rightarrow 0$, then $E^2 \rightarrow Fl/\lambda$.

And for $E \rightarrow 0$, then $v \rightarrow c$, and the spectrum behaves thus:

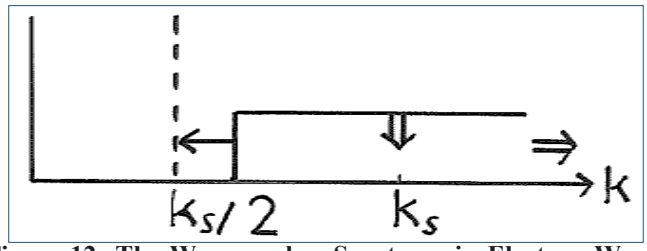


Figure 12: The Wavenumber Spectrum in Electron Wave-Space, for Vanishing Amplitudes (Intensities).

Methodology

The Work Function of the Metal

We have seen that when an electron (positron) acquires a component of velocity along field lines **E**, **B**, (internally to a circuit), dissipation occurs. Work is done and accordingly photons are released from the system according to $|\mathbf{E} \times \mathbf{B}|$ = Force × velocity. Now supposing that photo-electrons are emitted from the metal according to energy = hν - W, W being the work function of the metal, in accordance with Einstein's photoelectric effect. In our discussions, we have actually

ascertained that *electric field* = hν, not *energy* = hν. To convert from an electric field to an energy, we must multiply by the distance d over which the electric field acts. What is this distance d? Perhaps it is identically the amplitude, m_e, of the electron wave, as below.

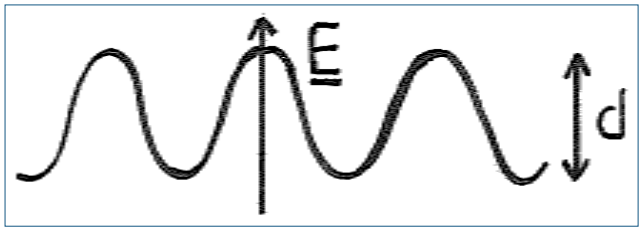


Figure 13: The Direction of Amplitude of the Electron Wave is the Direction of the Internal Field E Through which Dissipation Occurs.

So the electrons (positrons) move down the internal field lines by a distance $d = m_e$ through the operation of the field, E = hν/d. The work function of the metal then becomes:

$$W = qEd. \qquad (2)$$

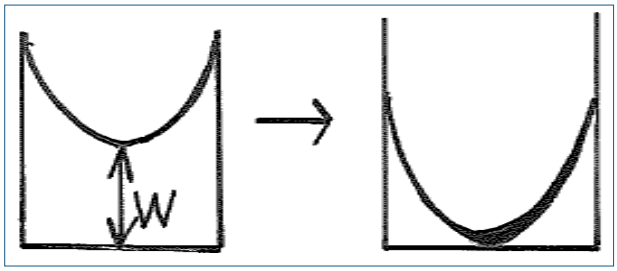


Figure 14: The Work Function of the Metal in Physical Space; the Massive Electron Becomes Massless (Photonic), W → 0, We Leave the Metal Lattice, Bohr Atom → Schrodinger Atom, Massive Electron → Massless (Photonic).

The work function of the metal is something we observe "physically", that is, it is in physical space, not electron wave-space [2]. We use W to find a spectrum in physical space, in accordance with the transformation in Figure 14 above.

So, we are concerned with photo-electrons. These are emitted as *massive* (speed < *c*) entities. They are *not* photons, they have been separated from their photonic wavepackets, the latter having become a *dual ghost*. Now the work function of the metal is a connection between protons of the metal lattice points and the photoelectrons that are being emitted at the surface. In accordance with Figure 14 above, you go up in energy if you go from a photonic state to a (massive) electronic state. By duality, the same thing applies to the positrons in the lattice. If you go from a positronic photon to a massive positron, you go up in energy by an amount equal to the work function of the metal. However, "W" is very much smaller for protons than positrons / electrons. If you go from a positronic photon to a proton, you only go up in energy by a very small amount W.

So the proton, being of greater energy W than the positronic photonic state, will eventually decay into the photonic state. However, the lifetime for the decay could be longer than the age of the universe, as has been suggested, since the energy of the proton is greater than that of the positronic photon by only a miniscule amount. By contrast, the massive electron / positron decays quickly back into the photonic state because the energy difference, W, is relatively large. W becomes very small for protons because there is such a large energy difference between orbital fermions and fermions in the nucleus. W(positrons) is so much larger than W (protons) because of the status of the nuclear as opposed to the orbital fermions in the atomic state, the energy thereof. [Reference: Trevor Hambley, School of Chemistry, the University of Sydney].

All of this gives the required variation of amplitude with Doppler-shifted velocity according to special relativity, whereupon we are dealing with *physical* space and relativistic Doppler shift. By contrast, to put yourself in the reference frame of the electron, ("electron wave-space"), is to acquire the "flat-top" spectrum, and this is achieved by the transformation v: 0 → *c*. This is where 4-vectors come into it. Consider specifically the space-time 4-vector, (*c*t, **x**). Operating with this 4-vector is equivalent to putting yourself into the reference frame of the (massive) electron. You are observing the laws of physics as they occur in the reference frame of the electron. It is still a wavepacket, and we still require the operation of Planck's law, E = hν. But the Doppler shift is non-relativistic.

Now the metallic work function, W, is a critical part of the Einstein quantum theory of light. To enter the circuit, as a conducting electron, the fermion starts out stationary, at the entrance to the flux tube. To enter the circuit, it employs the *naked* Reverse Higgs process. *Then* it crosses the work function region at the metallic surface. That is, the electron that is entering the circuit, will propagate internally, axially as a weak-strong gauge boson. *Not the helically propagated massless fermions*, photons, these do not enter the metal, they do not cross the work function region, they remain *outside* the metal, at the surface of the metal. So, to make the weak-strong GBs, the internal axially propagated fermions, the same as the surface, helically propagated photons, you just remove the work function, W, ok? You remove the metal, then that W-S GB just becomes a regular photon, like the helically propagated fermion, Figure 9 [2].

Electrical and Fermionic Currents

We'll conclude that the fermions and bosons above are identically the same thing, just moving in different directions. Consider an electronic and a positronic photon, moving oppositely.

← e^- e^+ →

We have a *nonzero* electrical current, since a negative charge moving in one direction has the same sign of electrical current as a positive charge moving in the opposite direction. Equivalently, we have a nonzero *magnetic* current, moving in the opposite direction. In terms of f*ermionic* fluxes, however, these *vanish*, since there are just as many fermions moving in one direction as in the other.

Consider then electronic and positronic photons moving *in unison*.

→ e^- e^+ →

In this case we have *zero* electric and magnetic currents, since there is no net transfer of electric and magnetic charge, but there is a net fermionic flux.

It would appear that we have stumbled upon the fermionic annihilation. Fermions *do not* disappear in the instance of fermionic annihilation, it is just that two fermionic entities moving in the same direction, with the same charge and speed, behave in a *bosonic* fashion. It is as if their charges have disappeared, but they haven't really.

$e^+ \rightarrow$

$\leftarrow\rightarrow \{\gamma_e + \gamma_p\}$

$e^- \rightarrow$

Frequently in physics this bosonic creation-annihilation is presented thus:

$\leftarrow \gamma \quad \gamma \rightarrow$

As if the two bosons (photons) were moving in the opposite direction. This is because *two* photons are required in the annihilation-creation in order that the law of the conservation of momentum be obeyed. In a particular frame of reference, these photons have opposite momenta. So they are moving in opposite directions?

No indeed! We have not considered the fact that, in accordance with Dirac, an electron has a positive energy while a positron has a *negative* energy, of the same magnitude. Consequently their *masses* are opposite in sign too. So if they have opposite momenta, and opposite masses, this implies they are moving *in the same direction*. We have previously described these photons that are produced in the fermionic annihilation as *dual ghosts*, that is, charge-less, in consequence of some deductions we have made about atomic physics and chemistry. However, as we shall see, this is not the truth. They *behave like* dual ghosts, but are not really, the charged fermions are still present, propagating upon the electromagnetic pathways but in a manner as if they were not.

$e^+ \rightarrow v \qquad e^- \rightarrow v$

$\leftarrow m_p v \qquad m_e v \rightarrow$

We have *no conservation of electric charge*, when we are in consideration of Faraday's law, only conservation of *magnetic* charge. We have stated that Maxwell's original equations and their dual cannot be solved simultaneously. Well in fact they can but only if the displacement current, $\partial\mathbf{E}/\partial t$ is absent, that is, as long as we do not insist upon conservation of electric charge. Where conservation of electric charge *and* magnetic charge is insisted upon, there is no solution. Where conservation of electric charge is not required, then we get a solution. Faraday's law operates and we get a solution to both Maxwell's equations and their dual. Where before we had just one electron, we now have *two* electrons. But we are concerned identically with just the one positron.

So for Faraday's law to constitute conservation of magnetic charge, we require <u>non</u>-conservation of electric charge so that there is simultaneously solutions of Maxwell's equations and their dual. Do we do this by insisting $\partial\mathbf{E}/\partial t = 0$? Or do we insist that $\nabla.\mathbf{B} = \mu\mathbf{J}$, regardless of the value of $\partial\mathbf{E}/\partial t$?

Consider our previously discussed transformation from electron wave-space to Physical Space.

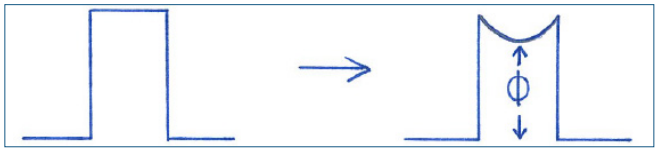


Figure 15: Transformation from Electron Wave-Space, ϕ Work Function Irrelevant, to Physical Space, where ϕ is Considered.

In electron wave-space, we have conservation of energy <u>and</u> conservation of *electric* charge. Ordinary Doppler shift applies, and we do not have to adjust for the work function. Surface electrons and positrons propagating on the helix propagate at the same radial distance, r, in cylindrical coordinates.

In physical space, we have *non*-conservation of energy and electric charge. Relativistic Doppler shift applies, and the work function of the metallic conductor comes into it. In the first instance, the surface fermions propagate helically at different cylindrical radii, the surface electron propagating on the helical field line **B** propagates *outside* the surface positron propagating on its helical field line, **E**. In this manner, the external helical electron *protects* its (relatively) internal positron such that we have *conservation of magnetic charge*. If then we perform a 90 degree rotation of the external field, **B**, such that is cylindrical radius is reduced to match that of the internal **E**, conservation of *magnetic* charge is transformed into conservation of *electric* charge, and we are back in electron wave-space. This is by analogy with our previous discussions whereupon what differentiates a positron from an electron is that they are 90 degrees out of phase with one another, and if one performs a 90 degree rotation in space, what one was originally saying about a positron can now be said about an electron and visa-versa. In particular, we had this to say about positrons locked in protonic p- and d-orbits in the nucleus of an atom. The work function of the metal, ϕ, is associated with the difference in helical radii in cylindrical coordinates prior to the 90 degree rotation that maps conservation of magnetic charge onto conservation of *electric* charge, and simultaneously maps physical space onto electron wave-space.

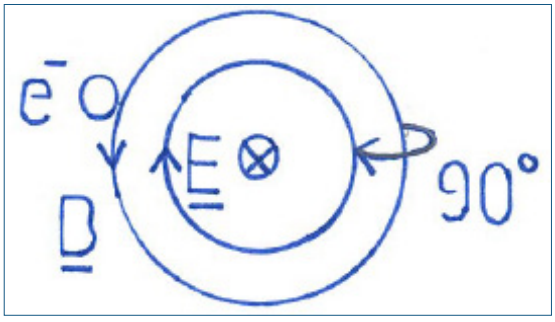


Figure 16: A 90-degree Rotation Maps Physical Space onto Electron Wave-Space, Transforming Conservation of Magnetic Charge onto Conservation of Electric Charge

Results

4 September 2026

With respect to the wavenumber spectrum in QTE, we seek a transformation such that you start as an observer in Einsteinian, relativistic, stationary space, "physical space", and then accelerate to the speed of light, an infinite transformation, v: 0 → *c*, *c*/0 = ∞, whereupon the curved profile of the relativistic wavenumber spectrum becomes the "flat top" QTE spectrum, we are now in electron wave-space, travelling at the speed of light.

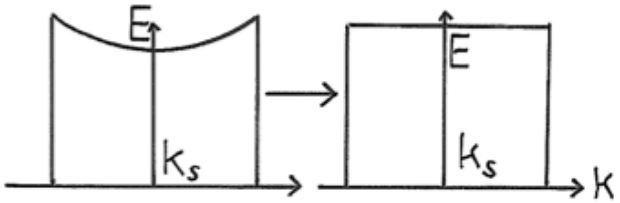


Figure 17: An Infinite Transformation as you go FROM Physical Space to Electron Wave-Space.

The Top of the Spectrum Flattens out Completely, (i) → (ii)

In QTE, we are concerned with wavenumber $\hbar k$ → frequency → energy, ($\hbar\omega$), versus *current*, quantity of photons:

E (energy/mass) = $\Sigma\hbar\omega$ → current → electrical. (3)

So energy is always relative, particularly when it depends on a potential, V, you can choose V arbitrarily, you are rather concerned with ΔV, for example, ∇V. So we choose $k_S = 0$!

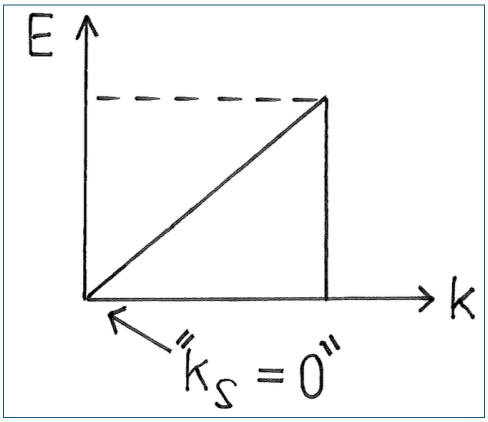


Figure 18: A Photon is Associated with Two Fermions, Positron and Electron. One of them is a Ghost. Here is the Positronic Contribution to the Spectrum. And Because V Can be Chosen Arbitrarily, we Choose "$k_S = 0$"

So we now have a mathematically plausible conjecture, a line of the critical slope, passing through the origin, a proportionality. And now, for the *electronic* contribution.

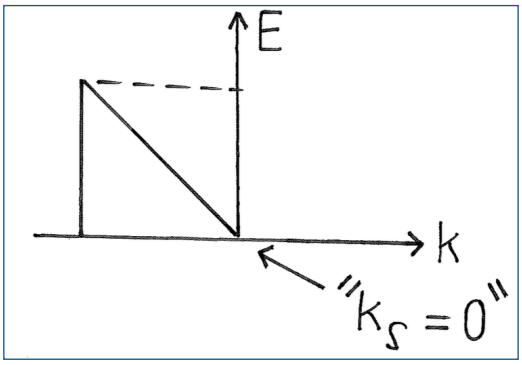


Figure 19: Electronic Contribution to Wavenumber Spectrum.

Why is it so critical that we have the simultaneous operation of a positron and an electron, photonically? The reason for this is that otherwise we could never get the spectrum 3 in Figure 3 above, the spectrum would dip *negatively* for $k < k_S$. So you add the two spectra together, positronic plus electronic, then you get the spectrum in Figure 2 above, with the proviso that "$k_S \rightarrow 0$", and, indeed, E → ∞. And not being bothered about choosing a different zero in wavenumber, between the electronic versus the positronic contribution.

And, just as we can arbitrarily displace our spectrum "horizontally", according to a "potential", "V"(k). Similarly, we can displace the spectrum *vertically*, according to an arbitrary choice of a *metallic work function*, a potential, Φ.

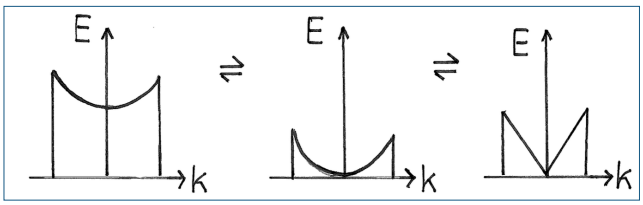


Figure 20: We Start with the Physical Space (relativistic) Wavenumber Spectrum, Displace Vertically by Variation of the Metallic Work Function, Φ, then Convert to Electron Wave-Space.

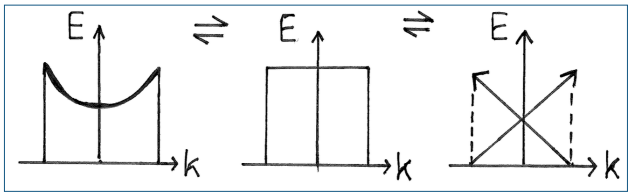


Figure 21: Alternatively to Figure Immediately Above, Employ the Infinite Transformation, v: 0 → *c*, to Get the Rectangular Spectrum, then Break it Down into its Two Components, Positronic Versus Electronic.

So, regarding the two figures immediately above, both start out the same, with the physical space wavenumber spectrum, then by various alternative transformations, you acquire (1) the "in phase" photonic result, the electron and positron (ghost), or positron and electron (ghost) are *in-phase*. Versus (2) the "out-of-phase" photonic result, the electron and the positron are out-of-phase. Because we are not talking about any ghostly

component of a photon now. Rather, we are discussing matters between two separate photons, one being an electronic photon and the other being a positronic photon.

In fact, perhaps the reason we shift the zeroes for the electronic versus positronic photons, to get the wavenumber spectrum as we desire, displace the spectrum horizontally, is that the electron and the positron are out-of-phase with one another, on the wave, the electromagnetic wave, the Reverse Higgs boson, the electromagnetic gauge boson, by ¼ λ. Yet within an individual photon, fermion + anti-fermionic ghost, the fermion and the ghost are *not* out-of-phase. Out-of-phase is a description of what is going on between two separate photons, a positronic and an electronic one. The respective fermions are out-of-phase, because the solution to the Maxwell wave equation is:

$$\Psi = \Psi_0 \times \exp j(kx - \omega t) = \Psi_0 \times [\cos(kx - \omega t) + j\sin(kx - \omega t)]. \quad (4)$$

Yet within an individual photon, fermion + ghost, the fermion and the ghost are propagating in phase with one another, one is on the **E** oscillation, one is on the **B** oscillation, and the **E** and **B** oscillations are in phase with one another.

So, to choose the arbitrary zero frame → absolute value of a potential, "V", such that you get a proportionality vector in the wavenumber spectrum. And we do it *twice*. Start with the two photons, one positronic, one electronic. Out-of-phase. Arbitrarily choose a position on the x-axis, the wavenumber axis, such that you get a proportionality, for the positronic component of the wavepacket. Then shift your frame to do likewise for the electronic component.

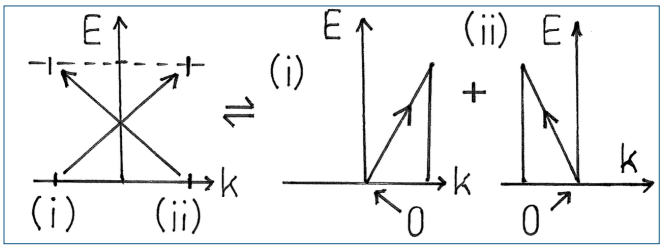


Figure 22: A Dual Transformation on the Wavenumber Axis Enables us to Convert Between Out-of-Phase Fermions between Two Individual Photons Versus the in-Phase Circumstance, a Fermion and its Anti-Fermionic Ghost, within an Individual Photon.

Then, you go back to the original frame, add the two spectral components together, so you have the out-of-phase spectrum super-imposed on the in-phase spectrum. The out-of-phase is a description of fermion content between two separate photons, the in-phase is a description of fermionic and ghost content within an individual photon. And you have arbitrary displacements on the y-axis, the E-axis, too, to get the required geometry and to reconcile with the algebra, in accordance with our discussions above.

So, this is reminiscent of *logarithms*!
ln ab = ln a + ln b.

To multiply a by b, and without access to a calculator, just a book of logarithms, you find it by:

$ab = \ln^{-1}[\ln a + \ln b)$.

That is, take the logarithm of both terms, add, and then take anti-logarithm of the result. Same as QTE spectrum, displace "horizontally" to put the one wavenumber vector through the origin, then displace again, for the other wavenumber vector to pass through the origin, then displace the entire spectrum back to its original position, that is the final "$\log^{-1}$" part of the process. The process "a × b" is identically the process of choosing proportionality vectors for e^+, e^-. Logarithm of a → "e^+", and the logarithm of b → "e^-" , then go back to the *original* frame, process is $\log^{-1}$, [3].

$$\int \frac{1}{x} dx = \ln x = \frac{x^0}{0} = \infty . \quad (5)$$

Well, we are all about choosing an arbitrary frame of reference, hence the choice of the energy potential, V = 0, to get the geometry of our wavenumber spectrum right, and it corresponds to the logarithmic algebra, then it is scarcely surprising hat the potential, V, is itself hyperbolic:

$$\frac{E}{q} = V = \frac{1}{4\pi\varepsilon}\frac{Q}{R} \ (+C, \text{arbitrary}). \quad (6)$$

So we, as *stationary observers*, (the massive electron was with us at $v_m = 0$, the *naked* Reverse Higgs process). So, as we observe, the electron has got on that wave. So now:

$E^2 = (pc)^2 + (m_0c^2)^2 \rightarrow (pc)^2$, (7)
(the electron has lost *all* its potential energy, $V = m_0c^2$, and so $E = m_ec^2 = pc$, we are talking about a photon, $E = pc = (mc)c = m_ec^2$, not a massive electron).

Well, what about at some point in the acceleration process? Somewhere between v = 0, $E = V = m_ec^2$ (v = 0) and E = KE = m_ec^2. m_0 somewhere between m_e and zero. So *consider* a massive electron:

$E^2 = (mvc)^2 + (m_0c^2)^2$. (8)

m_0c^2 is a *potential*, right! So we are free to choose $m_0c^2 = V = 0$. Then:
$E = mvc \propto p$. And so, we have the origin of the wavenumber spectrum, in electron wave-space. The line of proportionality, which can be displaced horizontally, to provide for either the fermion-(anti)fermion out of phase versus in phase with one another.

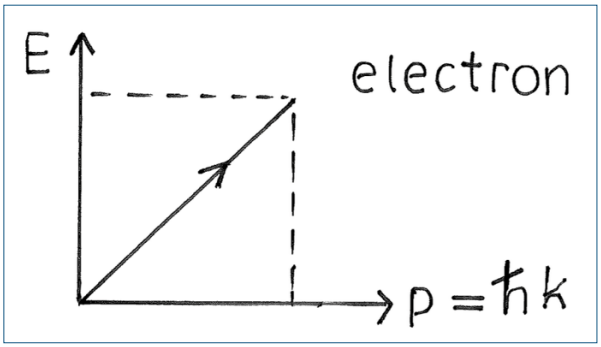


Figure 23: The Origin of the Line of Proportionality, that Appears in both the Out-of-Phase Fermionic Association (Two Separate Photons, Interphotonic) Versus the in Phase Fermionic-Ghost Association, (Intra-Photonic).

So, at the outset, we consulted a book on the Fourier transform.

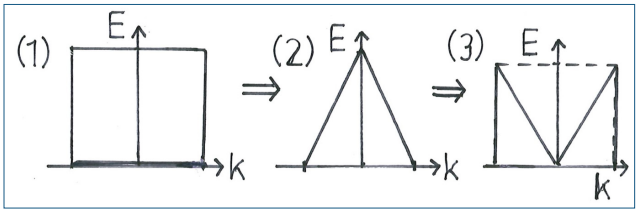


Figure 24: (1) The Standard Rectangular Spectrum (2) An Alternative Possibility for a Wavenumber Spectrum → (3) by Symmetry, this Spectrum has to be an Option. It is Clear Upon Inspection that (3) and not (2) Would be Relevant to this Physical Process.

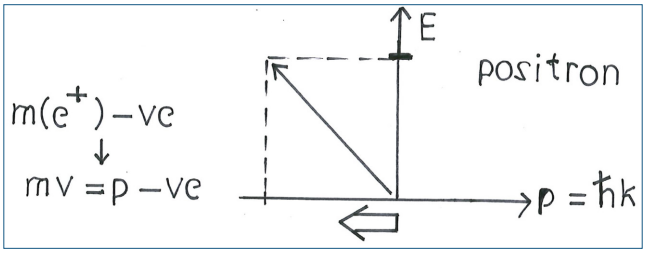


Figure 25: So, in figure 23, We Have the Electron, +ve Energy, Momentum p = , +ve p-axis, and Now we are Focusing on the Positronic Component, -ve energy, Momentum , because m(positron) = -m(electron).

That is, positrons have negative mass, and *most particularly* in electrical circuits. But the speed, v = *c*, of e^+ is the same sign as that of e^-. So, p = $\hbar$k is -ve, for the positronic contribution. Of course! We go into the radiational positronic frame. A positronic photon. But with one proviso! In a stream of radiation, where e^+, e^- are propagating in the same direction, the masses are the *same* sign, $m(e^+) = m(e^-)$. If the positronic versus electronic component were opposite mass-energies, then the radiation would carry no mass-energy. Of course it carries a mass-energy corresponding to the Poynting vector:

$$\mathbf{P} = \frac{1}{\mu}\,\mathbf{E} \times \mathbf{B}\,. \qquad (9)$$

But when you accelerate into the frame of the Reverse Higgs boson, v = *c*, the electron and the positron no longer have the same sign of mass, their masses become of *opposite* sign, according to Figure 25 above.

Now, where the fermions, electronic versus positronic, are oppositely directed, then they have negative mass-energies to one another such that there is a net transport of mass-energy. Most particularly, this occurs in Schrodinger atomic orbitals, and in the interior of electrical circuits, we call these axially propagated fermions "weak-strong gauge bosons", and also this applies to the helically propagated photons at the surface of a conductor, electronic versus positronic.

So how do you convert between mass +ve and mass -ve for a massless fermion, v = *c*? Let's start with the Maxwell wave, the solution to his wave equation.

$$\Psi = \Psi_0 \times \exp j(kx - \omega t) = \Psi_0 \times [\cos(kx - \omega t) + j\sin(kx - \omega t)]. \qquad (4)$$

We, the stationary observers, observe the radiational fermions, e^+, e^-, to have the same sign of mass. (The guy riding on the wave, the guy in the Reverse Higgs boson frame, observes them to have opposite masses). Consider $E = mc^2 = \hbar\omega$. So make it negative, -ve mass-energy → -ve ω, and therefore the wave becomes:

$$\Psi = \Psi_0 \times \exp j(kx + \omega t) = \Psi_0 \times [\cos(kx + \omega t) + j\sin(kx + \omega t)]. \qquad (4a)$$

So the wave has reversed direction! You change the direction of the wave, then you change the sign of its mass-energy. So, Dirac describes oppositely propagated fermions, e^+ versus e^-, and opposite mass-energies for these. Then you turn one of the fermions around, the sign of its mass-energy reverses, and presto, you have electronic and positronic photons of the *same* mass-energy, facilitating of course a *nonzero* Poynting vector.

Well, what about this velocity, v, in our QTE spectrum? We have the function E(v), we know exactly what the electric field, E, is. But what about the speed, v? We haven't exactly sorted what frame it is travelling at speed v with respect to. Now we do so. The fundamental equations of QTE, E(v) are indisputably correct, it is just a matter of obtaining a full interpretation of what it all exactly means. Consider:

$$E \rightarrow \frac{1}{v} \rightarrow = \infty. \qquad (5)$$

So v → 0 is the velocity difference between the fully accelerated electron, $m_0 = 0$, and the wave, the electromagnetic wave, the Reverse Higgs boson, $h\nu = h\nu_e = m_e c^2$.

Now we go back to that stationary electron, $p = m_e v = 0$, $KE = \frac{1}{2} m_e v^2 = 0$, and $PE = U = m_0 c^2 = m_e c^2$ is a *maximum*, corresponding to observed velocity difference between the em wave, (Reverse Higgs boson) and the (stationary) electron. So that is in fact our new definition of "v" in our QTE equations, E(v):

$$v = v_{em} - v_{fermion}. \qquad (6)$$

(A) Consider a stationary (massive) fermion. Then v = c, because v_{em} = c. So we expect E = 0, (QTE). Well, we know the amplitude $\Psi = |\mathbf{E}|$ is identically a mass. So here, the potential $V = m_0 c^2 = m_e c^2$ is maximised, and the $KE = \frac{1}{2} mv^2 = 0$ is minimised. So v →c, stationary (massive) fermion, E = 0 is minimised. And the potential, $V = m_0 c^2$ → $m_e c^2$ with an amplitude m_0, is maximised. So it is the opposite that we would expect, if the |E| and the m_0 were simultaneous, equivalent amplitudes.

(B) Now consider v = 0, the fermion fully on the wave, we expect E → ∞, (QTE).

So, for (A), v = *c*, we expect the internal axial field, E = 0 from QTE, in an electrical circuit. So the potential, V, across the circuit, or resistor, whatever you are happy with, would be zero, minimized, but instead you get $V = m_0 c^2$ *maximised*. And (B), v → 0, fermion on the em wave, the potential $m_0 c^2$ → 0 is minimized, yet we expect the opposite, V = |**E**|d → infinity, maximized. So, in both cases (A) and (B), we get the opposite of what we expect. "Two wrongs make a right"!

Could an explanation for this "dual discrepancy" be that the speed "v" of QTE, the difference between the speed of the wave in the Reverse Higgs process and the speed of the fermion, sometimes amounts to a description of the velocity of the fermion, and sometimes doesn't, but because of the critical handicap of the photon, being that it can only propagate at one speed, v = *c*, whereas the fermion can propagate anywhere between v = 0 and v = *c*. Because of this, the speed of the fermion takes precedence in interpretation of the equations of QTE.

Why the discrepancy? Why do we need "two wrongs make a right", to get the correct physical result? Because, returning to logarithms, you do the calculation, the addition, electronic contribution to QTE wavepacket plus positronic contribution, whether these contributions are in phase or out of phase, but once you do the addition, you need to take the *anti-logarithm*, to get the final result. Once you have "taken the anti-logarithm", you can then interpret. You take the anti-logarithm, which reverses the result. In conclusion, the equations of QTE are correct, all that's missing is a complete interpretation, and we have gone a long way in pursuit of this in these discussions.

So, taking the anti-logarithm is equivalent to acting on each component of the two terms, the two extremities, max → min and min → max, to reverse the extremities. Well:

$\int dR \rightarrow \ln R$

$\downarrow$

$\leftarrow$ Anti-logarithm

$\uparrow$

(becomes a reciprocal)

And really, the perfect function for reversing maxima/minima is obviously going to be the reciprocal function. The reciprocal function, moreover, is at the heart of the mathematical theory of zeros and infinities that we have devised, chiefly for the purpose of solving fundamental problems in physics, but also as a means of taking mathematicians out of the hopeless confusion they get themselves into when they try to staunchly defend their "division by zero not defined" nonsense [4]. Specifically, $1/\infty = 0$, and $1/0 = \infty$, where surely "∞" is the ultimate maximum, and zero is the ultimate minimum.

Now, considering just the right hand side of the wavenumber spectrum, say the electron contribution, as opposed to the positron contribution on the -ve k axis. (momentum p = is negative for positrons, because mass m is).

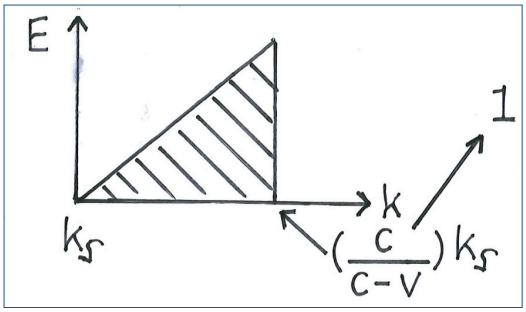


Figure 26: Electronic Component of Wavenumber Spectrum, in Electron Wave-Space.

We go into the photon frame, v → 0. That is, send the massive fermion onto the Reverse Higgs boson. The non-relativistic Doppler shift formula says:

$$\frac{c}{c-v}\mathbf{k_s} \rightarrow \underline{k_S}.$$

So in the limit as we approach the origin, v → 0:

$k_S = \ = 0,$ (7)

(because the *definition* of λ_S is:
$\lambda_S = h/(m_e v)$, where "v" is that of QTE, and the mass of the fermion travelling on the wave, in the naked Reverse Higgs process, is m_e), and because v → 0, λ → ∞. And the same for the positronic component, operates on the other half of the wavenumber spectrum. It is in this $\lambda_S = 2\pi/k_S$ system, identically obtained by accelerating onto the wave in the naked Reverse Higgs process, that the proportionality vectors, which have to pass through the origin if it is a genuine "creation" process, form the desired in-phase QTE wavenumber spectrum in electron wave-space. See Figure 2 above, in the creation process, it is necessary that $k_S \rightarrow 0$.

Considering the photon count. Obviously this increases in proportion to intensity, E^2, but the smaller the photon energy hν for a given E^2 the larger the number of photons.

$$\text{Photon count} = \frac{\mathbf{E^2}}{\mathbf{k_s}} = \frac{\infty}{\mathbf{0}} = \infty^2, \quad (8)$$

($k_S \rightarrow 0$, $\lambda = \lambda_S \rightarrow \infty$), upon inspection of Figure 26 above. The shaded area is a constant, so as v → 0, E increases to ∞, so does E^2, then, obviously, and the subsequent calculation below is justified insofar as, while it is E and not E^2 on the y-axis, nevertheless, E^2, in the limit v → 0, can be expressed simply as Fl/λ, the significance of the quadratic vanishes.

Well, a measured current in an electric circuit is identically a photon count. So we have Ohm's law, V = IR, and the current is in proportion to the central axial force on internal fermions, weak-strong gauge bosons, **F**/q = **E**. The Coulomb force, not the "curl force", $|\mathbf{B}| \propto 1/R$, $\mathbf{F} = q\mathbf{v} \times \mathbf{B}$. This Coulomb force, this divergent force, is:

$$\text{Force (electromagnetic)} = \frac{\mathbf{1}}{\mathbf{4\pi\varepsilon}} \times \frac{\mathbf{Q}}{\mathbf{R^2}}$$

$\rightarrow \infty^2$, (R → 0). (9)

So, we appear to be on the right track. So let us consider the current of the "circuit". Resistance is in proportion to distance, right? Resistance = resistivity × length/cross-sectional area. So we have the variable R, simultaneously a resistance and a distance. Let us calculate the electromagnetic current, and compare with photon count = ∞^2.

$$I = \frac{\mathbf{V}}{\mathbf{R}}$$

$$= \frac{\mathbf{1}}{\mathbf{R}} \times \frac{\mathbf{1}}{\mathbf{4\pi\varepsilon}} \frac{\mathbf{Q}}{\mathbf{R}}$$

$$\propto \frac{\mathbf{1}}{\mathbf{R^2}}$$

→ ∞^2 as R → 0. (10)

That is, the current I → maximal = ∞^2. It is as maximized as you can possibly get, every term is ∞. The crucial point here is that I is certainly maximized when R = 0 across a resistor. The "non-resisting" resistor will carry as much current as is required for downstream dissipation processes, but the resistor itself, "R = 0", makes no contribution to any possible reduction of these currents.

So, we have in the *atomic* circumstance:

$$I = \frac{1}{R} \times \frac{1}{4\pi\epsilon} \times \frac{Q}{R} \propto \mathbf{R^2}, \quad (10a)$$

distance R the variable, and I → ∞^2 as R → 0. By analogy, in the *electrical circuit* circumstance:

$$I = \frac{V}{R} = \frac{Ed}{R}$$

$$= \infty^2, \quad (10b)$$

because R → 0, by analogy with "atomic", and therefore E → ∞ by analogy with atomic, to get ∞^2 in both circumstances. Then for Resistance R → 0, the helically projected surface photons become rectilinearly directed photons in free space. It was only space-time curvature of these photons that kept them in their helical paths.

We then have I = photon current (intensity) → ∞^2. So what do we make of this electric field strength/amplitude E → ∞? Well, you start out as an observer of the radiation, amplitude E. You accelerate onto the wavepacket, v: 0 → *c*, then the amplitude observed undergoes a Lorentz contraction:

$$E = mc^2 = \frac{E_0}{\sqrt{1-\frac{v^2}{c^2}}} \rightarrow \infty.$$

This is the origin of the infinity, E → 1/v = ∞, in the QTE analysis. It is a different amplitude to the amplitude E' we describe in Peer Review (AJP), an infinite Lorentz transformation of the electric field lines is not possible in that circumstance.

Discussion

Hypothesis: v_{ax} of circuit analysis, identically the "v" of QTE, is the difference between the speed of the wave in the Reverse Higgs process, (v = *c*), and the speed of the fermion prior to becoming involved in the Reverse Higgs process. Obviously we are generalizing here, beyond the naked Reverse Higgs process. This is the "energy input" circumstance – in the naked Reverse Higgs process, the initial fermion speed = 0.

So applying "hypothesis" to the QTE electrical circuit, the crucial velocity difference becomes the difference between the axial speed of the photon on the helix, v_{ax}, and the axial velocity of the internal fermion, (non-photonic, it is a "weak-strong gauge boson", v = *c*). And:

$(v_{ax} - v_{WSG})$ -ve, and therefore:

$(v_{WSGB} - v_{ax})$ +ve,

([4]). And $v_{WSGB} = c$. And:

v_{ax} = "speed of fermion", 0 < v < *c*.

What about v → 0? We have learned in our research that there is a minimal "classical" permitted velocity of a (massive) fermion. We deduce this velocity from the classical theory of electromagnetism. Most particularly, it corresponds to the negation of the dual Lorentz force, the Lorentz force for magnetic charges.

F(em) = q(**B** – **v** × **E**)

$$= 0 \rightarrow v = \frac{B}{E} = \frac{1}{c}. \quad (11)$$

Now, the velocity spectrum of the electromagnetic force, through which Einstein acquires special relativity and general relativity:

v: 0 → $\frac{1}{c}$ → *c*

| ← GR → |

|←Electromagnetic →|

(SR) |← onset of return of GR (gravitation)

In the QTE circuit analysis scenario, this becomes:

v: $\frac{1}{c}$ → *c*

|← GR SR → |

That then is electron wave-space, QTE. What about "physical space"? Another name for this would be "relativistic space", and relativistic space has its own Doppler shift formula, separate to the Doppler shift formulae we derived and used in QTE. The relativistic Doppler shift formula is:

$$f = f_0 \times \sqrt{\frac{1+\frac{v}{c}}{1-\frac{v}{c}}}. \quad (12)$$

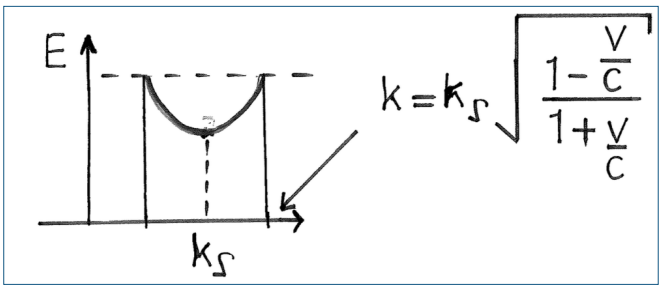


Figure 27: The Wavenumber Spectrum in Physical Space, Relativistic Space. The Electronic Contribution is to the Right of k_s, the Positronic Contribution to this Photon is to the Left of k_s.

Now, Dirac's positron. It has negative energy to the electron's +ve energy. Therefore the two fermions are oppositely directed. In the radiational scenario, the electrons are directed the same as the positrons, and the e^+, e^- both have +ve mass-energy. So for the electronic component, unified with the positronic component, in the wavenumber spectrum, we need to alter the sign of the

velocity, +/- → -/+.

Now say the relativistic Doppler shift formula applies to the right of k_s in the above spectrum. And to the left, we have the "reciprocal equation":

$$f = f_0 \times \sqrt{\frac{1-\frac{v}{c}}{1+\frac{v}{c}}}. \qquad (13)$$

This is in relativistic space, physical space, as opposed to QTE electron wave-space, (photonic). So $v < c$. $v = c$ is not possible in employment of relativistic physics, it is only possible in the electron wave-space scenario of QTE. So, we apply the velocity transformation, +/- → -/+. What this means, spectrally, is that the wavenumber spectrum hitting the wavenumber axis to the left of k_s has a redundancy, the two positions of k at the spectral extremity both relate to the *first* Doppler shift formula above.

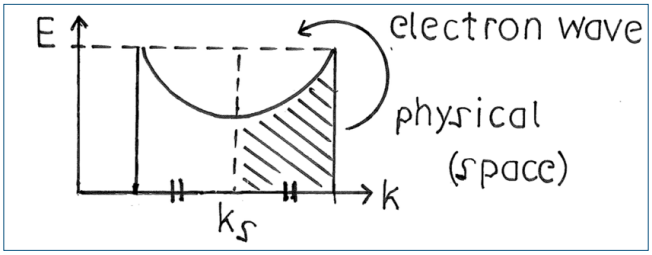


Figure 28: If the Entire Spectrum, in Physical Space, is Described by only the One Version of the Relativistic Doppler Shift, geometrically this Amounts to a *Symmetrical* Spectrum. So we only Look at the $k > k_s$ Part of the Spectrum.

Let us consider what happens with the physical spectrum, if we put spectral area = constant. Because the spectrum is symmetric, the situation will be greatly simplified.

$$\text{Spectral Area} = 2E(k_s\sqrt{\frac{1-\frac{v}{c}}{1+\frac{v}{c}}} - k_s)$$

$$= 2Ek_s(\sqrt{\frac{1-\frac{v}{c}}{1+\frac{v}{c}}} - 1)$$

$$= 2Ek_s(\frac{\sqrt{1-\frac{v}{c}} - \sqrt{1+\frac{v}{c}}}{\sqrt{1+\frac{v}{c}}})$$

$$= \text{constant} \rightarrow \sqrt{1-\frac{v}{c}} = 0. \qquad (14)$$

That is, $1 - \frac{v}{c} = 0$.

$v = c$.

This result excludes relativistic Doppler shift. Rather, it is necessary to implement a rectangular spectrum, that of the QTE analysis, in electron wave space. The "constant spectral area" approach does not work for physical space, only electron wave-space. In particular, the only useful thing we can do with the non-rectangular, non-dual-triangular spectrum is to convert it to the rectangular or the dual-triangular spectrum via the relativistic transformation v:0 → c, in a *naked* Reverse Higgs process. It only works for the naked Reverse Higgs, not the energy input circumstance, because we require $v_t/v_0 = c/0 = \infty$, it has to be an infinite transformation, to fully "flatten the top" of the wavenumber spectrum, make it rectangular.

Now, that covers the relativistic spectrum → square spectrum circumstance, as per Figure 10 above. What about the dual-triangular QTE spectral circumstance? To make some progress here, we need to do a "potential shift" of the relativistic spectrum, to bring the spectrum down, so it is sitting on the x-axis, the wavenumber axis. When we do this, the transformation between relativistic space and the electron wave-space of QTE is fully apparent.

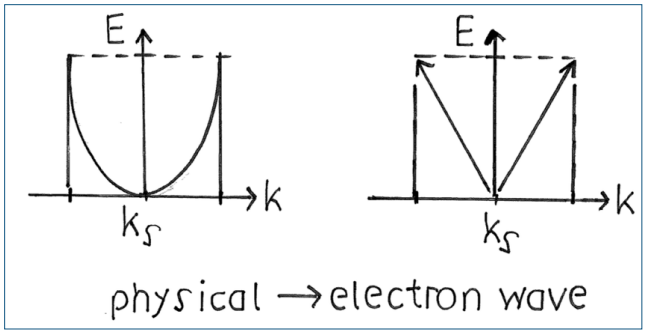


Figure 29: An Arbitrary Potential Shift on the y-Axis, Corresponding to Altering the Work Function of the Metal, in Fact, Removing the Work Function, So We End Up with a Photon Travelling in Free Space, Outside the Metal Lattice.

So, regarding the two "wavenumber vectors", in the dual triangular QTE spectrum above, the one pointing to the right of k_s is the electronic contribution, the one pointing to the left is the positronic contribution. This is *not* a rectangular spectrum, as per Figure 1 above. The rectangular spectrum occurs in the case that the fermion and the anti-fermion are *out-of-phase*. It is obtained by analogy with the QTE current-carrying processes.

Conclusion

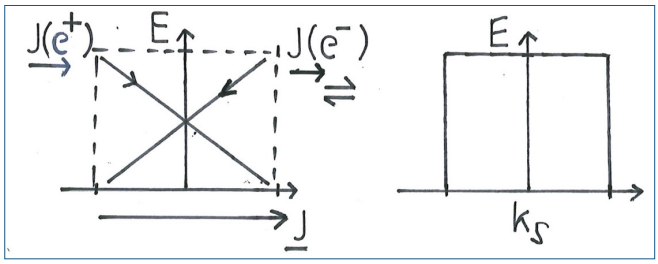


Figure 30: In the "Fermion and Anti-Fermion Out-of-Phase" Scenario, by Analogy with QTE Dual Current Processes, we Obtain a Rectangular Spectrum. When Fermion and Anti-Fermion are *in-Phase*, We Rather Have a Dual-Triangular Spectrum, the Two Sides of the Spectrum Add to One Another, they do not Subtract FROM One Another.

Well, the whole thing about QTE is that we are talking about *photons*, the aim is to account for the Planck equation, $E = h\nu$, and we have done that. And each photon contains a fermion and its anti-fermionic ghost. Yet the solution to the Maxwell equation, $\Psi = \Psi_0 \times \exp j(kx - \omega t)$, accounts for *two* photons, an electronic photon, and a positronic photon, and the electron propagating on the wave at $v = c$ is one quarter wavelength out of phase with the positron propagating on the "alternative wave". So the electronic photon has a positronic ghost, they are propagating on the same electromagnetic wave, the fermion is on one oscillation and the anti-fermionic ghost on the orthogonal oscillation, in phase. But if you compare the fermionic-anti-fermionic content between *two* individual photons, the fermion is *out-of-phase* with its anti-fermion. So the two possibilities for electron wave-space in QTE, in phase fermion-antifermionic, dual triangular spectrum, versus out-of-phase fermion-antifermionic, rectangular spectrum. In-phase applies to the fermion and its antifermionic ghost, within an individual photon, and out-of-phase applies to the fermion in one photon and its anti-fermion in the dual photon.

So each photon contains a fermion and a ghost. Each of these has spin $\pm \frac{1}{2}$, giving possibilities for the photon spin, $s = 0, \pm 1$. And the energy of the photon is $\frac{1}{2} mc^2 + \frac{1}{2}mc^2 = mc^2 = h\nu$.

This process has to be mimicked by the *strong* force, where the Maxwellian wavepacket, $\Psi = \Psi_0 \times \exp j(kx - \omega t)$, has *two* fermions and *zero* ghosts. So, in what manner is the QTE process related to the strong force? The *neutron* is gauge boson for the strong force, and the neutron can be massless, $v = c$ or massive, $v < c$. When you have two neutrons, involved in a strong interaction process, pulling two protons together into an alpha-particle, ${}^4_2He$, the "currency" for radioactive decay. The neutrons, consisting of e^+/e^- propagating on electromagnetic flux tubes connecting the two protons, $v = c$. But when a neutron is *not* involved in a strong interaction, binding two protons together, it simply exists as a solitary, massive particle, in fact very akin to the proton itself, but the massive neutron is uncharged, that's about the only manner in which it differs from a proton. This circumstance is facilitated, for the strongly interacting neutron, massless neutron, carrying massless e^+, e^-, propagating orthogonally on the dual electromagnetic wavepacket, by:

$$|\mathbf{E}| = E = m_0c^2 \times \exp j(kx - \omega t)$$

$= 0 \rightarrow v = c$, (QTE).

The massless neutron, involved in a strong interaction, between two protons. And:

$$\text{(i)} \quad |\mathbf{E}| = E = m_0 \exp j(kx - \omega t) \rightarrow \infty. \text{ Then:}$$

$v \rightarrow 0$, (QTE). Well:

Energy = KE + PE

$= \frac{1}{2} mv^2 + m_0c^2$

$(v \rightarrow 0) = m_0c^2$.

And so relative to KE, the PE becomes infinite:

$m_0(c^2) \rightarrow \infty$.

So what is different, in this respect, between the photon and the neutron? Everything is the same, except for one thing. The neutron carries e^+ and e^-, no ghosts, the total electric charge zero. So consider the Lorentz force:

$$\mathbf{F} = q(\mathbf{E} + v \times \mathbf{B}).$$
$$\downarrow$$
$$0$$

Because $q = 0$, it is no longer necessary that $\mathbf{E} + \mathbf{v} \times \mathbf{B} = 0$, in order that the neutron, as opposed to the photon, will not be deflected by any external electromagnetic fields. So we *lose that*, the electric oscillation can be displaced from the magnetic oscillation, axially, along the direction of propagation, the field **E** gets out of phase with the field **B**. This might be necessary, in order to prevent the fermion impinging spatially on the anti-fermion, the two fields are displaced axially from one another, where otherwise the fermion and the anti-fermion would coincide in space, obviously not permitted. By contrast, a fermion and a ghost can overlap in any manner that might be required, there are no constrictions placed on the position of the fermion versus the position of the ghost. And it is clear that if **E** gets out of phase with **B**, the negation of the Lorentz force, $\mathbf{E} = -\mathbf{v} \times \mathbf{B}$ is not going to be applicable.

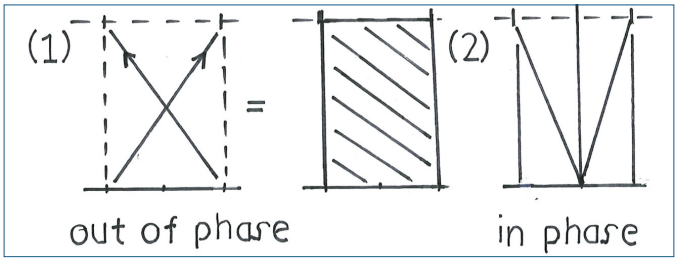


Figure 31: (1) Inter-Photonic, Out-of-Phase → Rectangular Spectrum, Versus (2) Intra-Photonic, Fermion and Antifermion (Ghost), In-Phase → Dual-Triangular Spectrum, as Presented in Toth-Maatian Review, 1990-93.

So for intra-photonic, in-phase, the same oscillation is carrying the fermion and the anti-fermionic ghost. Both of these spectra are QTE, as opposed to relativistic space, "physical space". These QTE spectra originate in the frame of the Reverse Higgs boson, where the fermion and the antifermionic ghost reside. In phase, within an individual photon, out-of-phase conversely when we compare the fermionic content of two separate photons, tied together by the Maxwell wave equation solution, $\psi = \psi_0 \times \exp j(kx - \omega t)$. The one of these is an in-phase association, the dual triangular spectrum, and the other is out-of-phase, the rectangular spectrum.

So, the spectral algebra is accounted for, identically by a rectangular spectrum, or a dual-triangular spectrum. The algebra is identical in both circumstances. Wavenumber k_S at the centre, the non-relativistic Doppler-shift formulae to either side of k_S. Whatever the shape of the spectrum, rectangular or dual-triangular, out-of-phase fermions or in-phase fermions, interphotonic versus intraphotonic, the resultant algebra, E(v), is identical. You can do it with either spectrum, the spectra are dramatically different in shape, but the resultant algebra is identical.

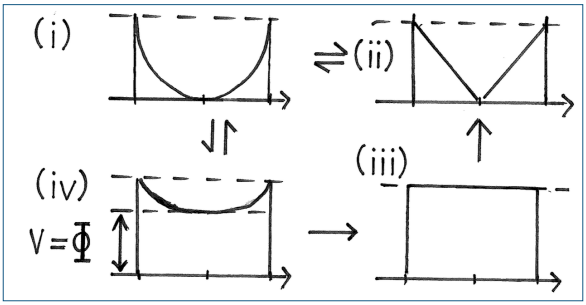


Figure 32: Transformations between the Various Spectral shapes. We have (i) and (iv) Such That to Convert Between, One Does a "Vertical Potential Shift". The Dual-Triangular Spectrum does not Have the Vertical Potential Variation Possibility. With the Square Wavenumber Spectrum, (Out-of-Phase), a Vertical Shift Changes Nothing.

So, regarding the transformation (i) → (ii), in the figure above, clearly there is a correspondence here, so while we are in physical space, not electron wave-space, for (i), nevertheless it is an inter-photonic circumstance. That is, in (i) we are in observation of two photons. Because relativistic dynamics, most particularly the relativistic Doppler shift formulae, is obtained by observation of the Maxwell wave, exp j(kx - ωt), a cosine plus a sine function, out-of-phase. It is all done in *observation* of two photons. By contrast, spectrum (ii) is in-phase, intra-photonic, within an individual photon.

In contrast, to pin down the QTE wavenumber spectra, two of them, you need to transfer to the frame of the Reverse Higgs boson, the "v = 0" frame is no longer the relevant frame. When you transfer to the photonic frame, you find $k_s \rightarrow 0$, $v \rightarrow 0$ (QTE), and intensity $E^2 \rightarrow \infty$. Now, for the transformation (i) → (iv), a "vertical" potential shift is involved, according to variation of the metallic work function, Φ. But any potential shift, vertical displacement, is not going to alter the fact that spectrum (iv) is a rectangular spectrum. Conversely, the spectrum (i) is a fundamentally different "shape" to the spectrum, (iv). Yet we have the transformation (iv) → (iii), afforded by the "infinite transformation", v: 0 → *c*, [5].

That is the jist of it. The relativistic, physical spectrum is obtained by *observation* of a photon, or more accurately, two out-of-phase photons. The QTE electron wave-space spectrum is obtained by accelerating to v = *c*, that is, you *enter* a photon, to observe the fermion and its ghost. And regarding the two different spectral shapes, (ii) and (iii), for the QTE analysis, they produce identical algebra.

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