

Extending the Standard Model Strictly is by Denoting the Observer the “Mass Gap”

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Observer remains in quantum mechanics an undefined notion. I argue that to eliminate the measurement problem, for instance, the observer must not be considered also an observable. Instead, it must be deemed by own definition as the self referencing state rather the *qualitatively* “un-definable”; in the exact same sense that the self referencing state is in Gödel’s 2nd incompleteness theorem own “un-decidable” qualitatively. This has the crucial import that the observer is in fact the “uncertainty” proper—same seen otherwise as the entanglement (norm; wave function) of observables. It is modeled here as the zero refractive index $n_o = v_g/v_p$. Meaning, observables are *non-zero* refractive indices. I show here that *absolute neutrino mass* (sterile neutrino) is in fact the “mass gap” n_o signifying man as the observer v_p .

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(1. a) INTRODUCTION:

Quantum mechanics treats rigorously of “observables” yet, oddly, it leaves the term “observer” hardly a rigorous notion. This lacuna gives rise, I suspect, to the measurement problem. One argues here that, it being the only agency by which to actually source/define the observables, the “observer” must be by definition itself *not* an observable (otherwise we have a case of circular reasoning). Instead, whatever the exact observables, the observer proper is what we must understand by the *initial condition*; same indeed represented in the standard model as the *uncertainty*/quantum of observables or in quantum field theory perhaps as the “mass gap”. To rephrase, the observer must be by *own* description as the self referencing state actually the “un-definable event”—in the exact same sense that in Gödel’s 2nd incompleteness theorem the self referencing state is to own self the *qualitatively* “un-decidable”. This granted, the practical question really is: how may we then model *physically* the qualitatively undecidable i.e., the self-referencing state? I propose here that it is as the zero refractive index n_o . And I show that this indeed is status of absolute neutrino mass (“sterile neutrino”) namely, it is the “mass gap” proper such that it is actually only its spectrum as the beat frequencies i.e. its so-called “oscillations” or “interference pattern” that constitutes the valid observables (e.g. matter/antimatter or space/time, wave/corpuscular nature etc).

(1.b) IMPORT:

The above approach to quantum theory would mean that the quantum need not be seen as some fixed absolute quantity, as the Planck constant is currently held to be. The quantum is thus ad hoc, it is simply the given observer. The observer (self-referential state) is, in other words, the norm n_o which, in principle, screens off (“symmetry-breaks”) every other. The observables proper are by definition thus solely *factors* or “scaling” (i.e., interference pattern or “dispersion” or “oscillations”) of n_o . They are then the “non-zero” refractive indices. Implied is that n_o per se, it being entirely the generator of scale or gauge e.g. mass, is the de facto “quantum field” typically seen perhaps as the scalar field or in general as the gauge group.

One pictures this simply as the sine wave [1] (or wave front of Huygens’ Principle)—

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“it retains its wave shape when added to another sine wave of the same frequency and arbitrary phase and magnitude. It is the only periodic waveform that has this property....then a standing wave pattern is created. Note that, on a plucked string, the interfering waves are the waves reflected from the fixed end points of the string. Therefore, standing waves occur only at certain frequencies, which are referred to as resonant frequencies and are composed of a fundamental frequency and its higher harmonics.”

(1.c) KEY EVIDENCE:

If fundamental nature is wave nature [2], [3], [4] then as only a part thereof the observer must be fundamentally too wave nature. Assume, now, that in being our own working “observer” man’s sensory threshold (say, the action potential threshold in man quoted at 55 millivolts [5]) h_o signifies the phase velocity “ v_p ”. It is thus the reference wave front (i.e., the normal, norm, critical angle) from which we are viewing a Huygens’ Principle soup of waves. Presently, let this whole soup of waves be represented by the CMB radiation as namely the group velocity “ v_g ” (perhaps hitherto the “black body cavity”). We should have between these a non-dispersive *media* defined by: $v_g/v_p = o = n_o$ so that “ n_o ” is the zero refractive index (perhaps the “black body radiation” proper).

Now, I predict “ n_o ” to signify here specifically the absolute neutrino mass-energy of precisely $55 \times 10^{-3} \text{ eV}/c^2$, this being actually the mass/energy equivalent of 55 millivolts —the observer. I suggest that this *rest mass* should define the so-called sterile neutrino [6], [7] . Meaning, it is never directly an observable; it is rather the space-time (wave function) proper. We can conclude thus: man in being our working *observer* “ h_o ” is also our de facto *quantum* “ n_o ” of observables. Put differently, man as our substantive observer is also our most fundamental “gauge group”—something pictured standalone as perhaps the “mass gap” or “natural unit” or the “wave function”.

The observables proper are predicted hereby to be then the anomalous/normal *dispersions* of “ n_o ” i.e., the *non-zero* refractive indices. As a clue to this, we note that $(n_o/4\pi)$ is actually the conventional *natural unit* of energy (in eV)—and hence at once also the implicit natural unit of mass (10^{-36} kg). In the frequency unit this simply is $1.67119421 \times 10^{14}$ hertz, signifying probably the Josephson constant as/or the so-called elementary charge (in the e/h unit).

Indeed, we can go even further and see the term $(n_o/4\pi)$ as replacing the term “electron volt” with the “neutrino volt” such that it is the authentic “elementary charge” defined stand alone as the neutrino stationary state $(n_o/4\pi)$. On the basis of this latter we should get even more precise predictions of observables.

It turns out, meanwhile, that the evolution i.e., Compton shifts of the “mass gap” n_o as reported by the mass gap *itself* is to be modeled entirely by the recursive form. Implied is that *it* (the observer and its dynamics) is simply the *asymptotic* i.e., qualitatively the “undecidable” if the so-called entanglement of physical information. We can picture it mathematically as the imaginary unit per se i , see Hawking-Hartle [8], [9] . This is such that its observables are the associated real numbers. And so we have altogether the complex form $(x + iy)$ or its conjugate. Thus spontaneous symmetry breaking must be a round-about statement of the fact that (a.) The observer (gauge invariance) is materially simply the self-referential state typically the wave function (or beat *frequency*) and vice versa. And the observables are its interference pattern—altogether its *beating*. (b.) the observer cannot actually observe itself. Rather, (c.) the observer is a self-contained state (a singularity); it may only be perturbed (Compton-Shifted) by another.

This simply is the all-or-none (self-referential) model of nature. It sees the observer as the “none information” (the modulus or “fundamental frequency”) and the observables as the “all information” (the modulations or harmonics or interference pattern). The key solution here to the measurement problem is that until we have specified the observer we cannot actually have the observables (determinism).

Another key tenet is that the observer is *not* a state that one may actually observe; it is a state that one may only actually *be* (or not be). Once we can picture the observer as the de facto *quantum* of observables the measurement problem vanishes.

This will suggest that as a variable parameter albeit merely the initial condition the observer (quantum) is really to be seen as the substantive virtual exchange particle a.k.a. the “mass gap” of the standard model. This is such that globally the quantum is effectively a Markov property and so is materially speaking the asymptotic—the qualitatively “un-decidable”. This eliminates realism of any sort, in fact it insists that the quantum is not even some fixed absolute value (as the Planck constant is conventionally regarded); the quantum is entirely like the imaginary unit a Markov property.

Meanwhile, seeing the observer as the “mass gap” (stationary wave), and hence as entirely what specifies the observables, should explain the double slit experiment (resolving the so-called measurement problem). This perspective should also resolve the so-called hard problem of consciousness (in so far as it borders essentially on the measurement problem i.e., that problem of indistinguishableness or otherwise of the observer and its observations). I propose, succinctly, that the given observer is the given *natural unit* (and natural limit) of physical information.

I interpret the singularity (“space-time”; “black hole”; “virtual exchange particle”; “self”) simply as in the 5th axiom of Peano’s axioms [10]; it contains *all* the physical information. It is the all-or-none.

(2.) THE MANY SHADES OF THIS ARGUMENT:

“The abstract idea of invariance under a certain transformation is shared in the formalism of both symmetry and self-similarity...”
—L. H. Kauffman [11]

There are many different ways of making this basic argument that the neutrino stationary state (neutrino absolute mass) is the zero refractive index i.e., wave mechanically the “stationary wave” and generally the *natural unit* of physical information.

Perhaps the most simple, way to frame our argument would be that we aim here to show that the observer h_0 is in fact own most fundamental definition of “nothing” n_0 . However, “nothing” hardly does justice to the concept of n_0 . The term “quantum of observables” or in physiology the term “all-or-none” [12] probably come closest. We would need to merge these two into one rigorous notion of *self* in the term self-reference.

Here we shall briefly try to show n_0 as (1.) the proper “string” for string theory (2.) the conventional Josephson Effect, (3.) the beat *frequency* or Casimir Effect and (4.) the “preferred frame”, in the sense that it is a particular norm (i.e., initial condition or threshold) I_0 in a relative intensity scale.

(2. a.) NEUTRINO AS THE PROPER “STRING” FOR STRING THEORY:

“Self-reference is the infinite in finite guise!”

—L. H. Kauffman

Perhaps the single strongest reason to reject our neutrino mass hypothesis right away would be that it obviously rejects the well tested Planck’s constant as the quantum of observables assuming instead that the quantum of observables is the self referencing state (the observer). But on a closer inspection here actually proposes neutrino absolute mass as the reciprocal of Planck’s constant say, as the natural unit of time. In the CODATA this equation has rather electron parameters thus $(\hbar/m_e c^2)$. Substituting now with our neutrino parameters as both the quantum of observables and the mass term we have that:

$$\frac{\text{neutrino frequency}}{\text{neutrino mass} * c^2} = 1.5091902 \times 10^{33} \text{ m}^{-2} \text{ kg}^{-1} \text{ s} = \frac{1}{h} \quad \dots \dots (1.)$$

This would be then the actual inverse or reciprocal of Planck’s constant. This will represent perhaps the most direct evidence for our hypothesis here.

We can also couch this argument in the form that n_o is simply the elementary charge thus $(e/h) = (n_o 4\pi/h)$ this being simply the frequency equivalent of absolute neutrino mass as signifying the applicable virtual exchange particle or “beat frequency”—the mass gap. To this effect we note that at $(55 * 10^{-3} \text{ eV}/c^2)$ absolute neutrino mass could be regarded as apriori the proper conversion factor between mass and energy. In the eV/kg unit this will be a correction of just two orders of magnitude to current CODATA value. And in the eV/u unit it is at $\approx 10^{-9}$ u tantamount to adopting absolute neutrino mass as the substantive vacuum energy [13]

Recall that perhaps the toughest obstacle to a theory of quantum gravity, to which in fact string theory is a response, has been the “zero-distance behavior” [14] in quantum field theory namely, the problem of infinities or the non-renormalizability of quantum gravity. The question here is: what of if we thought of the observer simply as the norm (normal; critical angle; zero refractive index)? It should follow then that the observer is simply all it takes to renormalize gravitation. The core proposal here is that we should have then a substantive gravitational norm in the parameter n_o .

Perhaps this would be merely like adopting ourselves as observer e.g. h_o as the reference wave front say, the phase velocity v_g , in a participatory observer form of Huygens Principle (same otherwise known, perhaps, as a space-time diagram). Indeed, barring whatever has been assumed to be physical attributes of the “graviton”, it seems that n_o should represent our bona fide quantum of gravitation. In so far as string theory in principle requires a “Planck length” to be able to make falsifiable predictions, that length should signify absolute neutrino mass thus,

$$\frac{c}{n_E/h} = 22.5425814 \text{ microns} \quad \dots \dots \dots (2)$$

Wherein, n_E is energy equivalent $(55 * 10^{-3} \text{ eV})$ of the neutrino mass. In fact this quotient roughly is the natural unit of length in the $(\hbar c/\text{eV})$ unit. Observe too that this length scale resembles more the conventional Planck length in the alternative form

$$\frac{n_0}{c^2} = 1.56703723 * 10^{-33} s^3 m^{-1} \dots \dots \dots (3)$$

As already indicated above n_0 ($1.40838283 \times 10^{-16}$ m s) here equals the cmb peak wavelength density (λ_{max}) divided by the frequency equivalent of n_E . Equation [3] may offer then an example of quantum gauge theory in four dimensions in that it signifies a gauge group.

(2. b.) THE NEUTRINO AS JOSEPHSON EFFECT:

Now assume that man as the relevant gauge invariance (observer) is nature's "voltage standard". In relation to the CMB peak frequency density ν_{max} we should have then a distinctive natural scale for the *Josephson Effect* (perhaps as defining the "vacuum" or "mass gap" or "elementary charge"). Thus,

$$\frac{cmb \ frequency \ value}{h_0} = Kj \dots \dots \dots (4.)$$

Now, I suggest that Kj should be the natural Josephson constant as predicted by our present hypothesis. In other words, if we thought of the cmb as unit Hertz and thought of h_0 as the unit volt then Kj should be the "mass gap" predicted wave mechanically by $v_g/v_p = 0 = n_0$. In other words, Kj should represent the zero refractive index. Think of it as the neutrino volt in analogy with the electron volt.

Strictly perhaps, it would be the neutrino defined as a beat *frequency*. By our electromagnetism analogy this should be the "elementary charge" defined perhaps as the neutrino stationary wave $(n_0/4\pi)/h$ in analogy with the electron volt (eV). Note that the neutrino stationary wave thus is same as mean frequency of visible light.

I suggest that our observer h_0 at 55 millivolts is the natural voltage standard yielding the n_0 as something akin to the Coulomb force constant which defines the Ampere and also represents the conversion factor between electromagnetic and mechanical phenomena.

One will only note, additionally, that when in the equation for Josephson constant we simply replace Planck's constant with h_0 , and then in place of the Josephson number 2 we have the number 4 (as signifying perhaps a 4-flavour neutrino) we get a value that is very likely hc^2 . Thus,

$$\frac{4e}{h_0} = 1.16521932 \times 10^{-17} \ farads = c^{-2} = \frac{1}{c^2} \dots \dots \dots (5.),$$

$$\approx \hbar \ in \ eV = \sqrt{\frac{h}{c^2}} \approx (n_0 4\pi)/h \approx e/h \dots \dots (6.)$$

The whole point is, perhaps that we should take $(4\pi n_0)$ to be the natural form of $(4\pi \epsilon_0)$ or $(u_0 \epsilon_0 = 1/c^2)$ which hitherto are assigned values. The term $(4\pi n_0)$ would be then what to mean materially (as against wave mechanically) by the "mass gap".

(2. c.) THE NEUTRINO AS BEAT FREQUENCY (CASIMIR EFFECT):

"Any distinction involves the self-reference of 'the one who distinguishes' "
—L. H. Kauffman

Now, let us attempt to define the neutrino as strictly a beat frequency thus,

$$f_1 - f_2 = f_0 \dots\dots\dots(7)$$

wherein f_1 is frequency equivalent of h_0 specifically ($55 \times 10^{-3} \text{ eV}/h$), and f_2 is frequency value of the CMB say, its ν_{max} . Then f_0 is the constant refractive index between them pictured now as the beat frequency between them (perhaps what has been termed the Casimir Effect) [15], [16] f_0 bestrides then the matter-antimatter spectrum i.e., the constructive versus destructive interference spectrum. It is thus the vacuum energy proper. Now observe that this assertion agrees with the perhaps more direct relation below,

$$(\text{cmb in eV})/(\text{h}_0 \text{ in volts}) = 6.70001132 \times 10^{-22} \text{ coulombs} \dots\dots\dots(8)$$

Which on the surface suggest the charge on/of our neutrino and therefore the elementary charge. Note, however, that in accord with its self-referential or gauge invariance status if the neutrino be the quantum of charge then it need not be itself an apparent observable “charge”. It need be only the virtual charge namely the effective charge conservation law or “field”, this being what we should mean physically by the beat frequency (strictly the neutrino oscillation unitary matrix or the wave function). See appendix for more detail on this perspective. Meanwhile, all the foregoing will lead us to a notion of the neutrino stationary sate.

(2. d.) THE NEUTRINO AS ZERO OR CONSTANT REFRACTIVE INDEX
(STATIONARY WAVE OR “PREFERRED FRAME” OR “SPACE-TIME”):

If a set S of numbers contains zero and also the successor of every number in S , then every number is in S .
—Peano [10]

“Self-similarity is embodied in the expressed fact that a has a copy of itself within itself. This is another reading of the equation $a = >a$. How is this formal self-similarity related to our intuition of self-within-self through introspection? I suggest that in form these circumstances are identical. It is in moving through the cycle *and* seeing the invariance that we come to a reflection of the self.”
—L. H. Kauffman [11]

“Each photon then interferes only with itself. Interference between two different photons never occurs.”
—Paul Dirac [17]

If granted the conventional argument that $\lambda f = c$, it should also be valid to adopt the converse argument that $\lambda/f = 1/c = \hbar$ (Planck’s constant perhaps in the eV s) unit, this latter being representative of the applicable “photon” or quantum of light. Now if we combined the two arguments say, in the natural unit sense that $\hbar = c = 1$ we should have effectively a model of variable speed of light in the sense of Dirac’s $\pm c$ [18].

In this writers view, implied in Dirac’s $\pm c$ is that speed of light could be viewed as at once the effective unit-and-limit of physical information. Such a model would signify indeed the “standing wave” (the self referential state) which ordinarily does interfere with itself infinitely in the recursion sense (and without collapse!).

This says simply that speed of light evolves and devolves as a recursive form say, as a self-similarity scale, if and only if we assumed a “self” to be by definition a distinct speed of light n_0 or v_g . It follows that the general relativity notion of a space-time diagram could be seen simply

as a self referencing state. It appears thus that Huygens Principle per se could be seen as modeling a self-referencing state namely, a harmonic series or standing wave or indeed a space-time (see ref [18]).

It seems that the only physical ground for distinguishing between two or more speeds of light would be then the *assumption* that only the same wave can interfere. Speed of light is *not* itself the information; it is the limit of information. Likewise the Planck constant is not itself quantized; it is that which quantizes. Meaning, the *sameness* (standing-ness) of a wave can be ascertained only in hindsight: if there be no interference pattern it means we simply did not have a distinctive enough standing wave and vice versa. In other words a standing wave is simply not an observable; it is the observer proper.

Now, this approach does offer a peculiar solution to the measurement problem as illustrated by the double-slit experiment in that we can presently extract a few tenets: (1.) the interference pattern (harmonics) must be pictured as by definition “contained” within the wave function (standing wave). One cannot then have either and leave the other. This simply is the all-or-none nature [19]. Analogously, (2.) the observer, in so far as by this we mean materially the *stationary wave* (zero refractive index) e.g. n_o , is simply the definition of “space-time” or in QM the “wave function”. Accordingly, because one cannot have actual physical instance of in-phase versus out-phase without first adopting a reference phase, in the double slit experiment we must assume that every *actual* interference pattern presumes a *unique* standing wave; it is what gives rise to the pattern in the first place. We can assert then that (3.) a wave function “collapses” on observation only by the extent that it is *not* really the wave function observing itself for then it fails to qualify as the *self-referencing* state. In the collapse scenario therefore we have instead the damping of a resonance state. And is really is as good as adopting a different norm (normal; wave front) altogether.

In the Huygens Principle analogy, the wave function being a participant in the “events” it observes may then actually only observe its own forward (or backward) light cone but never both—just as the Huygens model of speed of light is valid only in the odd dimension space (or say, in the forward light cone). The foregoing should explain simply matter-antimatter asymmetry. Namely, in real life we may only have time or matter as an extended spectrum but not space or antimatter. Matter (mass) may be regarded then as the *constructive* interferences.

The closest thing to matter and antimatter (i.e., destructive and constructive interferences) featuring apparently equally must be in the acoustic phenomenon of beating. In reality the beat *frequency* then must be the elementary charge or in general the [charge] conservation law. This will mean that the supposedly neutral body is only a distinct charge conservation law; indeed a different charge regime n_o .

The point now is that any self referencing state n_o may be considered in wave mechanics terms necessarily the stationary wave. In this sense it is at once its own photon: $(n_o 4\pi) = (u_o \epsilon_o) = 1/c$ (say, globally $\hbar / c m b \nu_{max}$) and also its own speed of light c (globally the CMB radiation times \hbar). The self-referential state (observer) n_o must be same then as Dirac’s $\pm c$ [18].

“Paul Dirac (1902-1984) gave an interesting general argument for a much stronger version of Huygens’ Principle in the context of quantum mechanics. ...To approximate as closely as possible to the instantaneous velocity, the time interval must go to zero, which implies that the position measurements must approach infinite precision. However, according to the uncertainty principle, the extreme precision of the position measurement implies an approach to infinite indeterminacy in the momentum, which means that almost all values of

momentum – from zero to infinity – become equally probable. Hence the momentum is almost certainly infinite, which corresponds to a speed of $\pm c$.”

We can understand thus that,

$$(\text{Planck's constant } h \text{ times the cmb peak frequency density } \nu_{max}) = \text{neutrino rest energy} \\ (n_o/4\pi) = 1.06149642 \times 10^{-22} \text{ joules} = \text{the proper Planck energy.} \dots\dots\dots(9)$$

$$\text{Conversely, (Planck's constant } h \text{ divided by the cmb temperature)} = 2.4311571 \times 10^{-37} \text{ m kg s}^{-1} \\ \approx \text{neutrino rest mass-energy } n_o. \dots\dots\dots(10)$$

Mathematically, the self referencing state $(n_o/4\pi)$ should amount basically to Peano's 5th axiom, in the sense that it is at once own *unit* and *limit* of physical information. It follows that, in so far as only the same wave may interfere, the self-referential form is essentially a “preferred frame” indeed the very state we call presently the *natural unit* or in mathematics the *imaginary unit*.

The bottom line is that by all useful definitions the substantive gauge invariance (the “constant” or “self”) cannot be to own self an observable; it must have observationally only a virtual status just as Compton's virtual “photon” and Einstein's “space-time”. This virtual becomes effectively “real” only in the sense that it is the *self* in the term “self reference”. Thus we can understand that just as $\lambda f = c$, it is true that

$(\text{CMB } \lambda_{max}) * (\text{frequency of the neutrino}) = \text{the observer proper as the applicable wave speed}$ perhaps the so-called “scalar field”. Thus

$$(1.873 \text{ mm}) * (1.32989409 * 10^{13} \text{ Hz}) = 2.49089163 * 10^{10} \text{ m s}^{-1} \dots\dots\dots(11),$$

Illustrating this more locally we have that, $(\text{neutrino rest energy}) * (\text{neutrino rest mass}) = \text{the applicable action}$. Namely,

$$(55 * 10^{-3} \text{ eV}) * (55 * 10^{-3} \text{ eV}/c^2) = 8.63982117 * 10^{-58} \text{ m}^2 \text{ kg}^2 \text{ s}^{-2} \dots\dots\dots(12),$$

Now, applying instead division as the reverse operation to multiplication in the last two equations we find that

$$(1.87300 \text{ mm}) / (1.32989409 * 10^{13} \text{ Hz}) = 1.40838283 * 10^{-16} \text{ m s} \dots\dots\dots(13)$$

While,

$$(55 * 10^{-3} \text{ eV}) / (55 * 10^{-3} \text{ eV}/c^2) = 8.98755179 * 10^{16} \text{ m}^2 \text{ s}^{-2} \dots\dots\dots(14)$$

So, while there are many ways to define wave speed [20], the group velocity v_g versus phase velocity v_p approach to modeling quantum gravity or dispersion relations (i.e., the evolution/devolution of speed of light) is certainly more symmetrical or gauge invariant. It permits us to define gauge invariance effectively as the zero refractive index or zero point energy or “mass gap” i.e., as the given *self* in “self-reference”.

In practical terms, it permits us to define the observer simply as the wave function n_o , and vice versa. Meaning, the observer is as a definition the “field” (the charge conservation law). The observables are then the “field quanta”—the “charged particles” or “spin states” (altogether its interference pattern).

Perhaps this is the one *extension* that the “measurement problem” is demanding of the standard model, a *valid* notion or model of the observer as per se the wave function—the “space-time” per se.

CONCLUSION: OUR AXIOM SET

- a.) A “wave function” i.e., *zero* refractive index n_0 is an observer (think of this globally as the norm, normal or *critical angle* below which we have the total internal reflection and above which we have the none-zero refractive indices).
- b.) Observables are the interference pattern i.e., the normal versus anomalous dispersions of the observer, this as implying specifically *none-zero* refractive indices.
- c.) The *observer* is not therefore in same instance also an *observable*; it is rather the modulus (“entanglement”; “space-time”) by which is described the modulations (the observables or the space and time).
- d.) There can be as any instance just one and only one *de facto* observer (*it* then is the *self* in “self-reference”). Need we add that the observer, in that it is globally speaking merely the initial condition, it is essentially then a Markov property?

In the second part of this discuss I try to frame the foregoing argument in the context of conventional Planck units.

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ACKNOWLEDGEMENT:

Caveat. This writer is not himself a trained physicist. He borders to write because he feels has caught a rear glimpse. He would have, however, the earnest scientist decide. In seeking answers to his own humble questions he has found the culture of creative commons among scientists a formidable resource he is indebted to. He welcomes the professional’s critique.

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APPENDIX:

This appendix is aimed to place in a wider context what appears within the body text.

(3.) SEEING HOYLES “STEADY STATE” AS EINSTEIN’S “COSMOLOGICAL CONSTANT”
AND BOTH AS THE SELF-REFERENCING STATE
(NAMELY, THE NEUTRINO “BEAT FREQUENCY” OR INDEED DIRAC’S $\pm C$):

“Any distinction involves the self-reference of ‘the one who distinguishes’ ”
—L. H. Kauffman

In any system of waves the norm, normal or “initial condition” adopted determines fundamentally what exact wave behavior e.g. what Doppler Effect or Compton Effects to be observed. As an example, we can see the cmb as in its own right a stationary wave or group velocity (so that it is a unique basis or “norm” on which to describe wave mechanical behaviors like refractions, diffractions, interferences, polarizations etc. This will mean that any

body of waves is very like a fractal having infinitely many degrees of freedom. In music for instance the keynote or fundamental determines the octaves (harmonics). This is very like in foundational mathematics as captured by Peano's axioms: the "constant" (think, number basis) determines the natural numbers i.e., the exact gradient of the successor function. We can therefore see the norm (constant; observer) as the Godel *formal system* in question. It is thus the de facto quantum of observables. To start with, we can actually see the cmb as our norm thus,

$$f_{\max} \lambda_{\max} = c_o \dots\dots\dots(1.)$$

Wherein, f_{\max} signifies the cmb peak frequency density (ν_{\max}) while λ_{\max} signifies the cmb peak wavelength density (λ_{\max}) and then we can take c_o to signify the cmb as a distinct wave speed ($1.69\ 812\ 000 \times 10^8\ \text{m s}^{-1}$). This would be then the one-way speed of light because it is roughly the conventional speed of light divided by two. Note also that c_o squared is at ($2.88361153 \times 10^{16}\ \text{m}^2 / \text{s}^2$) roughly same as the conventional c^2 . Now this all is telling us that we have in c_o what we might consider a preferred frame [21] [22], [23]. But, we want to take this to mean simply that c_o is indeed a stationary wave and precisely because only the same wave can interfere it is therefore unique; it is a singularity in its own right.

One can then imagine the harmonics or "beating" or Huygens' model of speed of light running or evolving from c_o or c_o^2 ($2.88361153 \times 10^{16}\ \text{m}^2 / \text{s}^2$) all the way down to n_o ($1.40838283 \times 10^{-16}\ \text{m s}$) and back, or indeed running vice versa. Now of these two possibilities the more natural axis or "spin" will seem to be that running from n_o to c_o^2 so then it should represent the natural axis of evolution. Meaning, n_o ($1.40838283 \times 10^{-16}\ \text{m s}$) is in signifying the observer actually the "fundamental" frequency or *keynote*. Eventually we can relate c_o^2 and n_o as a flux thus

$$(2.88361153 * 10^{16}\ \text{m}^2\ \text{s}^{-2}) * (1.40838283 * 10^{-16}\ \text{m s}) = 4.06122897\ \text{m}^3\ \text{s}^{-1} \dots\dots\dots(2)$$

Or conversely by division we have $= 2.04746285 \times 10^{32}\ \text{m s}^{-3}$. Note, meanwhile, that the inverse of this quotient is ($4.88409349 \times 10^{-33}\ \text{s}^3\ \text{m}^{-1}$) a value resembling more closely, perhaps, the conventional Planck length.

Now what do we make of all this? It explains basically that we have non-zero cosmological constant. Here is how.

If life (observer) v_g be the ultimate matter (mass gap) n_o then its "growth" must signify the ultimate impulse (for life necessarily grows). Now considering that this growth (impulse) might be termed simply the beat frequency (the frequency drift or the flux) then it explains cosmic inflation. It explains a non-zero cosmological constant.

The more conventional form of this argument would be that although mass is formally defined in terms of its inertia, it is usually measured by gravitation—its flux. Therefore, apparent position simply is momentum and vice versa.

Stated wave mechanically, observables must be only a form of the Doppler Effect. This is because to measure in principle say the "Lorentz transformations" or the Doppler Shift proper (or indeed the so-called Compton Shift)—to compare drift or shift of any kind, we must first fix our gauge or threshold. It is the effective norm or "initial condition" (by Peano's axioms the "constant" by which the natural numbers are specified). Now, because such "norm" is by definition ad hoc (tentative), we have that observables simply are a relative intensity scale.

However, we don't have the liberty of *choosing* a norm; we are the norm "chosen". We are the self-referencing state proper. We are the *preferred frame* [21] .

(4.) STEFAN-BOLTZMANN TYPE HOLOGRAPHIC PRINCIPLE:

One finds, per adventure, that we could phrase this argument quite simply in the Stefan-Boltzmann form that, $E = \sigma T^4$. Assuming CMB temperature to be the absolute temperature T wherein absolute neutrino mass (as signifying our *self*) is our constant of proportionality we have then that E embodies the CODATA mass *u* to energy *Hz* or conversion factor thus:

$$(2.72548 K)^4 * (55 * 10^{-3} eV/c^2) = 5.41007981 * 10^{-36} kg K^4 = \frac{(1 K)k}{c^2} = \frac{(1 eV)}{c^2} = \frac{(1 eV)}{k} = 1Hz \dots \dots \dots (3).$$

Clearly we are talking of the observer n_o as the relevant proportionality constant in some sort of holographic principle. Indeed if roughly we assumed the product above to represent the two dimensional mass-energy conversion scale or say, the area *A* in a Bekenstein-Hawking formula, then we may state the so-called entanglement entropy simply as neutrino absolute mass thus:

$$(5.41007981 * 10^{-36} kg K^4) / (2.72548 K)^4 = 9.80464049 * 10^{-26} m^4 kg / K^4 = (1 Hz)h/c^2 = (1 u) \dots \dots \dots (4)$$

See reference [13] . Perhaps, more strictly, by the Bekenstein-Hawking formula we should have roughly that,

$$S_{BH} = (A/4G) = 2.02652643 * 10^{-14} m kg^2 s^2 = (1 Hz)h \dots \dots \dots (5)$$

Now, true to this conjecture one finds that firstly,

$$(c_o * (\lambda_{max}/\text{neutrino frequency})) = 2.39160305 * 10^{-8} m^2 \dots \dots \dots (6)$$

And therefore secondly,

$$(A/4G) = ((2.39160305 * 10^{-8} m^2) / (4 * G)) = 89.5854953 kg s^2 m^{-1} \dots \dots \dots (7)$$

This we might take to be the entanglement entropy as, signifying perhaps, the Boltzmann entropy in the (k/hc) unit.

Then, thirdly, we can put this all more simply thus,

$$C_o / (n_o/4\pi) = (1.69812000 * 10^8 m s^{-1}) / ((55 * 10^{-3} eV) / (4 * \pi)) = 2.42161535 * 10^{29} m^{-1} kg^{-1} s \dots \dots \dots (8)$$

One sees this as the inverse of momentum space and which may qualify as the so-called entanglement entropy. Keep in mind that $C_o^2 / (n_o/4\pi)$ or indeed $C_o^2 * (n_o/4\pi)$ is then the inverse or reciprocal of neutrino absolute mass.

(5.) REVISING THE NEWTON-COULOMB INVERSE SQUARE LAW:

In fact we can phrase this line of argument as some inverse square law having the special trait that the observer is its *constant of proportionality* proper thus,

$$(n_o * \mu_B * \mu_N) / (cmb * G)^2 = G_o \quad \dots\dots\dots(9)$$

Here one sees G_o as the universal gravitational constant in natural unit ($\approx 6.70711 \times 10^{-57} / eV^2$) wherein μ_B and μ_N are respectively the Borh magneton and the nuclear magneton. The key point is that by definition the observer is the norm (quantum) that quantizes gravitation. Thus substituting μ_B and μ_N above instead with \hbar and c respectively as is the convention in the *natural units* we have that,

$$((n_o/4\pi) * \mu_B * \mu_N) / (cmb * G)^2 = 4.20989713 \times 10^{-27} \text{ m}^{-1} \text{ kg}^4 \text{ K}^{-2} \quad \dots\dots\dots(10)$$

Or indeed $= 4.20989713 \times 10^{-33} \text{ kg}^4 / \text{m}^3$. Both describe the observer n_o as the modulus (fundamental) by which is described a span of modulations (the harmonics). The numerator encodes the anomalous dispersions while the denominator encodes the normal dispersion. Yet, as in Snell's law, we never exclusively have either the "incident" or the "refracted" ray; we have always both as a complementarity principle or at best the whole as defining "none".

Now, simplify these so-called inverse square law arguments by making the basic assumption that in any system of waves the observer proper (in so far as it is also a part and parcel of the system of waves it observes) might be pictured wave mechanically simply as the reference phase (the wave front) n_o . This gives rise to expressing the observer cum its observables as altogether a space-time diagram a.k.a. Huygen's Principle model of speed of light; namely, basically a recursive (self-similar) form.

The lesson is that wave mechanically, just as in any physical scheme at all, we cannot distinguish between one and the same value; we can distinguish only in so far as there is a difference of values. But we cannot have differences except we adopt a standard of comparison. It is granted thus that a measurement is essentially a comparison of two values of which one necessarily is adopted apriori as the standard or "initial condition" (thus it is like in Peano's axioms the "equality" or "constant" on which *basis* the natural numbers are specified). All by itself the constant should be no more than a sea of infinities and this is just because physical information or proportion (finitude) obtains only as its "scaling" i.e., its interferences or "oscillations". It seems thus that the observer (self-referencing state) is what we should mean quantum mechanically by the norm or normal as implying the "vacuum" or "zero point energy" or indeed the "cosmological constant". I make the case that we should *stop* expecting this to be some actual observable; it is simply the observer in question i.e., the self-referencing state per se.

(6.) A THEORY IN NEUTRINO OSCILLATION:

To appreciate the assertion just above, assume that in some apriori system of waves the *observer* is by definition some unknown single frequency or energy or "wave front" of Huygen's Principle f_i . The question then is, how may we "measure" in principle this unknown observer frequency (the vacuum energy) and strictly *by itself*? I say it is from the self-referential perspective. Namely, we can assume that because it is roughly equal frequencies that *beat*, it should follow that the most fundamental instance of beating represents that frequency shift *closest* to the observer frequency (think of this frequency as the *mass oscillation*, "mass" being merely a quantum of energy or a Huygens' "wave-let").

Below the beat *frequency* we should have then the observer proper as representing the quantum i.e., the null information or singularity or entanglement. At exactly this beat frequency we should have basically uncertainty i.e., indeterminacy or “oscillation” between any two observables (perhaps the so-called time-energy uncertainty). And above it we should have increasingly apparent group dispersion; altogether a distinct interference pattern—which spectrum must constitute the observables proper (observable space and time, wherein the observer proper is the space-time).

Whatever we define the observables to be in fact they must be then most *indeterminate* closest to the observer i.e. they must *beat* closest to the observer frequency such that the observer proper is the substantive Mossbauer Effect—actually the point of resonance between all observables. Now, in so far as by “neutrino” we mean the *threshold mass* this is one reason we must see the neutrino mass oscillation *frequency* (say, its unitary matrix or “absolute mass”) to be where observables (typically G.R.’s “gravitational wave” and Q.M.’s “matter wave”) blend into one single frequency or phenomenon namely the “mass gap”.

This implies in fact a redefinition of observables under one scale—a “mass gap” scale or, more conventionally, an uncertainty-certainty scale.

The point then is that the most universal or unifying trait of all observables must be their intrinsic uncertainty f_c or, conversely, their intrinsic certainty λ_c . If we think of their uncertainty as their “beating” or Compton frequency f_c (typically the Planck’s constant \hbar) we must then think of their certainty as its Compton wavelength λ_c (or “period” or “beat frequency”), typically seen perhaps as the wave speed c_0 or c . Now, if otherwise we see f_c as their corpuscular nature (“time”) we must see λ_c as their wave nature (“space”), and so on ad infinitum. But we must accept that the most fundamental state of nature therefore is their *complementarities principle* (namely, the observer or self-referential state) as the “space-time” or beat *frequency* proper. It is that whose evolutions/devolutions are the observables.

Thus the observer per se is what classical physics perhaps broach under the notion of an “isolated system” or a “charge conservation law”. Modern physics perhaps sees it as the gauge invariance (symmetry).

A key importance in this notion of the self-referential state as in thermodynamics an *isolated system* is that we can then see the singularity (e.g. the virtual particle or the black hole or the space-time) to mean no more than a distinct observer and vice versa e.g. n_0 . The observables are basically therefore its “Compton scattering” or, more naturally, its interference pattern (its harmonics).

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REFERENCES:

- [1] Wikipedia.org, “Sine Wave”, 31 January 2017. [Online]. Available: https://en.wikipedia.org/wiki/Sine_wave. [Accessed 06 February 2017].
- [2] H. D. Zeh, “There are no Quantum Jumps, nor are there Particle!”, 01 1993. [Online]. Available: lss.fnal.gov/archive/other/print-92-0432.pdf. [Accessed 15 04 2013].
- [3] H. D. Zeh, “No Evidence for Particles”, 5 December 2009. [Online]. Available: <https://arxiv.org/abs/0809.2904v6>. [Accessed 29 January 2017].
- [4] C. Blood, “arxiv:0807.3930v2”, 24 July 2008. [Online]. Available:

- <http://www.arxiv.org/abs/0807.3930>. [Accessed 29 January 2017].
- [5] Encyclopædia Britannica., “"Action potential",” Encyclopædia Britannica., Chicago, 2012.
- [6] “"A White Paper on keV Sterile Neutrino Dark Matter",” 15 February 2016. [Online]. Available: [arXiv:1602.04816v1 \[hep-ph\]](https://arxiv.org/abs/1602.04816v1). [Accessed 06 February 2017].
- [7] J. W. Moffat, “"The Graviton as a Bound state and the Cosmological Problem",” 29 Oct 2003. [Online]. Available: [arXiv:gr-qc/0309125v2](https://arxiv.org/abs/gr-qc/0309125v2). [Accessed 06 February 2017].
- [8] “"wikipedia.org,” 29 June 2016. [Online]. Available: https://en.wikipedia.org/wiki/Hartle-Hawking_state. [Accessed 31 January 2017].
- [9] Encyclopædia Britannica , “"Cosmology",” Encyclopaedia Britannica Ultimate Reference Suite, Chicago, 2012.
- [10] E. W. Weisstein, “"MathWorld--a Wolfram web resource,” 30 January 2017. [Online]. Available: <http://mathworld.wolfram.com/PeanosAxioms.html>. [Accessed 30 January 2017].
- [11] L. H. Kauffman, “"Self-reference and recursive forms,” *J. Social Biol. Struct.*, vol. 10, pp. 53-72, 1987.
- [12] W. B. Cannon, “"Biographical Memoir, Henry Pickering Bowditch 1840-1911,” vol. Volume Xvii, 1924.
- [13] J. Baez, “"What is energy density of the vacuum?,” 10 June 2011. [Online]. Available: <http://math.ucr.edu/home/baez/vacuum.html> . [Accessed 28 January 2017].
- [14] P. Schwarz, “"Why did strings enter the story,” [Online]. Available: <http://www.superstringtheory.com/basics/basic3a.html>. [Accessed 29 January 2017].
- [15] E. Bianchi and C. Rovelli, “"https://arxiv.org/pdf/1002.3966v3.pdf,” 11 April 2010. [Online]. Available: <https://www.arxiv.org>. [Accessed 30 January 2017].
- [16] H. Z. S. E. Rugh, “"The quantum vacuum and the cosmological constant problem”,” *Part B: Studies in History and Philosophy of Modern Physics.*, vol. 33, no. 4, pp. 663-705, 2002.
- [17] P. A. M. Dirac, *The Principles of Quantum Mechanics*, 4th ed., Oxford.
- [18] mathpages.com, “"Huygens' Principle,” [Online]. Available: <http://www.mathpages.com/home/kmath242/kmath242.htm>. [Accessed 31 January 2017].
- [19] W. B. Cannon, “"wikipedia.org,” 30 September 2016. [Online]. Available: https://en.wikipedia.org/wiki/All-or-none_law. [Accessed 31 January 2017].
- [20] “"Phase, Group and Signal Velocity,” MathPages, [Online]. Available: <http://www.mathpages.com/home/kmath210/kmath210.htm>. [Accessed 07 February 2017].
- [21] “"One-way Speed of Light,” wikipedia.org, 22 December 2016. [Online]. Available: https://en.wikipedia.org/wiki/One-way_speed_of_light. [Accessed 31 January 2017].
- [22] J. S. Diaz, “"Overview of Lorentz Violation in Neutrinos”,” in *Proceedings of the DPF-2011 Conference.*, 2011.
- [23] “"Wikipedia.org,” 24 January 20. [Online]. Available: https://en.wikipedia.org/wiki/Modern_searches_for_Lorentz_violation. [Accessed 31 January 2017].